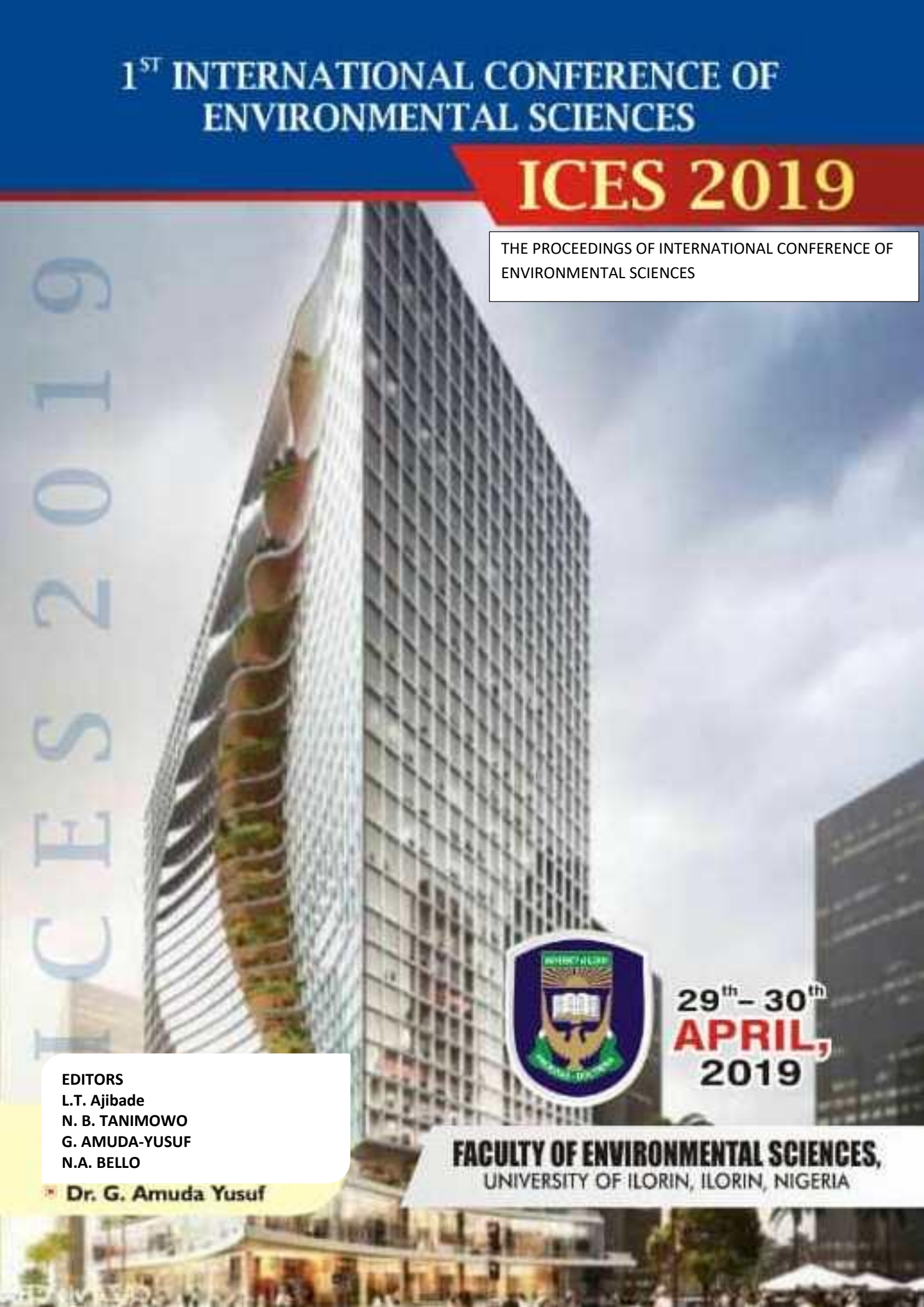
1ST INTERNATIONAL CONFERENCE OF ENVIRONMENTAL SCIENCES

ICES 2019

THE PROCEEDINGS OF INTERNATIONAL CONFERENCE OF ENVIRONMENTAL SCIENCES



EDITORS
L.T. Ajibade
N. B. TANIMOWO
G. AMUDA-YUSUF
N.A. BELLO



ICES2019

INTERNATIONAL CONFERENCE OF ENVIRONMENTAL SCIENCES

COLLABORATION FOR SUSTAINABLE DEVELOPMENT IN THE BUILT ENVIRONMENT

Editors:
Ajibade, L.T; Tanimowo, N.B, Amuda-Yusuf, G and Bello N.A

Faculty of Environmental Sciences, University of Ilorin, Ilorin, Nigeria

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FOREWORD

It's my privilege and pleasure, on behalf of the Vice Chancellor of this great institution, Prof. Sulyman Agenjolola AbdulKareem, to welcome you all here today. It has been a long journey since the idea of the first ***International Conference of Environmental Sciences*** (ICES) was muted. It looks then that we cannot do it, what with many other problems we have to cope with as a very young Faculty.

Being the very first academic outing of our fledging faculty, we are all aware that it cannot be our best effort. We just needed to start somewhere, hoping that in subsequent years, as we develop capacity, we will continue to build on gains of today. So feel free to tell us areas we can improve upon because in years to come, the goal is to make ICES a flagship biennial national dialogue.

The encouragement for the university administration, particularly our Leader and Vice Chancellor, Prof Abdulkareem and the doggedness of faculty staff and students have made today a reality. I therefore want to appreciate our Vice-Chancellor and my colleagues in the faculty for making today possible. .

The goal of sustainable development is to meet the needs of today, without compromising the needs of tomorrow. This implies that we cannot continue using current levels of resources as this will not leave enough for future generations. Therefore, stabilising and reducing carbon emissions is key to living within environmental limits as this will create a truly sustainable built environment that is fit for the future.

The theme, ***Collaboration for Sustainable Development in the Built Environment***, captures our focus as academia and professional in the larger society and the broaden Sustainable Development Goals (SDGs). Beyond that, it gives exciting opportunities to several of our professionals like Quantity Surveyors, Architects, Geologists, Geo informatics, Town Planners, Land Surveyors, Estate Valuers, Engineers etc to express themselves and their activities at ICES.

Collaboration is essential for development in today's world because real life challenges require researches that are multidisciplinary in nature. When you want to control flooding for instance, you need Civil Engineers, Soil Scientists, Geographers, Geologists, even Public Relations Professionals etc for diverse roles.

For robust development of built environment in a sustainable ways, **geographers**, who are concerned with the study of places and relationships between people and their environments; **Surveying and Geo-Informatics Professionals** who are concerned with geo-data and geo-information about locations in relation to the earth and **Urban and Regional Planners** who will develop and design use of land are essential partners.

Furthermore, **Architects** helps with planning, designing, and construction of buildings and any other structures that made up the environment while based on the structural performance of different materials and geometries the **Structural Engineers** design the 'bones and muscles' that create the form and shape of the structures designed by the Architect. **Services Engineers** strive to achieve a safe and comfortable indoor environment whilst minimizing the **environmental impact** of buildings through collaboration with **Chemical Engineers** and other specialists. Then **the Quantity Surveyors,** who are the construction cost experts, will predict and manage construction cost from inception to completion.

So evidently, we must all collaborate to make possible the attainment of Sustainable Development Goals (SDGs). And as if to emphasize the need for collaboration, the drafters of the Seventeen (17) Sustainable Development Goals made goal Seventeenth, perhaps the ultimate goal- partnership for all the previous 16 goals. Besides, the University authorities here have always emphasize multidisciplinary collaboration among researchers.

We are honoured to have Prof. Adeniyi Suleiman Gbadegesin, our Keynote speaker, in our midst this morning. He is a colossus and mentor to many professors of Geography. As an international scholar of repute with wide and varied experience, this gathering will benefit immensely from his paper.

Similarly, we have with us Prof. Ahmad Doko Ibrahim of the Department of Quantity Surveying and Project Construction Management, Ahmadu Bello University (ABU) Zaria who had done a lot to bring ABU into reckoning. I salute you sir and welcome you heartily.

The 1st International Conference of Environmental Sciences (ICES 2019) received a total of 150 abstract, accepted 72 and today we have a total of 49 full papers to be presented by authors in 6 parallel sessions. Students' competition on the theme of the conference will be conducted to conclude the activities of the conference.

Let me express the warm appreciation of staff and students of this faculty and the entire university to all our professional colleagues who are gracing this occasion in the spirit of town and gown mandate.

"It's therefore my pleasure to extend a cheerful welcome to you all! Your presence makes us very happy."

Thank you for coming

Dr. Ganiyu Amuda-Yusuf
Ag. Dean Faculty of Environmental Sciences

ACKNOWLEDGEMENTS

The First International Conference of Environmental Sciences (ICES 2019) organized by the Faculty of Environmental Sciences, University of Ilorin, Nigeria owes its success to the hard work, commitment and support of individuals both in the academia and the general public. These individuals provided the technical, financial and logistic supports that enable the Faculty realize the objectives of this epoch making academic event.

First, the Local Organizing Committee (LOC) sincerely appreciates the Vice Chancellor of University of Ilorin – Professor Sulyman Age Abdulkareem, who provided huge moral and logistic support for the Faculty to make the conference possible. We are grateful to the Vice Chancellor and the entire University Management for providing accommodation and transport logistics for the Guest Speakers and for the general smooth running of the conference. This singular support demonstrates the commitment of the Vice Chancellor and his Management team to academic excellence which enhances the visibility of University of Ilorin both nationally and internationally.

The LOC is grateful for the dynamic leadership of the Acting Dean of the Faculty of Environmental Sciences – Dr. Ganiyu Amuda-Yusuf, whose vision and relentless efforts saw to the conception, planning and execution of this conference. Your support and encouragement have, in no small measure, assisted in the realization of the objectives of this conference. The support of the Acting Dean of Faculty of Communication and Information Sciences (CIS) – Dr. Jimoh R.G. at the conceptual and implementation stages of the conference is quite commendable. His inputs help crystallize the conference concept notes while the provision of venues for the technical and plenary sessions addressed our logistic needs. We are also grateful to the Dean, Students Affairs – Prof. L.T Ajibade who assisted the LOC in the review of conference papers and in the mobilization of the Students for the conference.

The keynote speakers at this international conference delivered thought provoking papers that served as the conference ice breaker and they have made us proud. We are grateful to Prof. Adeniyi Gbadegeshin, the immediate past Vice Chancellor of Ladoke Akintola University (LAUTECH), Oghomosho and Prof. Ahmad Doko Ibrahim of Ahmadu Bello University for accepting our invitation and for delivering the lead papers for the conference.

We recognize the contributions of Dr. Bolaji Sulieman, the Sub-dean of the Faculty of Environmental Sciences who coordinated conference planning and execution activities on behalf of the Faculty. The secretariat operations of the conference were adequately handled by the Faculty Officer –Mrs. Azeezat Ibrahim. The LOC is grateful to her and other administrative staff of the Faculty for their immense contributions.

At the preparatory stage of this conference, the Faculty reached out to individuals and corporate organizations for financial support. In response, many donated substantial amounts of money which assisted a lot in procuring materials for the conference. The Faculty appreciates the well-meaning individuals and management of all corporate organizations for this kind gesture.

This conference could not have been a success without the dedication and untiring efforts of the LOC and other sub-committees that handled the conference planning and implementation. On behalf of the LOC, I sincerely thank **all those** who served in the LOC and all other sub-committees. I am specifically grateful to the Chairmen of all sub-committees in person of Dr. N.A Bello (Technical Sub- committee); Dr. Maimuna O. Abdulraheem (Logistic Sub-committee); Dr. A.I Bako (Publicity and Linkage Committee) and Mr. Ahmadu Hussein (Student Competition Sub-committee).

Worthy of singular mention and appreciation is a member of the LOC - Mr Rasheed Abdulkadir Shehu who was a wonderful and reliable partner in progress. His calm and confident deportment to all knotty issues coming from any of the sub-committees translated in several ways to the accomplishment of this conference

The list of contributors to the success of this conference is almost endless. We are grateful to all Heads of Department and academic staff in the Faculty of Environmental Sciences who assisted in one way or the other to make the conference a resounding success. We hold all our paper reviewers, plenary chairpersons and rapporteurs in high esteem and thank them for their selfless services. Finally, I thank all the non-teaching staff and students of the Faculty for their roles. May God reward you all for your contributions.

Dr. Maimuna O. Abdulraheem
Chairperson, Local Organizing Committee

CONFERENCE CENTRAL ORGANISING COMMITTEE

Dr. Maimuna O. Abdulraheem - Department of Urban & Regina Planning – Conference Chair
Dr. N. A. Bello - Department of Estate Management - Conference Secretary
Dr. Ranti T. Adebiyi - Department of Quantity Surveying - Member
Dr. A. I. Bako - Department of Urban & Regional Planning – Member
Mr. S.Y. Suleiman - Department of Architecture - Member
Mr. A.S. Rasheed - Department of Quantity Surveying - Member

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Mr. H.Y. Agava
Mr. H.A. Ahmadu - Secretary

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Mr. Idris Soliu
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Mr. H.A.Tanimu - Secretary

Conference Advisory Committee

Prof. L.T. Ajibade - Dean of Student Affairs, Department of Geography & Environmental Studies - University of Ilorin, Ilorin - Nigeria

Prof. N.B. Tanimoowo - Department of Urban & Regional Planning, LAOTECH, Ogbomoso - Nigeria

Prof. A.D. Ibrahim - Department of Quantity Surveying, Ahmadu Bello University, Zaria - Nigeria

Prof. A.A. Adedeji - Department of Civil Engineering, University of Ilorin, Ilorin - Nigeria

Dr. R.G. Jimoh - Ag. Dean of Faculty of Communication & Information Studies, University of Ilorin, Ilorin - Nigeria

Paper Review Panel

Prof. A.A. Adedeji – Department of Civil Engineering, University of Ilorin.
Prof. L.T. Ajibade – Department of Geography, University of Ilorin
Prof. V. A. Bello - Department of Estate Management, Federal University of Technology, Akure- Nigeria
Prof. N.B. Tanimowo – Department of Urban and Regional Planning, LAUTECH
Prof. A.D. Ibrahim- Department of Quantity Surveying, Ahmadu Bello University, Zaria
Dr. Ganiyu Amuda-Yusuf - Department of Quantity Surveying, University of Ilorin, Ilorin -Nigeria
Dr. I. O. Orire - Department of Geography, University of Ilorin, Ilorin - Nigeria
Dr. N. A. Bello - Department of Estate Management, University of Ilorin, Ilorin - Nigeria
Dr. Bolaji Sulaiman - Department of Quantity Surveying, University of Ilorin, Ilorin - Nigeria
Dr. A. I. Bako - Department of Urban & Regional Planning, University of Ilorin, Ilorin - Nigeria
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Dr. K. B. Bolayemi - Department of Estate Management, Federal Polytechnic, Ilaro - Nigeria
Dr. Ranti. T. Adebiyi - Department of Quantity Surveying, University of Ilorin, Ilorin - Nigeria
Dr. O. O. Olanrele - Department of Estate Management, University of Malaya, Malaysia - Nigeria
Dr. I. E. Wallace - School of Architecture, Victoria University of Wellington, New Zealand
Dr. Ayo Babalola - Department of Surveying & Geo-Informatics, University of Ilorin, Ilorin - Nigeria

Peer Review Process

The papers submitted to this conference were subjected to a rigorous peer review process which involved an initial review of abstract. A total of 150 abstracts were reviewed and 72 accepted. Afterwards, the authors of accepted abstracts were provided with the reviewers' comments and were advised to proceed to full paper submission, incorporating all suggested amendments in the reviewed abstracts.
Blind reviews of full manuscripts by minimum of two reviewers were carried out on the submitted manuscripts. A total of 72 full papers were received and the reviewer's comments were then sent to the authors of accepted papers with the request that they should address all of the issues raised by the reviewers. Tracked changes made by reviewers on authors' original papers were also sent to authors to help with revising their papers. A compliance check of authors returned corrected papers was further done to ensure that all the reviewer's comments were followed.
During the review process, members of the paper review panel, editors and conference organisers were not involved with the review of any paper they authored or co-authored.
A total of 52 papers of all authors who have demonstrated sufficient evidence that all reviewers' comments had been addressed were accepted into the conference proceedings.

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CONFERENCE PROGRAMME

DAY 1 MONDAY 29TH APRIL, 2019

PROGRAMME FOR THE OPENING SESSION

8:00 am - 9:30 am	**Registration**
	Venue: University Main Auditorium
9:30 am - 9:40 am	**National Anthem & Unilorin Anthem / Introduction of Guest**
9:40 am - 9:50 am	**Opening Remarks by the Conference Chair.**
	Dr. Maimuna O. Abdulraheem, Chairperson, Organizing Committee
9:50 am - 10:00 am	**Welcome Address by the Host.**
	Dr. Ganiyu Amuda - Yusuf -Ag. Dean Faculty of Environmental Sciences
10:00 am - 10:20 am	**Vice Chancellors Address.**
	Prof. Sulyman Age Abdulkareem - Vice Chancellor University of Ilorin
10:20 am - 11:00 am	**Keynote Adress 1.**
	Prof. Adeniyi Gbadegesin - Professor of Geography, Immediate Past Vice- Chancellor, LAUTECH, Ogbomoso.
11:00 am - 11:40 am	**Keynote Address 2**
	Prof. Ahmad Doko Ibrahim - Professor of Quantity Surveying, Ahmadu Bello University, Zaria.
11:40 am - 12:00 pm	**Questions/Contributions/Responses**
12:00 pm - 12:10 pm	**Address by the Special Guest of Honour**
	Arc. M. J Faworaja. (MICIArb, MFIMS, FNIA, PPNIA) MD/CEO ARCHCON NIG. LTD
12:10 pm - 12:30 pm	**Launching of the Maiden Edition of Faculty of Environmental Sciences Journal** - *(Journal of Environmental Spectrum)*
12:30 pm - 12:40 pm	**Goodwill Messages**
12:40 pm - 12:50 pm	**Closing Remarks**
	Prof. N. B Tanimoowo - Pioneer Dean, Faculty of Environmental Sciences
12:50 pm - 1:00 pm	**Vote of Thanks**
	Dr. N.A Bello - Conference Secretary

DAY 1 MONDAY 29TH APRIL, 2019

PROGRAMME FOR THE TECHNICAL SESSIONS

1:00 pm - 1:30 pm **Tea Break/Snacks/Small Chops**

PRE-CONFERENCE WORKSHOP *Venue: University Main Auditorium*

RESEARCH CLINIC **Chairperson:** *Prof. Titilayo A. Alabi*

1:30 pm - 2:10 pm **Research Lecture:**

Prof. Ahmad Doko Ibrahim - Professor of Quantity Surveying,

Ahmadu Bello University Zaria.

2:10 pm - 2:30 pm **Questions & Answers**

2:30 pm - 3:00 pm **Lunch Break**

FIRST PARALLEL SESSION

FIRST PARALLEL SESSION DAY 1 - MONDAY 29TH APRIL, 2019

VENUE: FACULTY OF COMMUNICATION AND INFORMATION SCIENCES [CIS]

3:00 pm - 5:00 pm

GROUP 1	**GROUP 2**
INFORMATION TECHNOLOGY ADOPTION IN CONSTRUCTION	**REMOTE SENSING & DIGITAL INFORMATION SYSTEMS**
CHAIRPERSON: Dr. Saudat S. Baki	CHAIRMAN: Prof. J.F Olorunfemi
RAPPORTEUR: Dr. N. A Musa	RAPPORTEUR: Dr. Ayo Babalola
Paper 1:	**Paper 1:**
Bim Adoption Challenges in Malaysia: Expert Opinion.	Assessment of Users' Satisfaction on Manual & Digital Land Information System in Kwara State, Nigeria
Badiru, Y. Y.; R.B Tukur.; and Abdulazeez, A.D	*Adekoya, A. A., and Bello. M. O.*
Paper 2:	**Paper 2:**
Sustainable Architectural Practices in Nigeria: Benefits of Adopting Building Information Modeling	Spatio-Temporal Analysis of Bida Housing Market Using Geographic Information System
Elimisiemon, Monday Chris	*Mohammed, J. K. & Sulyman, A. O.*
Paper 3:	**Paper 3:**
Factors Affecting Human Resource Management in Small Construction Firms in Lagos Metropolis, Nigeria	Establishment of Deformation & Subsidence Monitoring Baseline in the Coastal Environment: A Case Study of University of Lagos
Oluwaseyi Modupe Ajayi; Oluwasegun Emmanuel Akinsiku & Tajudeen Olufemi Salami	*Alademomi Alfred Sunday, Mayaki Anthony Omeiza, Daramola Olagoke Emmanuel & Salami Tosin Julius*
Paper 4:	**Paper 4:**
Influence of Web-based Project Management System on Project Delivery	Design and Implementation of Sustainable Built Environment: The Role of Surveying & Geo-Informatics towards Effective Collaboration with Other Professionals
A.S. Rasheed & R. T Adebiyi	

Ahmadu, H. A., Babalola, A. and Salami, B. I.

Paper 5:

Assessment of Readiness of Nigerian Construction Firms on Adoption of Lean Construction Principles

M.L Aisha & A.M. kasimu

Paper 5:

GIS as a Tool for Sustainable Development in Public Secondary School Mapping

Ipadeola A. O., Abdulyekeen A.O., Olatunde G.

Paper 6:

Perceptions of Career Development among Women in Nigeria Construction Industry

Adebiyi Ranti Taibat, Amuda-Yusuf Ganiyu, Rasheed Abdulkadir Shehu, Idris Soliu & Ola-Ade Esther Oluwafolakemi

Paper 6:

A Review of Intelligent Transportation System: Adaptive Management

Busayo Adebiyi, Risikat Folashade Adebiyi, Ahmed Tijani Salawudeen & Abubakar Umar

Paper 7:

Effect of implementation of E-Procurement on Corrupt Practices in Nigerian Construction Industry

Odulana, A. O. & Oyewobi, L. O.

5:00 pm - 5:10 pm

CLOSING

DAY 2 TUESDAY 30TH APRIL, 2019

SECOND PARALLEL SESSION

SECOND PARALLEL SESSION DAY 2 - TUESDAY 29TH APRIL, 2019

VENUE: FACULTY OF COMMUNICATION AND INFORMATION SCIENCES [CIS]

8:30 am - 10:30 am

GROUP 1

ARCHITECTURE & HOUSING DEVELOPMENT MANAGEMENT

CHAIRPERSON: Dr. Nasmat T. Surajudeen-Bakinde

RAPPORTEUR: Dr. A.I. Bako

Paper 1:

GROUP 2

CONSTRUCTION ECONOMICS & COST MANAGEMENT

CHAIRMAN: Prof. A.M Junaid

RAPPORTEUR: Dr. Ranti T. Adebiyi

Paper 1:

Assessment of Crowd Control Strategies in the Design of National Stadia at Abuja and Uyo, Nigeria

Naimu M. S & Abdulrahman M. E

Paper 2:

Retrofitting Prospects for Daylight Enhancement in 'Dark' Corridors of an Institutional Prototype Building

O. M. Idowu, A. A. Umar, S. Humphrey & A. U. Attah

Paper 3:

Assessment of Landscape Design Elements Application for Crowd Movement Optimization in Catholic Churches in Benue State, Nigeria

David Lubem Angitso & Chukwudum J. Eze

Paper 4:

The Challenges of Placemaking of Leisure & Recreation Parks Development in Nigeria

Abdulwahab Engworo Etudaiye, Abdullahi Sadauki, Yusuf Saliu & Ibrahim Yusuf Baba

Paper 5:

Critical Assessment of Fire Safety Measures in Shopping Malls, Abuja, Nigeria

Audu Francis Eleojo & M.E Abdulrahman

Paper 6:

Hardened Property of Blended Cement Mortar for Sustainable Housing Construction

Oyejobi, D. O., Adelabu, J. K., & Abdullahi, K. O.

Paper 7:

Influence of Risk Factors on Redevelopment Projects: A Case Study of Yankari Resort & Safari Project, Bauchi State

Aminu Muhammad Bashir

Paper 2:

Risk Management Strategy in Public Private Partnership on Housing Development. A Case of Niger State

Yatsu U.M and Kasimu M.A

Paper 3:

Risk Factors Affecting Cost and Time Performance of Civil Engineering Projects in Kwara State

Idris Soliu, Awodele., O. A & Amuda-Yusuf., G

Paper 4:

Appraisal of the Causes of Ineffectiveness of Skilled Tradesmen in Building Construction Industry in Lagos State

Olanrewaju, Rauf A., Adebiyi, Ranti T. & Fasasi, Abdulwaheed

Paper 5:

Drivers and Barriers to the Implementation of Green Building Development

Onososen, Adetayo Olugbenga & Osanyin Oladipupo

Paper 6:

Appraisal of Causes and Effects of Delayed Payment on Building Construction Projects Delivery in Niger State

M. N. Amina; J. E. Idiake & A. M. Kasimu

Paper 7:

	Assessment of Aspect Ratio & Configuration Effects in Corporate Office Buildings Courtyard, in Abuja, Nigeria *Ofiedane J.M & Eze J. C*	Evaluating Methods of Training of Mason for Productivity Improvement in Nigeria Construction Industry *Suleiman, Ayinde Elelu & John, Ebohimen Idiake*
	Paper 8: Architectural Design Considerations to Enhance Security in Mixed-Use Building, Lagos, Nigeria *Ogunbayo, R. A & Akande, O. K*	
10:30 am - 11:00 am	**TEA BREAK**	

THIRD PARALLEL SESSION

THIRD PARALLEL SESSION DAY 2 - TUESDAY 30TH APRIL, 2019

VENUE: FACULTY OF COMMUNICATION AND INFORMATION SCIENCES [CIS]

	GROUP 1	**GROUP 2**
	URBAN/ENVIRONMENTAL MANAGEMENT & PLANNING	**REAL ESTATE DEVELOPMENT AND PROPERTY MANAGEMENT**
	CHAIRMAN: Prof. A.M Junaid	CHAIRMAN: Prof. B.T Aluko
	RAPPORTEUR: Dr. A.B Ola	RAPPORTEUR: Dr. Ranti T. Adebiyi
11:00 am - 1:00 pm	**Paper 1:** Multidimensional Approach to Flood Vulnerability Assessment in Coastal Communities of Suleja and Tafa LGA, Niger State *Abdulhakeem Salau Bello and Muhammad Ahmed Emigilati*	**Paper 1:** The Impact of Emotional Intelligence on the Performance of Consultant Estate Surveyors and Valuers in Nigeria *Akinwamide, David Oluwatofunmi*
	Paper 2: An Assessment of Streetscape Infrastructure in Ilorin Metropolis, Nigeria *Abdulraheem M. O., Suleiman A. R. Alao R. O. Alimi R. K. Alade A. K & Garba I.O.*	**Paper 2:** Emerging Barriers to Efficient Urban Land Acquisition Process for Real Estate and Facilities Development in Nigeria *Kazeem .B. Akinbola; Taofik .I. Salau,; Nurudeen .A. Bello.*

Paper 3:

Assessment of Spatial Changes in Coastal Ecosystem at Amuwo-Odofin, Lagos Nigeria

Alfred Sunday Alademomi, Tosin Julius Salami, Olagoke Emmanuel Daramola, Elias Adediran, & Joseph Olayemi Odumosu

Paper 3:

Challenges of Accessing Affordable Housing by Low-Income Civil Servants in Abuja, Nigeria

Olayinka Ezekiel Ajayi & Oyekunle Luqman Oyewobi

Paper 4:

The Practice and Challenges of Biomedical Waste Management: A Study of Selected Medical Facilities in Ile-Ife, Osun State

Ola, A. B.; Bako, A. I.; Abdulraheem, M. O.; Raheem, W. M.; Raheem, W. A. & Adewale, Y. Y.

Paper 4:

Collaborative Working Relationship among Nigerian Built Environment Professionals: Factors and Benefits

Nurudeen Akinsola Bello, Kazeem Bolayemi Akinbola, Rasheed Olamide Alao, Sulaiman Adetoye Adepoju & Sulaiman Adesoji Olabisi

Paper 5:

Understanding Vulnerability and Resilience of Ilorin Central Area, Ilorin, Kwara State

A.I. Bako, O. T. B. Aduloju, A. R. Suleiman, & F. O. Lawal

Paper 5:

Conventional Approaches and Mechanism to Housing Market Analysis

Mohammed, J. K. & Sulyman, A. O.

Paper 6:

Effect of Informal Activities on Urban Road Network Infrastructure in Minna, Niger State

Adeogun, A. S., Idowu, O. O., Olabisi S.A, & Iroh E.

Paper 6:

Challenges and Opportunities of Resolving Land Use Conflicts through Mediation in Nigeria

Uwaezuoke, Ngozi Ifeanyi & Owolabi, Kayode Michael

Paper 7:

Gully Erosion: Vulnerability and Impact on the Resident of Agulu-Nanka

Nwokocha Oluchi and Musa Dalil

Paper 7:

User Satisfaction of Social Housing in Kaduna Metropolis

Julius Andrew Baji, Jonah Binga, Deborah Babarinsa, Mercy Richard Auta, Yakubu Ahmed Ubangari, & David Ayock Ishaya

Paper 8:

Paper 8:

	Evaluation of Petrol Filling Stations Against Established Standards in Ilorin Metropolis. *Tanimowo, N. B., Raheem, W. M., Owolabi, O. Q.., Raheem, M. O.. Salawu, G. O. and Onundi Lawal, F. O.*	Effect of Public Budgeting on Neighbourhood Quality and Rental Values in Ilorin *W.A Durosinmi, M.T.A Ajayi, M.B Wahab, W.O Shittu & A.O Hassan.*
	Paper 9: Child Poverty Mapping: Towards Effective Child Poverty Reduction *Akande Sheerifdeen Olaide, Mohammed Ndana & Aremu Reuben*	**Paper 9:** Evaluation of the Contribution of Real Estate-based Revenue to IGR of Kwara State. *Agava, Halim Yusuf; Adedotun, Ife Adeshola & Gombwer, Nenrot Wuyokwe*
1:00 pm - 2:00 pm	**STUDENT COMPETITION PRESENTATION**	
2:00 pm - 3:00 pm	**LUNCH**	
3:00 pm - 4:00 pm	**CONFERENCE COMMUNIQUE**	
	CERTIFICATES & CLOSING	
	DEPARTURE	



KEYNOTE SPEAKER 1

PROFESSOR ADENIYI GBADEGESIN

Adeniyi Gbadegesin was educated at the University of Ibadan between 1976 and 1984. He completed his undergraduate programme with a First Class degree in Geography in 1979. His doctoral program was completed in 1984 specializing in soils, natural resource analysis and management. He is a Professor of Geography at the University of Ibadan, a Senior Fellow at the Foundation for Urban Initiatives and Environment as a Biodiversity and Natural Resource management expert and the Immediate Past Vice-Chancellor of the Ladoke Akintola University of Technology (LAUTECH), Ogbomoso. Oyo State.

In addition, he has held several international research positions including a Visiting Research Scholar of the Third World Academy of Sciences at CSINAR, Beijing, China in 1991 and a Visiting Associate Professorship of the Swedish Institute at the University of Linkoping, Sweden from 1998-1999. He is also one of the first Claude-Ake Memorial Award Winner of the African-American Institute for the year 2001.

KEYNOTE ADDRESS 1:

FACTORS FOR SUCCESSFUL COLLABORATION AMONG STAKEHOLDERS IN THE BUILT ENVIRONMENT

By

Professor Adeniyi Suleiman Gbadegesin, Department of Geography, the University of Ibadan, Ibadan, Nigeria.

Protocols

It is a great honour for me to be here as a keynote speaker amidst top echelon of academics, professionals and policy makers, among others, who represent different categories of stakeholders in the management of the built environment. While I congratulate the Faculty of Environmental Sciences, particularly the Dean and the Local Organizing Committee for this very important academic exercise, I wish to say that the topic is very apt and reflects the interest of the faculty, as a major category of stakeholders, in devising measures for addressing the daunting challenges in the management of the built environment.

In this presentation, I shall be providing a general overview of the "factors for successful collaboration among stakeholders in the built environment" (which is the topic given to me in your invitation letter), while our highly resourceful conference participants shall provide the flesh to the skeletal overview. The content of the keynote proper is hereby divided into six sections: (1) Introduction, (2) the Built Environment: Definition, Scope and Issues, (3) Stakeholders in the Built Environment, (4) Collaboration in the Management of Built Environment: Nature, Types and Benefits (5) Challenges of Collaboration, (6) Making Collaboration Work, and (7) Conclusion

Introduction

The increasing human population on the surface of the earth over time is an incontrovertible phenomenon. The world population grew slowly over one and half centuries from 1 billion in 1800 to 2.5 billion in 1950 and rose rapidly to 6.1 billion in 2000 (Bongarts, 2001). The population growth, according to the estimates from relevant sources of international agencies like World Bank and UN-Habitat, among others, would continue reaching about 7.5 billion in 2020. Conversely, the size of the

earth surface is relatively stable, giving rise to the phenomenon of urbanization, which is simply defined here as increasing levels of agglomeration of humans and their activities at different places. While the growth rates of human populations and urbanization levels of different countries and regions of the world differ, and may be controvertible, as argued in some quarters (Potts, 2012), analysis of the inter-regional variations is not the main object here. The main issue has to do with the fact that humans, in their quest for survival and improved living, continue to increasingly interact with their natural habitat – environment – in what seems more like a parasitic, rather than symbiotic relationship. This has a negative impact on the environment, an issue to contend with by all categories of stakeholders in the management of the built environment – professionals, academics, policy makers, etc. However, among those stakeholders, who are supposed to be role players in the process of managing the built environment, the problem of forming synergies is a serious one. This is why collaboration is a sine-qua-non. Effective collaboration may, however, not easily come by, except the following questions are attended to:

- What is meant by the built environment? What are issues of the built environment?
- Who are the stakeholders? How do we identify them? How can we promote synergies among them?
- What are the types, purposes and problems of collaboration for effective management of the built environment?
- How do we collaborate? What are the essential ingredients of effective collaboration?

The above, among other related questions, constitute the focus of this presentation.

The Built Environment: Definition, Scope and Issues

Human's interest in exploring and overcoming certain life challenges has left the natural environment with physical transformation of all sorts, which serves as imprints that reflect its several epochal approaches to survival, comfort and productivity. These changes, which may be at a micro scale such as felling of trees, erection of new structures, setting up of new business spaces, or at a large scale such as simulating a new world through beautifying vision for intentional purposes in their physical expression, all culminate into what is described as the built environment. The built environment, though a comparatively new term, describes in one holistic and integrated concept, the creative (and not so creative) result of human activities throughout history (Dassah and Nimlyat, 2010). Conceptually, it is a product (Campbell, 1996; Hughes, 2010; Valeria and Emilia, 2015), a process (Thorns, 2002; Craig, 2005; Dassah and Nimlyat, 2010) and a School of thought (Ashiru, 2015). The built environment is a functional system with a usually intricate and all-inclusive process that has entrants and resultants. The entrants are various human activities that either inform the built environment, while the resultants are all forms of effects caused by the built environment. These may be positive or negative, however, as a special system, the product defines and redefines the system.

The built environment fills every nook and cranny of the everyday world; it is directly aligned to the daily expression and activities of everybody. It strongly influences human lives with their creation and modification of it (Dassah and Nimlyat, 2010). It is everything that reflects man's intervention in the natural environment in terms of design, construction, management and operations of buildings and infrastructure (Hughes, 2010). The built environment is made up of historic and contemporary buildings and spaces between them including parks, streets and housing (Wendy, Lesley and Lawrence, 2003). It is the part of life that humans are in constant interaction with and as such emerged out of man's desire for satisfaction; hence it is usually modelled, modified and re-modified. It is also a material, spatial and cultural product of human labour that combines physical element and energy in form of living, working and playing (Ashiru, 2015). Conceived as an historical artifact, Bartuska, (2007) observes that the built environment is man's art piece and accretions of different identities that emerge as an historical product of man's quest for meeting several demands. The built environment is a value judgment for historical justification of the use of space and most of the society's knowledge of past civilization is a derived remnant of the built environment, while present cultures will be evaluated in the future by what they have created. The built environment is also an interdisciplinary field that addresses the design, construction, management and use of these man-made surroundings as an interrelated whole and their relationship to human activities over-time (Ashiru, 2015).

The built environment is certainly pervasive but its reach and implications are evasive, more comprehensive and far-reaching than most of us realize; even though we live in it every day (Dassah and Nimlyat, 2010). Hence, it may be hard to find today an earthly existence that is absolutely disconnected from the built environment. The built environment is manifested in physical objects and places; it is relatively easy to observe and study. Bartuska, (2007) identifies seven components of the built environment viz products, interior, structures, landscape, cities, region and earth. These components are the levels of interaction at which human interfere with the natural environment and the scales at which built environment is manifested.

Products are the materials and set of conditions to extend human capacity to perform specific tasks. Products can be as simple as tables, chairs e.t.c. Groups of products arranged within an enclosed structure makes interior. Structures are planned groupings of defined spaces. Structures are accumulated products that have both internal and external space as well as forms. Landscapes are exterior areas of a planned group of spaces and structures. Cities are extensive agglomeration of structures defined by landscapes of all sorts. Cities are the first level of systematic functional level of the built environment such that structures are connected to structures and products connected to products with each part dependently functioning within the system. Regions are connected cities while the earth is a combination of different regions. Indeed, the scope of built environment is limitless and its level of operation extensive. One may, therefore, submit that the built environment is everything we see around.

The central question to the built environment, however, is sustainability, especially at the sight of the ever-increasing and continual replacement of the natural environment with the built environment. As the population of man increases and his quest for sustenance increases at the sight of great success in technology, the built environment gets expansive with larger threat to sustainability. This is further increased with globalization where all areas are getting exposed to new inventions and communities are constantly localizing these inventions. This is particularly worse as most of these changes are irreversible and in some other cases have resultant effects on the environment. Although the built environment is a product created to fulfill man's purpose, the non-reversible effects of this product is a case. Another challenge of the built environment is the emergence of various tangential (usually conflicting) elements within a system. Because man's purposes are diverse and in many cases divergent, there is usually a problem of incompatibility of various elements that sum up the built environment. These either render the whole built environment system dysfunctional or partly functional. An example of such is the patches of conflicting land uses which pervade several cities and towns. In some instances, residential land uses are either bothered or co-existent with public land uses such as religious centres, while in some other cases commercial centres are made to align with educational and other institutional uses. The continual disappearance of natural environment to several elements of the built environment that are currently unnecessary or could be smartly surrogated is another issue associated with the built environment. The natural environment is a resource that must not only be cherished but sustainably managed.

Most important and relevant to this discourse is the challenge of management of the built environment. This scenario gets worse as several beliefs and perceptions are reserved on this subject matter. Some believe that managing the built environment is the sole responsibility of the government, while others perceive it as the basic civic responsibility of the citizenry. Another aspect and most alarming dimension to this challenge is the usurpation of responsibilities and eventual sheer disharmony among professionals in the built environment. The latter has led to management of the built environment by non-professionals and exploitation of the same by those with less concern for the environment itself.

As extensive and intricate as the built environment is the non-collaborative nature of professionals has further enhanced its risk on sustainability and effectiveness. Cities and regions are daily engaged in planning, designing, implementing and managing sustainable development process, yet urban sustainability is far from being reached. This results from inconsistency of actions (Valeria and Emilia, 2015). The unguided and unguarded use of the built environment system really calls for a collaborative approach and concerted efforts from all professionals and other stakeholders in the management of the built environment.

Stakeholders in the Built Environment

Stakeholders Defined

Literally, a stakeholder is a person or group with a direct interest, involvement, or investment in something. It is a diction that appears to have more relevance in business practice. The word was first adopted at the Stanford Research Institute in 1963 to denote a member of the "groups without whose support an organization would cease to exist" (Freeman and Reed, 1983). A corporate stakeholder can affect or be affected by the actions of a business as a whole. By and large, stakeholders can be conceived as the elemental components of any initiative without which the said initiative dissolves. When applied to the built environment, a stakeholder refers to any individual, group or organization that has a legitimate interest or business in the management of the built environment and a crucial role in actualizing its ideal. The different types of stakeholders in the built environment are highlighted in the next section of this presentation.

Categories of Stakeholders

Given the extensive and all-encompassing nature of the built environment, there is undeniably a multiplicity of stakeholders involved. In the interest of lucidity, this will be discussed under five basic categories namely;

- ✓ The professionals
- ✓ The government agencies
- ✓ Non-governmental organizations
- ✓ International agencies
- ✓ The populace

<u>The Professionals</u>

These are specially trained experts in different fields that address the design, construction, management and use of manmade surroundings – the built environment – as an interrelated whole as well as their relationship to human activities over time. The general idea conveyed by the term 'professionals', relates to individuals involved in carrying out specific activities or rendering services, on the basis of having acquired specialised knowledge to do so, and sharing an understood code of ethical conduct. The fact that roles exist with accompanying responsibilities derives from the assumption that, those considered as professionals have developed competencies and skills to be involved in specific activities, and as such are in a position to either initiate action or offer technical advice (Dassah and Nimlyat, 2010). They include urban planners, engineers, architects, landscape architects, surveyors, builders, facility managers and lawyers, the list goes on (Figure 1)

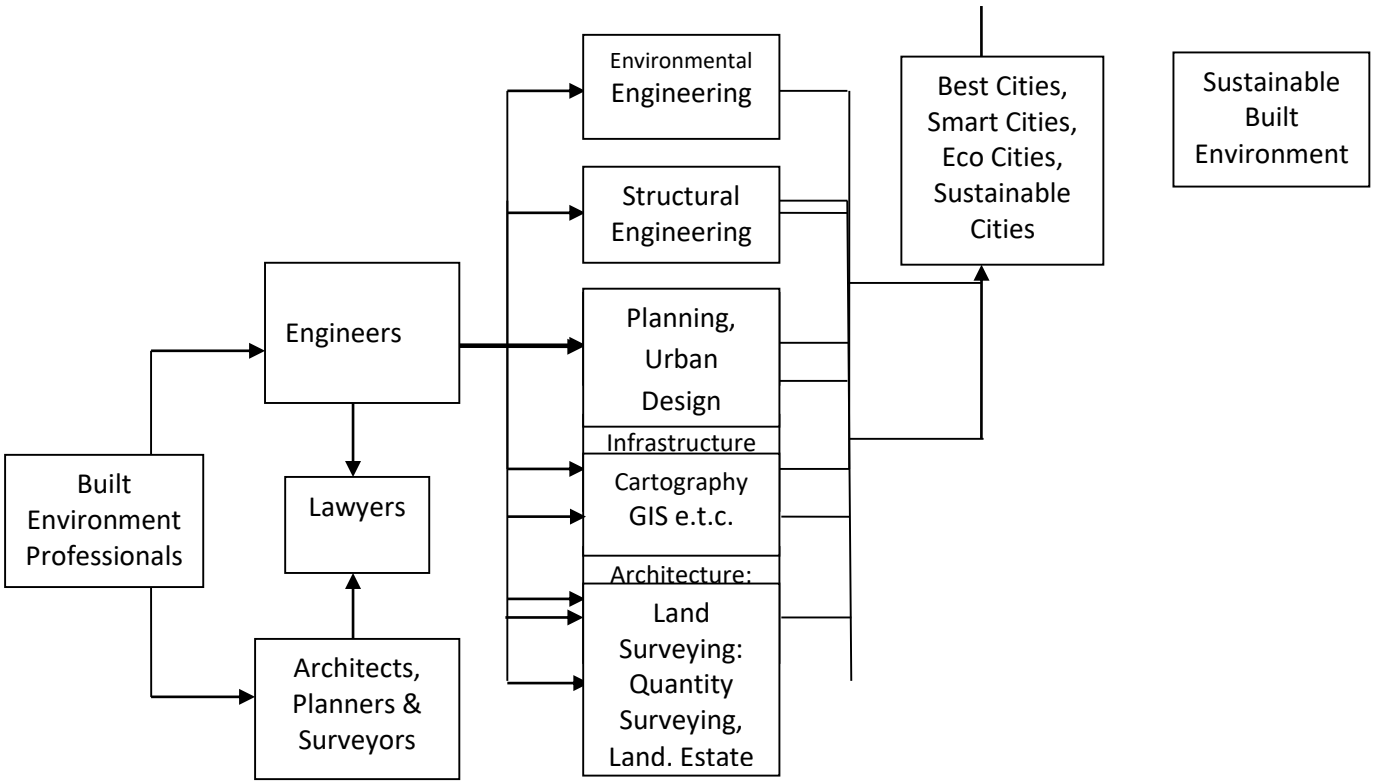


Fig. 1: The Built Environment Professionals (Adapted from Waziri, 2012)

Nevertheless, the key professions within the built environment can be put under broad areas of planning, surveying, design, and engineering, which are regrouped, according to the International Labour Organization 's International Standard Classification of Occupations, ISCO-08, into two main categories of professionals: "Engineering professionals" and "Architects, planners, surveyors and designers" (ILO, 2007).

Buildings are indispensable components of the built environment and their design is primarily the Architect's responsibility. He comes up with imaginative new buildings designed to meet the needs of users and the environment, as well as solutions for restoring or reusing old buildings.

Engineers in construction are involved in creating connective infrastructure such as bridges, roads or systems of distribution for utilities such as gas, water and electricity as well as providing structural solutions helping buildings to withstand extremes weather and heavy loads. Civil and structural engineering are vital spheres of engineering concerned with how to make a building or structure stand up and in essence its strength and stability. Other ones include environmental and mechanical engineering.

Surveying is another area with indispensable input into the construction of buildings and developing the built environment. The Land Surveyor advises on the features of a particular piece of land by providing accurate measurements of natural and man-made structures. The Quantity Surveyor manages and advises on all of the costs of a construction project while the Building Surveyor provides professional advice on the design, maintenance, repair and refurbishment of buildings.

The Town Planner manages the use of space in towns and countryside on everyone's behalf. Theirs is a challenging role in trying to encourage new development while considering the environmental and socioeconomic impacts. Planners ultimately shape the built environment and guide the use of land and development of resources in the interest of the community. They balance the conflicting demands of housing, industrial development, agriculture, recreation, transport in the environment in order to allow appropriate development to take place.

The lawyer is another player among the built environment professionals although he is often omitted in any listing of built environment professionals. Bosher et al. (2007), for instance, notes that the disciplines in design and planning, engineering and construction are the most influential that shape the resilience of the built environment. This notwithstanding, the lawyer plays an important role too. His input, however, unlike that of other professionals, does not produce tangible element directly linked with him in the built environment. For example, a bridge is an output of engineering, an imposing edifice the result of architecture and an aesthetic layout of cityscape, the product of planning. The input of the lawyer is reflected in the intangible social component of the process of managing the built environment.

In the case of a lawyer, although his output is not so obvious yet his expertise is sought from time to time by other professionals. He can be engaged in different stages of construction like land purchase, documentation and agreement drafting of the preconstruction stage and project handing over, payment e. t. c. of the post construction stage. The lawyer is also involved in resolving environmental interest disputes among multiple parties and even agencies over the use and abuse of land, air, water, surface, and subsurface resources.

Government Organizations

Government agencies represent another category of the built environment stakeholders. The agencies can be found at the national, state and local levels. They are commissions, ministries or organizations established for oversight, administration and protection of the environment and its resources against misuse and degradation from human activities. Many environmental agencies are established by the government for environmental protection, management and preservation of the ecological resources. These agencies are guided by and function in accordance to enacted environmental laws and acts in Nigeria. Prominent ones among them include:

- ✓ Federal Environmental Protection Agency (FEPA)
- ✓ Forestry Research Institute of Nigeria (FRIN)
- ✓ Federal Ministry of Environment, Housing and Urban Development (FMEHUD)
- ✓ National Biosafety Management Agency (NBMA)
- ✓ National Environmental Standards and Regulations Enforcement Agency (NESREA)
- ✓ National Oil Spill Detection and Response Agency (NOSDRA)

At the state level are numerous state ministries of environment, physical planning and urban development, waste management and sanitation agencies created by individual states.

Non-Governmental Organizations

Environmental NGOs are often said to be advocates of activities such as introducing environmental policies and provision of information related to environmental issues (Yamamura, 1998). According to Fowler (1996) NGOs can make the political process more inclusive, increasing the level of engagement of citizens interested, and able, to participate in the political system, and secondly, by making representatives of government more accountable for their behaviour and performance. Basically, these organizations take the responsibility of environmental preservation upon themselves. Prominent ones in Nigeria include the Nigerian Conservation Foundation (NCF), Friends of the Environment (FOTE) and the Nigerian Environmental Society. The NCF is dedicated to nature conservation and sustainable development and has as its vision towards having a "Nigeria where people prosper while leaving in harmony with nature". FOTE's primary goal is to initiate and undertake programs and activities that address the needs of identified groups that impact on the environment. The Nigerian Environmental Society is considered the largest NGO in the country, having at least twenty one branches and playing an active role in local and international environmental programs. It is committed to advocacy and actions towards environmental protection, sustainable environmental development and promotion of environmental professionalism within Nigeria and in the global arena.

The functions of NGOs in maintaining the built environment cannot be overemphasized. Generally, as pointed out by Ryu et al., (2004) they perform the role of:

- ✓ *Proponent of a policy/ project:* advocating more sustainable alternatives at the stage of policy or decision making where the benefit of the earth, human being, and nation may not necessarily take priority over that of a government or a public or private enterprise
- ✓ *Providers of information:* Providing citizens with expert knowledge and information obtained from their research activities, in order to facilitate participation in, and improve understanding of, environmental issues among the public
- ✓ *Watchdog:* Monitoring government proposals and the activities of enterprise for the degree to which the impact the proposal might have on the environment is considered
- ✓ *Pressure group:* Urging other actors, such as government or enterprise, to facilitate environmental NGOs in the performance of these roles appropriately.

International Agencies

These are renowned international agencies directly or indirectly involved in analyzing and/or finding solutions to the built environment issues around the world. Most of these agencies are affiliated with the United Nations through negotiated agreement but remain independent international organizations funded by both voluntary donations and regular contributions of member countries. Examples include UN-Habitat, United Nations Environmental Programme (UNEP), World Health Organization (WHO), World Bank (WB), United Nations Development Programme (UNDP), and United Nations Centre for Human Settlements (UNCHS). These agencies carry out studies, engage in laudable programmes and render financial and other assistance that not only promote environmental sustainability but also are beneficial to other built environment stakeholders.

The Populace

This is the last but not the least stakeholder in the built environment. The built environment is a material, spatial and cultural product of human labour that combines physical elements and energy in form of living, working and playing (Waziri, 2012). Hence, it is conceived as the human made space in which people live, work and recreate on a day to day basis. This makes obvious the fact that the general public are perhaps the most important stakeholders in the built environment. The inhabitants or residents of a particular geographical area or region influence their ambient environment with their day to day activities. More importantly, the actions taken by other stakeholders have direct impact on them, while their own lifestyles and consumption patterns also have a lot to do with the environment. This makes them a force to reckon with in the built environment and is the rationale for public participation, the process by which people, through interaction with other stakeholders are made to understand their situations or problems and are motivated to be part of the solution rather than being passive recipient.

Conflicting Positions of Stakeholders

Quite often, conflicts do exist within and among the identified stakeholders given the number of agencies and the complexity of institutional and professional relationships in the production, management and regulation of the built environment. It is however more pronounced with the professionals and government agencies.

Conflicts among Built Environment Professionals

Among professionals, there is sometimes the lack of precise understanding and acceptance of what each professional does and how they relate to one another. Often, there is difficulty in defining specific boundaries as to where the work of one professional starts and where it ends, hence, overlapping roles. The Town Planner- Architect and the Architect-Engineer conflicting positions are typical examples. The situation partly stems from the educational models of the built environment professions, which appear to have prevented cross-disciplinary cooperation but fostered stereotypes as students construct their own professional identity, in part learnt from their teachers and peers, and naturalised by professional institutions that form the context of their education.

This is true of architecture, where the predominant pedagogical system has an emphasis on producing star students – and ultimately star architects – through nurturing individual creativity in the design studio at the expense of collaborative or interdisciplinary work (Edwards et al., 2009). Just as in architecture, planning and construction, sometimes transmit contempt for others in the formation of

new cohorts. This sort of philosophy creates tunnel vision that impedes successful collaboration in the interest of sustainable built environment especially where there are overlapping professional roles.
Collaboration is a challenge for both architects and engineers due to their different design foci, purposes and methods. For example, architects are responsible for many aspects of design as they seek to meet their clients' expectations. They must satisfy both functional and aesthetic expectations, and as such may try to avoid the potential blandness of symmetry, regularity and orthogonality – sought-after by structural characteristics! Architects frequently aspire to create a sense of lightness of building elements, whereas engineers' almost sole focus is upon 'grounding', or providing force paths from superstructure to foundations (Charleson, 2014).
Furthermore, urban design is a field located between urban planning and architecture. Both architects and planners are designers. Both are concerned with the arrangement, functionality and appearance of urban spaces. As a matter of fact, urban design is popularly known as the intersection of architecture and planning (Inam, 2002; Steger, 2000). Both town planners and architect lay claim to urban design as a field in their discipline, and this often leads to conflict. While planners are often wrongly criticised of ignorance about design, architects are considered blind to the practicalities of life and often unaware of the totality of the social, economic and environmental stresses in wider society and unskilled to engage in the communicative process among diverse interests which planners try to facilitate. The professionals in different areas of the built environment disciplines will sometimes go beyond their areas of expertise and competences to other areas where they are worse than quacks, all in the name of lack of jobs, particularly in Nigeria, and probably most other developing countries.

Conflicts among Government Organizations

Changes in organizational and institutional structures are usually a source of conflicts for built environment agencies. Parastatals are set up without clearly defined functions and boundaries that differentiate them from the existing parastatals or agencies of the same government. More so, the apparent inconsistent administrative structures and frameworks established for specific built environment programmes also lead to conflicts. In most cases, organizations are established to achieve the same set of objectives with the existing ones. This usually leads to conflicts in roles and functions among the similar organizations or institutions designated for ensuring such objectives.
There has been a continued shifting of responsibilities between agencies and the various tiers of government. For instance, bye-laws which have been issued by states to regulate refuse and sewage disposal are not properly enforced because of the persistent struggle for the control of environmental sanitation functions between the state agencies and the local governments (Adebayo, 2000). In Lagos, there is the Lagos State Waste Disposal Board (LSWDB), Lagos State Environmental Protection Agency (LASEPA), Lagos State Waste Management Authority (LAWMA) and Lagos State Waste Management Agency operatives (PSP). In Kogi, there is the Kogi State Ministry of Environment and Physical Planning and Development, Kogi State Environmental Protection Board, Kogi State Sanitation and Water Management Board. There is often times a confusion of roles of agencies with multiple and overlapping responsibilities. Hence, government agencies rather than complementing one another's effort resort to unhealthy political rivalry.
Conflicting priorities also exist among the built environment professionals and the government. This is especially a limiting factor to the success of housing programmes and infrastructure development in the country. Housing development projects are sometimes seen as political projects used by ruling political parties and groups to secure political patronage from the citizens and reward political loyalists by locating and awarding contracts for housing or infrastructural projects on political basis. Even when the professionals with their own technocracy recommend specific locations for certain projects, the whims of political dimension sometimes prevail and in the end with detrimental impacts on the built environment.

Promoting Synergies among Built Environment Stakeholders

The key to synergy, especially among professionals, as stakeholders, is effective collaboration. Sambhare (2012) aptly points out that:

> *"the key to successful interdisciplinary collaboration is in understanding that it is not a technology but rather a psychology. Collaboration is not a process that can be codified into a set system; it is more of an attitude that needs to be inculcated in the culture of a firm. It begins with every participant acknowledging that each of the others brings something valuable to the project and that their combined intelligence is more likely to deliver positive results than working in isolated silos. This can be challenging for architects, since a culture of pride in individual authorship is deeply ingrained in the profession."*

This attitude needs to be imbibed into the educational process of each built environment discipline right at the outset to foster cohesiveness in the interest of the built environment. Practicing the culture of professional socialisation will be instrumental in reducing the negative impacts of exclusivism and conservatism. Each of the distinct professionals should see other professionals not as clogs but cogs in the wheel of the built environment, as experts needing one another to work together to make the built environment better. Successful collaboration is characterised by an open and trusting culture. Planners, architects and engineers must be open with each other regarding aspirations, designs and concepts, appreciate one another's strengths and specialities, and be willing to engage in dialogue over built environment projects or programmes.

With respect to government organizations, built environment problems are not really solved with a continuous profusion of agencies. What is needed is an effective institutional framework and mechanism for collaboration and delivery.

Collaboration in Managing the Built Environment: Nature, Types and Benefits

Intuitively and literarily, collaboration is known to virtually everyone as a common terminology. However, when it is used, the concept is often confused with cooperation. It is quite more than that, as collaboration is more formal, more contained and guided more by laid than rules (or contract of agreement or memorandum of understanding). As observed by scholars, the confusion about the concept of collaboration becomes compounded when other related terms such as networking and coordination are considered (Denise, 1999; Grosz, 1996; Himmelma, 2001; and Pollard, 2005). In their own view, Camarhina-Matos and Afsarmanesh (2008), consider the four elements of collaboration – networking, coordination, cooperation and collaboration – as different stages of it or different points along collaboration continuum, without any of which collaboration may be incomplete. In effect, collaboration is not meaningful without networking, coordination, cooperation and all other formalities of it between two or more parties. Who are the parties and how does collaboration work in managing the built environment?

In managing the built environment, parties involved in a collaboration arrangement may be completely local, like the case of a local government or its department or agency working with a non-profit oriented community based organization (like landlord association) and a business-venture local organization (like a private waste management organization) for the purpose of waste management of the concerned neighbourhood, estate or the entire local government area.

Collaboration may be inter-institutional or inter-agency in nature. In this type of collaboration, different departments or agencies of government or institutions within a state or between/among states may decide to work together through a memorandum of understanding for the purpose of addressing a particular environmental issue. For example, the ministry of environment of any state may decide to work together with another ministry or agency of the same state or a relevant department of a higher institution of learning or a research institute on a certain environmental management problem.

At a very large scale, collaboration can be international, involving multinational companies, international agencies (like World Bank, UN-Habitat, UNICEF, etc) and reputable higher institutions of learning, where resources and responsibilities are shared/contributed under defined roles, benefits and commitments. This type of collaboration has, in most cases and over time, lead to fully established institutions (like UN-Habitat, University Network Initiative of the UN-Habitat, UNI, etc). This type of collaboration has in the past yielded a lot of benefits to the parties involved in different areas of the

built environment such as waste management, transportation, conservation, tourism, etc, as well as in research and award of joint degrees in built environment disciplines. Another good example of collaboration in this category is the one reported by Kamar, et al (2010) between the Construction Research Institute of Malaysia, University of Salford, UK and other research institutes in Malaysia on Industrial Building System (IBS).

Collaboration on issues bordering around environmental management may not be restricted to that between professional or built environment profession-related institutions only. It involves mutual willingness to learn about each other's operations, to plan and set goals for environmental improvement, to reduce environmental impacts associated with materials flow in the supply chain (Bowen, et al, 2001; Koufteros, et al, 2007; and Carter, 1998). It also, according to Pero, et al (2017), comprises a good understanding of each other's responsibilities and capabilities in the field of environmental management. For example, Ramanathan, et al (2014) analyse two case studies of manufacturers' collaboration with suppliers and buyers in reducing CO_2 emissions. In other words, collaboration in managing the built environment transcends just experts in the built environment fields to include producers and consumers of goods on the best ways to reduce waste and emissions from production, consumption and waste discharge processes that would also best suit the need of the consumers. This is made possible through enhanced and logistic communication (on environmental matters), technical integration and results into joint development. This is the path towards protected bio-physical environment and improved living and other conditions of the built environment.

What is of utmost importance is the fact that in collaboration, parties are more closely aligned in the sense of working together to reach the desired outcome, which is better than "individualistic" participation constrained by contextual factors (Camarihna-Matos and Afsarmanesh, 2008).

Constraints to Effective Collaboration

Constraints to effective collaboration in managing the built environment can be discussed under such headings as: resources, reward, commitments, and responsibilities. It is important to observe that effective collaboration requires that each party contributes resources based on agreement. However, often times, parties are not able to meet up as required. The unfortunate situation comes in a way that when a party is ready and willing to commit its own quota, another party may be facing economic challenges, even when it is willing to cooperate, thereby resulting into delay of the collaboration process or total abandonment of the mutual initiative. The long term effect of this may be made manifest in unwillingness of any of the parties to enter into such mutual agreement with the defaulting party in future, even when sincerity on the part of the latter is not in doubt.

Reward sharing can also be a problem, especially when collaboration process involves creation of intellectual property (like a collaboration between two higher institutions of learning or research institutes and government agencies). That is, determining the contributions or value addition quantum of each of the parties sometimes results into disagreement, except it is well envisaged and defined right from the outset.

Commitment of each party is a very important element of collaboration process. This may also be hindered for a party due to a number of factors ranging from economic dwindling, instability or change of management, to other unforeseen prevailing circumstances on the part of a party. Closely related to that is unclear responsibility sharing which may affect the level of commitment of the parties.

Making Collaboration Work

To make collaboration work effectively certain requirements must be met, while some process must be undertaken. Requirements for collaboration, in line with Brna (1998) and Giesen (2002) include:

- A purpose. It is not enough that parties have their own individual goals, but there should be a joint goal or problem to be solved by their collective efforts. That is the purpose or essence of the collaboration
- Mutual agreement to collaborate, which implies accepting to share the common goal, resources, etc

- Understanding of each other's capabilities, especially on main areas of collaboration that require expert inputs
- Sharing of a goal, and keeping of some common vision during the collaboration process
- Maintenance of shared understanding of the problem at hand, which implies discussing the state of the progress

For effective collaboration, the process, in line with Gieson (2002) and Camarihna-Matos and Afsarmanesh (2008), include:

- Identifying parties and bringing them together
- Defining the scope of the collaboration and desired outcomes
- Defining the structure of the collaboration in terms of leadership, roles, responsibilities, ownership, communication means and process, decision making, access to resources, scheduling and milestones
- Defining the policies, including handling disagreements or conflicts, accountability, rewards and recognition, and ownership of generated assets
- Defining the evaluation/assessment measures, mechanisms and process
- Identifying risks and plan contingency measures
- Establishing commitment to collaborate

Conclusion

The built environment is a continually burgeoning sociocultural environment that needs to be adequately taken care of in terms of environmental protection, resource conservation and urban or regional development planning. In doing this, however, experts and/or professionals of diverse disciplines of the built environment and other categories of stakeholders are involved directly or indirectly at different levels. Often times, such involvement is not well coordinated to promote synergies among different stakeholders. It is, therefore, imperative that a more coordinated approach to managing the built environment be considered. This necessitates the need for exploration of collaboration as a means towards this end. In this paper, effort has been made in this direction. It is hoped that the various arguments on the complex issues of the built environment, stakeholders involved, their complex relationships, and how to promote their capabilities through effective collaboration, will be useful to all categories of stakeholders towards having sustainable built environment at different scales of human habitat – villages, towns, cities, regions, and states

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KEYNOTE SPEAKER 2

PROFESSOR AHMAD DOKO IBRAHIM

Ahmad Doko Ibrahim started his educational pursuit in Doko town, where he attended North Primary School, Doko between 1979 and 1985, and from where he proceeded to Government Secondary School, Doko and Ahmadu Bello University Demonstration Secondary School between 1985 and 1991. He went on to Ahmadu Bello University, Zaria in 1991, where he bagged his B.Sc degree in Quantity Surveying in 1998, after which he joined the Quantity Surveying department of the university as assistant lecturer in 2000.

Doko proceeded to King Fahd University of Petroleum and Minerals, Saudi Arabia, in 2001, where he obtained his M.Sc degree in construction engineering and management in 2003. From there he went to Loughborough University, United Kingdom in 2004, where he obtained his Ph.D degree in 2007.

Professor Doko served as head of Quantity Surveying department of the university between 2008 and 2012. He was first appointed as the managing director of the main consultancy firm of the university (ABUCONS) in 2010.

KEYNOTE ADDRESS 2:

Collaborative Initiatives for Sustainable Development in the Built Environment of Developing Economy

by

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INTRODUCTION

Developments of built environment facilities usually involves the temporary assembly of diverse parties that often have different sets of objectives, management styles and operating procedures (Hillebrandt and Cannon, 1994). Typically, these parties include clients/owners, design consultants, general contractors, subcontractors, suppliers, etc. Communication between these parties may be restricted with each party making decisions based on the goals and objectives of their organisations in a process often treated as confidential. Parties have relied on contracts to bind themselves together but because each party is often self-seeking, conflicts of interests are common resulting in suspicion of motives and actions (Larson, 1997). Cowan *et al.* (1992) argued that while clients often used contracts to command the contractors to work in accordance with any changed preferences (e.g. adjustment in design or schedule), contractors fight back by exploiting loopholes in the contract to their benefits. The diverse cultural and behavioural characteristics of the parties involved in construction projects, as a result of the fragmented and adversarial nature of the industry has made their coordination and integration an arduous task. The traditional contracting practices in the construction industry have exhibited some fundamental limitations which have serious impacted on project delivery. In general, Scott (2001) postulated that there are three principal areas in which the traditional contracting approaches have limitations:

1. misalignment between the owner and the individual contractors,
2. misalignment between the individual contractors, and
3. lack of access to contractors' skills and expertise at a time when they can best and most influence the eventual outcome.

Consequently, the fragmentation of the construction industry has had significant negative impacts – low productivity, cost and time overrun, conflicts and disputes, resulting in claims and time consuming litigation. This has been acknowledged as the major cause of performance-related problems facing the industry (Latham, 1994; Egan, 1997). The legacy of this high level of fragmentation is that the project delivery process is considered highly inefficient in comparison with other industry sectors. Some of the consequences of the fragmentation problem include (Evbuomwan & Anumba, 1998):

1. inadequate capture, structuring, prioritisation and implementation of client needs;
2. the fragmentation of design, fabrication and construction data, with data generated at one not being readily re-used downstream; development of pseudo-optimal design solutions;
3. lack of integration, co-ordination and collaboration between the various functional disciplines involved in the life-cycle aspects of the project; and
4. poor communication of design intent and rationale, which leads to unwarranted design changes, inadequate design specifications, unnecessary liability claims, and increase in project time and cost.

On a global scale, construction industry has been notorious for inefficiency, backwardness and adversarialism, 'project failures', dissatisfied clients due to poor quality of work, time and cost overruns, low labour productivity, poor safety records, high levels of conflict and disputes resulting from acrimonious and adversarial relationships between project participants (Duncan, 1986; Fenn *et al*., 1997; Bordoli and Baldwin, 1998; Love *et al*., 1999; Gyi *et al*., 1999; Tam *et al*., 2000; Chiang *et al*., 2001). This has made the achievement of sustainable development within the built environment to remain a mirage. A plethora of sources adjudge that the situation is not any rosier in developing economies such as Nigeria (Ajanlekoko, 1987; Okpala and Aniekwu, 1988; Dlakwa and Culpin, 1990; Elinwa and Buba, 1993; Odeyinka and Yusif, 1997; Jagboro and Alli, 1999; Aibinu and Jagboro, 2002). Accompanying these concerns have been streams of research by the academic community, analysing the nature of the industry and its various components, systems and structures, as well as the determinants of construction project success. Concurrently, researchers commissioned by governments or large construction organisations in many countries have been actively promoting a variety of approaches for managing/solving the woes associated with the construction industry. To overcome industry fragmentation, a number of integration/collaboration approaches and strategies, and their successful applications in manufacturing and other industries have been recommended (Mohamed, 1997). Consequently, many new collaborative management techniques have evolved to help in redressing these hurdles.

The increasing popularity of both collaborative and partnership systems reflects a desire to move from the development of policy and the planning and delivery of services through fragmented organisational, professional or sectoral premises toward integrated multi-sectoral, multi-professional and multi-party approach which will deliver improvements in the outcomes of projects and programmes to all stakeholders. This is particularly important given the rapid changes in demographies, technologies, fashions, expectations, coupled with the increasing opportunities for different ways of working offered by advances in information and communication technology and process redesign. These collaborations can occur as a result of a variety of motives and goals, take a range of forms and occur across vertical and horizontal boundaries (Ngowi, 2007). These, however, come with tremendous challenges in managing the interfaces and the potential conflicts of interests, especially in relationships involving parties from the construction industry that is historically characterised with adversarial relationships.

In order to achieve sustainable development, there has been varied responses to the call for the built environment to look at other sectors and settings for best practices. On one hand, researchers and practitioners have searched for related good practices that have been successfully adopted and implemented in other countries and industries (for example, Anumba *et al*., 2000; Ngowi, 2000; Fernie

et al., 2001; 2002; 2003; Green *et al*., 2002; 2004; Errasti *et al*., 2007). The underlying assumption being that borrowing something that has gained acceptance elsewhere, rather than inventing a new solution, is easier to exploit (Towill, 2003). On the other hand, practices originating from other countries, industries or even other construction projects have been rejected on the basis of being inappropriate because the characteristics of construction and of each project are perceived as "unique" both in terms of discontinuities and the fragmentation of the teams into different professional disciplines (Bresnen, 1990; Ahmad and Sein, 1997; Pasquire and Connolly, 2002; Bresnen *et al*., 2003). While these two contrasting views may not be necessarily mutually exclusive, this paper has adopted Lillrank's (1995) suggestion that good practice adopted elsewhere can be exploited, provided that it is sufficiently adapted to the new situation. Therefore, rather than attempting to 're-invent the wheel', this paper will identify and utilise existing internationally recognised collaborative best practices[1] in and around built environment whilst highlighting the relevant contextual issues. This paper will specifically explore the concepts of partnering (Ibrahim and Price, 2006), supply chain management (Abdulrazak, 2015) and building information modelling (Abubakar, 2012).

PARTNERING

As a way of enhancing project delivery through improved supply chain relationships, many countries have encouraged the incorporation of 'partnering' philosophy into their procurement systems (Gyles *et al*., 1992; Latham, 1994; Egan, 1998; Grove, 2000; Tang, 2001). The concept of partnering encapsulates a variety of practices intended to facilitate greater collaboration amongst those involved (Barlow *et al*., 1997). Partnering eschews traditional adversarial relationships between project parties and encourages relationships based on the principles of trust, mutual respect and cooperation towards the achievement of a common goal (Warne, 1994; Holti and Standing, 1996; CIRIA, 1999). In the construction-related businesses, partnering relationships may be either short-term and project-orientated or long-term and strategic in nature (Barlow *et al*., 1997). In the former, emphasis is more likely to be on agreeing project governance issues to secure immediate project benefits rather than on developing advanced cooperative practices, whilst in the latter case the partnership is typically concerned with optimising the partnership's resources through closer collaboration to maximise long-term benefits (Beach *et al*., 2005). The application of partnering has been shown to be especially beneficial when the alliance partners are not in direct competition, such as between public and private sector organisations.

Ibrahim (2005a) explored the potentials for using partnering approach to support the establishment of sustainable relationships between contractual parties in the Nigerian construction industry. In making a case for the adoption of partnering in public construction procurement in Nigeria, Ibrahim (2005b) examined the limitations of traditional procurement approaches, outlined the main ways by which partnering could address the limitations and highlighted the potential implementation barriers under the Nigerian context. Even in the UK construction industry where partnering can be said to have matured, however, the success of partnering amongst main contractors, subcontractors and their suppliers is still not thought to be entirely successful (Dainty *et al*., 2001; Beach *et al*., 2005; Smyth and Edkins, 2007). These may not be unconnected with differences in values, beliefs and cultures of the different parties from different sectors (Thompson *et al.*, 2003).

As will be seen, not only do definitions of partnering vary widely, but it varies also in principles as forms such as 'alliancing', 'joint venturing', 'long-term contracts', 'relational contracting' and other collaborative working arrangements and better risk sharing mechanisms exist.

Defining Partnering

[1] 'Best practices' are the ways of doing work that have proved to be efficient and effective in providing particular services (Ngowi, 2002).

Although Infante (1995) stated that defining partnering will assist in understanding the concept, partnering in construction is not a neatly defined concept. While some researchers believe there are more similarities than differences in opinion regarding its definition (Naoum, 2003), others think it is rather a complex subject that is difficult to pin down and define (McGeorge and Palmer, 2000; Cheung *et al.*, 2003). At its loosest, it can mean no more than an informal agreement between participants to eradicate the adversarial aspects of their respective cultures and substitute an ethos of goodwill and cooperation. At its strictest, it can denote a sophisticated contractually significant matrix regulating successive contracts over a long period of time. Crowley & Karim (1995) suggests that partnering can be defined in one of the following three major ways:

1. the 'anticipated outcomes' or 'attributes' of partnering, such as compatible goals, mutual trust, long-term commitment, etc;
2. the 'process' that led to the outcomes where partnering is used as a verb to indicate an action, such as commitment to common goals, organizing partnering workshops, developing trust, etc; and
3. the 'organizational interface' that generates the new organizational structure.

In construction, the most notable and widely cited definitions include the following:

The Construction Industry Institute (CII) (1989, 1991) defines partnering as "*a long term commitment between two or more organizations for the purposes of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisational boundaries. The relationship is based on trust, dedication to common goals, and on an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovations, and the continuous improvements of quality products and services*."

From the above point of view, partnering is primarily concerned with 'maximising effectiveness', thereby reverberating the intent of countless other management improvement techniques. Emphasis is also given to 'culture' and the need to base relationships on trust and understanding and the influence of the rhetoric of "Total Quality Management" (TQM) is readily noticeable in the reference to 'continuous improvement'. The definition brings together all the essential elements of a partnering relationship and outlines the benefits of undertaking a partnering as well as the requirements.

The National Economic Development Office (NEDO) (1991) define partnering as "a *contractual arrangement between a client and his chosen contractor which is either open ended or has a term of a given number of years rather than the duration of a specific project. During the life of the arrangement, the contractor may be responsible for a number of projects, large or small and continuing maintenance work and shut downs. The arrangements have either formal or informal mechanisms to promote cooperation between the parties."*

Apart from this definition's bias towards the client – main contractor relationship, the question of partnering being a contractual agreement arises. First, partnering does not have to be contractual. It is about working within an open and honest team spirit rather than the letter of the law. Both CII's and NEDO's definitions of partnering cover both the 'attribute' and 'process' aspects.

Bennett and Jayes (1995) define partnering as "*a management approach used by two or more organisations to achieve specific business objectives by maximising the effectiveness of each participant's resources. The approach is based on mutual objectives, an agreed method of problem resolution, and an active search for continuous measurable improvements*." This definition develops the idea of the need for the measurement, on a continuous basis, of any improvements to be achieved.

Crowley and Karim (1995) used an organisation's point of view to describe partnering "*as an organisation that is formed by resolving conflicts, expediting decision-making and increasing organisational competence in achieving project goals*". This view reflects a decentralised, pseudo-organisational structure, designed to allow better flexibility in meeting specific project needs, as illustrated by Figure 1. They defined partnering as "*(an) organisation (that) implements a cooperative strategy by modifying and supplementing the traditional boundaries that separate companies in a competitive market. In this way, partnering wraps the major project participants into an alliance that creates a cohesive atmosphere for the project team members to openly interact and perform*".

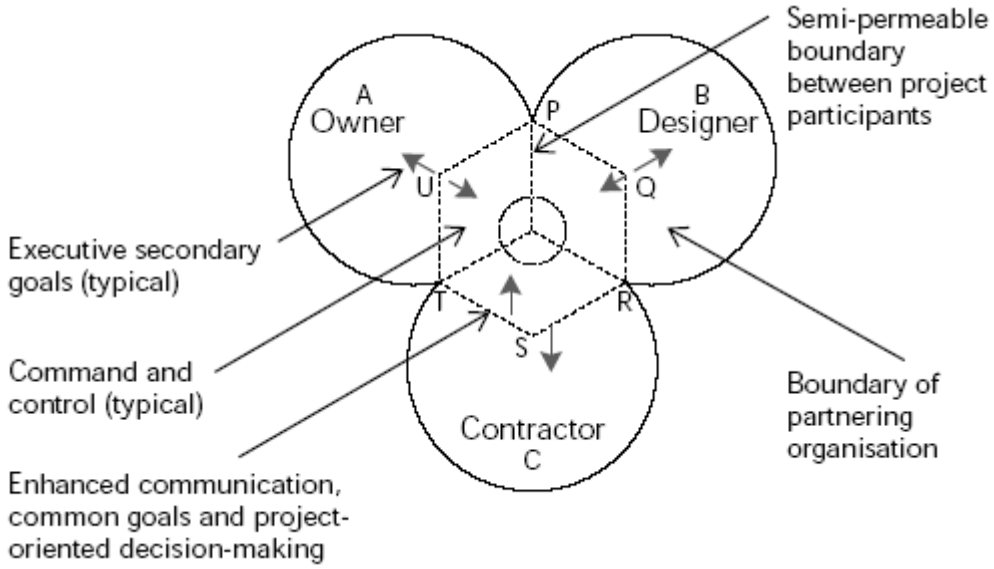


Figure 1: Conceptual Model of Partnering (Source: Crowley and Karim, 1995)

The European Construction Institute (ECI) (1997) however took a step further from the rather rigid definitions and in applying partnering to the public sector stated that partnering is a generic term that "*embraces a range of practices of varying formality, designed to promote more cooperative working between contracting parties*". They also expanded the type of partnering to include the Post-Award Project-Specific Partnering (PAPSP). ECI (1997) explains that in PAPSP arrangement the contract is subject to normal competitive processes and partnering starts after the contract has been awarded.

Egan (1998) describe partnering to "*involve two or more organisations working together to improve performance through agreeing mutual objectives, devising a way for resolving disputes and committing themselves to continuous improvement, measuring progress and sharing the gains*." Egan further consider partnering to be a 'tool to tackle fragmentation', which is increasingly used by the best firms in place of traditional contract-based procurement and project management.

Building on their earlier work, Bennett and Jayes (1998) introduced the idea of three generations of partnering, developing in an evolutionary manner as the working relationship between partners develops. They indicated that extensive research and analysis suggests that a second generation style of partnering, with greater degree of sophistication than that previously used and with a higher level of strategic decision making, had emerged. In this case, there is a deeper understanding of the essential elements required. This has consequently led to defining partnering as "*a set of strategic actions which embody the mutual objectives of a number of firms achieved by cooperative decision-making aimed at using feedback to continuously improve their joint performance*". This second generation partnering begins with a strategic decision to cooperate by a client and a group of consultants, contractors and specialists engaged in an ongoing series of projects.

Categories of partnering

Although cooperative working can take many forms, all seek to address the issue of adversarialism directly. Scott (2001) posited that it is based on the simple premise that "better results can be achieved for all participating companies if they work together towards agreed goals rather than as individual companies each with its own separate agenda and objectives". The most common forms of partnering approach can be categorised as follows:

1. *Project partnering* (sometimes referred to as project alliancing) - This type of arrangement lasts for the duration of a single project (Scott, 2001) and the contract may be awarded competitively (ECI, 1997). In this instance, the arrangement can be between the owner and single contractor, but more commonly it is between owner and several contractors (Scott, 2001). There is a variation of project-specific partnering (commonly called alliancing) where the arrangement is underpinned by an incentive scheme, whereby the rewards of the contractors and the owner are linked to actual performance during the execution phase of the project.

   Post-award project-specific partnering is a variation of the project-specific partnering type and is more suited to the public sector. Here, the contract is subject to the normal competitive processes. As the name suggests, the partnering arrangement is entered into after the contract has been awarded. However, the intent to partner should be a criterion in the award process (ECI, 1997).

2. *Strategic alliancing* - This type of arrangement generally covers the provision of services for the execution of series of projects (ECI, 2003) over a specified period of years (Scott, 2001) rather than a single project (ECI, 1997). It is most commonly used between the owner and a single contractor (Scott, 2001) but could involve more than one contractor and it is often time-bound.

3. *Long-term partnering* - This is the development of sustainable relationships between two or more organisations, to work in cooperation for their mutual benefit in the requisition and delivery of works, goods and/or services over a specified period to achieve continuous performance improvement (ECI, 2003). It is most commonly used between the owner and a single contractor and maybe an open-ended relationship (Scott, 2001).

It should be noted that project partnering does not have to have a contract. Commonly, a *charter* is drawn up and signed, usually at a *workshop*, which contains the goals for the project. The charter lies next to the 'contract' and promotes the agreed way of working together rather being a legal commitment. However, in the development of the charter, the participants may inadvertently create legal relationships they did not intend. It is important, therefore, that consideration is given to the potential consequences before drafting out a charter.

Key Features of Partnering

It has been suggested that the essence of partnering is the recognition of common goals and the creation of an atmosphere of trust, teamwork and goodwill which will facilitate the achievement of these goals. Most successful partnering arrangements display a number of key features, and it is important for these to be recognised at the outset of any future project. These elements fall into two categories. First are the attitudinal factors that must be shared by all parties concerned (Ibrahim, 2005a):

1. *Early involvement of key participants* - allows their expertise and knowledge to be brought to bear at the crucial stage of early project's development, resulting in a better defined project and greater certainty regarding its eventual delivery (Matthews *et al.*, 1996).

   Open sharing of best practices in value engineering, together with a focus on design innovation, simplification and optimisation, and constructability at the earliest possible opportunity provides significant potential for reducing project costs and schedules. Apart from these benefits, early selection and involvement means that all the participants have an opportunity to develop other key aspects of successful alliances before project execution starts.

2. *Equitable relationship* – requiring that firms develop agreed objectives, as well as finding ways of accommodating each other's individual objectives. A critical hurdle to be overcome in arriving at a successful win-win relationship is that of identifying the risks associated with a project and apportioning these between the parties.
3. *Management commitment* – for the introduction, supporting, and marketing of the partnering concept, convincing doubters and finding individuals who can nurture the partnering process on a day-to-day basis are crucial at both inter-organisational and project levels. This can be aided by ensuring that all those involved in the arrangement understand that its goals are mutually agreed, and are not imposed from above or by the owner.

   Commercial alignment - by instituting an incentive scheme that firmly links the returns of all the participants to actual performance against specific criteria. These criteria are a direct measure of the overall project outcome rather than just of each contractor's individual performance. The 'targets' for the performance criteria are derived from jointly developed and agreed data, such as project cost estimates and schedules.

4. *Integrated team* - The creation of an effective 'single' integrated project team is crucial to success. There are two aspects to this:
   a. *Project team structure* - One of the key underpinning concepts of partnering is that each of the parties retains accountability for delivering the part of the project for which it has been selected (e.g. design, fabrication, construction), but at the same time there is a collective responsibility for delivery of the complete project. The organisational structure of the project must be constructed in such a way that it recognises and demonstrates these two points. The allocation of personnel to the team, and especially to key positions, must reflect individual corporate accountability. Each of the key functional areas (e.g. design, fabrication, construction) of the team should be led by a person from the party that is accountable for that function.

      To reflect the collective responsibility of the parties, the organisations should be constructed in such a way that it eliminates duplication of function to the maximum extent possible. Areas where needless duplication can often occur include planning, cost control, procurement and technical and safety audits. The parties should take active steps to determine the extent to which duplication might or does occur and to explore every opportunity for integrating such functions. In doing so, care must be taken to ensure that individual corporate needs are met.

      Creating an integrated team can bring immediate benefits through a reduction in the manpower resources allocated to the project. It also offers the possibility of other

efficiency gains through having single point accountability and more transparent processes than might otherwise be the case.

b. *Project team alignment and commitment* - Ultimately, an alliance derives its main power from the effectiveness of the project team. It is widely recognised that it is people and the way in which they work individually and collectively that is the main determinant of the results obtained. Research has indicated that the performance of a team can be linked to a number of key factors, including:
   - clear leadership;
   - tam capability;
   - clarity of roles and responsibilities;
   - effective communication throughout the team;
   - understanding of and alignment with project aims;
   - motivation and commitment to achieve results;
   - a 'no blame' culture;
   - recognition and acknowledgement of individual contributions;
   - arrangements to foster team integration.

   It is, however, arguable that these factors are not in themselves sufficient, and that the single most important driver of team performance is the strength of the alignment and commitment of the team leaders and team members to achieving results. Senior management personnel from all the parties as well as the project manager have an important role to play in engendering the alignment and commitment. Many successful partnering teams have reported that investing in the use of external consultants with specific skills in this area has played an important, if not indispensable, part in their success.

5. *Trust* - The majority of participants in alliances have asserted that trust is an essential element of success, and the importance of trust has been borne out by studies of such arrangements. The Construction Industry Institute has an accepted definition of 'trust', on which the following definition is based: "*Trust is the confidence and reliance one party has in the professional competence and integrity of the other party (parties) to contribute to the successful execution of a project in a spirit of openness, fairness and cooperation".* It is important to recognise that trust is usually developed and strengthened over time as the alliance participants work with each other.

6. *Innovation* - Innovative thinking and the application of new approaches, both at a technical level and at an engineering and business process level, drive the achievement of significantly improved performance. Thus creating structures and processes to encourage and promote innovative thinking and application should be a key focus for those participating in an alliance. This must be continuous through all phases of the project, including execution.

7. *Open communication* - Communication is always important, but in alliance open and honest communication between all the parties is vital. It promotes all the key behavioural aspects of alliancing, and is particularly important in encouraging everyone to confront issues and differences of view from the perspective of developing solutions rather than allowing them to escalate into disputes.

Companies participating in an alliance should also give very careful thought to considering what information can be shared with the other members of the alliance. The more information that is relevant to developing the understanding of the others that can be shared the better. In some instances this may include information that individual companies have previously considered to be confidential. Personal contact between key staff on a day-to-day basis, as well as at regular meetings, is important.

ECI (1997) summarised the second category of essential elements to comprise of the techniques and procedures:

1. *Selection procedures* - These are constructed to ensure that the parties involved in the partnering process will be compatible and committed. This normally involves a two-stage process of selection by questionnaire and interview.

2. *The workshop* - All parties and stakeholders attend a partnering workshop at which the objectives for the project and of the parties are aligned and the ground rules for the partnering arrangement established.

3. *The charter* - This set out the aspirations and expectations of the parties and the relationships that they hope to achieve. It is not intended to be a contractual document nor does it supersede the contract. While the contract establishes the legal relationship between the parties, it is the charter which is concerned with the working relationships. It is in effect a statement of how the parties intend to conduct themselves.

4. *The communication structure* - Open and full communications between the parties is a necessary condition of partnering. The structure of communications and relationships at all levels, both on and off-site, is agreed at the workshop.

5. *Evaluation procedure* - Continuous monitoring is essential to ensure that the partnering relationship is achieving its objectives and those of the project. This is facilitated by a jointly formulated and agreed procedure.

6. *Dispute avoidance procedure/resolution procedure* - A jointly agreed procedure must be established for the avoidance and resolution of issues arising. The objective is to have the issue resolved at the earliest possible opportunity at the lowest possible level of authority, subject to any contractual and/or statutory rights of the parties.

7. *Continuous improvement procedure* - One of the main benefits of partnering is that there is a continuous process of seeking opportunities to improve performance.

Potential barriers to partnering implementation

Faruk (2014) evaluated the readiness of Nigerian construction industry to adopt partnering/collaborative procurement strategies using four readiness components (management, people, process and technology) and found that the stakeholders are not fully ready for the adoption. The study reported full readiness only in the management dimension.

It is also important to note that partnering cannot solve all the problems in the construction industry as it is only a management technique, and its success is totally dependent on the people who drive it (Slater 1998). Scott (2001) broadly observed that most of the barriers can be viewed as being primarily self-imposed and resulting from the way in which organisations are structured and the ways in which they have been used to conducting business. According to Ibrahim (2005b), the broad areas include:

1. organisational structures
2. cultural attitudes
3. partner fit
4. commercial concerns
5. availability of owner skills
6. legal considerations

SUPPLY CHAIN MANAGEMENT

According to Saad, Jones, and James (2002), modern manufacturing industry, including construction, is moving away from vertically integrated companies that control all aspects of production and distribution, and moving toward networks of independent suppliers and distributors. These supply networks more commonly called "supply chains" address a number of business needs, including concentration on core competencies and the ability to respond rapidly to unanticipated change (Wang & Xue, 2004). Supply Chain Management (SCM) as a new management philosophy is developed under this context to meet these needs. Although SCM is a concept that originated in the manufacturing industry, it has emerged as a popular and useful concept in the construction industry and its research community since the mid-1990s (O'Brien, 2002). Following the example of other sectors of economy, a small but increasing number of construction organisations are beginning to adopt SCM to improve their performance, to enhance their competitive advantage, and to address their adversarial inter-organisational purchaser-supplier relationships and fragmented processes. Construction Supply Chain Management (CSCM) is defined as the strategic management of information flows, activities, tasks, and processes, involving various networks of independent organisations and linkages (upstream and downstream) which produce value that is delivered to the owner in the form of a finished project (Benton & MacHenry, 2010). Hatmoko and Scot (2006) stated that CSCM focuses on strategies for lean construction including just-in-time purchasing, supplier evaluation, subcontractor selection, subcontractor relationship management, equipment acquisition, information sharing, and project quality management. The typical supply chain for any given construction project could include client, consultants, main contractor, specialty subcontractors, money and material suppliers that come together one time to build a single project for a specific owner (Cox & Ireland, 2002). Millet, Dainty, Briscoe, and Neale (2000) noted that this complex supply chain is characterised by adversarial short-term relationship which causes dissatisfaction throughout the supply chain and results in arms-length, one-time, project-focused relationships.

Supply Chain Management Concept

Today, economic forces and heightened competitive pressures are driving organisations to constantly change their business strategies (Tucker & Mohamed, 2001). Organisations throughout the world are taking bold steps to break down both inter- and intra-organisational barriers to smooth uncertainty and enhance control of supply chains (Stevens, 1998). A supply chain simply represents the cross-functional integration of activities that cross the borders of individual organisations (Chao, Hadavi, & Krizek, 2000). It is a network of various organisations involved both through upstream and downstream linkages in different kinds of activities and processes (Christoper, 1998). It seeks to bring together activities that traditionally were split between independent entities creating a mutually beneficial win-win supply chain partnership (PE Consulting, 1997). The supply chain covers the full range of activities from the earliest level of incoming raw materials through the internal processes at the site and on to the outgoing products through the distribution and marketing channels (Tucker & Mohamed, 2001). Therefore, supply chain is the planned continuous improvement of processes and

relationships that exist to support the movement of these products and services through the supply chain. The major contribution of today's supply chain model is to improve the organisation's bottom line by enhancing collaboration between business and their clients and/or trading partners (Computer Science Corporation, 2000).

Supply chain management (SCM) seeks to break down barriers, which exist between each of the links in the supply chain, in order to achieve higher levels of service and to substantially reduce costs (Fearne, 1996). A fundamental issue in SCM is the development of closer linkages between chain partners, and the management of information as it moves across organisational boundaries. La Londe (1998) defines SCM as "the delivery of enhanced customer and economic value through synchronised management of the flow of physical goods and associated information from sourcing through consumption". The supply chain has been defined as 'the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer (Christopher, 1992). SCM looks across the entire supply chain, rather than just at the next entity or level, and aims to increase transparency and alignment of the supply chain's coordination and configuration, regardless of functional or corporate boundaries (Cooper & Ellram, 1993). Cox (2002) argues that SCM should be seen as the central unit of competitive analysis, whereas Tan and Kannan (1998) go even further by advocating that all strategic (key) suppliers in the supply chain should integrate to act as a single entity and thus enhancing overall performance in the chain. SCM stresses the need for collaboration among successive chain partners, from primary suppliers to end-customers, to better satisfy customer demand at lower costs. SCM has been beneficially applied to several industries, notably in the manufacturing and retail industries. The manufacturing industry had been at the forefront of developing SCM for many years (Landry, 1998), whereas the retail industry has arguably been most successful in the implementation of SCM strategies.

The Model of Construction Supply Chain

Construction Supply Chain (CSC) includes all the businesses and organisations involved in the construction process from the extraction of raw materials to the eventual demolition of a building, and disposal of its components (Wang & Xue 2014). The process is often explained as a supply chain and can be cyclical whereby several repetitions of the process are undertaken as facilities are modernised or replaced; or can be terminated as is the case with many one-off private developments (Edum-Fotwe, Thorpe, & Ma Caffer, 2002). According to Muya (2000), there are three types of CSC: the primary supply chain, which delivers the materials that are incorporated into the final construction product; the support chain, which provides equipment, expertise and materials that facilitate construction, and the human resource supply chain which involves the supply of labour.

Figure 2 presents a schematic view of the process that is made up of the operational activities of production within construction. In terms of CSC's structure and function, CSC is a converging, temporary, and make -to-order supply chain (Vrijhoef & Ridder, 2007). Converging refers to all materials being directed to the construction site where the components are assembled from incoming materials. In contrast to traditional manufacturing systems where products pass from the factory and are then distributed to many customers, the "construction factory" is established around the single product: one-off construction project. Temporary refers to CSC producing one-off projects through repeated reconfiguration of project organisations. This characteristic results in CSC being typified by instability, fragmentation, and especially by the separation between the design and the construction of the building. Make-to-order refers to every project creating a new product or prototype to suit each project's specific needs. Considering the relationships and behaviours involved in CSC, there are three attributes or key factors: networks, attitudes and collaboration (Malik, 2001).

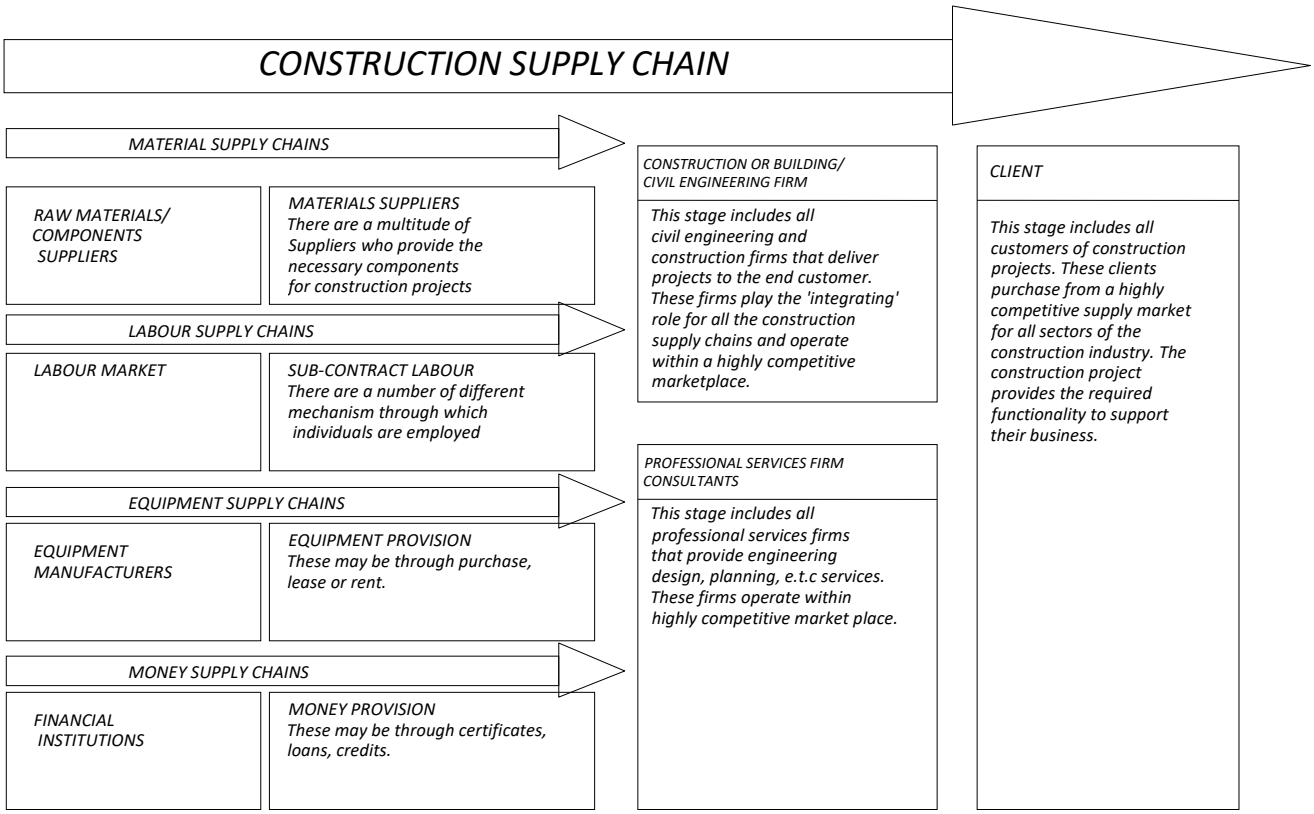


Figure 2.2: The Myriad of Construction Supply Chains

Source: Harris et al. (2008)

Barriers to Construction Supply Chain Management

According to Benton (2010), SCM offers promise for the construction industry. Intense implementation challenges, however, often prevent effective exploitation of SCM benefits and prove detrimental to any planned operational efficiency advantage. The barriers are summarised in Table 1.

Table 1: Barriers to Supply Chain Management

1. Failure to share project information
2. Fear of loss of control
3. Lack of self awareness
4. Lack of partner awareness
5. Enormity of project complexity
6. Inability to recognize project goals
7. Lack of understanding project owner
8. Lack of understanding of supply chain
9. Myopic thinking
10. Myopic Strategies
11. Deficiency of Mutuality

Source: Benton (2010)

BUILDING INFORMATION MODELLING

The basic concept of BIM is underpinned on the need to provide a platform that addresses the weaknesses of the previous Computer-Aided Design (CAD) technologies by providing collaborative platform that integrates all building information in a single file which can be exchanged and shared by all relevant project stakeholders. The acronym 'BIM' has many interpretations depending on the context in which it is used: It could be 'Building Information Modelling'; 'Building Information Model'; or 'Building Information Management'. The term BIM is considered to be ambiguous and has no universally accepted definition. Hence, the proliferation of definitions in literature (Aranda-Mena *et al*., 2008). According to RICS (2014b), the concept of BIM has no accepted definition due to its ever-evolving nature where new areas and frontiers are creeping into the boundaries of what it could be defined as.

There are definitions that present BIM as a 'Process', a 'Product', a 'technology', an 'innovation', or a 'Strategy'. However, simpler definitions consider BIM as a digital representation of the physical and functional characteristics of a facility. Whatever definition is given to BIM, the major function and goal of BIM involves the detailed and complete replication of a building in a digital environment with the sole goal of providing a collaborative platform for managing Building information throughout the lifecycle of a facility (Aouad *et al*., 2014) . The terms '*Building Information Model'* and '*Building Information Modelling'* are often used interchangeably, basically referring to a way of creating, using, and sharing building lifecycle data.

The following are some of the most notable definitions of BIM in literature

a) ***US National BIM Standards (NBIMS):*** **"***Building Information Modelling is digital representation of physical and functional characteristics of a facility creating a shared knowledge resource for information about it forming a reliable basis for decisions during its life cycle, from earliest conception to demolition."(NBIMS, 2007).*
b) ***AGC (Associated General Contractors of America):*** *A Building Information Model, is a data-rich, object-oriented, intelligent and parametric digital representation of the facility, from which views and data appropriate to various users' needs can be extracted and analysed to generate information that can be used to make decisions and to improve the process of delivering the facility (AGC, 2005).*
c) ***Autodesk (2016)*****:** *BIM is an integrated process for sharing key physical and functional characteristics digitally before it is built. With BIM, AEC professionals can deliver projects faster and more economically while minimising environmental impact.*
d) ***Gu and London (2010)):*** *Building Information Modelling (BIM) is an IT enabled approach that involves applying and maintaining an integral digital representation of all building information for different phases of the project lifecycle in the form of a data repository.*
e) ***Kymmell (2008)****: A building information model is a project simulation consisting of the 3D models of the project components with links to all the required information connected with the project's planning, construction or operation, and decommissioning*
f) ***Eastman, Teicholz, and Sacks (2011)***: define BIM as a modelling technology and associated set of processes to produce, communicate, and analyse *building models.*

In the US the National Building Information Modelling Standard (NBIMS) Committee of the National Institute of Building Science's (NIBS) Facility Information Council (FIC) is a major industry actor that regulates and promotes BIM implementation and application. The NBIMS vision for BIM is *"an improved planning, design, construction, operation, and maintenance process using a standardised machine-readable information model for each facility, new or old, which contains all appropriate information created or gathered about that facility in a format useable by all throughout its lifecycle" (NBIMS, 2007).*

NBIMS categorises BIM in three ways; as a product, a process and as a technology (Eastman *et al*., 2011). As a product, BIM is an object-based digital representation of the physical and functional characteristics of a facility that serves as a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its life cycle from inception onward. BIM as a process is a collection of defined model uses, workflows, and modelling methods used to achieve specific, repeatable, and reliable information results from the model. As a technology, BIM is an ICT that is driven by the fundamental principles of CAD. It uses the technological advances made in the area of 3D modelling, especially from the product development and manufacturing sector. The principal difference between BIM technology and conventional 3D CAD is the parametric modelling approach used in BIM models. While 3D CAD is made up of geometric entities, the constituents of BIM are parametric.

BIM is an extended 3D model that stores all building information of a project. With a 3D BIM, all the required project drawings (sections and elevations), presentation drawings, renderings and detailed construction drawings, as well as quantity calculations and price estimations could be directly extracted, especially if the model is at the highest level of details. Consequently, changes to the model are instantly updated on all drawings. The most significant highlights of the BIM methods are; single file concept; use of real Architectural elements for modelling, parametric capabilities where changes to the model affect all related drawings (and vice versa) and the automatic generation and updating of documentation among several others (Abdullahi, Ibrahim, & Ibrahim, 2014; Aouad, Wu, & Lee, 2006; Aouad, Wu, Lee, & Onyewobi, 2014; Aranda-Mena, Crawford, Chavez, & Froese, 2008).

BIM has successfully moved the AEC industry forward from current task automation of project and paper-centric processes (3D CAD, animation, linked databases, spreadsheets and 2D CAD drawings) to an integrated and interoperable workflow where these tasks are collapsed into a coordinated and collaborative process that maximises computing capabilities, Web communication, and data aggregation into information and knowledge capture (Eastman *et al.*, 2011). All of these are used to simulate and manipulate reality-based models to manage the built environment within a fact-based, repeatable and verifiable decision.

BIM is not a software as so many people perceive it to be. BIM is a terminology, an idea, a concept NOT a software. However, many software vendors adopt BIM concepts in their design. These software are called BIM-based applications. These BIM-based software are digital environments set up by software vendors with appropriate tools within their interfaces that support building information modelling. For example, Revit adopts BIM (e.g. parametric object modelling) concept but BIM is not Revit.

The Dimensions of BIM

A BIM model starts with a parametrically enriched 3D which has both geometric and non-geometric information embedded into its various components. However, as more information is added to the parametric objects in a 3D BIM model, the model becomes richer and more robust featuring other information dimensions. Researchers classify BIM as 3D, 4D, 5D, 6D, 7D and nD (Aouad *et al*., 2006):

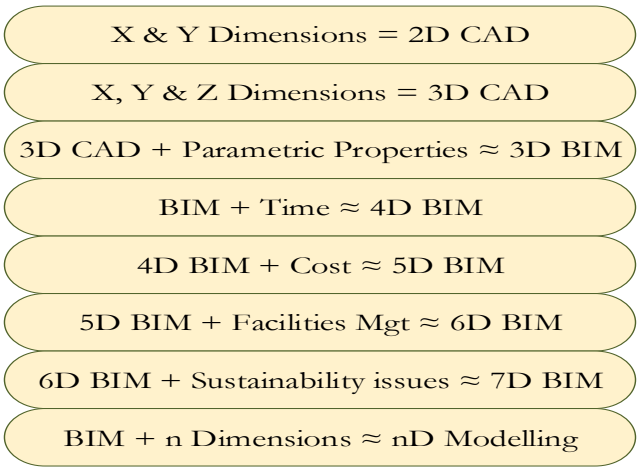


Figure 3: BIM Dimensions (Source: RICS (2014))

- **3D BIM:** This is a highly rich three-dimensional model (X, Y and Z) made up of intelligent/smart parametric objects.
- **4D BIM:** 3D model with time dimension assigned to its objects. Each component or object of the model can be assigned a schedule indicating its start and finish time.
- **5D BIM:** 4D model with cost parameter added to it. A 5D model facilitates cost management function such as cost analysis and planning, and cash flow management.
- **6D BIM:** This constitutes a 5D model with facilities management related information embedded to it.
- **7D BIM:** A 6D Model with sustainability issues.
- **nD Model:** is an extension of a Building Information Model that incorporates all design information required at each stage of the lifecycle of a building facility. It was first developed at the University of Salford by Aouad *et al*. (2006).

BIM Technologies

There are basically two major technologies that drive the implementation of the concept of BIM. These technologies are:

1. Object oriented CAD
2. Parametric Modelling

Object oriented CAD Technology

There are two forms of CAD technologies; the entity-based CAD, and the 'Object-oriented CAD'. The entity-based CAD is a CAD technology that uses vector graphics such as dots, lines, arcs and circles to create designs (Aouad *et al*., 2014). For example, series of lines can be used to form a wall. The entity-based CAD has the capability of creating 2D and 3D 'dumb' CAD using geometric entities in a way similar to real world objects. Traditional CAD software such as AutoCAD, internally represent design information using geometric entities. However, the fundamental drawback of this approach as observed earlier is that, while the system can accurately describe geometry in any domain, it cannot capture non-geometric domain-specific information about objects (e.g. properties of a column, hosting of a door or window in a wall, location of the pipe rack etc.).

On the other hand, the object-oriented CAD technology utilises complete parametric objects to form a design (Aouad *et al*., 2014). Building elements or components such as walls, columns and floors are created using pre-defined parametric objects that have sufficient information regarding the properties and attributes of the object embedded into them. Object oriented CAD is one of the technologies behind BIM that addresses the weaknesses of the 'dumb' 3D CAD by providing domain specific data of every

object, capturing both geometric and non-geometric information. BIM objects used in most BIM software nowadays are stored in the objects' libraries and contain customised objects created and commercialised by manufacturers and suppliers.

Parametric Modelling

The objects created and used in BIM environment become intelligent only if they are enhanced using defined parameters in the form of attributes, properties and other parametric characteristics. The parametric characteristics of BIM objects allow some degree of automation in the modelling process that makes the objects intelligent and sensitive to changes made to other related objects in a model. For example, defining a parameter that captures the design intent that the location of a window is midway between its horizontal edges. When a modeller uses this window in the model and defines the size of the window, the location of the window is automatically set using the parametric characteristic of the object, thus allowing the window in a BIM environment to update itself as its context changes (Eastman *et al*., 2011).

The parametric object modelling provides a powerful way to create and edit geometry. Without it, model generation and design would be extremely cumbersome and error-prone. Designing a building that contains a hundred thousand or more objects would be impractical without a system that allows for effective low-level automatic design editing. The concept of parametric objects is central to understanding BIM and its differentiation from traditional 3D objects. Eastman *et al*. (2011) defined parametric BIM objects as follows:

- Consist of geometric definitions and associated data and rules.
- Geometry is integrated non-redundantly, and allows for no inconsistencies. When an object is shown in 3D, the shape cannot be represented internally redundantly, for example, as multiple 2D views. A plan and elevation of a given object must always be consistent. Dimensions cannot be "fudged."
- Parametric rules for objects automatically modify associated geometries when inserted into a building model or when changes are made to associated objects. For example, a door will fit automatically into a wall, a light switch will automatically locate next to the proper side of the door, a wall will automatically resize itself to butt to a ceiling or roof, and so forth. Objects can be defined at different levels of aggregation, so a wall can be defined as well as its related components. Objects can be defined and managed at any number of hierarchy levels. For example, if the weight of a wall subcomponent changes, the weight of the wall should also change. Objects' rules can identify when a particular change violates object feasibility regarding size, manufacturability, and so forth.

In parametric design, instead of designing an instance of a building element like a particular wall or door, a designer first defines an element class or family which defines some mixture of fixed and parametric geometry, a set of relations and rules to control the parameters by which element instances can be generated. The shape from a model family will vary according to its context. Objects and their faces can be defined using relations involving distances, angles, and rules like *attached to, parallel to*, and *offset from.* These relations allow each instance of an element class to vary according to its own parameter settings and the contextual conditions of related objects (such as the walls a given element butts into). Alternatively, the rules can be defined as requirements that the design must satisfy, such as the minimum thickness of a wall or concrete covering of rebar, allowing the designer to make changes while the rules check and update details to keep the design element satisfying the rules and warning the user if the rules cannot be met. Object-based parametric modelling supports both interpretations.

BIM Applications

BIM has potential applications to different stakeholders and across the project lifecycle. For stakeholders, the applications vary as shown on Table 3.

BIM can be applied at any stage of the lifecycle of a facility. This section presents a brief highlight of the various applications of BIM at various project phases; project programming, design, preconstruction, construction, and post-construction (operations and maintenance) (Aranda-Mena *et al*., 2008; Ashcroft & Shelden, 2008; Eastman *et al*., 2011; Kymmell, 2008).

Table 3: Applications of BIM to project stakeholders

Areas of Application	Project Stakeholders			
	Owners	Designers	Constructors	Facility Managers
Visualisation	X	X	X	X
Options Analysis	X	X	X	
Sustainability Analyses	X	X		
Quantity Surveying & Cost Estimating	X	X	X	
Site Logistics	X		X	
Phasing and 4D Scheduling		X	X	
Constructability Analyses		X	X	
Building Performance Analyses	X	X	X	X
Building Management	X			X

Source: Azhar *et al.* (2015)

Status of BIM Implementation

BIM is currently becoming widespread around the globe, affecting the construction industries of many nations at various levels. The construction industry in the developed world is rushing to embrace BIM as a catalyst for gaining operational efficiencies, and tremendous rise in adoption in the last three to five years has been recorded. Annual surveys are frequently being conducted to document the state of affairs, and national-level initiatives are in place to produce BIM standards and guidelines by various public and non-governmental institutions.

High rate of BIM adoption is globally more visible in the developed economies where research activity focusing on BIM has also increased. Studies on the status of BIM implementation as reported in both academic literature and industry publications, generally focused on few selected countries, from the developed world. A typical example is the famous McGraw Hill BIM report (McGraw-Hill Construction, 2014). The story in the developing countries is quite opposite. This is despite the volume of construction going on which is logically expected to leverage the gains that can be achieved from using BIM which are quite enormous.

Recent report by McGraw-Hill Construction (2014) summarises the status of BIM adoption over the last three to five years around the globe and identified Canada, France, Germany, the UK and the USA as mature markets for BIM technology with new under explored market in countries such as; Australia, Brazil, Japan, New Zealand, South Korea, China and India.

On a general note, the report depicts the rapid and robust BIM uptake globally, especially in the US and Scandinavian regions where BIM adoption is at its peak level. Significant successes have also been reported in the UK, Australia and other maturing countries in the Middle East (McGraw-Hill Construction, 2014). Table 4 and Table 5 show the global status of BIM adoption by contractors as at 2014. According to the report, construction companies have reported a positive return on investment with more savings expected in the future; the volume of construction companies' work using BIM will increase by 50 per cent in the year 2016, leading to increased investment in BIM is expected.

Table 4: Status of BIM Adoption Globally

Country	Status of Adoption
United States	71%
Europe	46%
UK	54%
Middle East	25%
China	15%
India	10-18%
Australia	40%

Source: McGraw-Hill (2014)

Table 5: BIM Implementation by Contractors

Over 40% | 30% to 40% | 15% to 29% | Under 15%

Building Projects	UK	France	Germany	US	Canada	Brazil	Japan	South Korea	Aus/NZ
Commercial (Offices, Retail, Hotels)	69%	68%	59%	66%	54%	53%	63%	48%	70%
Institutional (Education, Healthcare, Religious)	61%	32%	31%	77%	41%	31%	23%	35%	39%
Government/Publicly Owned (Courthouses, Embassies, Civic/Sports and Convention)	54%	10%	22%	68%	44%	12%	0%	51%	37%
Multifamily Residential	33%	35%	44%	18%	26%	19%	23%	20%	26%
Single family Residential	17%	19%	22%	1%	10%	16%	0%	1%	4%
Non-Building Projects									
	UK	France	Germany	US	Canada	Brazil	Japan	South Korea	Aus/NZ
Infrastructure (Roads, Bridges, Tunnels, Dams, Water/Wastewater	33%	19%	16%	14%	31%	28%	13%	24%	25%
Industrial/Manufacturing	26%	23%	19%	35%	36%	31%	47%	24%	34%
Industrial/Energy (Primary Power Generation, Oil/Gas facilities)	20%	13%	3%	18%	28%	12%	0%	21%	16%
Mining/Natural Resources	6%	0%	0%	4%	18%	6%	0%	1%	11%

Source: McGraw-Hill BIM Implementation Survey, 2014.

In Nigeria, few researches are available on the level and status of BIM implementation. Studies by Abdullahi, Ibrahim, and Mohammed (2011); Abubakar *et al*. (2013); Abubakar, Ibrahim, Bala, and Kado (2014); Usman (2015); and Isa (2015) are among the few investigations carried out on issues related to BIM implementation in Nigeria.

Abubakar *et al.* (2013) evaluated the readiness of Nigerian Building Design firms to adopt BIM using four readiness components (management, people, process and technology) and found the firms not fully ready for the adoption. The study reported various readiness levels across the different categories of firms, with some firms fully ready in some components, while critical attention is needed in others for full readiness to be attained. Similarly, although the Nigerian Public Sector (specifically, Federal Ministries and Departments and Parastatals) have demonstrated some level of preparedness for BIM adoption in some readiness components, the Nigerian public sector is also not fully ready for BIM implementation. Usman (2015) assessed the readiness of the Nigeria public sector (Federal Ministries and Departments and Parastatals) to implement BIM in its project delivery process. Results of the study show that the Federal Ministries of Nigeria have achieved management, process and technology readiness but need to put in more efforts to improve people's readiness. Similarly, the agencies

considered in the study have management and people's readiness but do not have process and technology readiness. Table 6 below shows the readiness status of Nigeria public sector.

Table 6: Readiness of Nigerian Public Sector to Adopt BIM Project Delivery Process

Sectors	Readiness Parameter	Readiness Status
Overall	Management	Ready
	Process	Ready
	People	Not ready
	Technology	Ready
Ministries	Management	Ready
	Process	Ready
	People	Not ready
	Technology	Ready
Agencies	Management	Ready
	Process	Not ready
	People	Ready
	Technology	Not ready

At industry level, factors such as 'the availability of trained professionals to handle BIM tools'; 'software availability and affordability'; 'enabling demands'; 'clients demand'; market demands, competitiveness advantage and growing awareness in BIM were identified as the major drivers influencing the industry's preparedness.

Barriers to BIM Adoption in Nigeria

Several barriers have been identified to be the stumbling blocks hindering successful implementation of BIM in the industry. Abubakar *et al*. (2014) identified 'lack of client demand'; lack of awareness and understanding of the technology among others. Table 7 below presents some of these barriers as outlined by Abubakar *et al*. (2014); Isa (2015); and Usman (2015).

Table 7: Barriers to BIM implementation in the Nigerian Construction Industry

Barriers
PROCESS BARRIERS
Lack of Awareness of the technology
Lack of knowledgeable and experienced partners
Lack of Trained Professionals to handle the tools
High Cost of Training
Clients are not requesting the use of BIM on projects
Lack of Enabling Environment (government policies and legislations) to guide implementation
No proof of financial benefits
Legal and Contractual Constraints
Social and Habitual Resistance to change

TECHNOLOGY BARRIERS
Frequent Power Failure
High Cost of Integrated software/Models for all professionals
Lack of Standards to Guide Implementation
Poor Internet Connectivity

To improve the maturity level of BIM implementation reported in Nigeria, Isa (2015) developed strategies for overcoming the barriers for implementation. Isa (2015) developed strategies for overcoming both the process and technology barriers identified. The strategies developed were then mapped to the various barriers and subsequently, a roadmap for BIM implementation was developed mapping analysis was expressed as roadmap for implementation of BIM. The roadmap provides a clear direction to follow for successful BIM implementation in the Nigeria construction industry. Figure 4 and Figure 5 show the barriers/strategies mapping analysis and the BIM implementation Roadmap developed by Isa (2015) respectively.

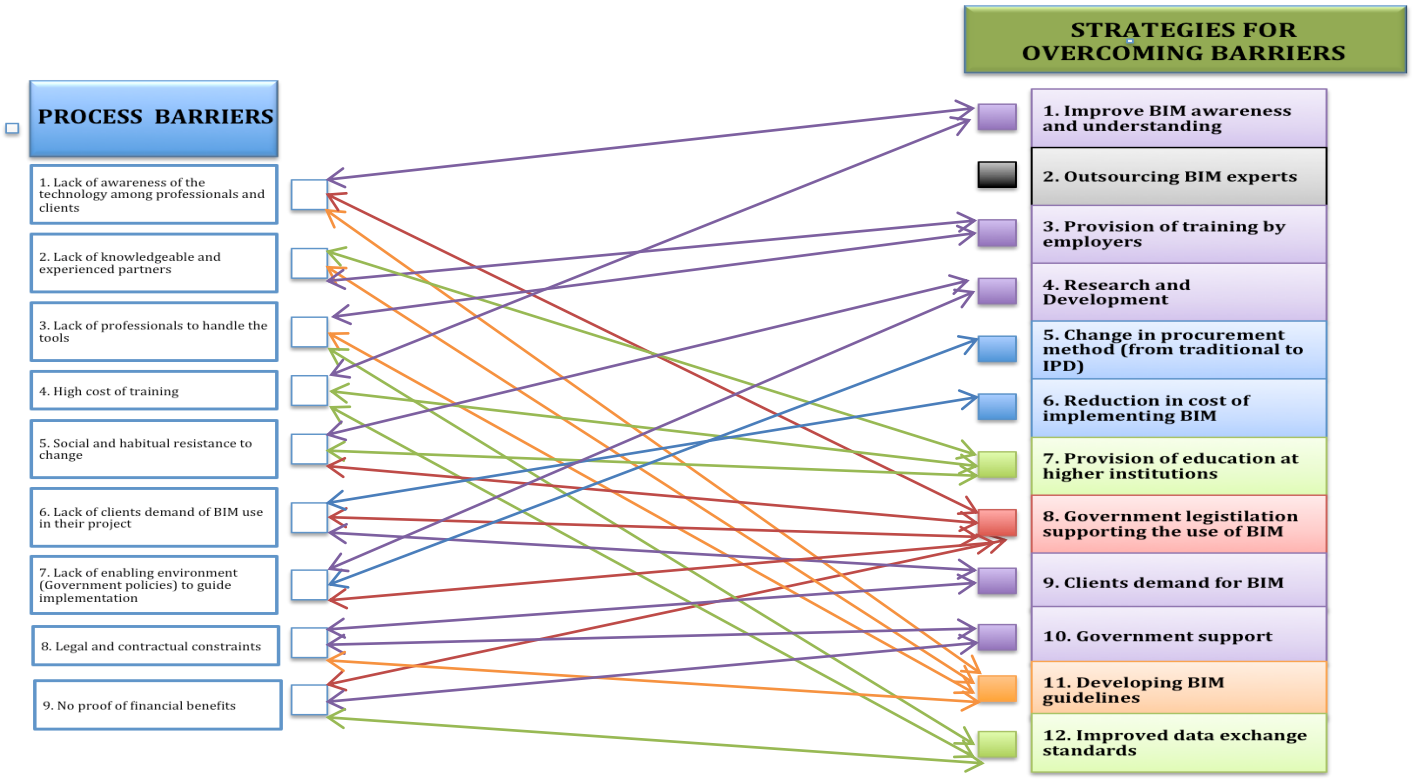


Figure 4: Strategies for overcoming process barriers to BIM adoption Figure 5: Roadmap for BIM implementation in the Nigerian Construction Industry (Source: Isa (2015))



CONCLUSION

The evolution of collaborative initiatives in the construction industry commenced out of the realisation that the traditional practices in the delivery of construction projects were not resulting in sustainable development because they were frequently failing to deliver results that were acceptable to either or both the owners and the contractors. Many reasons for this failure have been put forward, each of which has some degree of validity. This paper attempted to review some of the collaborative initiatives with a view to encouraging their adoption as a panacea to sustainable development in the Nigerian construction industry.

The review provided in this paper suggests that partnering is still an imprecise and inclusive concept, capturing within it a wide range of behaviour, attitudes, values, tools, techniques and practices. In agreement with Fisher and Green (2001), it is evident that partnering practice is best described as either a range along a continuum from competition to co-operation, collaboration and coalescence, or in terms of the idea of three generations proposed by Bennett and Jayes (1998), developing in an evolutionary manner as the working relationship between partners develops.

The paper also reviewed other pertinent collaborative concepts such as supply chain management and building information modelling.

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SECTION 1:

ARCHTECTURE AND HOUSING DEVELOPMENT & MANAGEMENT

ASSESSMENT OF CROWD CONTROL STRATEGIES IN THE DESIGN OF NATIONAL STADIA AT ABUJA AND UYO, NIGERIA

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Abstract

Stadium crowd referred to the number of people coming together in cluster for sporting activities and other events in the stadium. The stadium crowd is usually associated with certain problems that include but not limited to problems of movement, ventilation, temperature, and crime, whereas this research is limited to the problem of circulation. The researcher reviewed past studies in which FIFA guide/recommendations and other similar areas of interest were made useful. The study aimed at providing football stadium that can allow safer crowd environment for sustainable spectatorship. The study population comprised of 25 management staff, 20 technical staff, 20 security staff including police men, 49 spectators from Abuja and Akwa-Ibom stadia. Purposive sampling, under non-probability sampling technique was used for the study. Questionnaire was used as the research instrument. The researcher used research assistant to collect some of the data, and the entire data was then coded and organised for analysis using SPSS and Excel software, and were summarised in tables and charts for easy interpretations. The result indicated that the original crowd management plans at the stadia were adequate except at the situation of full capacity evacuation. Line dividers as crowd control devices were suggested as recommendation.

Keywords: *Crowd management, disaster, egress, football stadium, sustainable, spectators.*

1. Introduction

Fruin, (2002) defined Crowd control as a systematic coordination of human movement within a certain environment. There are several crowd disaster incidences that happened around the world. The English unforgettable football disaster is one of the many, it occurred in 1989 at the Hillsborough stadium where 96 people died as a result of suffocation by large crowd (Friberg and Hjelm, 2014). In Nigeria, about 7 people lost their lives in National stadium Abuja as a result of stampede by enormous crowd force during mass entry for an event organised for fewer people than the number attended, several injuries were as well recorded (Africa independent Television, 2014). Also, an incidence where a female referee was beaten by fans of Akwa-united, this is due to the inability to control the large crowded fans during the event (Chibiuke, 2017). According to Dimmock and Grove (2005), mass crowding has resulted to disasters in stadia and other sport grounds. One significant part of making sure that there is crowd safety is by designing proper systems of circulation which can enable effective and strategic evacuation (Liu *et al*, 2011

Sporting activities attracts lot of human crowd all around the world, with football stadium been in fore front in such crowd generation. Nigeria has experienced chaos, violence and disasters among spectators in football as a result of mass crowd, leading to lot of damages on properties, many injuries and even death. From the earlier statements, it is obvious that the Abuja and Uyo state stadia had experience disasters and loss of lives due to human crowd, this also mean that worst had happened in others stadia of same country since the Abuja and the Uyo stadia are the top class available. This is a big problem that require adequate solution. It is by this that the need to provide management strategies is paramount in our stadia, so as to have improvement from the current trend. The management strategies investigated will cover planning areas such

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as egress and ingress, closed circuit television (CCTV), full capacity evacuation and personnel co-ordinations.

To investigate the design factor of management strategies (entry/exit points, CCTV and co-ordination) for crowd control in the Abuja and Akwa-Ibom national Stadiums to enhance sustainable spectatorship is the main purpose of this study.

One significance of the study is that it will help the sport authority to know about ways of improving the standard of planning for sport facilities that that would provide safer crowd and convenient spectatorship within stadium environment. The study would also help in providing awareness to stadium operators on ways of improving their services to spectators.

2. Review of Literature

2.1 Concept of crowd control

As earlier defined, crowd control is as a systematic coordination of human movement within a certain environment (Fruin, 2002). Sport grounds or public areas are developed to support mass crowded movement all the times or regularly, but it is unusual to think that movements within the exits and escape routes of these places are crucial (Hoskin & Spearpoint, 2004). Also it is encouraged by the National disaster management authority (NDMA), 2014 to have the provision of multiple entry and exit routes to event places like stadium so as to have a normal, short cut, and emergency access ways in order to carter for the vulnerable people (disabled and children).

Some potential features of stadium crowd control that were different from the common egress are; the provisions of rarely used evacuation routes, voice/Audio and visual coordination, coordinated circulations, use of line dividers. There are now increase in awareness about the ideas related to evacuation in so many stadiums around the world. It is due to this reason that the main stadium scoreboards were used for advertising the directions and instructions for emergency and movement routes prior to event and during first half. Also placement of directives to emergency evacuation on tickets, posting of escape maps at entrance ways, toilets and within the stadium for the purpose of improving safety awareness among the users (Hoskin & Spearpoint, 2004).

2.2 The process of crowd disaster

NDMA, (2014) classified crowd disaster into either natural, human created or structural, and either of these could be as a result of high level of event attendance, as a form of reactions due to input actions and as a result of inadequate space planning.Fruin, (2002) explained from his FIST instances that the initial crowd situation which is the Force, the crowd Information (true or false) that determine the crowd action, the Space (space for seating, chair, floor, gates and so on) used and the time period of the occurrence of mass entry and exit has great influence on the creation of high crowd density which is mass population in one area unit, and the increased movements (high velocity).

Sometimes, these results to a heavy injury or death by suffocative, trampled and violent actions. The figure below shows the process of crow disaster by Fruin, (2002).

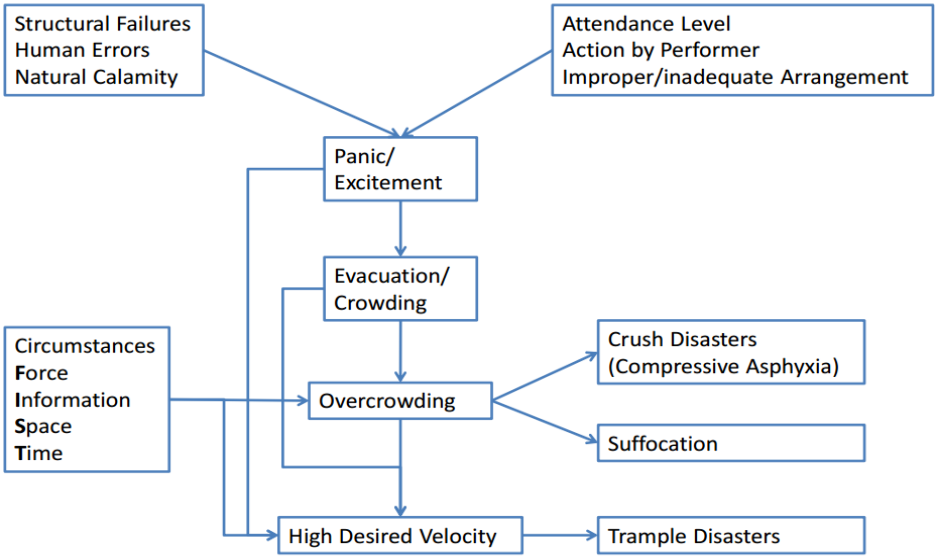


Figure 1: Process of crowd disaster
Source: Fruin, 2002

2.3 Stadium pre and post crowd management

According to Marsden, (1998) protection of users from risks, methods of design and type of event are what comprises the management of crowd in a large gathering. The plan for crowd management should be done to align with event requirements and other crowd related to social character, size, arrangement of seats, time, circulation, parking and demography (Berlonghi, 1994). At the event or process of football, management of spectators could be done in terms of certain factors which are; population, event and venue. Larger number of ingress and egress that will easily lead people to access their vehicles can greatly improve the possibilities of crowd disasters (Cox, 1998). Proper security screening of the belongings, wears, and other items of the individuals (spectators) can lower the possibilities of crowd disasters due to individual violent behaviours in the stadium (MacDonald, 2004). The spectator's evacuation at the end of each event should be properly controlled to eliminate high disasters from the place of gathering (Talalay, 2007). There should be awareness programs on penalties and sanctions to spectators on immoral behaviours in the stadium (Bralley, 2007).

2.4 Stadium capacity

Fédération Internationale de Football Association (FIFA), 2012 questioned that how could the developers consider the capacity? That is, is it necessary to only consider the self-need of the club who are the basic users when planning for a stadium? Or should there be consideration for higher tournaments like international matches? In such situations, a client that operates to a capacity of 20,000 for instance and is expecting to build another new stadium of capacity to about 30,000 should preferably be thinking to have about 40,000. (FIFA, 2012).

2.5 Holding capacity

The holding capacity according to FIFA (2012) is the amount of spectators which can be adequately supported under safety and which is dependent of the real amount of seats available excluding those that are either providing restricted view, missing or damaged, not found for use, or not fit to standard.

The presence of intensified crowd and when there are high densities, results in the generation of built up pressure in the midst of the crowd which could be by balanced or unbalanced movements that makes it impossible or almost impossible for the spectators to have total control of the movements they are on (An-roinn-oideachais department of education, 1996). The possibilities of pressure due to the crowd could trigger to a higher or worrisome level at these situations and under the same situations, an individual could be difficult to be avoided or helped by if they fall or stumbled. An-roinn-oideachais department of education, (1996) believed that the solution to the dangerous threat is in the provision of adequate control or management measures of the crowd pressures. The safety of event venues in terms of disaster of crowd is greatly critical with large gatherings (Bateman & Majumdar, 2018). These threats are usually associated with entry and exits ways and also walkways (An-roinn-oideachais department of education, 1996).

2.6 Entry capacity

Is the amount of spectators that are able to move through turnstiles, gates or any other monitored entry within an hour time, and the rate of the entry is affected by number of factors as; the separations and number of points of entry, adequate communication and information signposting, diversification of entry and special considerations such as for the disabled

2.7 Exit capacity

This is the amount of spectators or visitors that are able under normal situation to evacuate the stadium safely within a time period that is reasonable. The exit capacity is affected by;

- The separation, amount, and size of exterior egress.
- Adequate communications, correct placement of information by signposts and the spectator's knowledge about the layout of the stadium.
- The wideness and separation of escalators, gangways and staircases
- Points that are choked.
- Objects that obstructs

Young (2002) in his saying, the basic crowd management strategies are to avoid large densities of crowd and to allow for faster movement of people. Also that, management of crowd has to consider all event elements like the event type, the facility characteristic, crowd size, way of crowd coordination, communication system and ingress/egress (Wann, 2006).

3. Materials and Methods

3.1 Method of data collection

For the purpose of this research, a research assistant was used for data collection. The first respondents were the football fans whom were given copies of questionnaire during the period of a friendly match at half time. The other respondents were the operators and staff of the stadia whom were given the questionnaires at their desks, some of the questionnaires were been retrieved at that time, others were until the next day.

3.2 Research instrument

The researcher used structured questionnaire as research instrument for the Abuja and Akwaibom stadia in which a research assistant was used for the Akwa-Ibom stadium. An observation schedule was as well used to compare what is available in the stadia and the ones recommended by FIFA (2007).

3.3 The study areas

The two study areas chosen for this research work are Abuja and Akwa Ibom state of Nigeria with Abuja, located along the earth axis, latitude 9.06313° N, and longitude 7.46179° E. While Akwa Ibom State is located along latitude 4°32′N and 5°33′N, and longitude 7°25′E and 8°25′E (Rimi, 2014).

3.4 Data Analysis and Presentation

The information gathered from the questionnaire were computed and interpreted as codes. Then the analysis was carried out using Microsoft Excel software and Statistical Package for Social Sciences software. The data was then put to summery using tables and charts (bar and pie) for easy interpretations. The analysed data was based on the adequacy of stadium's crowd control planning.

3.5 Study population

The study population consist of the stadium spectators, security staff and management staff of both the two sport stadia. These also comprised of 25 staff (managers), 20 staff (technical), 20 security personnel including police officers and 49 spectators, giving a total of 114 targeted populations.

3.6 Sample size and procedure

The study utilizes purposive sampling under non-probability sampling technique. A 70% sample size was adopted for all the stratum in order to reduce sampling error. The following are the distributions of the sample size: 25 (70%) staff from the management, 20 (70%) technical staff and 20 (70%) security personnel including police officers, these sums the first group, the operators/staff. The second group is the spectators/fans, consisting of a total of 49 numbers selected based on the fisher's formula, $n = Z^2pq/d^2$.

4. Data Presentations and Research Findings

4.1 Adequacy of surveillance system (CCTV) and voice control

The below table shows the responses in summary of adequacy of surveillance system (CCTV) and voice control as observed by the management staff/security staff and the main spectators.

Table 1: Adequacy of surveillance system (CCTV) and voice control

Respondents	Responses			Total
	Adequate	Fair	Inadequate	
Operators/Security Staff	32(49.5%)	16(24.6%)	17(26.6%)	65(100%)
Main Spectators	38(77.5%)	7(14.3%)	4(8.2%)	49(100%)
Total	70(61.4%)	23(20.2%)	21(18.4%)	114(100%)

Source: Author's work, 2018

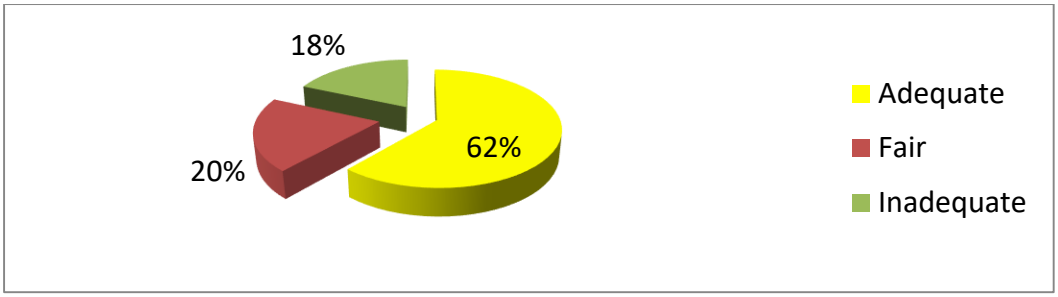


Figure 2: Adequacy of surveillance system and voice control
Source*:* Author's work, 2018

From the above chart and table in which the analysis findings were represented, higher fraction of the respondents (population) indicated surveillance system and voice control as adequate with a score of 61.4%, 20.2% as fair and 18.4% as the score for inadequate.

4.2 Provision of multiple main entry/exits to the stadiums

The provision of multiple main entrances is one of the key factors in assessing crowd control strategies, below is a table showing the responses in summary of adequacy of provision of multiple main entrances as observed by the management staff/security staff and the main spectators.

Table 2: Adequacy of multiple main entry/exits to the stadiums

Respondents	Responses			Total
	Adequate	Fair	Inadequate	
Operators/Security Staff	48(73.8%)	17(26.2%)	0(0%)	65(100%)
Main Spectators	43(87.8%)	3(6.1%)	3(6.1%)	49(100%)
Total	91(79.8%)	20(17.6%)	3(2.6%)	114(100%)

Source: Author's work, 2018

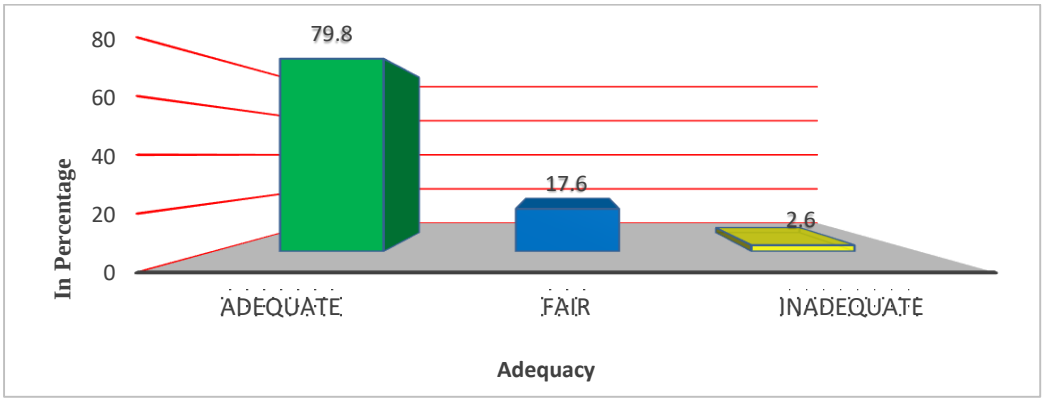


Figure 3: Adequacy of multiple main entry/exit
Source*:* Author's work, 2018

The above analysis shows that 79.8 percent of the respondents indicated that main entrance provision in the stadiums is Adequate, 17.6 percent indicated as fair, while 2.6 percent indicated as Inadequate.

4.3 Adequacy of security coordination strategy at entry and exit points in the stadia

Table 3: Adequacy of security coordination strategy at entry and exit points

Respondents	Responses			Total
	Adequate	Fair	Inadequate	
Operators/Security Staff	12(18.5%)	28(43%)	25(38.5%)	65(100%)
Main Spectators	9(18.4%)	20(40.8%)	20(40.8%)	49(100%)
Total	21(18.4%)	48(42.1%)	45(39.5%)	114(100%)

Source: Author's work, 2018

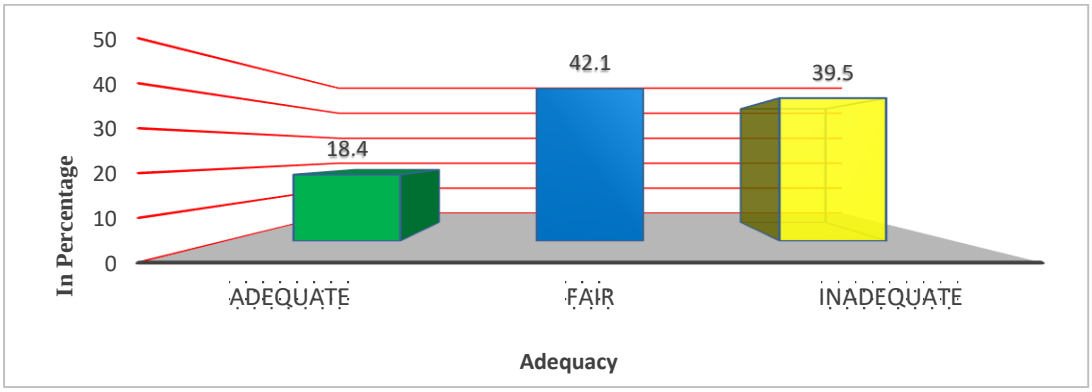


Figure 4: Chart showing the adequacy of security coordination strategy
Source*:* Author's work, 2018

The above analysis shows that only 18.4 percent of the respondents indicated that crowd coordination by security staff is Adequate, 42.1 percent indicated as Fair, while 39.5 percent indicated as Inadequate.

4.4 Adequacy of evacuation at full capacity

Table 4: Adequacy of evacuation at full capacity

Respondents	Responses			Total
	Adequate	Fair	Inadequate	
Operators/Security Staff	11(16.9%)	0(0%)	54(83.1%)	65(100%)
Main Spectators	7(14.3%)	5(10.2%)	37(44.9%)	49(100%)
Total	18(15.8%)	5(4.4%)	91(79.8%)	114(100%)

Source: Author's work, 2018

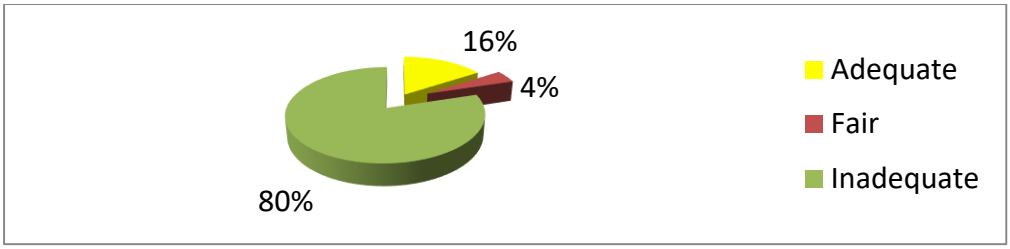


Figure 5: Adequacy of evacuation at full capacity
Source: Author's work, 2018

The above chart described the percentages of provision Adequacy of evacuation at full capacity; 15.8% of the respondents indicated the provision as Adequate, 4.4% of the respondents indicated as Fair, 79.8% of the respondents indicated the provision as Inadequate.

5. Discussion of findings

It is now very clear by the evidence of this study that the main adequate strategies of crowd management in the two stadia are made between the use of active surveillance (CCTV) / audio coordination system, provision of multiple entry and exit (Egress/Ingress) and coordination of crowd by active means of the stadium security personnel at entry/exit points. When compared with previous studies, these are also well provided. The concern here is the inadequacy of full capacity evacuation situation which the findings recorded with previous studies as well.

6. Conclusion and recommendation

This study concluded as; evacuation is not effective at full capacity situation, despite the adequacy of circulation planning used in some stadia in Nigeria, which is due to human character at crowded situations. Therefore, the need to provide effective passive coordination devices in form of line dividers and other highly effective planning strategies like placement of regular and active coordination personnel at strategic places to be used during the full capacity evacuations.

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RETROFITTING PROSPECTS FOR DAYLIGHT ENHANCEMENT IN 'DARK' CORRIDORS OF AN INSTITUTIONAL PROTOTYPE BUILDING

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Abstract
Though retrofitting offers prospects for enhancement of daylight in built spaces, the quantum of its effect is a function of the architectural features of the space and the possibilities of its modification. The study sought to ascertain the extent to which some architectural modifications and strategies could improve daylight in the corridors on the upper floor of some new buildings in Modibbo Adama University of Technology, Yola. The simulated experimental design deployed lux meter to evaluate lighting levels at selected points on the floor of the existing corridors, and outside the building. Each of the corridors measured about 29.5m long, 2.0m wide and 3.0m high. Light levels were also observed on the corresponding points in and outside of the space in an architectural model of upper part of the building constructed at scale 1:25. Different roofs with monitor light of various sizes over the corridor were mounted on the model; reflective surfaces were introduced on the corridor walls and ceiling. Daylight levels were observed in each case with and without the reflective surfaces under four different lighting conditions. Data generated were analyzed with descriptive including percentage, mean and range. Daylight factors were estimated for different cases of the space, and used as a measure of daylight performance. Results showed over 2500% improvement of daylight factor in the corridor, from 0.61% in the existing situation to 16.3% in the proposed monitor roof opening about 12% of corridor floor area, and reflective wall surfaces. The study concluded by recommending retrofitting of the buildings to enhance daylight in the corridors, rather than keeping the corridors perpetually 'dark' without electric light.

Keywords: *Dark corridors, Daylight factor, Retrofitting, Daylight enhancement, Institutional buildings.*

Introduction

Building retrofitting is the act of modifying an existing building in order to improve its energy efficiency through reduced system running and maintenance cost, and to enhance occupant's level of satisfaction as well as measurable return of investment (Martine,2016; Rabani, Madessa & Nord, 2017). According to Zhenjun *et al*. (2012), retrofitting should be considered as one of the main approaches to achieving sustainability in the built environment at relatively low cost and high uptake rates. This is largely because existing buildings consume about 40% of final energy used in most countries (Janda, 2009). Artificial lighting is identified as one of the major sources of energy consumption corresponding to 15-60% of the final energy use in the buildings (Spyropoulos & Balaras, 2011; Jason and Thomas, 2007). The world's stock of old buildings far outnumbers the new ones (Thaleia and Ulrich, 2011); thus retrofitting the old buildings will help significantly reduce electricity demand for illumination in a room by more than 50% (Jamaludin et al, 2015; Lechner, 2009).

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Idowu O. M, Umar A. A., Humphrey S. and Attah A. U, (2019). RETROFITTING PROSPECTS FOR DAYLIGHT ENHANCEMENT IN 'DARK' CORRIDORS OF AN INSTITUTIONAL PROTOTYPE BUILDING. Collaboration for Sustainable Development in the Built Environment. International Conference of Environmental Sciences, ICES 2019. 1st International Conference of the Faculty of Environmental Sciences, University of Ilorin, Nigeria, 29th - 30th April 2019.

Thus, day-lighting design becomes a significant part of building retrofitting especially when building component that have influence on its day lighting performance are replaced (Christoffersen et al, 2000).

The problem of building retrofit optimization include the determination, implementation and application of the most cost effective technologies to achieve enhanced energy performance while maintaining satisfactory service levels and acceptable indoor thermal comfort, under a given set of operating constraints (Ma, Cooper, Daly & Ledo, 2012). Finding the optimum retrofit strategy, according to Rabani *et al* (2017), is a complex procedure that needs to be critically investigated. Ray (2004) highlighted three main types of architectural retrofit strategies: (i) stabilization strategy consisting of a set of incremental interventions that do not fundamentally modify either the substance or the appearance of the building; (ii) the substitution strategy which consisting of a complete change of certain elements transforming simultaneously the substance and appearance of the building; (iii) the double-skin facade strategy which consists of partially stabilizing the existing facade and adding a new glass skin, resulting in a complete metamorphosis of the building's appearance but maintaining a significant part of its original substance.

Literature Review

The conscious use of natural light in non-residential buildings such as educational and institutional buildings has become an important strategy to improve energy efficiency by minimizing lighting, heating, and cooling loads. Thus the use of various architectural day-lighting strategies right from conceptual design stage of a building helps considerably in the improvement of the quality of indoor space such as lightning. According to Vincenzo, Gianpiero and Luigi (2017), day-lighting is a process that makes use of daylight to achieve some expected lighting effects in buildings, such as lighting up a task area, highlighting some objects while obscuring others, or even totally avoiding its contribution under particular circumstances. Jamaludin *et al.* (2015) on the other hand, defined day-lighting as a technique that brings natural daylight into a building, through openings so that the day's natural light provides effective internal lighting. Conceptually day lighting can be distributed to interior space through openings from sides, top, or the combination of the two, and interior finishes and furnishings of adequate surface reflectance. Michael (2008) noted that top lighting strategies in institutional buildings include skylight (horizontal glazing placed embedded in flat or sloped roofs) and roof monitors (vertical or sloped glazing raised on elevated roof planes). Choice of strategy is driven by the building type, height, aspect ratio, massing, dominant climatic conditions, site obstruction and adjacent buildings (Christoffersen, Aschehoug, Edmonds and Jakobiak, 2000). It has also been pointed out that the innovative day-lighting systems work by redirecting incoming sunlight and/or skylight to areas where it is required, and, at the same time controlling glare. These systems are particularly appropriate where an interior space is too deep for conventional windows to provide adequately uniform lighting or where there are external obstructions (Christoffersen *et al.,* 2000). Jamaludin *et al*. (2015) wrote that the effectiveness of day-lighting depends on several factors, including the building architectural features (shape, window area, glazing type), the building locations the surrounding climate. Thus, daylight retrofit could be accomplished through the modification of these architectural features which might be inhibited or enhanced by the buildings structural systems (Sedor, Griffin and Konis, 2012).

Buildings as old as a century retrofitted in the last two decades are reported to be 57 to 61% more energy efficient with Energy Star ratings ranging from 92 t0 98 (The New Building Institute & Preservation Green Laboratory, NBI &PGL, 2011). Other benefits of day lighting in buildings have also been investigated and reported. For instance, Kesten and Tereci (2015) studied the effect of daylight availability on visual comfort and cost of lighting electricity in educational spaces and found that students and lecturers were more alert, and ready to work under appropriate daylight visual comfort conditions. Dilay and Aysegül (2015), Martine (2016), and Jamaludin *et al.* (2015) also indicated that a higher day lighting quality can increase health, self-assessed performance, and lead to a higher job satisfaction and productivity in work environment.

However, these studies are largely after the facts, being the outcomes of real life and existing building retrofits, and without any premonition of what such outcomes would probably be ahead of the real retrofitting strategies.

Various methods have been deployed to predict the potentials of building retrofit strategies. Among these are energy simulation models such as physical models, gray box and black models, multi-objective mathematical models, and building information models (Hestnes & Kofoel, 2002; Thaleia & Ulrich, 2011; Ma *et al*, 2012). With these models, operations such as energy auditing, building performance assessment, economic analysis, risk assessment and measurement, and verification of energy savings can be performed on proposed building retrofit strategies. The physical model simulation seems the most practical and closest to reality but the least applied or reported in building retrofit studies, probably due to the tedious process of making the models manually.

Modibbo Adama University of Technology Yola (MAUTECH) is replete with existing building stock which may be candidates for retrofitting. Preliminary survey reveals poor lighting of varying degrees in most of the buildings, which may be ameliorated through architectural retrofits. Considered most critical is the corridor of the upper floor of the newly constructed buildings which is the subject of this study.

Methodology The particular building of of study is that accommodating the Departments of Building and Surveying in MAUTECH, Yola. The building has classrooms arranged around a courtyard located at the ground floor while the first floor houses offices which were arranged along a corridor facing one another as shown in figure one below.



Plate 1: An aerial view of selected building

Physical measurement of parameters around the study area was conducted in which components parts that have an effect on the study were taken in to cognisance they are floor, ceiling, walls and window in which their area was considered. This data was used to generate the architectural drawings and physical model scaled in the ratio of 1:25, using embossed paper

of different colours as wall finishing, while glass and aluminium foils were used as reflective surfaces for the purpose of simulation, as written by Nicholas (2011) that simulation involves devising a representation in a small and simplified form (model) of a system, which can be manipulated to gauge effects. This provides an artificial environment in that it does work with original materials at the same scale but calibrated with scale so as to represent the real sense so as to have reliable results, and several variables constituting different roofs with monitor light of various sizes over the corridor were mounted on the model (Figures 5 and 6). Simulated experimental design was used in which a lux meter deployed to evaluate lighting levels at eleven (11) selected points on the floor of the existing corridors, and outside the building. Each of the corridors measured about 29.5m long, 2.0m wide and 3.0m high. Light levels were also observed on the corresponding points in and outside of the space in an architectural model of upper part of the building, reflective surfaces were introduced on the corridor walls and ceiling. Daylight levels were observed in each case with and without the reflective surfaces under four different lighting conditions. Various architectural strategies were applied in which the resultant changes in lighting were noted thereby inference could be drawn in the process. Data generated were analyzed with descriptive method including percentage, mean and range. Daylight factors were estimated for different cases of the space, and used as a measure of daylight performance.

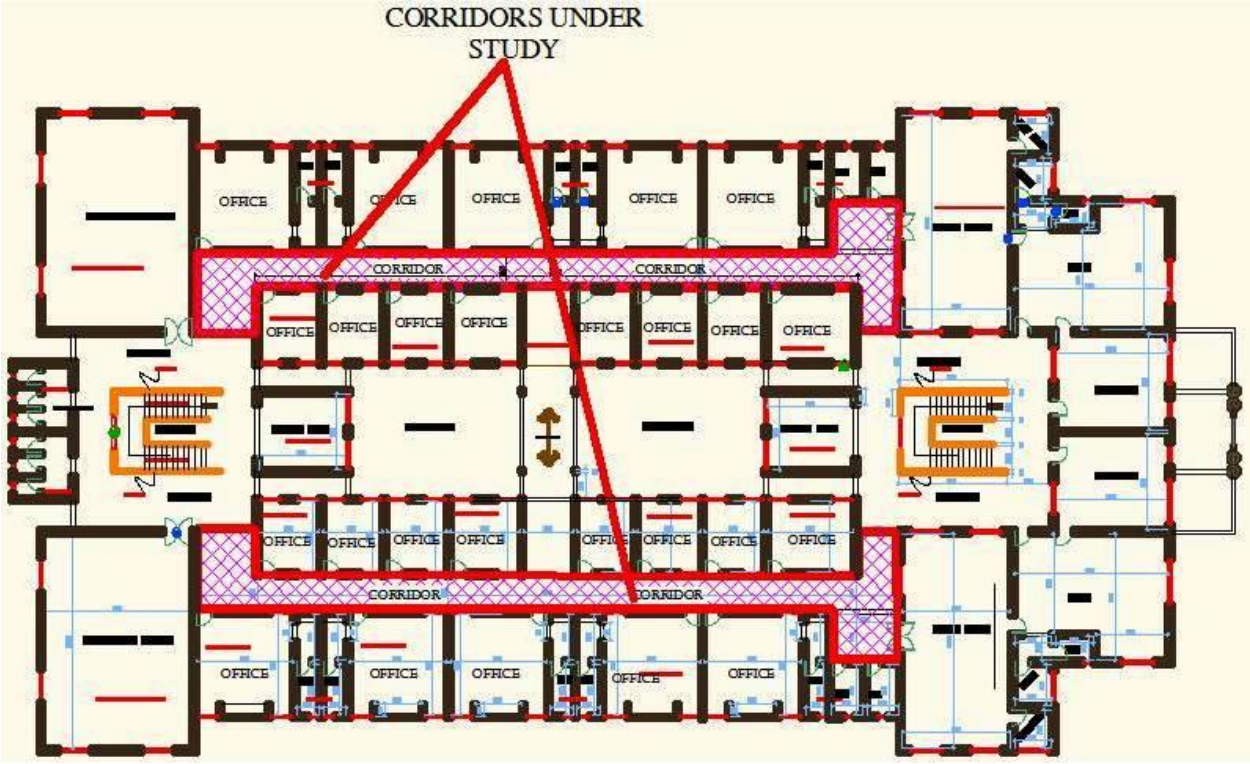


Figure 1: First floor plan of Survey & Building Departments showing corridors under study
Source: (Physical Planning Unit MAUTECH 2018)



Figure 2: Typical side elevation of Survey & Building Departments showing windows proportions
Source: (Physical Planning Unit MAUTECH 2018)

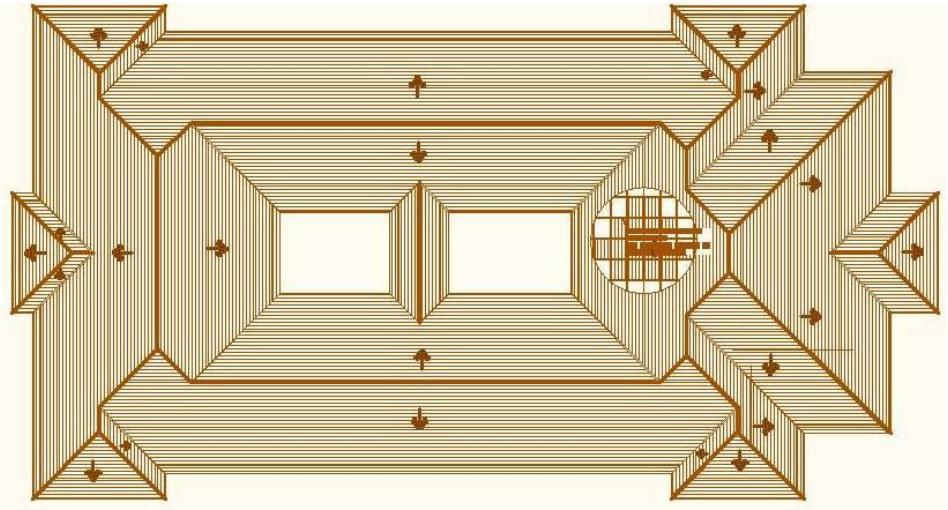
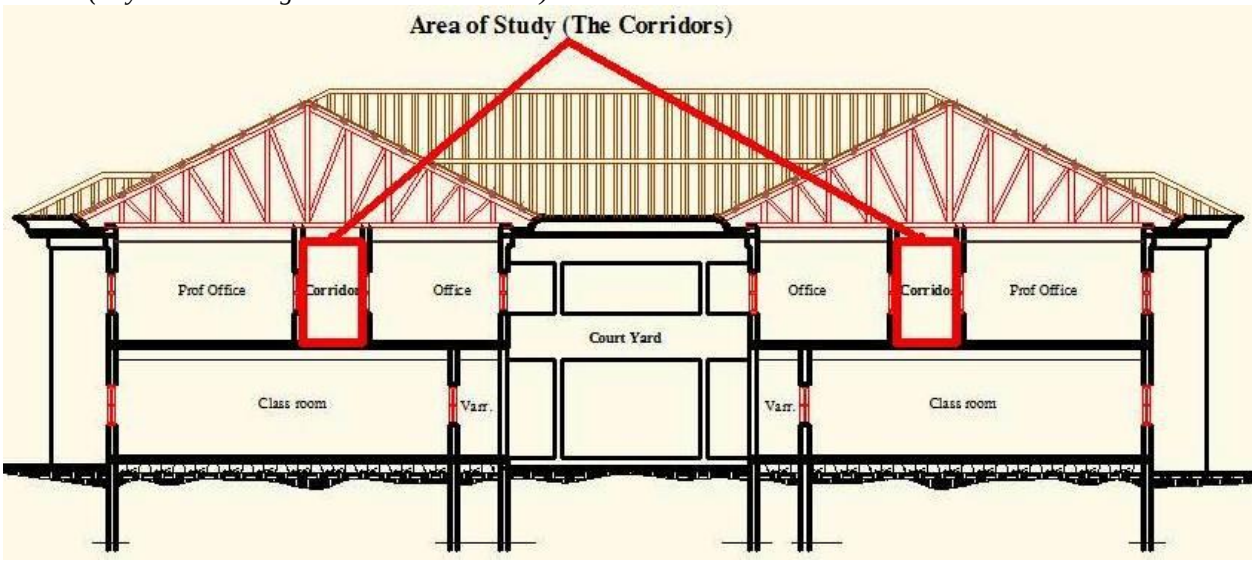


Figure 3: Roof plan of Survey & Building Departments
Source: (Physical Planning Unit MAUTECH 2018)



: Figure 4: The building Section showing the corridors *Source: (Physical Planning Unit MAUTECH 2018)*

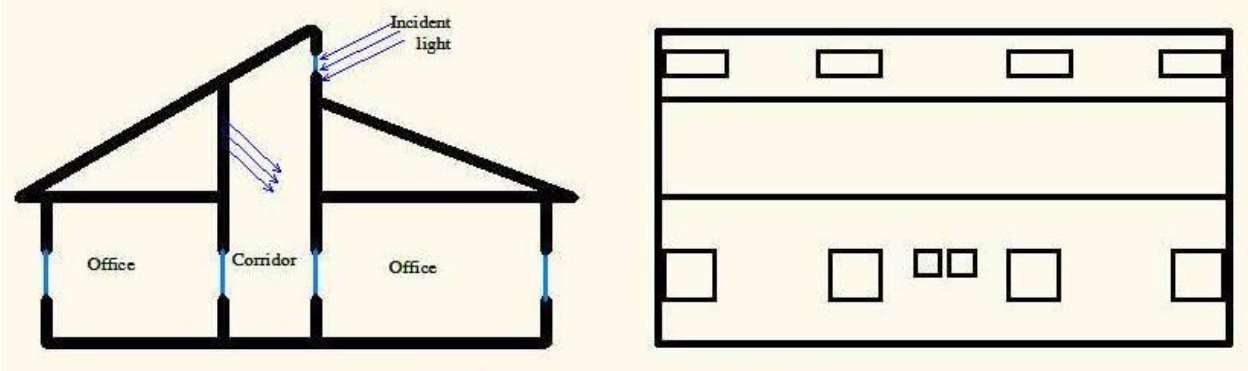


Figure 5: Section and Elevation of simulated Roof Monitor I

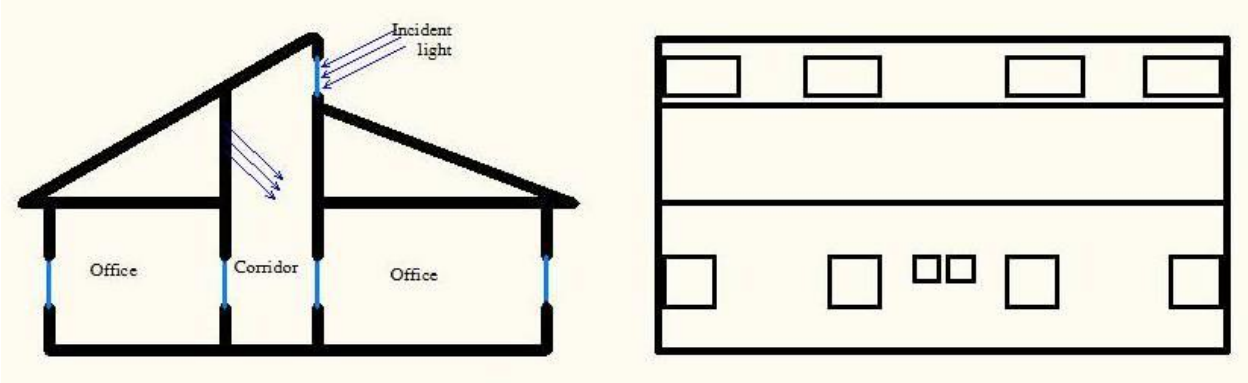


Figure 6: Section and Elevation of simulated Roof Monitor II

Results and Discussion

Results

Table 1 indicates the illumination levels at eleven selected points on the floor of the lobby in the simulated (model of) section of the existing building under four daylight conditions. The illumination levels at the selected points on the floor when roof monitors retrofit only were introduced over the lobby of the simulated section of the building were indicated in Tables 2 and 3. When reflective materials were mounted on the lobby walls of the roof monitor retrofitted lobby, the illumination levels observed at the selected points of the floor are shown in Tables 4 and 5. Figure 7 is a graphical representation of the effects of the the roof monitors and reflective wall materials on the daylight factor of the lobby floor.

Illumination levels ranged from 001 to 035 lux under each of the first and second daylight condition; and from 012 to 395 lux and 03 to 079 lux respectively in the existing simulated lobby under the third and fourth daylight conditions as indicated in Table 1. The indoor mean illumination level was 10.8 lux, the mean outdoor illumination was 1778.4 lux with a resultant daylight factor of 0.61%.

In the simulated roof monitor only retrofit lobby, illumination levels under the four conditions of daylight ranged from 009 to 315 lux, 018 to 194 lux, 019 to 295 lux and 011 to 190 lux from the first to the fourth in that order. The indoor mean illumination in the lobby of the retrofit under the four daylight conditions was 135.1 lux, while the outdoor mean illumination was 1932.3 lux with 7.0% resultant daylight factor (Table 2 and Figure 7). When the size of the

roof monitor was increased, the indoor mean illumination level also increased to 153.4 lux with a resultant daylight factor of 8.0%.

When a reflective material was applied on the walls of the initial roof monitor retrofit, illumination levels under the four daylight conditions ranged separately from 111 to 458 lux, 106 to 316 lux, 213 to 513 lux and 126 to 372 lux. The indoor mean illumination level was 266.3 lux with the outdoor mean illumination level at 1929.7 lux and a resultant daylight factor of 13.8% (Table 4 and Figure 7). Indoor mean illumination level increased to 312.6 lux with a resultant daylight factor of 16.3% in the lobby with the reflective material and larger roof monitor opening (Table 5 and Figure 7).

Table 1: **Simulated existing lobby illumination levels (lux)**

Space daylight-condition

	One open-side				***Two open-side***				***Three open-side***				***Four open-side***			
	a		b		a		b		a		b		a		b	
Point 1	002	009	001	027	005	012	001	024	016	047	012	165	011	019	002	043
Point 2	003	012	002	030	005	021	002	027	014	090	013	250	009	038	004	051
Point 3	003	014	004	035	006	028	006	036	019	136	029	260	011	072	005	068
Point 4	004	027	002	033	011	033	005	036	039	165	025	317	015	014	005	065
Point 5	003	027	001	031	010	034	003	035	028	148	013	318	012	063	003	068
Point 6	007	029	007	029	011	035	005	034	038	175	029	250	015	091	005	071
Point 7	003	025	003	024	009	030	005	029	041	175	028	395	011	064	006	062
Point 8	005	027	002	042	009	031	003	007	036	190	009	105	012	079	001	035
Point 9	004	024	002	018	006	028	004	019	024	152	018	223	010	047	006	041
Point 10	005	020	003	012	007	033	003	014	039	173	026	120	012	058	004	025
Point 11	004	015	002	007	007	026	002	011	055	148	028	074	013	040	003	019

Indoor mean	**10.8 lux**
Outdoor mean	**1778.4 lux**
Mean Daylight factor	**0.61%**

Table 2: Roof monitor and reflective wall retrofit simulated lobby illumination levels

Position	*One open-side*		*Two open-side*		*Three open-side*		*Four open-side*	
	a	**b**	**a**	**b**	**a**	**b**	**a**	**b**
Point 1	315	091	038	068	072	201	033	096
Point 2	289	124	072	093	177	225	062	190
Point 3	314	144	077	115	134	281	109	145
Point 4	100	125	112	123	203	284	130	142
Point 5	120	154	125	126	222	281	141	170
Point 6	139	151	134	124	206	239	190	182
Point 7	115	117	122	194	295	218	142	111
Point 8	121	009	135	018	218	019	163	011
Point 9	093	183	107	086	230	180	104	089
Point 10	084	065	102	060	183	084	129	056
Point 11	079	038	065	042	150	063	090	036
Indoor Mean							**135.1 lux**	
Outdoor Mean							**1932.3 lux**	
Mean Daylight Factor							**7.0%**	

Table 3: Roof monitor retrofit simulated lobby illumination levels

Position	***One open-side***		***Two open-side***		***Three open-side***		***Four open-side***	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Point 1	060	403	028	081	072	269	035	085
Point 2	125	333	046	085	177	275	045	136
Point 3	203	378	066	138	205	309	089	165
Point 4	522	333	098	099	265	286	090	116
Point 5	225	429	077	111	223	281	078	156
Point 6	234	396	095	106	316	273	123	134
Point 7	227	472	074	105	219	204	072	086
Point 8	304	025	069	012	257	047	098	005

Position	***One open-side***		***Two open-side***		***Three open-side***		***Four open-side***	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Point 9	296	125	057	060	148	143	061	017
Point 10	447	026	054	040	183	072	067	015
Point 11	189	049	045	027	125	041	054	011
Indoor Mean							**153.4 lux**	
Outdoor Mean							**1923.7 lux**	
Mean Daylight Factor							**8.0%**	

Table 4: Average Level (lux) of each point on the basis in the model when reflective device applied

Position	*One open-side*		*Two open-side*		*Three open-side*		*Four open-side*		mean
	lux	df	lux	df	lux	df	lux	df	
Point 1	406	21.28	106	5.56	237	14.31	129	6.76	228.5
Point 2	413	21.65	165	8.65	342	17.92	252	13.21	293
Point 3	458	24.00	192	10.06	415	21.75	252	13.21	329.25
Point 4	225	11.79	235	12.32	487	25.52	272	14.26	304.75
Point 5	274	14.36	251	13.16	503	26.36	311	16.30	334.75
Point 6	281	14.73	258	13.52	445	23.32	372	19.50	339
Point 7	232	12.16	316	15.96	513	26.88	253	13.26	328.5
Point 8	130	6.81	153	7.73	237	12.42	174	9.12	173.5
Point 9	276	14.47	193	10.12	410	21.49	193	10.12	268
Point 10	149	7.81	162	8.49	267	13.99	185	9.70	19.75
Point 11	111	5.82	107	5.61	213	11.16	126	6.60	140.75
Indoor Mean							**266.3 lux**		
Outdoor Mean							**266.3 lux**		
Mean Daylight Factor							**13.8%**		

Table 5: Average Level (lux) of each point on the basis when fenestration sizes increases

POSITION	*ONE SIDE*	*OPEN-*	*TWO SIDE*	*OPEN-*	*THREE SIDE*	*OPEN-*	*FOUR SIDE*	*OPEN-*	MEAN
	lux	df	lux	df	lux	df	lux	df	
POINT 1	463	24.33	109	5.73	341	17.92	120	6.31	258.25
POINT 2	458	24.33	131	6.88	452	23.75	181	9.51	305.5
POINT 3	581	30.53	204	10.72	514	27.01	254	13.35	388.25
POINT 4	855	44.93	197	10.35	551	28.95	260	13.66	452.25
POINT 5	654	34.37	188	9.88	504	26.48	234	12.30	395
POINT 6	630	33.11	201	10.56	589	30.95	257	13.50	419.25
POINT 7	699	36.73	179	9.41	423	22.23	158	8.30	364.75
POINT 8	329	17.29	81	4.26	504	26.48	103	5.41	204.05
POINT 9	421	22.12	117	6.15	291	15.29	78	4.10	226.75
POINT 10	473	24.86	94	4.94	255	13.40	82	4.31	226
POINT 11	238	12.56	72	3.78	166	8.72	65	3.42	135.25
INDOOR MEAN								**312.6 lux**	
OUTDOOR MEAN								**1917.8 lux**	
MEAN DAYLIGHT FACTOR								**16.3%**	

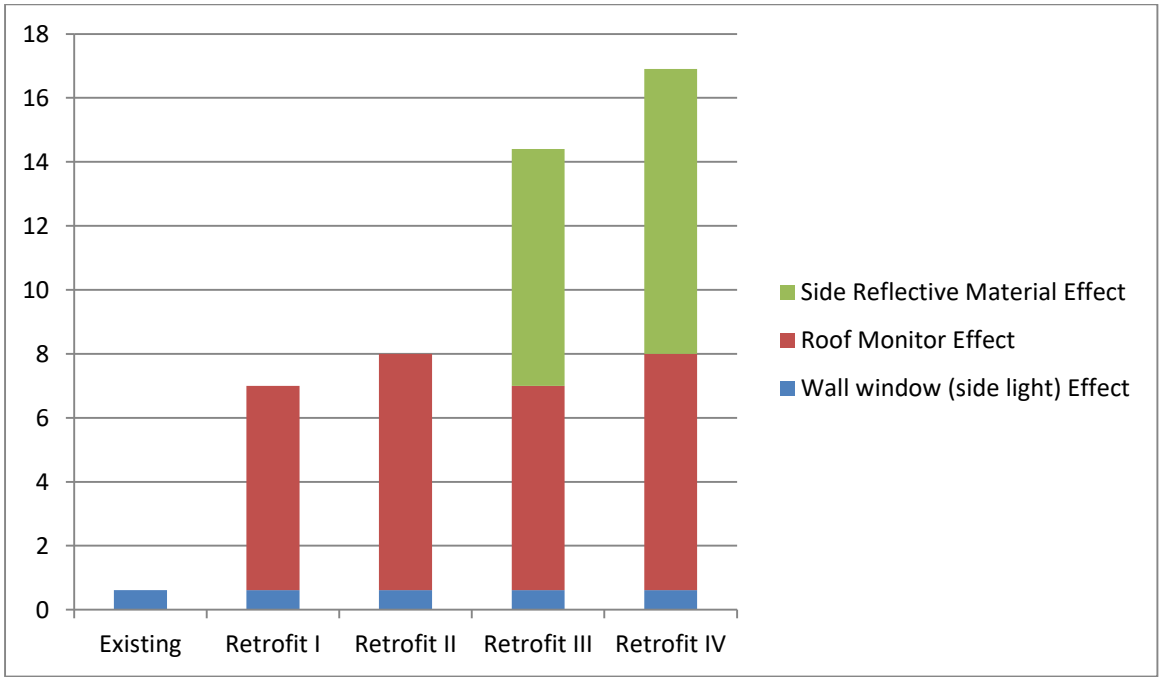


Figure 7: Effect of the retrofits on lobby daylight factor

Discussion

There seem to be a significant difference among the indoor mean illumination levels in the simulated existing and retrofit proposals of the lobby. This difference suggests that daylight could appreciably be enhanced in otherwise 'dark' lobbies through some architectural retrofits,

which in this study included introduction of roof monitor and reflective wall finish in the lobby. Previous works with which to compare the quantum of increase in daylight due to retrofit in this study could not be established since the known works (NBI & PGL, 2011; Jamaludeen *et al*, 2015; Martine, 2016; Rabani *et al*, 2017) were on energy efficiency and cost implications, and not on daylight quantity differentials of retrofit. An implication from these known works is that the enhanced daylight from the retrofit may translate into a more energy efficient and cost saving building. It could also be implied from Kesten & Terea (2015) and Dilay & Aysegul (2015) that the enhanced daylight would conduce to enhanced visual comfort, health, performance, job satisfaction and productivity of lecturers, students and other users of the building after retrofit.

While the introduction of roof monitor and the mounting of reflective wall finish in turn produced momentous effect on the lobby illumination level, the effect of changes in roof monitor opening size only seemed relatively low. The extent of modifications of these architectural features have, however, been influenced by the buildings structural systems, thus in line with the submission by Sedor *et al* (2012).

Conclusion

In this study, the potentials of some architectural retrofitting strategies to enhance daylight in a poorly lit lobby was investigated through a simulated experimental design. The effect of roof monitor of different opening sizes and reflective wall finish on the illumination level of a lobby was investigated. Seemingly significant positive change in indoor mean illumination levels and daylight factors were observed due to the roof monitor and reflective wall finish retrofits of the study lobby. These daylight strategies hold a high potential for sustainable interior lighting, rather than resorting to electric lighting. It was hence found expedient to recommend that roof monitors and wall finishes of high reflectance be strongly considered to enhance daylight of indoor spaces totally bounded by internal walls.

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ASSESSMENT OF LANDSCAPE DESIGN ELEMENTS APPLICATION FOR CROWD MOVEMENT OPTIMIZATION IN CATHOLIC CHURCHES IN BENUE STATE, NIGERIA

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Abtract
The optimization of crowd movement assists not only in the efficient discharge of crowd, and facilitation of comfortable environments, but also helps to check crowd related crime. This paper aims at determining the extent to which landscape design features have been applied in Catholic churches to aid crowd control and optimise crowd movement. Data collection was based on structured observation schedule and questionnaires issued to Catholics drawn randomly from public places. Data collected was analysed using SPSS and the results were imputed in the Microsoft excel package for the development of charts. Findings show that 55% of catholic churches have applied landscape design elements to optimise crowd movement. Majority of catholic churches in the State have provisions for parking that is below the optimum, most of respondents' worship at churches having defined paths in the landscape, of which 89% expressed that paths provided for circulation are of at least optimal widths. 82.4% of respondents held that way finding in their places of worship is easy and effective. The paper concludes that for crowd movement to be optimised, there must be a synergy between building capacity and landscaping provisions to enhance free flow of crowd even at peak periods.

Keywords: *Catholic churches, Crowd, Crowd management, Landscape, Urban development*

INTRODUCTION

With the increasing population in urban areas and a rise in the rate of public events, there has been an increase in the amount and scale of assemblage of large numbers of people going about in public places (Haghani and Sarvi, 2016). The practice of managing crowd involves the assessment and interpretation of diverse information sources, making predictions of crowd behaviour as well as deciding on a range of possible, highly context dependent intervention mechanisms (Wijermans *et al*, 2016).

According to Wijermans (2011), a crowd is a large assembly of different people at the same place and time, who do not necessarily share the same goal or interest. Haghani and Sarvi (2016), points out that crowd can form at different magnitudes and for different reasons, and identifies some of the activities that result into crowding to include sport events, political protest, religious gatherings, and the demand for public transport and public buildings at peak hours.

Collection of crowds at public places, particularly in public buildings, has become a serious problem in urban areas resulting from urban development and expansion. Incidentally, increasing population is often not matched up with a corresponding increase or expansion of infrastructural provisions, leading to the overstraining of public amenities and shared facilities. As already revealed by ICOMOS 2001 survey, buildings having the highest number of visitor are not always the most crowded. The survey further indicated that overcrowding is not just a function of population, but also an outcome of carrying capacity of facilities. The simple logic

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is that overcrowding can be cancelled out to a large extent when large populations are matched up with large capacities of facilities. Thus, large building capacities must be complemented with corresponding large capacity circulation provisions, both within the building and out in the surrounding landscape for crowd movement to be optimised.

This paper determines the extent to which landscape components have been applied in Catholic churches to aid crowd control and optimise crowd movement, taking Benue state as the study area. Benue State is chosen as the study area because the State's population is dominated by Christians and so there is a tendency for large influx of crowd to churches.

LITERATURE REVIEW

The Effect of Over Crowding

Mass gatherings involving large crowds pose a challenge on infrastructural capacity and potentially results into accidents (Taneja and Nomesh, 2017). According to Ahuja and Karlapalem, (2015), these accidents are not totally unexpected, and they keep reoccurring at similar occasions. Cases of disastrous incidents occurring in recent times show that crowded places can be prone to reasonable safety risks and that in the phase of large numbers of people, if not well planned and managed, can potentially result in serious injuries and fatalities (Helbing *et al,* 2007; Still, 2014).

Some Incidences of Crowd Disaster

Just within 2013 to date, thousands of people have lost their lives to stampedes, fires and other disaster resulting from overcrowding. Yamin and Albugami, (2014) notes that most of such events happened to be religious gatherings. On the eve of 2013, more than sixty people died and hundreds sustained various degrees of injury in Ivory Coast (CNN, 2013). Dozens of people were reported to have been crushed to death in a stampede at Kumbh on 10th February, 2013 (The Guardian). On the 13th day of October, 2013, more than one hundred people were reported to have lost their lives when a bridge collapsed due to overcrowding that resulted into a stampede in India (ABC Online News).At least 717 people were reported to have lost their lives in a stampede that resulted during a hajj pilgrimage in Mina (BCC News, 2015). In 2016, at least 52 people were killed during a thanksgiving festival in Ethiopia from human stampede (BBC news, 2016). In the year 2017, eight people were killed and 60 seriously injured in a stadium crush in DembaDiop stadium in Senegal. (Al Jazeera, 2017).

Churches as Public Buildings

By their very nature, churches are buildings were a lot of people collect. Komechak (1982) notes that the early Christians used the term 'church' to refer to the gathering of Christians (the act of gathering) rather than the building. However, in the present day, the term 'Church' is conveniently used to connote the buildings in which Christians carry out their worship. The people who collect in the premises of churches come from all works of life and from different places and have different ways of life. Ikibe and Akande (2017) describe church buildings as both public and religious buildings. Adedayo *et al* (2016), affirms that churches are public buildings because they are open to all members of the public and there are no restrictions to people who make use of the church. The absence of restriction in the church environment is the major reason why people having different motives go in, some as participants and others as opportunists. This makes church buildings to be prone to overcrowding and the attendant risks and safety dangers associated with it.

The Nature of Crowd

According to Kingshott (1993), in all circumstances of crowd, the members will have a degree of mobility, and attempting to control their mobility may result into group or individual irritability that may lead to unpredictable and impulsive action. However, since the circumstances of crowds differ, the nature of crowd also differs. Some crowd are peaceful and organised, while some can be violent, aggressive and highly disorganised.

Different researchers express the classification of crowd differently. For instance, according to Momboisse (1967), crowds could be of four distinct natures including casual, conventional, expressive, and aggressive. Berlonghi (1995) expressed the classification of crowds to include spectator crowd, demonstrator crowd, or escaping crowd. Kingshott (2014) identifies two type of crowd to include passive and active crowd. However, for the purpose of this paper, the classification by Kingshott has been adopted because it provides a broader spectrum of classification and considers the possible circumstances of crowd.

The Passive Crowd

Under ideal conditions, crowd in churches are always passive. The passive crowd refers to one that accepts manipulation for reasons of their own needs and the personal objective of the members. In other words, this type of crowd are peaceful and organised, and are willing to be controlled because of the motive its members.

The Active Crowd

Relative to active crowd, four categories have been identified to include the aggressive, escapist, acquisitive and expressive crowd (Kingshott, 2014). The aggressive crowd describes crowds whose objective is violence, destruction or both in achieving what is perceived as their common purpose. Under normal situations, this category of crowd cannot be found in churches.

The escapist crowd describes the crowds that may initially be passive, but as a result of a common element of danger and fear, feel the need to escape from the immediate environment. This is usually the nature of crowd in churches when there is a call for emergency such as a fire, an interior explosion or an attack on the congregation

The acquisitive crowd define a crowd in which some people take advantage of a general disorder to perpetrate criminal acts. In other words, some people who may be acting along with the crowd or separately from the crowd mask themselves with the shield of disorder to unleash criminal offences such as looting on others. This type of crowd can also be generate in churches in times of emergency

Finally, the expressive crowd refers to one whose primary concern is to express feelings and emotions. This type of crowd is rarely of church origin, and their activities are usually not within the environment of the church.

Passive Crowd Control in the Landscape of Churches

Having looked at the nature of crowd in churches, it can then be deduced that in the church environment, the landscape can be said to be effective in the control of crowd if it has the following features

- Makes easy the control of passive crowd by properly organised functional spaces such as parking spaces, meeting venues, green areas, and relaxation spots on the site; way finding optimization and traffic control by way of clearly defined walkways and driveways leading to the functional spaces; and proper signage to give direction to people who are new in the environment
- Makes easy the movement of escapist crowd by way of optimally sized and properly defined route to enable free movement and give direction so as to avoid multi-directional movement that would result into increased rate of trampling when trying to escape in the case of an emergency

RESEARCH METHOD

A descriptive survey was conducted on the selected catholic churches in Benue state. The post occupancy evaluation method, which gives room for direct observation of the areas to be studied using observation schedule and questionnaires was used. According to Adedayo *et al* (2016), the post occupancy evaluation is generally acceptable for getting users' opinion and carrying out observation studies in the built environment. The churches included in the study are churches situated in the major urban centres chosen based on the four catholic dioceses in the State. Eight (8) churches were studied. The churches studied comprise of the two major churches in each diocese (including the cathedral), having clearly marked boundaries, which hold at least two worship sessions on Sundays, and have a total population of at least 2000 persons.

Table 1: List of Churches Studied

S/N	Name of Church	Diocese
1	OLPH cathedral, Makurdi	Makurdi
2	St. Theresa's Parish, Makurdi	Makurdi
3	St. John's Cathedral, Gboko	Gboko
4	St. Thomas Parish, Gboko	Gboko
5	St. Gerald's Cathedral, K/Ala	K/Ala
6	St. Mary's Parish, K/Ala	K/Ala
7	St. Francis Cathedral, Otukpo	Otukpo
8	St. Mary's Parish, Otukpo	Otukpo

Source: Authors' fieldwork (2018)

Three hundred questionnaires were administered to Catholics drawn randomly from public places like markets and schools. The data collected was then inputted into the SPSS package for analysis. The result was then inserted in the Microsoft excel for the development of charts as a form of presenting the results.

DATA ANALYSIS AND RESEARCH FINDINGS

Population Control

The result show that 92.9% of respondents' worship at churches were not less than two worship sessions are held on Sundays, while only 7.1% worship were only one session is held. 2.7% of respondents perceived their places of worship as under populated on Sundays, while 47.7% expressed that their places of worship are optimally populated, while 49.5 % felt that their

places of worship were over populated. Of the total population, 84% of respondents walk to church on Sundays, while only 16% drive their vehicles to church.

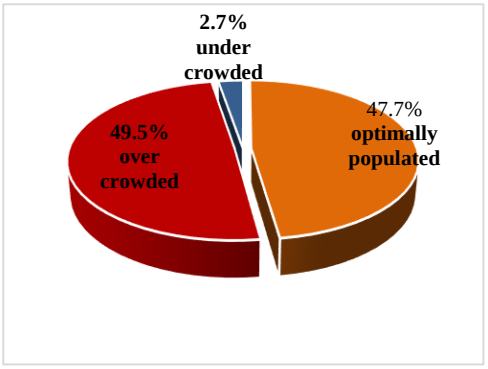


Figure 1: Respondents' Perception of crowd at Catholic Churches in Benue state on Sundays

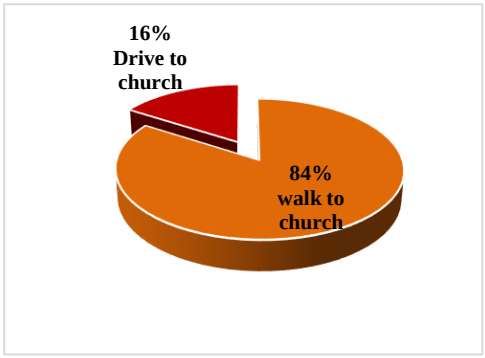


Figure 2: How Respondents get to their places of worship on Sunday

Table 2: Parking Space Provision at Case Studies

S/N	Name of Church	Capacity of Church Building	Number of Available Parking Spaces	Obtainable Parking Ratio	Remark
1	OLPH cathedral, Makurdi	2112	115	1:19	Below optimum
2	St. Theresa's Parish, Makurdi	2512	111	1:23	Below optimum
3	St. John's Cathedral, Gboko	2376	172	1:14	Below optimum
4	St. Thomas Parish, Gboko	1984	54	1:37	Below optimum
5	St. Gerald's Cathedral, K/Ala	2150	210	1:10	Below optimum
6	St. Mary's Parish, K/Ala	1780	40	1:45	Below optimum
7	St. Francis Cathedral, Otukpo	2500	225	1:11	Below optimum
8	St. Mary's Parish, Otukpo	1450	48	1:32	Below optimum

Source: Author's fieldwork (2018)

Table 3: Discharge Rate of Crowd from Church Premises at end of Worship

S/N	Name of Church	Capacity of church building (No of persons)	Total Width of Exits on building (mm)	Discharge rate of Crowd from building (persons /time)	Estimated Rate of pedestrians (84% of total discharge /time)	Total width of pedestrian exits from premises (mm)	Discharge Rate from premises (Persons /time)
1	OLPH cathedral, Makurdi	2112	10800	18	15	1500	2
2	St. Theresa's Parish, Makurdi	2512	9000	15	13	2000	3
4	St. John's Cathedral, Gboko	2376	12600	21	18	3000	5
5	St. Thomas Parish, Gboko	1984	10800	18	15	3000	5
6	St. Gerald's Cathedral, K/Ala	2150	12600	21	18	3000	5
7	St. Mary's Parish, K/Ala	1780	5400	9	8	3000	5
8	St. Francis Cathedral, Otukpo	2500	12000	20	17	1800	3
9	St. Mary's Parish, Otukpo	1450	7200	12	10	1800	3

Source: Authors' fieldwork (2018)

Circulation

From the analysis, 26.1% of respondents expressed that no path have been defined to coordinate circulation at their places of worship. 30.6% indicated that paths to be used by both pedestrians and vehicles were provided, while 43.2% moved that walkways were provided separately from driveways at their places of worship. Of the population that said path ways were provided at their places of worship, 11% felt that the provided paths were too narrow, 78% perceived the paths as optimally sized, while 11% moved that the paths were too large.

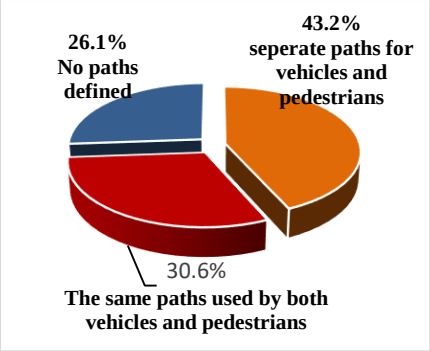


Figure 3: Respondents' description of the organisation of circulation in their places of worship

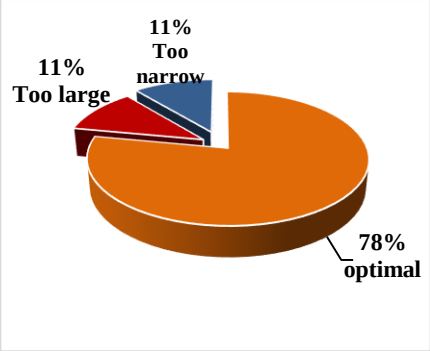


Figure 4: Respondents' Perception of paths in the environment in their places of worship

Way Finding

82.4% of the respondents expressed that way finding at their places of worship is easy and effective, while just 17.6% moved that way finding at their places of worship is difficult and demanding. Of those who perceive way finding as easy and effective stated their reasons, the result which is portrayed in figure 5, and the reason of those who perceive it as difficult and demanding portrayed in figure 6

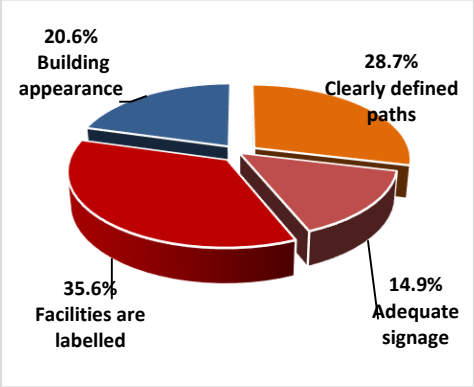


Figure 5: Respondents' reasons of easy way finding in the landscapes of churches in Benue State

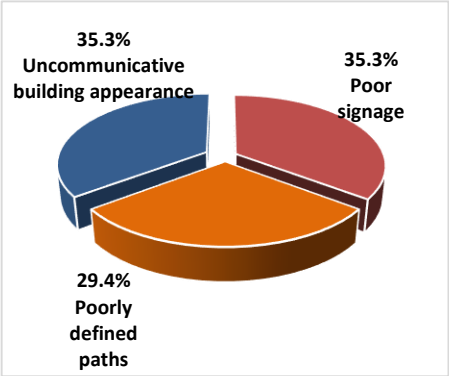


Figure 6: Respondents' reasons of difficulty in way finding in the landscapes of churches in Benue State

DISCUSSION OF FINDINGS

Respondents' perception of population at their places of worship indicate that a vast majority of churches are filled at least up to capacity on Sundays, with a significant percentage of churches been over crowded. This implies a shortage in infrastructural provisions, which results into some challenges posed on infrastructural capacities of such churches. The results further shows that 84% of respondents walk to church on Sundays, which is an indication that most Catholics worship at the Catholic Church nearest to their place of residence. By implication, it can be deduced that since only 16% of them go to church with their vehicles, a parking ratio of 1:6 will be optimal for catholic churches as against the traditional 1:4 for public buildings found in many standards. This ratio was compared with parking ratios obtainable in the studied churches considering the carrying capacity of church halls relative to the available parking spaces, and the result portrayed that parking consideration in those churches is below optimum. The great deficit in the discharge rate from premises when compared with the discharge rate from church building in the case studies indicates that pedestrian exits leading

out of the premises are usually crowded at the close of worship, resulting from a build-up of crowd and some pedestrian resort to making attempts to go through exits meant for vehicles, which jeopardises any attempt to control crowd at these points, a condition which can potentially result into safety dangers leading to serious injuries and fatalities as pointed out by Helbing et al (2007) and Still (2014)

The result further shows that in a vast majority of catholic churches there are no paths for circulation. However, going by the users' perception, it can be seen that in majority of the places where circulation paths have been provided, they are at least adequate. The result also reveals that way finding in the church environment is not a problem to most users.

CONCLUSION AND RECOMMENDATION

The major problems in the landscape of churches in urban centres, particularly catholic churches in Benue state comprises of inadequate parking provisions and the hick up in the discharge of pedestrian crowd at the close of worship sessions. The problem of parking space shortage as observed during this study arises from the fact that more emphasis is placed on building structure developments and large building capacities, which results into the inadequacy of space on the site to provide enough parking spaces that would suit the capacity of the worship space. Inefficient crowd discharge rate arises from the fact that these churches have fences constructed round the perimeters and the pedestrian exits provided on the fence do not match up discharge rate from building. Although as noted by Anon, provision of perimeter security, combined with landscape elements and stand-off areas is a good way of achieving passive security for buildings, when there is no adequate provision made to ensure efficient discharge of crowd, this would result into the build-up of crowd at exit during closing, which jeopardises users' comfort and which may create an avenue for crowd related crime to be perpetrated.

Crowd movement optimisation should be seen as a key consideration right from the planning stage of church building projects. Development control agencies should pay close attention in checking for parking considerations in church designs to ensure that adequate parking ratios are attained. Designers in the building industry should be thorough when designing to ensure that there is enough space left on the site to make adequate provisions for landscaping elements on the site plan so that they meet up ratios that match up with the building capacity, and where this is not possible, other options like basement and multi-storey parking should be explored. When designing for churches with a complex of facilities in the landscape, architects should bear in mind that communicative building concept is key to aiding way finding to new comers in the environment. Church leaders and administrators should ensure that facilities in the landscape of churches are well labelled, and adequately sized paths should be properly defined to reduce haphazard movement, thereby enhancing safety in church environments.

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THE CHALLENGES OF PLACEMAKING OF LEISURE AND RECREATION PARKS DEVELOPMENT IN NIGERIA

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Abstract
This paper examined the phenomenon of "placelessness" and its challenges on leisure and recreation parks development in Nigeria. This problem is best described as the erosion of local culture and the institutionalization of modern architecture across the nation. The study was conducted by physical survey of the parks for assessment, and photographs were taken as well. Consequently, through a careful study of local tradition, and synthesis from received philosophy of qualitative evaluation of related region's cultural and environmental sensitive indices, the paper found out many of the parks are not in tune with their environment (place location) due to non-involvement of the indigent people in the design decisions. Lack of government policy and advocacy campaign, lack of proper site selection and support service also posed serious challenges. The paper, therefore, stressed for application of critical regionalism concept for the place making of recreation parks as that will help to create a semblance of place; an architecture which relates in its base forms and materials both in the place and to the international.

Keywords: Leisure, Place, Place Identity, Recreation Park, Sense of Place

1.0 INTRODUCTION

Man has unconsciously engaged in recreational activities right from the ancient age where he wandered through the dark virgin forest in search of light, shelter and food, to the renaissance via a modern search for novelties and fun (Egbaiji, 2007). As time went on, development and discoveries came up in leaps and bounds; therefore, giving rise to the modern day planned fun-filled human activities. The development of these activities with western culture is what brought about tourism as it were today (Akpan and Obang, 2012). As a result of European colonization of various countries of the world, European sporting, leisure, and recreation practices were transferred and adapted by the colonizers into the colonial settlements they established, and over time were taken up in varying degrees by the indigenous peoples of and other migrants to those countries (Jennings and Weiler, 2005). This colonization and its consequent globalization have, however, made most African countries including Nigeria to lose track, leading to near abandonment of placemaking of recreational facility development. Placemaking – the art of making places for people (Sepe, 2013) is the creation of unique places that people want to use, to be in, to enjoy, to be a part of, and to remember (Wycoff and Heidel, 2012). It concerns the connections between people and places, movement and the urban form, nature and the built fabric (Sepe, 2013). Also referred to as the difference between place and space (Bonner, 2002), or the separation of space and place in modern life (Giddens, 1990).

At the commencement of the twenty-first century, a wide range of niche tourism, sport, leisure, and recreation experiences provide tourists, sportspersons, and people at leisure, with substantial choices for how to spend their nonworking time. Such niches include adventure tourism, sports tourism, recreational tourism, event tourism, marine tourism, national park tourism, and "sun, sea, and sand" tourism (Jennings and Weiler, 2005). Leisure is a category of human experiences found in recreational and creative behaviour pursued with a relative

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sense of freedom from obligations, and regarded as personally pleasurable (Leiper, 2004). Godale and Godbey (1999) defined recreation as what an individual would do given a minimum of constraints on high autonomy or ‘‘it is a set of personally ideal activities in the mind of the individual which given the opportunity he or she will undertake. Recreation may take various routes, but the results are the same. Recreation revitalizes the spirit. It restores a person’s vitality, initiative, and perspective of life, thereby preparing the individual to return to his [sic] toil (Douglass, 1982). By these definitions, leisure and recreation can be understood to be the two sides of a ‘tourism coin’, and any object designed to achieve this relaxation can be referred to as a recreational facility. In this context, recreational facilities are taken to be the structures or physical assets such as amusement park sport, football pitches, playgrounds, galleries, bar and restaurant, and games arcades, which accommodate recreation activities.

Today in Nigeria, it is no longer a doubt that leisure and recreation parks are sited without recourse to the ‘place-people’ context. As Oluigbo (2009) posited, the importation of architectural character has flourished over the years and high demand for western building components and ideas have little room for the development of indigenous styles and expression. One can ask how many of the recreation parks and their compositions have their relationship with the site i.e. portraying the place culture and environment. Are they designed with respect to the site and region in which they are situated? How many of them are situated around the “Area of Outstanding Natural Beauty” (AONB) like interesting topography, availability of natural landforms e.g. Rocky outcrop, water bodies, good scenery and meet the need for quiet enjoyment of the countryside and having regard for the interests of those who live and work there? This problem is best described as the erosion of local culture and the institutionalization of modernization across the nation. This study, therefore, examined the challenges faced with the ‘place-making’ of leisure and recreation parks in Nigeria; from the perspective of Rasheed and Kamal (2008) thematic categorisation: the physical dimension, dependent on the characteristics of the environment; and the local cultural dimension, dependent on the qualities of community; its behaviour patterns and its various ideologies activities. The study is significant as it would unravel the mystery behind the provision of recreation parks that are a semblance of place; an architecture which relates in its base forms and materials both in the place and to the international.

2.0 LITERATURE REVIEW
3.0 THE CONCEPT OF LEISURE AND RECREATION

According to Jennings and Weiler (2005), leisure tends to be defined based on a duality of work and non-work time, particularly non-work time that is free from obligations (Neulinger, 1974; Goodale and Godbey, 1988; Seabrook, 1988; Godbey, 1994; Bennett, Emmison, and Frow, 1999; Iso-Ahola, 1999), while recreation is seen as the refreshment of the mind and the body after work, especially by engaging in enjoyable activities or can be understood as the activity a person takes part in for pleasure or relaxation rather than as work (Gray, 2001). According to Douglass (1982), any action that refreshes the mental attitude of an individual is recreation. Recreation is a wholesome activity that is engaged in for pleasure; therefore, it is a play and embraces a wide variety of activities which are undertaken during leisure (Mathieson and Wall, 1982). Several books and researches have been written about tourism, recreation, and leisure. The work of (Oluigbo, 2009; Jennings and Weiler, 2005; Veal, 2002; McCool and Moisey, 2001; Gartner and Lime, 2000) provides rich literature path to tourism, leisure and recreation development and maintenance, but research pertaining to placemaking has been minimal. however, have focused specifically on challenges of their place-making. Therefore, this study concerns itself with the challenges and proffers wide workable recommendations that would help to bolster the place image of leisure and recreation development in Nigeria.

2.2 CONCEPT OF PLACE AND PLACEMAKING

This paper is premised on the concept of "critical regionalism". An approach to architecture (1980s) which provides a framework for thoughtful and informed works that strives to counter the "placelessness", and lack of meaning in modern architecture by using contextual forces to give a sense of place and meaning. The theories of sense of place are all about cherished aspects of the location which could be referred to as spirit (soul) of place. Halpenny (2006) defined a place as "spatial" location that is assigned meanings and values by society and individuals". As cited in Oluigbo (2009), Agnew and Duncan (1989) outlined the three common meanings of place in social sciences as: location, that is, spatial distribution of social and economic activities; locale, which is routine social interaction in a place; and, sense of place, which mean the identification with a place emotionally or symbolically. Altman and Zube (1980) suggest that the transformation of a 'space' into 'place' occurs when the 'abstract geographical qualities of environment become transformed into meaningful places as people use, modify, or attribute symbolic value to specific settings'. In broad terms, these concepts refer to a person's identification with, and attachment to, places and associated features (Low and Altman, 1992; Hummon, 1992; Sime, 1986). But the essential point is that people can possess a 'sense of place' associated with the 'character of places', or the aggregation of distinctive and familiar place features. While a place can possess unique and distinctive character only people can have a 'sense of place'.

The practice of place-making can be traced to several origins, such as 1960's New Town Movement, in which "placeless suburbs" sought after European towns, creating community centric villages and cities, offering different housing and working opportunities all within close distance of the public realm (Bohl, 2002). Simultaneously, William "Holly" Whyte began scientifically observing people and the way that naturally used public space in his movie *The Social Life of Small Urban Spaces (1979)*. His work began "turning the tide", and focusing place-making on more of a "human-centred design" (Silberberg, 2013). At a larger scale, urban activists Jane Jacobs and Kevin Lynch were studying human perceptions and issues of the current built environment, and how it affected developing cities as well as urban sprawl (Silberberg, 2013). The key attributes of place-making, "Sociability, Uses and Activities, Access and Linkages, and Comfort and Image", according to Project for Public Spaces (PPS), are surely attributed to the foundation laid by past researchers and scholars in the likes of Whyte, Lynch, and Jacobs.

3.0 MATERIALS AND METHODS

This study is a descriptive case study research and qualitative in nature. An interview was conducted on the management of the parks, and physical observations of the parks were made and analyzed as well to establish the challenges bedevilling the cultural identity, and environmental (place) consciousness in leisure and recreation parks and to know their architectural characters as well. Pictures and photographs were taken for proper analysis. Therefore, a total of nine (9) major recreation parks were selected based on regional placement and recognition with three (3) chosen from Southwest; Jhalobia Park and Garden - Lagos, Elegushi Beach – Lagos, Ikogosi Warm Spring - Ekiti state, two (2) from FCT Abuja; Maitama Amusement Park, Wonderland Amusement Park and Resort, two (2) from North-central; Pixie Dixie Amusement Park - Kaduna, FSP Amusement Park – Lokoja, one from Southeast; Polo Amusement Park Enugu, and two (2) from the South-south of Nigeria; Obudu Mountain Resort – Cross River state, Rufus Amusement Park, Warri-Delta State.

4.0 DATA ANALYSIS AND RESEARCH FINDINGS

4.1 THOSE WITH CHALLENGES OF PLACEMAKING

Through a careful study and appreciation of regional traditions, an in-depth assessment was made of them using the architectural vocabularies like a building site and its planning, forms and shape, building materials, texture & ornamentation, and cultural characteristics. And the inference derived from the studies shows that those conforming in one way or the other to the concept of 'sense of place' are more are architecturally and socio-culturally sustainable while those that do not, may be much more patronized because of their being completely modern, but are not economically sustainable, and do not represent the region in which they are situated. Molotch, Freudenburg, and Paulsen (2000), agree on the fact that locality still matters. They have reasoned that locality matters since similar outside forces can have very different consequences depending on the local context. One difference lies in how various communities deal with comparable outside forces. As shown in the **plate I, II, III, IV & V,** its evidently clear that Polo amusement park, Enugu has no any sign of being made with in terms of its materials and construction techniques. Also, Maitama amusement park, Pixie-Dixie, and Rufus seemed to have been dumped on their respective sites without recourse to placemaking. Places whose identity seems inaccessible, confusion or contradictory do not present themselves as destinations. They do not, in other words, seem visitable.



Plate I: Polo Amusement Park, Enugu State. An example of 'Mass tourism" without Any Regional Identity (Source: Field Survey)

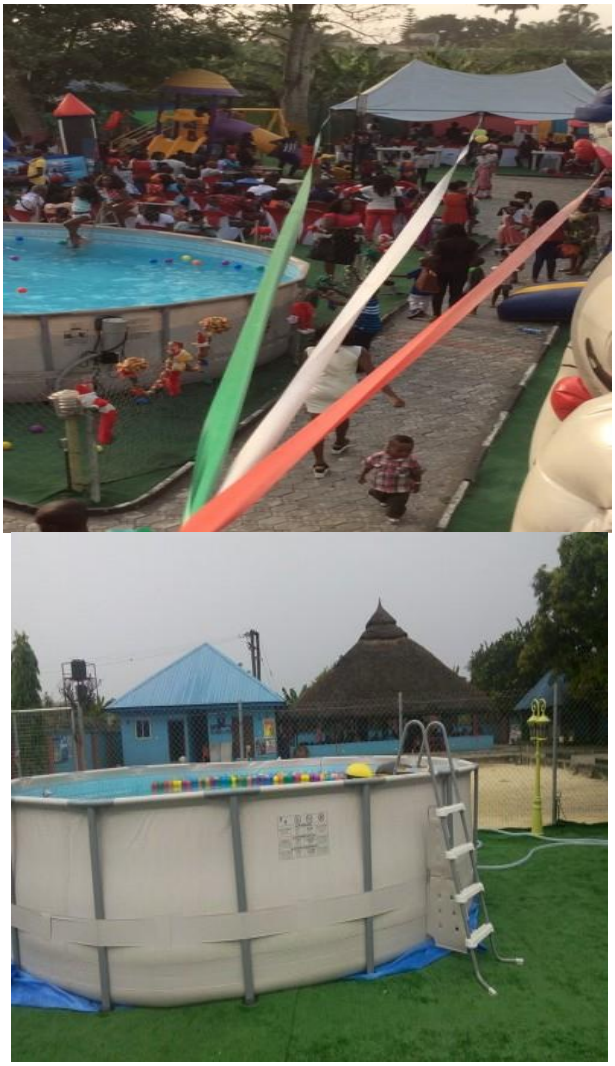


Plate II: Rufes Amusement Park, Warri-Delta State (Source: Field Survey)





Plate III: Pixie-Dixie Leisure and Amusement Park, Kaduna Completely modern and exhibits placelessness (Source: Field Survey)

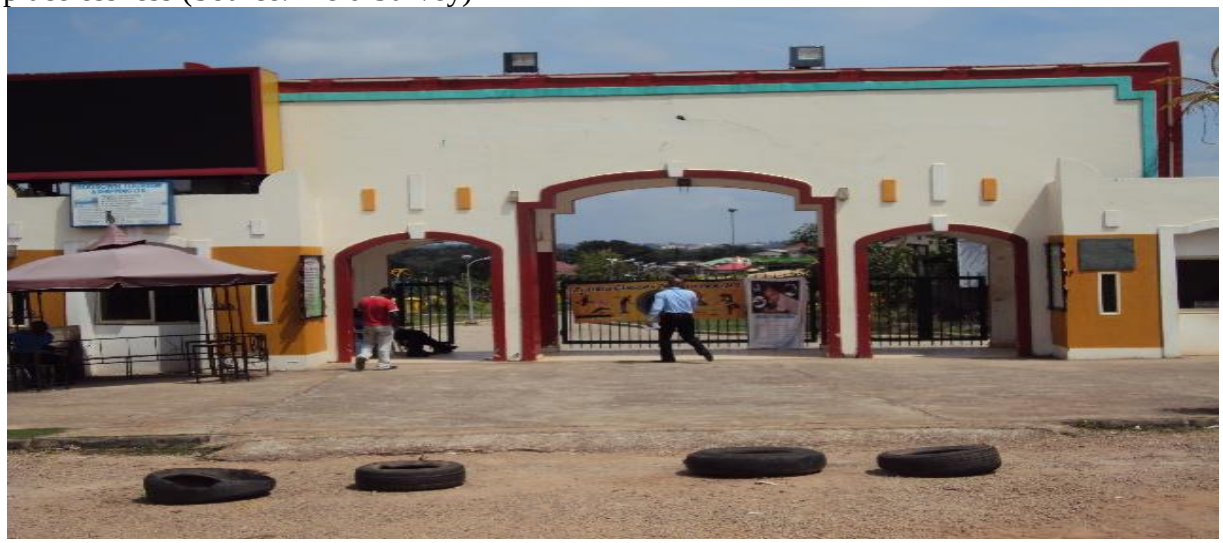


Plate IV: Maitama Amusement Park, Abuja. Modern but with 'pinnacles' a Northern architectural element. (Source: Field Survey)



Plate V: Maitama Amusement Park, Abuja. Completely modern and can be prototyped anywhere in the country. (Source: Field Survey)

4.2 THOSE WITH PLACE IDENTITY CHARACTERS

Paasi (2001) observed local identity as a counterforce to globalization and has claimed that it refers to people's attempt to mark boundaries. Regional identity is created in a distinctive manner; regions try to distinguish themselves by natural, cultural elements and their inhabitants. Therefore, the core of sustainable design lies in the "spirit of place". Illustrations of those in conformity with placemaking are in the **plates VI-XI;** which are modeled after house form and settlement pattern of people of coastal area, an exquisite Yoruba house form and structure, use of available indigenous building materials, constructed around rocky outcrop and finished with stones – an example growing of buildings (AONB) around area of outstanding natural beauty respectively. All these place characters help to create a unique architectural environment in their respective locations.



Plate VI: Elegushi Beach; typical coastal area house form (Source: Field Survey)



Plate VII: Typical Yoruba Palatial Village Setting Of Jhalobia Recreation Park & Garden, Ikeja Lagos (Source: Field Survey)

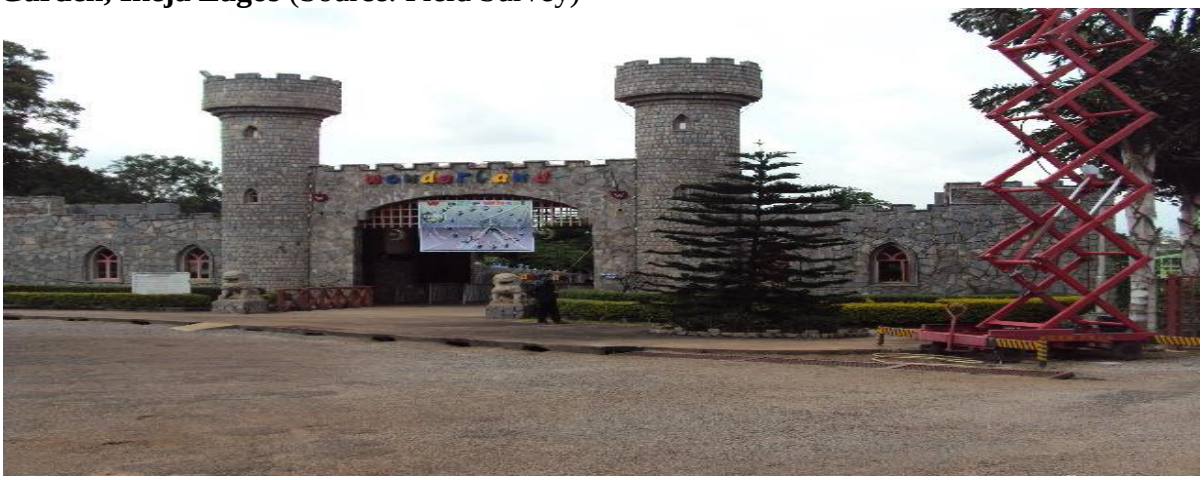


Plate VIII: Wonderland Amusement Park Abuja, constructed with Stones (Source: Field Survey)

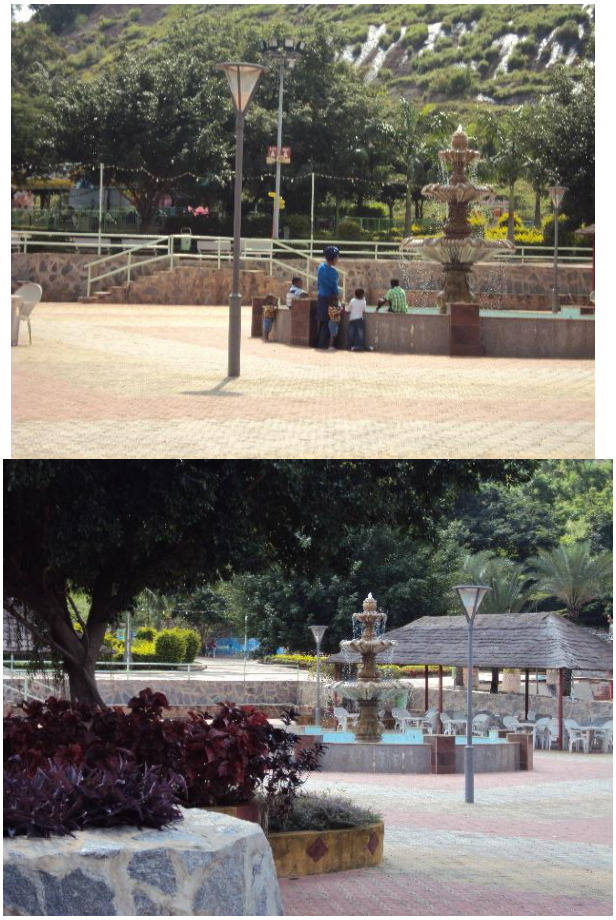


Plate IX: Wonderland Amusement Park, sitting around (AONB) Igneous Rock Outcrop and Use Of Stones for Landscaping (Source: Field Survey)

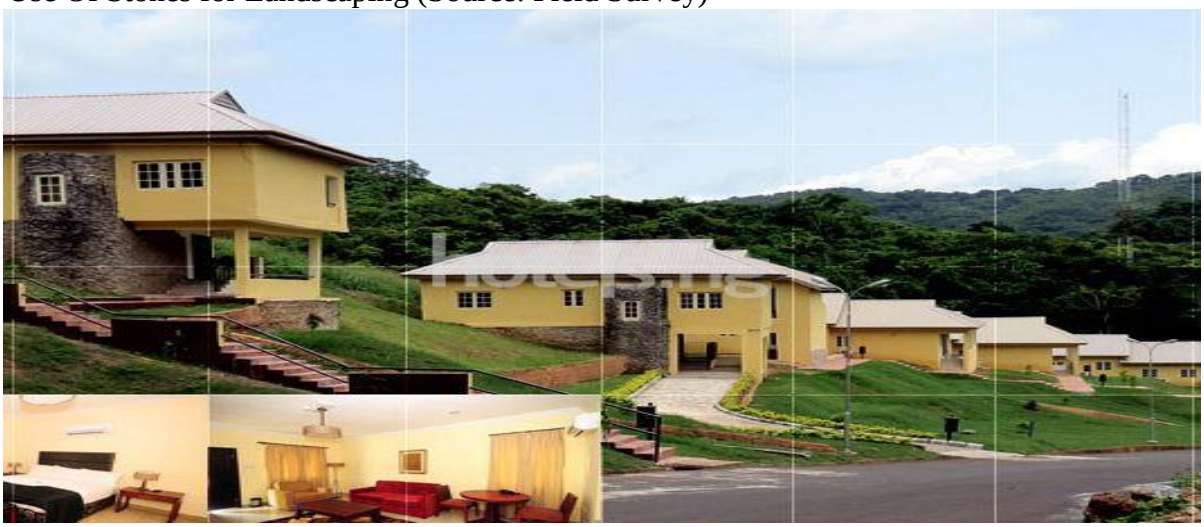


Plate X: Guest Chalets of Ikogosi Warm Spring Resort, Ekiti State, situated on Hilly Site (Source: Field Survey)

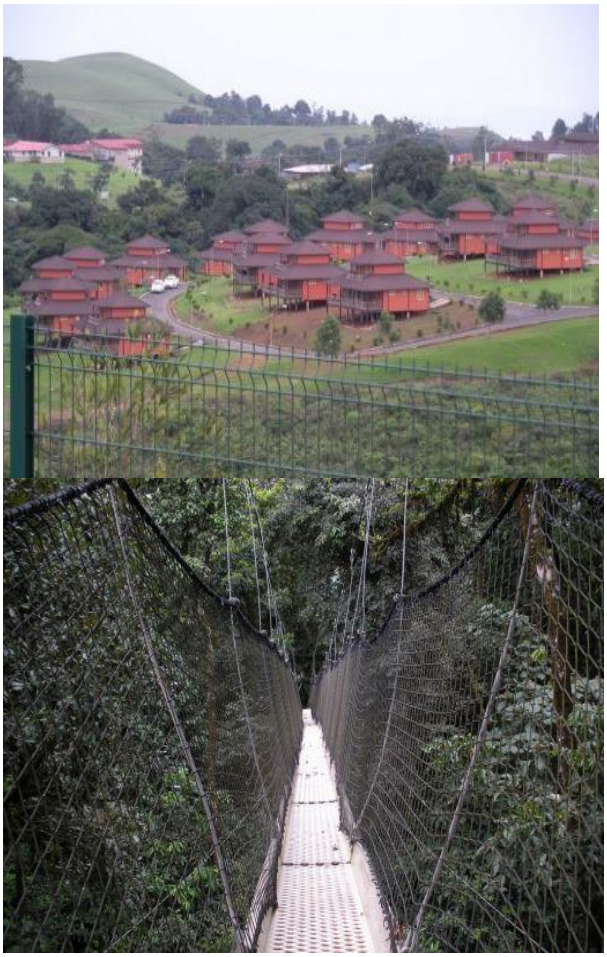


Plate XI: use of red burnt bricks with indigenous house form, and Suspended Rope – Bridge In Obudu Mountain Resort, Calaba – Cross River State (Source: Field Survey)

5.0 DISCUSSION OF FINDINGS

i. **Lack of involvement of indigenous people:** It has been observed that indigent people of the host communities were not carried along as important stakeholders in the design and implementation stages. This has completely deprived them of their inputs as regards consideration for the environmental characteristics, local culture, and its various ideologies activities.

ii. **Financial and capital outlay:** The high cost of capital investment and cost of new facilities, congestion or crowding at some parks, inadequate use/vacancy at some parks or facilities, complaints from citizens about park conditions, problem of staffing facilities or training employees, determining how best to provide services to different user groups and to manage different uses of the same parks are serious challenges.

iii. **Lack of government policy and advocacy campaign:** The research found out, among many other challenges that there has been little advocacy by the government for useful and effective public policies to guide leisure and recreation park sitting and development in destination resort regions, particularly regarding the effective planning for regional or local identity, and lack of interest by the public sector to fund awareness campaign to encourage the populace to embrace the leisure and recreation practice to harness the resources.

iv. **Psychological conception and public safety:** The pursuit of recreation activities is also seen as elitist hence majority of the lower strata of the society find no reward in its pursuits, and believing that patronizing parks and gardens are the exclusive reserves of

children & elites and not adult thereby making the park owners to concern themselves with the provision of children's games, ride, and roller coaster and not providing facilities that takes care of adults. Public safety in parks and recreation areas is now the greatest challenge facing leisure, recreation and tourism development in this era of insurgency and terrorism.

v. **Lack of proper site selection and support services:** While lack of acreage or suitable sites for new parks and recreation facilities poses a serious challenge to the recreation parks development, insufficient funds for land acquisition, operation, and maintenance of parks is a major limiting factor facing the recreation facility development.

5.0 CONCLUSION

Therefore, recognizing and maintaining place identity is one of the many ways of avoiding mass tourism and duplication of architectural products. For this reason, our approach should involve a recovery of a sense of place and the application of the concept of critical regionalism. Since every site or community has its own distinct character, the challenge is to divorce that unique character and stimulate it into architectural poetry. But this first step to getting this done is by involving the indigent people in the recreation policy formulation, design and implantation. A monumental architectural composition as leisure and recreation parks could be an important architectural statement, which without spoken words can visually communicate the language, idea, culture, and even the purpose of its design.

In a country like Nigeria, rich in cultural and environmental diversity, residents convey their sense of place through myriad cultural expression, and this can be factored into the land-use decisions. A cultural conscience is necessary if people hope to survive. Conclusively, if the peculiarities of the region are carefully factored into design decisions and not compromising the quality of the environment, the tourism recreation industry will become more viable as it will enhance the attraction, recreation perception, and experience, and will result in a highly intelligent, appropriate, and sustainable leisure and recreation park architecture.

RECOMMENDATIONS

Recreation is an essential element of human biology and psychology, therefore to be in tune and harmony with the place, there is a need for a cultural consciousness of approach for the enhancement of human psychological experience within and around recreation parks, and since every state in Nigeria is gifted with some unique and cherished cultural and environmental characteristics, and they are all required to develop their tourism, and recreation destinations. Therefore, the attribute of place identity should be adopted in solving the problem of spatial interaction and circulation, mass tourism inherent in parks using the under listed;

i. In deriving the aspect of this kind of design, the architectural sensibility of the work should dwell much on the textural looks to the uniqueness of site, and location, while preference should be on the architect great deals with irregularities of the physical landscape and the blending of the local culture and traditions that are deeply rooted in the local condition. And the sure way of getting this done is by involving the indigent people, and the expert in the recreation resort destination.

ii. The influence should also be felt on the modern method but relies on the organic unity of local materials, climate, cultural characteristics, and topography, vegetation and building methods to land coherence to the finished work.

iii. The adaptations of local forms and method should be hinged on the proper planning of the recreational & amusement park so that space distribution and facilities juxtaposition is flexible and reflects or embraces the requirement of modern functionality.

iv. There should be a sense of place in most of the recreation facilities, and prominence should be given to the Entrance castle/ tower, and a towering fencing with relief sculptures, terracing contours and overall landscape, and height of the buildings which in most times helps in creating architectural "vista" and the feelings of "thereness".

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CRITICAL ASSESSMENT OF FIRE SAFETY MEASURES IN SHOPPING MALLS, ABUJA, NIGERIA

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Abstract
Fire safety measures and practices has been a thing of neglect in most public buildings in Nigeria and this has been a contributing factor to incessant fire incidents. This has generated concern among the public and construction professionals. The study is aimed at evaluating fire safety measures towards enhancing the safety of lives and properties in the design and construction of shopping malls in Abuja. Random sampling method was used in gathering data from people in malls through self-administered questionnaire. A total of 107 questionnaires were obtained from the occupants and used for the analysis. The data were analyzed with statistical package for social science, using frequency and mean score (descriptive statistics), while correlation analysis (inferential statistics) was used for the test of hypotheses. The study revealed that 86% of the respondents have awareness on fire safety measures. The result also indicated that the most common cause of fire incidences in buildings are electrical fault. This could be avoided where electrical fittings are properly installed. The results revealed the need to improve on fire safety measures by designers and property owners. Careful observance of fire safety measures as specified in building code must be considered in design of shopping mall.
Keywords: *Fire safety, Measures, Shopping malls, Users.*

1.0 INTRODUCTION

Shopping malls are accessed by variety of people from all walks of life and, therefore, provision of adequate fire safety measures is of paramount importance. Fire outbreak in a constructed facility presents risks to human and their properties. There have been many efforts to address fire risks in buildings. Oladuokun and Ishola developed a risk analysis model for fire disasters in commercial complexes in Nigeria. Daily, the needs for organized shopping malls are gaining importance in our society. These buildings must be safe and in the event of an emergency or fire disaster, allow for fast and safe evacuation from the building by all its occupants (Peter, 2006).

Although adequate safety and security including fire safety measures are prerequisites for enjoying a hazard free shopping environment; collectively they remain the most neglected issue in the context of total urban development (Martin & Andrew, 2005). In the design of the public buildings such as shopping malls, fire safety is one of the most important and complex considerations. Shopping malls; like any retail centre, face substantial public liability for a whole host of risks, from accidents and trips to the risk of fire. From a fire protection perspective, shopping malls are generally the most complicated of retail structures, requiring a fire alarm system sufficient enough to provide communication between active systems such as zoned sprinklers, smoke control provision, secondary power supplies, emergency lighting and manned control centers (David, 2006). Fire outbreak has caused a lot of disaster and the call to curtail its excesses cannot be overemphasized and measures are constantly put in place to checkmate available control measures.

Shopping malls are associated with a variety of combustible materials from the merchandise they sell and the building materials themselves (Peter, 2006). As public facility, every shopping mall needs to be safe for human use. Fire safety measures must be considered right from the preliminary shopping mall design stage to finish. In Nigeria, shopping malls rely on fire fighters to extinguish fire rather than extinguishing from the fire safety instruments in the shopping mall. This trend has been a problem to the society and as such, the need for providing both active and passive fire control instruments in the shopping mall becomes prerequisite (Odinaka, 2014).

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Audu F. E. and Abdulrahman M.E. (2019). CRITICAL ASSESSMENT OF FIRE SAFETY MEASURES IN SHOPPING MALLS, ABUJA, NIGERIA. Collaboration for Sustainable Development in the Built Environment. International Conference of Environmental Sciences, ICES 2019. 1st International Conference of the Faculty of Environmental Sciences, University of Ilorin, Nigeria, 29th - 30th April 2019.

The purpose of a shopping mall fire risk assessment is to identify the fire hazards, identify people at risk, evaluate, remove or reduce the risks, record your findings, prepare an emergency plan and provide training and review and update regularly. In Nigeria, the comparative advantages of location, administrative, economic and other functional factors have contributed towards a substantial increase in shopping activities. Rising on the back of demographics, rapid urbanization, changing shopping culture and a growing middle class the expansion sweeping through the retail market in Nigeria is getting bigger as the market anticipate about 200,000 sqm of real estate space (Caroline, 2014).

The growth in the Nigerian retail market is a direct reflection of the growing sophistication of the Nigerian middle class, whose shopping preference has shifted from the traditional shopping in the open market, to a more organized and convenient shopping experience offered by retail malls (Odinaka, 2014). In order to achieve a convenient shopping experience, there is need for the shoppers to feel safe in case of fire accident. This can be achieved only by providing both preventive and control safety measures in the event of fire outbreak in the shopping malls and commercial centres.

A large, crowded, shopping centre represents a significant potential for loss of life in fire. It therefore requires the highest standards of management to ensure that risks are anticipated and covered by the best possible systems for life safety and property protection. This study is of high significance as it reveals the rate of preparedness of occupants in the event of fire outbreak. Else, fire risks, especially in commercial buildings will continue to be a safety issue if not properly evaluated.

2.0 REVIEW OF LITERATURE

2.1 Concept of Fire

Fire starts when a flammable and/or a combustible material, in combination with a sufficient quantity of an oxidizer such as oxygen gas or another oxygen rich compound (though non-oxygen oxidizers exist that can replace oxygen), is exposed to a source of heat or ambient temperature above the flash point for the fuel/oxidizer mix, and is able to sustain a rate of rapid oxidation that produces a chain reaction (John, 2014). Hassan (1999) describes fire as chemical reaction of three elements. The rapid combination of the three elements; *Oxygen*, *Heat* and *Fuel* result in the production of heat and light. Oxygen in the air combines with flammable vapours given off by fuels which create a form of heat at molecular level with an ignition source (a match or spark) causing combustion. Combustion occurs when flammable vapours mix with air (Oxygen) and are ignited by a spark of flame. The fuel for a fire may be solid, liquid, or gas. The type and quality of the fuel will determine which method should be used to extinguish the fire.

Fire incidents are becoming rampant in shopping malls. Statistics of such suggests the necessity to determine the origin and causes of fires in buildings so as to enhance control measures. Research has shown that most fires in commercial buildings are caused by the defaults in electrical and mechanical equipment.

2.2 Causes of Fire in Shopping Malls

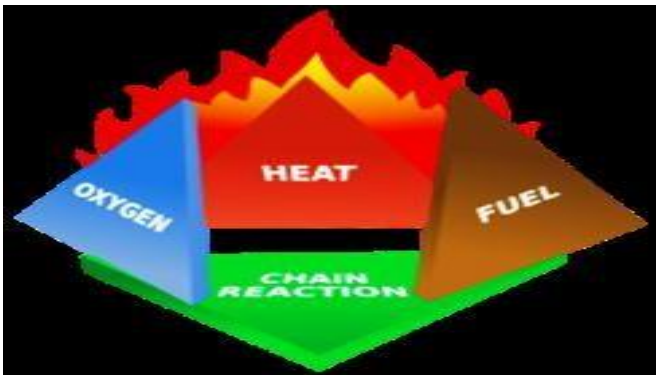


Figure 1.1- Fire Tetrahedron
Source: www.nfpa.org

Fire incidents are becoming rampant in shopping malls. Statistics of such suggests the necessity to determine the origin and causes of fires in buildings so as to enhance control measures. According to Saniya and Sabir (2014), most fires in multi-storey shopping centers are caused by the defaults in electrical and mechanical equipment.

A. Fire caused by electrical appliances: electrical appliances sometimes become partially or fully faulty which might have developed due to over loading. Fires may also start due to overheating of filament lamps. Igniting of flammable fluids from leaking pipes and ducts by electrical energy. Fire from defective or improperly installed and operated electrical and heating equipment and services.

B. Mechanical Causes of Fire: most common source of fire from mechanical devices is due to friction which result from lack of lubrication. When there is friction between mechanical devices, it might initiate some sparks and may result to fire. Overheating of mechanical devices may also result into fire. And heat of compression by the forced reduction of a gaseous volume.

C. Other (Minor) Causes of Fire are:

i. Fraud Fire (Arson): the malicious burning or exploding of the dwelling house of another, or the burning of a building within the cartilage, the immediate surrounding space, of the dwelling of another. In many states, the act of burning any insured dwelling is done with intent to defraud the insurer.

ii. Careless disposal of ash and other waste

iii. Exposure from other buildings on fire.

2.3 Fire Prevention Measures in Buildings

Fire safety measures include fire extinguishing installations, fire detection and alarm systems, as well as integrated design features. Fire outbreak in a constructed facility presents risks to human and their properties. There have been many efforts directed to addressing fire risks in buildings.

Oladuokun and Ishola (1999) developed a risk analysis model for predicting the proneness of a commercial complex to fire accident. Chow advocated that all fire safety requirements can be translated to some critical design features, such as travel distance and fire resistance period.

Beever proposed “cabins” and “islands” and elaborated that “cabins” are areas of high fire load, such as shops that are limited in extent and well defined and “islands” are areas of combustible materials including seating which tend to be well separated with large circulation space in between. He further proposed that “cabins” be protected separately by sprinklers and provided with smoke extract on system and disclosed that, for “islands”, fire spread is not a problem.

Kobes et al proposed sprinkler system, fire safe elevators, especially designed extra staircases for fire fighters, and spoken and personal directives to prevent fatality in case of fire in high-rise buildings. Sutula and Ryder proposed the use of cone calorimeter as a standard test method that would allow for relevant material properties and material performance data to be obtained on green materials. They

further elaborated that, as buildings become more elaborate and move toward increasing sustainability through the use of green materials, the used materials may present an increased fire risk.

FIA (Fire Industry Association) pointed out that there is a need of escape signs, such as exit, fire exit and emergency exit in large and more complex premises, directing people along escape routes. FIA disclosed other protective measures to include: structural and passive fire protection; fire detection and warning signs; signs and notices; and recording, planning, informing, instructing and training.
The *Fire and Rescue Act of 2007* also provides for automatic fire sprinklers for building which has a storey, the floor of which is more than 24 m above the level of the street or ground surface to be provided in every room, office and hall. Fire safety measures in buildings are inadequately provided and, in cases where they are provided, are not well maintained.

Rubaratuka revealed that fire safety measures in investigated buildings are inadequately provided and that in case of fire serious damages are likely to occur. Kachenje et al found that most of buildings have a limited number of facilities and means against fire hazards and some of them are either not easily accessible or not functioning at all.

Makushita found that majority of studied high-rise buildings did not have escape signs, fire hydrant, fire safety system, fire extinguishers or fire alarms. Mydin et al disclosed that the fire protection systems in ancestral temples in Georgetown were very limited, very simple and of basic level where only fire extinguishers were provided.

Flynn listed standardized procedures for development and implementation of fire safety programmes for each individual in commercial building premises to include:

i. Prevention of outbreak of fire through establishment of day to day fire prevention procedures;

ii. Instruction and training of management and staff on all matters relating to fire safety;

iii. Emergency procedure and fire evacuation drills and maintenance of fire protection equipment;

iv. Provision of fire safety instructions to the public/guests;

v. Maintenance of buildings and its fittings with escape routes;

vi. Liaising with fire authority and assisting the fire brigade while keeping safety records.

Hayward cautioned that, once a shopping mall installs a sprinkler system, it is imperative to maintain and test it regularly for the system to work properly.

2.4 Training and Knowledge of Fire Safety Measures

Training through short course, seminars and workshops will equip visitors, users and occupants of building with knowledge to take action in case of fire out breaks. Tabassum et al recommend that all shopkeepers and security guards in the shopping malls should be involved in regular fire drills at least once a year and they should be trained in the use of fire fighting appliances. Rahim et al revealed that involvement in related fire safety programmes was the most effective method of educating building occupants on fire safety. Awareness and ability to use available fire safety provisions in a building will protect people and their property from loss due to fire occurrence.
The study disclosed that, respondents were presented with six different signs and everyone understood the “NO SMOKING” sign and “EMERGENCY EXIT” with a man running sign but only 53% understood the sign for fire hose. Further investigation revealed that majority of the people in shopping malls are not aware about Emergency Operation Centre and majority are not aware whether their buildings are constructed according to the *National Building Code* and fire safety.

3.0 RESEARCH METHODOLOGY

In order to achieve the said objective of the study, a review of fire safety measures and factors in two case study shopping mall buildings was conducted. The study consisted of a case study survey and questionnaire administration to the building occupants. Random and purposive sampling was carried out in order to examine and ascertain the fire safety measures that have been put in place. The occupant survey was to determine their perceptions of fire safety measures in shopping malls buildings and the practicability of measures that could be adopted to improve safety.

The survey questionnaire was designed with two different sections. The first section determines the respondents profile and demographic data, while the second section sought to measure the level of awareness of respondents with fire safety measures and its implementation in shopping malls building. Occupants of two shopping mall buildings located in Abuja, central Nigeria were targeted and questionnaires were distributed among them. One hundred and seven questionnaires were distributed to targeted and random audience from selected office occupants in the case study shopping mall buildings.

4.0 DATA ANALYSIS & RESEARCH FINDINGS

4.1 Case Studies: ***Ceddi Plaza, Abuja.***

Location - 264 Tafawa Balewa way, CBD, Abuja, Nigeria. Ceddi plaza consists of 10,000 sqm of retail and office space. It was constructed in 2003 and opened in November 2005. It is managed by Broll property services Nigeria. It has a total of five floors including ground and basement floors.

Silverbird Galleria, Abuja.

Location – plot 1161, Memorial Drive, by Musa Yar'Adua centre business. Silverbird galleria is a shopping and recreation facility located in Abuja. The major building material of silverbird is concrete, sandcrete blocks and lattice steel frames for the roof.



Figure 4.1(a): Ceddi Plaza, Abuja.



Figure 4.1(b): Silverbird galleria

4.2 Responses to Interviews and Questionnaires

One hundred and seven (107) questionnaires were prepared and hand-delivered to 53 staff from each shopping mall, and 10 interviews were planned for each shopping mall. The demographic data ratios are summarized in Table 4.0 below. All planned interviews were conducted and questionnaires were dully filled and returned from Ceddi plaza and Silverbird respectively. However, respondents from a group of shopping mall users were reluctant to participate in the study. This resulted into many requests for interviews than expected, and thus getting hold of 20 respondents was a challenging exercise. This implies that attention to fire safety measures of users of shopping malls and other public places is relatively low. The response demographic information is presented below.

Table 4.0: Respondents' demographic data

Description	Frequency	Percentage (%)
Sex		
Male	64	59.8
Female	43	40.2
Age Range		
18–25	23	21.5
26–35	41	38.3
Above 35	43	40.2
Academic Qualification		
School Certificate	19	17.7
Diploma (OND & HND)	46	43
First Degree	31	29
Masters	11	10.3
PhD	0	0
Designation		
Designation		
Director	7	6.5
Manager	19	17.8
Account Officer	29	27.1
Clerical Staff	34	31.8
Others	18	16.8

4.3 Availability of Fire Safety Measures in Shopping Malls

Shopping malls need to be equipped with fire extinguishing installation and equipment, as well as fire detection and alarm systems. An examination of available fire protection measures in the two shopping malls is shown below.

Table 4.0: Fire safety measures in shopping malls

Serial	Fire safety measures	Ceddi	Silverbird
1	Horse reel	√	×
2	Sprinklers	√	√
3	Drenchers	×	×
4	Dry/wet riser	×	×
5	Dry powder	√	√
6	Carbon dioxide	√	√
7	Heat detectors	×	×
8	Smoke detectors	×	×
9	Fire alarm system	√	√
10	Escape signs	√	√

The two malls have in common portable fire extinguishers (dry powder and carbon dioxide) and escape signs. While studies like advice and advocates the use of sprinklers, fire alarms and detectors, none of these were provided in the malls. Hayward maintained that, in an enclosed area, such as a mall, smoke represents a major threat to human life, since smoke-related injuries and deaths outnumber fire-related fire related injuries and death four to one. The study of the awareness of fire safety measures in the shopping malls is demonstrated in the figure below.

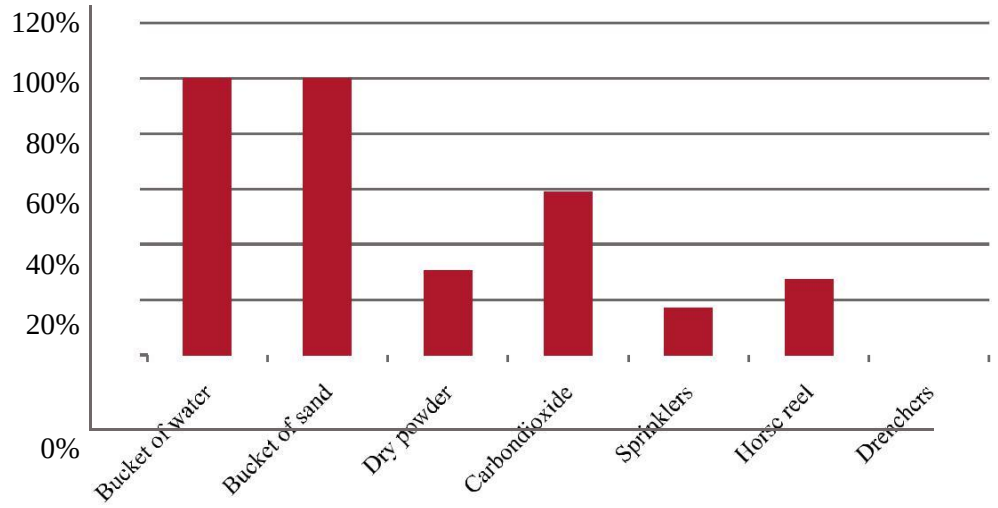


Figure 4.2: Study of fire safety measures in the shopping malls.

5.0 DISCUSSION OF FINDINGS

4.4 Knowledge of Fire Fighting Equipment

Users, as well as staff of shopping malls, need to have knowledge of fire safety measures. Respondents' knowledge was sought, and it was revealed that 98% have which is commonly used in many buildings. The survey revealed that; less than 85% of the targeted audience has knowledge of the usage of firefighting equipment and less than 20% has received training of any sort on fire safety.

Installation of firefighting equipment in shopping malls or any other building is incomplete if occupants cannot use them at the time of fire outbreak. Respondents' ability to use firefighting equipment was assessed and results are summarized below. Results indicate that good number of respondents (15.90%) cannot use firefighting equipment. This suggests that firefighting equipment is installed in shopping malls for complying with fire safety regulations rather than protecting people and their properties. Ability to use firefighting equipment is a result of training that is extended to staff and users of any building. Respondents training on fire safety measures were examined and results obtained is presented in table 4.1 (b). It is evident that majority of respondents (81.31%) have never received any training on fire safety measures.

Table 4.1(a): Demonstration of ability to use firefighting equipment.

Ability to use firefighting equipment		
Response	Frequency	Percentage
Yes	90	84.10%
No	17	15.90%

Table 4.1 (b)

Training on fire safety		
Response	Frequency	Percentage
Yes	20	18.69%
No	87	81.31%

This finding is in consistent with other scholarly work findings which implies that firefighting equipment is installed in buildings but most users, staff or occupants are not trained on how to use them in case of fire outbreak.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Shopping malls construction and use in Abuja, Nigeria at large are relatively new experience. As a result, provision of fire safety measures, awareness and training on how to use provided safety measures in shopping malls remain a challenge to owners, staff and users. The study, therefore, concludes that:

i. Ceddi plaza and Silverbird shopping malls have in place fairly fire prevention measures with varying degrees, however, means of fire safety instructions were almost non existence;
ii. Awareness of safety measures presented in shopping malls is relatively low;
iii. Most shopping malls users and staff do not know how to use fire safety equipment.

The paper recommends that owners should provide adequate fire prevention measures in shopping malls. Furthermore, fire safety training should be provided to staff and fire safety instructions, such as posters made available for users, as well as staff of shopping malls and government fire and safety management regulatory agencies should enforce safety principles and fine defaulters.

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HARDENED PROPERTY OF BLENDED CEMENT MORTAR FOR SUSTAINABLE HOUSING CONSTRUCTION

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Abstract
This study examined the influence of varying palm kernel shell ash (PKSA) content, as blended cement on the compressive strength of mortar cubes. Palm kernel shell ash was used as a substitution for ordinary Portland cement (OPC) from 10 to 40% at 10% intervals using mix ratios 1:2.75 and 1:2.36 together with river sand. The compressive strength of the blended mortar was tested for different curing ages, with the strengths at ages 14 and 28 days reported. Result showed that the compressive strength of PKSA-OPC mortar increased with curing age but decreased with increasing percentage of PKSA compared to the compressive strength of the control. For ratio 1:2.75, the compressive strength of the control with 0% PKSA was 13.57 N/mm^2 while mix ratio 1:2.36, yielded 12.10 N/mm^2 at 28 days respectively. This class of strength could be used for mortar type N, O and S classification. The compressive strength of 8.12 N/mm^2 was obtained for 10% replacement at 28 days of age with percentage strength reduction to the control of 40%, while 20%, 30% and 40% substitution of cement with PKSA yielded compressive strength of 8.65 N/mm^2, 7.43 N/mm^2 and 2.97 N/mm^2 respectively with percentage strength reduction to the control of 36%, 45% and 78% respectively. This research showed that PKSA has the potential of being used as a substitution of cement up to 40% to produce blended mortar.

Keywords: *Palm kernel shell ash, cement, blended mortar, mix ratios, compressive strength.*[7]

INTRODUCTION

The present housing in the country is not only insufficient, but unaffordable and unsustainable for a fast-growing population with low income like Nigeria. According to the World Bank and National Bureau of Statistics in the year 2014, the housing deficit was put at over 17 million units. Hence, with a population of over 190 million, many people sleep in slums due to the housing shortage (Pat-Mbano & Nwadiaro, 2012). Apart from the failure of government housing policies and schemes in meeting this shortage, available housing from public-private partnerships are not affordable for the average Nigerian whose monthly income is below ₦30,000 (Iheme, Effiong & Ekung, 2015). This is mainly attributed to the fact that conventional building materials are expensive, environmentally unfriendly and energy intensive, hence the need to provide alternative building materials that are green, affordable and eco-friendly over the traditional ones in the provision of sustainable cities and communities (Muazu & Alibaba, 2017).

Concrete as a leading construction material has always been produced using conventional materials which include sand, gravel, Portland cement, water and probably some admixtures. The overdependence on these conventional materials in Nigeria has led to a drastic increase in their cost which is making it difficult for an average Nigerian to assess affordable housing (Oladiran, 2015). Also, the natural deposits of these conventional materials are fast depleting (Naik, 2008). It is to this end that researches are being tailored in the direction of substituting these conventional materials with alternative, cheap and locally available materials without

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necessarily compromising the performance of the concrete produced (Oladiran, 2015; Muazu & Alibaba, 2017). Therefore, the essence of this study is to substitute the conventional Portland cement with blended cement using agricultural wastes and to investigate the performance of the mortar produced in using both blended cement and ordinary Portland cement.
Cement is a necessity and a very expensive binder in the construction industry globally. Cement production heavily depends on exploitation of non renewable natural resources leading to the depletion of such resources while it contributes about 5% to 7% of the total gaseous antropogenic emission to the atmosphere Chen, Habert, Bouzidi, and Jullien (2010). Fadele and Ata (2016) reiterated that in view of these challenges, recent studies have focused on the investigation of the behaviour and performance of agricultural waste as supplementary cementing materials (SCMs). The need to produce durable and low cost building components using local building materials is now more paramount than ever. Utilization of wastes like palm kernel shell ash as cement replacement materials may reduce the cost of concrete production and also minimize the negative environmental impacts associated with the disposal of these wastes while making affordable housing construction possible.

Malhotra and Mehta (2014) studied the incorporation of agricultural by-product pozzolans calcined at high temperature and reported positive results in the manufacture and application of blended cements. It was reported that the compressive strength of PKSA concrete did not exceed that of plain concrete and the results showed that 10% of the PKSA in replacement for cement was 22.82 N/mm² at 28 days Olutoge, Quadri, and Olafusi (2012)

Oyejobi, Abdulkadir, and Ahmed (2015) in a study of partial replacement of cement with palm oil fuel ash in concrete production reported that the compressive strength of the concrete cubes were observed to be increasing with increase in the curing age but decreased as the PKSA content increase. The percentage reduction of compressive strength for 10%, 20% and 30% replacement of cement with POFA compared with control were 7.76%, 19.79% and 40.40% respectively. Karim, Zain, Jamil, and Islam (2011) discovered that the concrete produced using a particular level of PKSA replacement achieved same or more strength as compared to OPC concrete. No significant strength reduction of concrete is observed up to about 30% replacement of PKSA which is contrary to Oyejobi et al. (2015).

Olowe and Adebayo (2015) investigated effect of palm kernel ash as partial cement replacement in high strength concrete and stressed that the addition of PKSA into concrete mixture did not improve its ultimate compressive strength at 7 days curing but only small increase in compressive strength with addition of PKSA content was observed, at 28 and 58 days respectively. Tay and Show (1995) conducted a study on the use of PKSA as a partial replacement material for Portland cement, with the submission that the PKSA can be used as cement replacement materials in small amounts up to 10% without detrimental effects on long-term strength property.

Bamaga, Ismail, and Hussin (2011), and Bamaga, Hussin, and Ismail (2013) reported that the ultimate compressive strength of concrete could be improved by using 20% of POFA to replace Portland cement in concrete mix and their study concluded that the compressive strength of PKSA concrete at 7 and 28 days, were 39.31 and 48.72 MPa respectively which were generally lower than the compressive strength of control concrete at the same ages. To this end, the present study aimed at investigating performance of mortar blended with the palm kernel shell ash in terms of their compressive strength by varying the mix ratios.

Materials and Methods

The materials used for the mortar in this study are: cement (Dangote brand cement), palm kernel shell, fine aggregate and water.

- Cement

Dangote brand cement of grade 42.5R which belong to ordinary Portland cement family was in accordance with British Standard Bs (2011).

- Palm kernel shell

This was collected from a local Palm oil producer situated at at Omu-Aran, Kwara State, Nigeria. The raw palm kernel shell was shown in Fig 2.1.



Fig.2.1 Raw palm kernel shells

- Fine aggregate

The fine aggregate used for this work was sand and this was sourced from a construction site in the University of Ilorin premises. The sand was in accordance with BS EN 12620 (2008)

- Water

Clean and drinkable water which is clear from impurities and in accordance with ASTM C1602 / C1602M-12 (2012) as used for mixing.

Burning of palm kernel shell

The pretreatment of the palm kernel shell was carried out by washing it with water and soap thoroughly. The samples were air-dried after pretreatment for 72 hours and subsequently burnt in a furnace properly for 4 hours at a temperature of 600^0C. The burning was done at the fabrication workshop of Department of Mechanical Engineering, Institute of Technology, Kwara State Polytechnic, Ilorin, Nigeria by control burning. Figures 2.1, 2.2 and 2.3 showed raw PKS, controlled furnace during burning and processed PKS ash respectively. The burnt

ash was ground using mortar and pestle and sieved with 0.075mm sieve to the required fineness.





Fig. 2.2: Controlled furnace used for PKS incineration Fig.2.3 Processed PKS ash

Mortar Production

Two different mixes were prepared according to ASTM C109 / C109M-16a (2016), the control mortar was prepared using ordinary Portland cement with mix ratio of 1:2.75 as shown in Table 2.1. However, mix ratios 1:2.75 and 1:2.36 in Table 2.2 and 2.3 were adopted for the production of mortar cubes at water/cement ratio of 0.485 for the blended cement. Cement content was replaced at 10%, 20%, 30% and 40% with sieved palm kernel shell ash. The Portland cement and the PKSA were first inter-ground homogeneously by an electric mixing machine before the addition of fine aggregate and water. Figure 2.4 showed the process of inter-grind by electric machine.

The mould used is cleaned with black engine oil to prevent the development of bond between the mould and the mortar. The freshly mixed mortar is scooped into the mould. Each mould is filled in three layers with the mortar; each layer was rammed 25 times with a tamping rod. 50mm x 50mm x 50mm cubes are produced for the tests with a total of 120 cubes casted. Mortar cubes are stripped from the mould carefully after 24 hours of the mortar setting under air. All the cubes are cured in water for curing period of 7 and 28 days respectively. An average of three cubes was crushed for each test.

Table 2.1 Control mix of 1:2.75

Cement (g)	Fine aggregate (g)
1000	2750

Table 2.2 Mix ratio of 1:2.75

Percentage	Cement (g)	Fine aggregate (g)	PKSA (g)	Water (ml)
10%	900	2750	100	520
20%	800	2750	200	610
30%	700	2750	300	700
40%	600	2750	400	750

Table 2.3 Mix ratio of 1:2.36

Percentage	Cement (g)	Fine aggregate (g)	PKSA (g)	Water (ml)
10%	900	2360	100	510
20%	800	2360	200	600
30%	700	2360	300	715
40%	600	2360	400	780



Fig. 2.4: The process of inter-grinding by electric machine

Compressive strength test of mortar

The test for the determination of the compressive strength of the blended cement mortar cubes were carried out according to method specified by the ASTM C109 / C109M-16a (2016) using universal testing machine as shown in Figure 2.5. Three specimens are cured and crushed in the testing machine for each replacement at each interval of ages of 7, 14, 21 and 28 days. The specimens were tested for their compressive strength by applying increasing compressive load until failure occurs as shown in Figure 2.5. Therefore, the maximum load causing failure is recorded and the load is divided by the cross sectional area which gave the compressive strength of each sample as calculated from the equation below.

$$CS = P/A \quad \text{---------- (1)}$$

Where:
CS = Compressive Strength, N/mm^2
P = Ultimate compressive load of mortar, N
A = Surface area in contact with the plate, mm^2

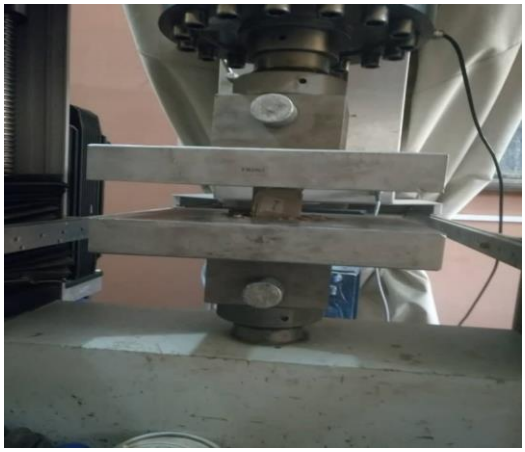
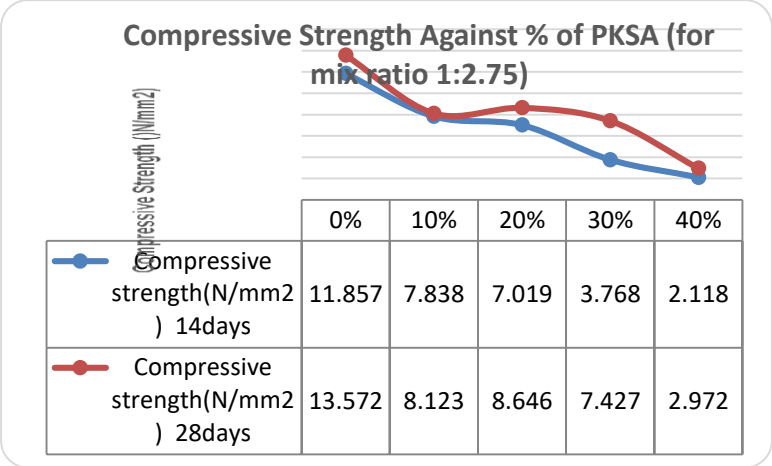


Fig. 2.5: Compression test of cubes using Universal testing machine

RESULTS AND DISCUSSION

Compressive strength

The Compressive strength of blended mortar mixes made with and without PKSA was determined at ages 7, 14, 21 and 28 days. Figures 3.1 and 3.2 show the plot of the tests performed at ages 14 and 28 days respectively for the two mixes.



	0%	10%	20%	30%	40%
Compressive strength(N/mm2) 14days	11.857	7.838	7.019	3.768	2.118
Compressive strength(N/mm2) 28days	13.572	8.123	8.646	7.427	2.972

Fig. 3.1 Compressive Strength for various % replacement of PKSA at different ages.

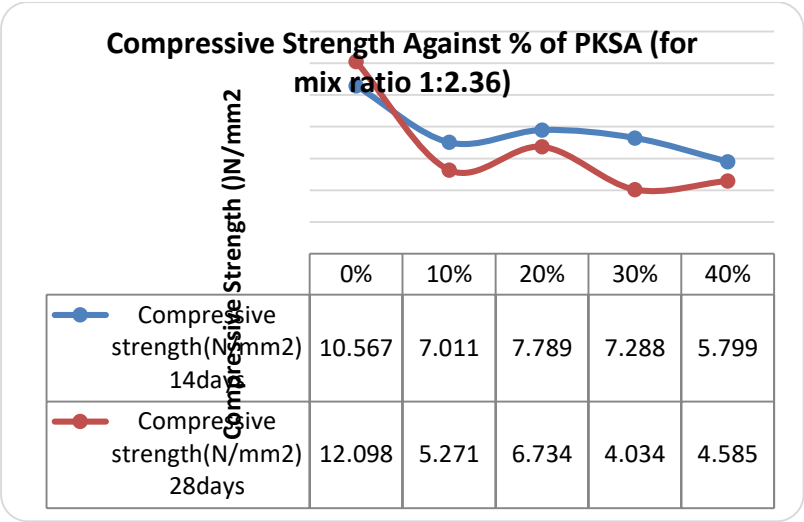
The variation of compressive strength against percentage PKSA for both 14 and 28 days at a standard ratio of 1:2.75 shows that the characteristics strength developed for 14 days (over several percentage of PKSA) varied in a decreasing manner. However, for 28 days testing, the

curve rise and drop progressively which indicate a limit to which the maximum compressive strength at 28 days could be achieved using blended cement mortal with PKSA which is 20%.

At 14 days, the compressive strength was found to be 11.86 N/mm^2 for the control mix ratio. As the percentage of PKSA increase from 10% to 40%, there was gradual fall in the values of compressive strength. These were 34%, 41%, 68%, 82% reduction in the value of the compressive strength. At 28 days, there were gain in the values of compressive strengths with 14.46% for 0% PKSA, 40% for 10% PKSA, 36% for 20% PKSA, 45% for 30% PKSA, 78% for 40% PKSA. A reasonable compressive strength was achieved up to the replacement level of 30% and beyond this point, value of compressive strength is low.

In the same vein, the variation of the compressive strength at 28 days resonates with the result obtained by Oyejobi et al. (2015) in a study of partial replacement of cement with palm oil fuel ash in concrete production. It was reported that the compressive strength of the concrete cubes was increasing with increase in the curing age, but decreased as the PKSA content increased. Likewise, Sooraj (2013) on his on the study of the effect of palm oil fuel ash (POFA) on the strength properties of concrete recommended that strength of cement replaced by palm oil fuel ash concrete specimens were lower than that of normal OPC concrete suggesting 20% replacement of POFA could be the optimum level for the production of concrete, because strength of concrete reduced gradually beyond this replacement level. It was showed that the strength at 28 days decreased beyond 20% PKSA replacement of a standard mix ratio 1:2.75. Although, this was contrary to Karim et al. (2011) that reported no significant strength reduction of concrete was observed up to about 30% replacement of PKSA. Also Bamaga et al. (2013) stated that the ultimate compressive strength of concrete could be improved by using 20% of POFA to replace Portland cement in concrete mix

The result of compressive strength against percentage PKSA for adopted mix ratio of 1: 2.36 was presented in the Figure 3.2. The aim of choosing this ratio was to study the effect of percentage PKSA on compressive strength on a mixture with lesser fine aggregate 1: 2.36 at 0%, 10%, 20%, 30% and 40% substitution level of the PKSA percentage PKSA content. The result obtained showed that the PKSA content could be increased beyond 20% substitution level and the mortar could still give meaningful comprehensive strength using ratio 1:2.36 with substitution level up to 40%. From the result, the percentage reduction in comprehensive strength for 10%, 20%, 30% and 40% substitution with PKSA are 33%, 26%, 31% and 45% respectively for 14 days curing age and 56%, 44%, 67% and 62% for 28 days curing age compared with control of 0% replacement.



	0%	10%	20%	30%	40%
Compressive strength(N/mm2) 14days	10.567	7.011	7.789	7.288	5.799
Compressive strength(N/mm2) 28days	12.098	5.271	6.734	4.034	4.585

Fig. 3.2 Compressive Strength for various % replacement of PKSA at different ages.

According to mortar mix classification in ASTM C270-14a (2014), a mortar mix type N is usually recommended for exterior and above-grade walls that are exposed to severe weather and high heat with medium comprehensive strength of 5.175 N/mm^2 at 28 days, while type O is used for interior or non-load–bearing walls with medium comprehensive strength of 2.415 N/mm^2 but not recommended in areas subjected to high winds. Also, mortar type S offers a high compressive strength, over 12.42 N/mm^2, and with high tensile bond strength while mortar type M is recommended for heavy loads, masonry below grade, foundations, retaining walls and driveways with 17.24 N/mm^2 compressive strength. With the above mortar classification and the results from this research, the produced blended cement at replacement level of 10, 20, 30 and 40% could be used for type N and O applications.

CONCLUSION

The aim of the study was to investigate the property of hardened of cement mortar produced with palm kernel shell ash for blended cement. The following submissions are reported:

Firstly, it was clearly shown that palm kernel shell ash (PKSA) is a pozzolanic material that has the potential to be used as blended cement replacement material and can contribute to sustainable housing construction.

Secondly, the hardened compressive strength for 20% replacement level yielded the highest compressive strength, while more than 20% replacements decrease in compressive strength.

Thirdly, the blended cement mortar using palm kernel shell ash (PKSA) could be used for mortar type N, O, and S according to mortar classification.

Lastly, for environmental sustainability, palm kernel shell ash could be utilized for the production of durable and cheap mortar due to its availability in significant quantities across the country and this will result in considerable low cost of housing construction.

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ASSESSMENT OF ASPECT RATIO AND CONFIGURATION EFFECTS IN CORPORATE OFFICE BUILDINGS COURTYARD, IN ABUJA, NIGERIA

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Abtract
The courtyard is known as a micro-climate modifier and has been used in many houses over centuries in several countries. The corporate office which incorporates many administrative functions, consumes lots of energy due to lighting and cooling, as thus measures of self-sustainability should be integrated. The aim of this research is to identify aspect ratio and configuration effect as it affect airflow, shading and thermal mass of the building in-order to promote natural lighting and ventilation in the building. The scope of the research covers government secretariat buildings situated in Abuja municipal area council (AMAC), Abuja. Descriptive research approach was utilised in carrying out the research using observation method, data was collected by means of observation schedule from field work. Stratified random sampling technique was used to study office buildings in Abuja, the primary data obtained was analysed using SPSS software, version 19 and bar charts were used to show the results. The result revealed that, 75% of the 8 sample size assessed, had aspect ratio moderate and above, 75% made use of the semi- enclosed courtyard. 25% of the buildings had aspect ratio to be low. 25% of the courtyard configuration were fully enclosed. It is therefore recommended that, Courtyard should be designed with high aspect ratio in consideration especially in office buildings, to reduce cost of artificial lighting. The semi- enclosed courtyard configuration should be continually encouraged, as this has been identified by many researchers to be the most effective.

Keywords: *Aspect Ratio, Courtyard, Configuration, Energy, Office*

[8]INTRODUCTION

According to Younis (2016), Courtyard should be introduced into office buildings in tropical climate regions, in order to provide indoor thermal comfort and a cut in energy consumption. The courtyard is defined as an open space within a housing unit without roof , it can also be an open space as a result of arrangement of individual building units to form an open space within the compound (Eze, 2018). The corporate office building is the main base of operation of an organization, clerical duties are majorly carried out in these buildings. The aim of this research is to identify aspect ratio and configuration effect as it affect airflow, shading and thermal mass of the building in-order to promote natural lighting and ventilation in the building. Heat gained by buildings should be minimised, this is an important concept in building design, as this has great implications on both the economy and cost of operating such buildings. Many authors have demonstrated that the air temperature within the courtyard is usually lower than the air temperature at the inside of the building, thus the courtyard serve as heat exchange point between itself and servant spaces thereby providing cooling in the building (Rajapaksha and Hyde, 2005).

The significance of the paper reflects the possible comfort conditions that can be achieved through the use of courtyard in office building. The positive implication it will have on the health of users of such building, besides lowering down on the cost of operating such buildings thereby helping to improve the power supply capacity of the country. The research would be a yardstick guide for safety and effectiveness within the office space while promoting courtyard

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usage, even as temperature within the country keep increasing and rainfall keep decreasing due to climate changes as a result of ozone layer depletion.

Scope and Study Area

The scope of the paper would cover some selected government secretariat office buildings in Abuja municipal area council (AMAC) Abuja, which use courtyard or atrium in the building, to save time and cost while carrying out the research. The choice of AMAC is because, the bulk of corporate office buildings are situated in this region, with only a pocket of offices outside this region. Abuja has six area council: Abaji, Abuja municipal (AMAC), Gwagwalada, Kuje, Bwari and Kwali area council. Of the six area council, Abuja municipal area council (AMAC), is the largest, most developed and constitutes of the bulk of the built area in the FCT. AMAC is situated between Latitude 8°40' and 9°20' north of the equator and longitude 6°40' and 7°40' east of the Greenwich meridian. It constitutes of six main districts, namely Asokoro, Maitama, Garki, Central area , Utako and Wuse with some developing districts such as Apo, Gaduwa, Gudu, Lokugoma, Kaura, Durumi, Katampe, Gwarinpa, Guzape and Kado

THEORETICAL FRAMEWORK

Design Considerations for Courtyard

According to Almhafdy, Ibrahim, Ahmed and Josmin, (2013) and Bulus (2016) in every study of courtyard the following are variants that are constants: functions, configuration, orientation, wall enclosure and natural elements within the courtyard.Courtyard functions in various ways, which ranges from being used as a meeting place, gardening, cooking, working, playing, and sleeping to keeping of animals. Invariable this various functions can be categorised as, social, leisure and micro-climate (Edwards, 2006). In order for the courtyard to receive sufficient sunshine, the aspect ratio (AR) must be put into consideration and it is defined as the degree of openness to the sky (Sthapak and Abir, 2014). Therefore the greater the aspect ratio the more exposed the courtyard will be to the sky and can be calculated using the formula:

$$\text{Aspect ratio} = \frac{\text{Width of the courtyard floor}}{\text{Average height of the surrounding wall}}$$

Therefore in the instance in which more sunlight is required into the building, the courtyard is wide and shallow (high aspect ratio) but when less sunlight is required, it should be made narrow and deep (low aspect ratio) in order to serve as a sunlight protector. Aspect ratio when moderate is 1 but should be greater than 1, in-order to optimise its thermal cooling effects (Rodriguez, Tablada, Mabel, Guillermo, and Andreas, 2018). It is worthy of note that, courtyard configuration could be fully enclosed, semi enclosed, and semi open. The courtyard create micro-climatic conditions particularly when some variables are taken into consideration such as the orientation, volume and ventilation. A study was carried-out on polygonal courtyard forms (non-typical form) and it's shading performance to develop a shading calculation tool for courtyards (Ahmed and Mohamed, 2006).

The study concluded that courtyard geometry and proportions have a significant influence on the shading produced on the internal surface. The orientation of courtyard usually depends on the building layout and it affects the ventilation effect or wind speed. It has been argued that the right orientation of a courtyard can improve thermal comfort within the building, as the building should be oriented with respect of solar angles and wind direction (Antonio and carvalho, 2015). There is a general believe that courtyard orientation should be such that the elongated side is best to face north south direction (Bulus, 2016). It has been discovered that increased height of courtyard walls will cause reduction in the degree of air temperature in the

courtyard as well as the rooms in the nearby location to the courtyard. The design variants of courtyard wall enclosure include, its shape, size and details of the enclosing wall of the courtyard. Courtyard wall enclosure components such as walls, doors and windows need to be considered during the design stage. Wall enclosure can play a very important role in the micro-climate conditions of the courtyard through natural ventilation techniques. Placing natural elements in a courtyard produce some environmental benefits, as plants such as: trees, shrubs and flower within a courtyard can significantly affect the thermal comfort as they provide shade and oxygen in the courtyard (Almhafdy, *et al.,* 2013). It has been found that water body (pool) and water spray within the courtyard produces some thermal effect, the courtyard with pool, tent and water spray during sunny hours provided significant cooling effect within the internal surroundings of the courtyard.

Outdoor spaces in office building

According to a study, the courtyard acts as an interaction point for users of the building. It encourage them to act as a group, promotes visual privacy when the court is visually secluded by screening or walled entrances. It serves as a relaxation spot especially when the climate is conducive to out-door activity and it promotes acoustical privacy, enclosure elements work as a noise barrier between the courthouse and the outside area (Sthapak and Abir, 2014).

The courtyard can play a role in promotion of sound health, simply by the architect adding courtyard features such as shade, water, trees and flowers, wind tower, pavement and colours which could all provide a positive effect towards the five senses of the human body (Rust, 2010). The courtyard is generally referred to as a microclimate changer due to its ability to reduce high temperatures, channel breezes and adjust the degree of humidity.

The courtyard can bring about some environmental benefits if the space and the surrounding servant spaces maintain favourable environmental conditions for thermal comfort. The airflow, thermal mass and passive solar all regulate heat transfer between the courtyard, its adjacent servant spaces and the out-door environment. In the tropics, the courtyard can be exposed to overheat and transfer solar heat to adjacent occupied servant spaces, in order to avoid this issue, airflow effect, shading and thermal mass must be promoted (Rajapaksha and Hyde, 2005).

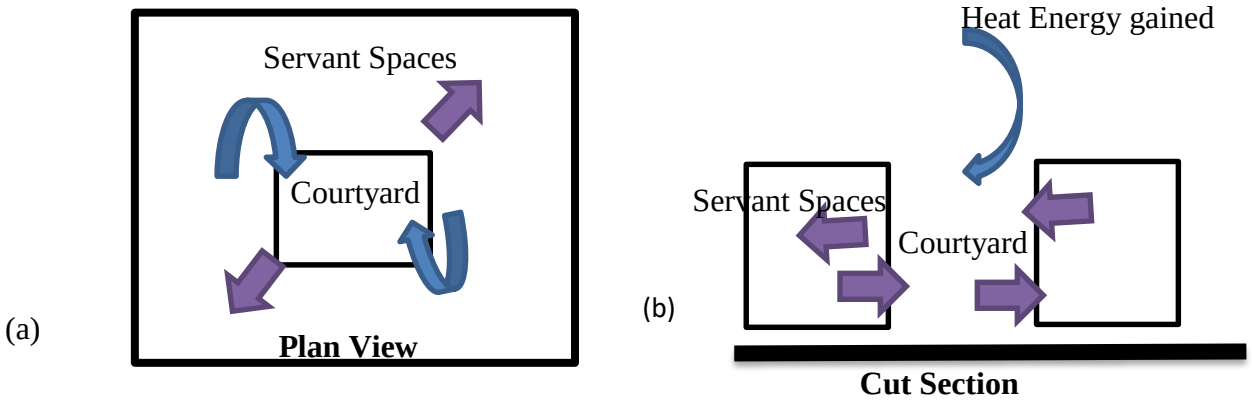


Figure 2.5: Heat transfer in a typical fully enclosed courtyard building
Source: Researcher 2018

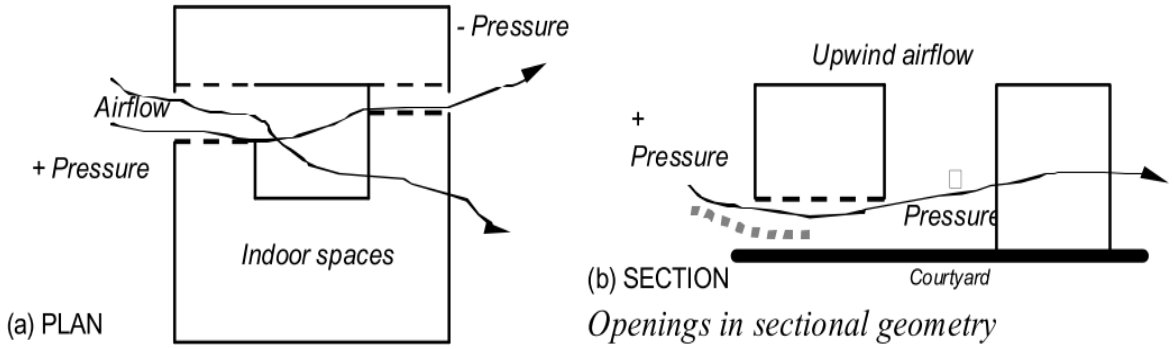


Figure 2.6: Semi enclosed courtyard acting as an air funnel, wind permeability of plan
Source: *(Rajapaksha and Hyde, 2005)*

Airflow is the major effect which dictates the thermal environment inside the courtyard as shown in figure 2.5 and 2.6, this effect is what causes comfort cooling for occupants, structural cooling, controlling of excess heat and the removal of heat from interior spaces. Airflow effect is caused due to wind pressure effect or stack effect which can be regulated either by wind permeability of the geometry or wind permeability of the enclosure as shown in figure 2.6. It is worthy of note that air flow effect is much more felt in a semi enclosed courtyard, such courtyard promotes cross ventilation through the courtyard and attached servant spaces. The wind that moves across the building increases the pressure fields around the building, creating high pressure zones at the openings in the enclosed envelop.

METHODOLOGY

Data was collected from field exercise using observation schedule as also used by Almhafdy, et al., (2013) and Bulus (2016) to carry out similar research. The data was then analysed using IBM statistical package for social science software (SPSS). The descriptive analysis from SPSS were interpreted using Microsoft excel spread sheet program by generating charts and distribution frequencies. Descriptive method was adopted by this research, Stratified random sampling technique was used to sample data, and a total of eight (8) buildings out of 20 were studied. Four sample each, from two unit subset of government system representing federal and state level secretariat. This represented 40% of sample size of 20 from a population of 21 buildings as obtained from 1970 Morgan's table of determining sample size from a given population.

Result and Discussion

Table 1: Variable Measurement for Aspect Ratio in Eight Selected Government Secretariat Buildings in Abuja, Nigeria

S/N	Building	High	Moderate	Low	Aspect Ratio
1	Federal Ministry of Environment	0	0	1	0.84
2	Federal Ministry of Agriculture	0	1	0	1.14
3	Head of service of the federation	0	1	0	1.25
4	Department of education	1	0	0	3.24
5	Abuja municipal area council	0	1	0	1.33
6	Abuja metropolitan management council (AMMC)	0	0	1	0.43
7	Abuja geographic information system (AGIS)	1	0	0	5.81
8	Ministry of works power and housing	1	0	0	3.41

S/N	Building	High	Moderate	Low	Aspect Ratio
	Total number of buildings	3	3	2	8
	Total percentage of buildings	37.5%	37.5%	25%	

Scale factor: yes =1, No= 0 Source: Field Work, 2018

As observed in table 1, 37.5% of the courtyard has aspect ratio to be high, 37.5% has it to be moderate while 25% of the courtyard aspect ratio was low. Aspect ratio less than 1 is considered low, aspect ratio in the range of 1 is considered moderate whereas aspect ratio above 1 is considered high as stated by Rodriguez, et al., (2018). Courtyard with high aspect ratio allowed greater permeability of sunlight, with less shading and good air flow. Courtyard that were observed low had low sunshine permeability with shading in portions of the courtyard.

Table 2: Variable Measurement for Courtyard Configuration

S/N	Building	Fully enclosed	Semi enclosed	Semi open
1	Federal Ministry of Environment	0	1	0
2	Federal Ministry of Agriculture	0	1	0
3	Head of service of the federation	1	1	0
4	Department of education	0	1	0
5	Abuja municipal area council	0	1	0
6	Abuja metropolitan management council	1	0	0
7	Abuja geographic information system	0	0	1
8	Ministry of works power and housing	0	1	0
	Total number of buildings	2	6	1
	Total percentage of buildings	25%	75%	12.5%

Scale factor: yes =1, No= 0 Source: Field Work, 2018

Assessment of table 2, was based on observation of the various configuration type utilised. The fully enclosed courtyard is completely rectangular or square in shape, the semi enclosed courtyard is U-shape or semi rectangular whereas the semi open configuration is L-shaped

Courtyard Configuration

It is an established fact by researchers that the best form of courtyard configuration is the semi-enclosed courtyard due to reasons stated in the framework of study. It was observed that 75% of the buildings surveyed made use of the semi- enclosed courtyard as shown in figure 1, in these courtyard good air pressure was observed, but some of the buildings had poor internal partitioning.

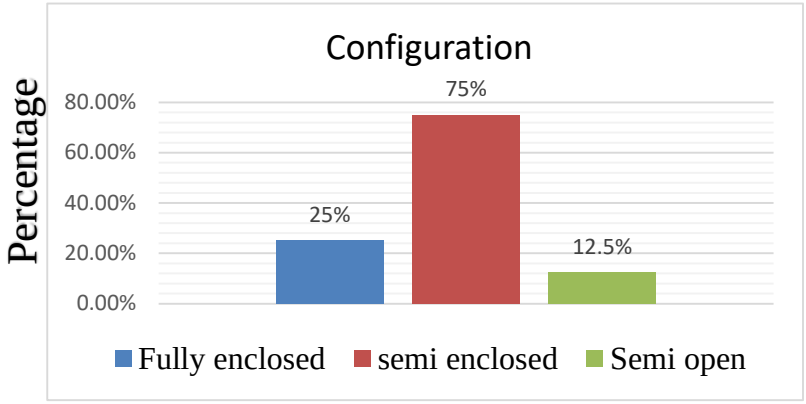


Figure 1: Shows the most dominating of the configuration
Source: Field Work, 2018

Courtyard Aspect Ratio

Aspect ratio can be defined as the degree of exposure of the courtyard to sunlight. From the data set in figure 2, it is observed that the courtyard luminous light varies, from low to high. The highly luminous courtyard is most effective for lighting purpose, one cardinal need of office buildings is lighting. Poor lighting is the resultant effect of artificial lighting which sustainability seeks to address.

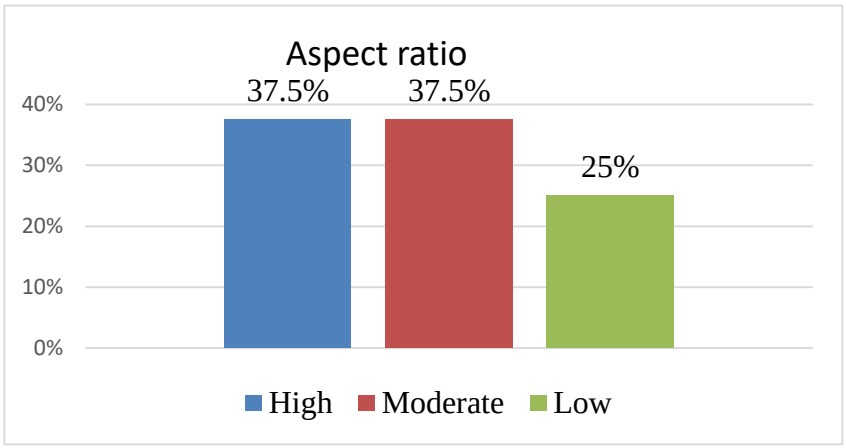


Figure 2: Shows the most dominating of the aspect ratio

Source: Field Work, 2018

CONCLUSION

This paper basically assesses the aspect ratio and configuration effect of office buildings in AMAC region of Abuja, Nigeria. From the findings in this paper, high aspect ratio is not given due consideration in office buildings, this could be due to the scarcity of land in the location. Low aspect ratio is one of the cardinal reasons behind courtyard shading. The semi- enclosed courtyard is the most dominating of the courtyard configuration types that was surveyed, this allows for good air flow which aid cross ventilation when there is proper positioning of openings in the building. Some of the buildings were observed not to be well partitioned internally. Even when aspect ratio was discovered to be high in this places, lighting conditions was still poor internally due to one directional lighting source.

This study clearly explains in details how adequate lighting and cross ventilation can best be achieved through courtyard system in corporate office building. The study creates awareness of courtyard shading due to inadequate aspect ratio and poor air flow condition due to the use of wrong courtyard configuration. As much as courtyard are spaces in buildings with opening to the sky, without due consideration for aspect ratio and configuration type, the efficiency of the courtyard will be under-achieved

RECOMMENDATION

1. Courtyard should be designed with high aspect ratio in consideration especially in office buildings, to reduce cost of artificial lighting. Greenery, in form of trees, shrubs and grasses should constitute the courtyard to compensate for over-exposure.
2. The semi- enclosed courtyard configuration should be continually encouraged, as this has been identified by many researchers to be the most effective. This promote good air pressure difference in the courtyard.
3. Government should enact policies that will mandate courtyard placement and effectiveness within the office space, to serve for natural ventilation and lighting

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ARCHITECTURAL DESIGN CONSIDERATIONS TO ENHANCE SECURITY IN MIXED-USE BUILDING, LAGOS, NIGERIA

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In recent time, the concept of mixed-use development has been widely accepted as a sustainable strategy in urban planning as they provide efficient land usage and comfort for its occupants. One of the major problems associated with mixed-use building is security challenge as they contain several land-use with conflicting interest that has to be reconciled. This paper seeks to assess adequacy of design considerations for security in mixed-use building using Crime Prevention Strategies Through Environmental Design (CPTED). Fifteen mixed-use building were randomly selected from four local government areas in Lagos state. A descriptive survey method was adopted for the research and a structured observation schedule with selected variables focusing on CPTED principles was utilized. Data obtained were documented and analysed using Microsoft excel package. The study reveals that architectural design elements were not adequately used to deter offenders which make the building prone to attack. The study recommends that built-environment professionals adopt CPTED principles to enhance security. It also suggests adequate placement of bollard as an anti- intrusion system, the use of recreational play space to enhance natural surveillance, defining entrances for various functions in a mixed-use building to improve access control, and creating routine management plan to ensure image management.

Keywords: *Defensible Space, Design Consideration, Mixed-Use Building, Security, Sustainable Strategy.*

1. Introduction

In recent times, the concept of mixed-use development has been widely accepted as a sustainable strategy in urban planning and has been increasingly adopted in many cities (Hui et al; 2015), as they provide efficient land usage and at the same time provide comfort for its occupants (Anunobi et al.,2015). Mixed-use building is a well-structured building and with either the combination of shops, offices, residents, restaurant and other facilities (Niemira, 2007). It is a concept recommended contrary to zoning in urban planning since it created design challenges such as congestion, urban extension, pollution due to increase in greenhouse gas as a result of burning fuel for transportation from the residence to the workplace (Grant, 2002; Rowley, 1996). Greenhouse gas should be reduced as it may lead to global rising temperatures and climate change (Akande, 2015). Mixed-use building is now a vital means to address several urban design challenges (Garreau, 2011) and to achieve sustainability and smart development goals (Barnett, 2007).

One of the major problem associated with mixed-use building as highlighted by Niemira (2007), is security challenge since it contains multiple land-use with conflicting interest that has to be reconciled. This has led to fear of crime and security issues within the property. Also, crime statistic report from National Bureau of Statistics (NBS, 2017) reflected a high level of insecurity in Nigeria as 134,663 cases were reported in 2017. Offence against property has the highest number of cases stated with 68,579 cases reported. Lagos State which is the study area

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has the highest percentage share of total cases reported with 50,975 (37.9%) cases recorded. Offences reported include; 370 armed robberies, 77 wounding with menace, 12, 724 theft/stealing, 1,213 on burglary, 668 on house breaking, 417 store breaking offences, 5,623 on fake pretence and cheating/fraud, 403 offences on forgery, 233 offenses on stolen property, 764 on Unlawful possession of property, 222 reported offences on arson, 24,989 on offenses against property and 2,275 on other offenses (NBS, 2017).

However, building security now rely on active gadget for safety. These security gadgets may be hacked (Harris, 2013), or fail has they rely on electricity for their proper functioning and also due to their cyber nature. Hence the need to reduce over reliance on active security gadget, and ensure safety through physical security design element and considerations. This paper seeks to assess adequacy of architectural design element for security in mixed-use building. It adopts principles and strategies of Crime Prevention through Environmental Design (CPTD) for its assessment, as effective use of crime prevention strategies in the built environment can lead to a reduction in fear and occurrence of crime and also improve quality of life (Crowe, 2000). This study will help architects and planners to effectively utilize CPTED principles to reduce fear of crime and crime rate thereby creating a defensible space.

2.0 Development of Crime Prevention Though Environmental Design Concept

Crime Prevention Through Environmental Design (CPTED) is a concept that utilize architecture design strategies to reduce fear and occurrence of crime (Crowe, 2000). Cozen et. al (2015), reported that CPTED ideas are traced to Jacobs (1961), Jeffery (1971), and Newman (1972, 1973), among others. However, Newman's work on Defensible Space was acknowledged by Jeffery in 1976 as the basis of modern CPTED (Jeffery, 1976). This was based on the complexity of Jeffery's work while Newman's approach was much simpler and had the potential for instant application (Andresen, 2010).

Defensible Space as defined by Newman (1973) is a residential setting whose physical features function to allow users of a space to become key agents in ensuring their security (Cozens et. al, 2015). It is made up of four design elements, which includes: Natural surveillance, Territorial reinforcement, Natural Access control and image management. Presently, the application of Defensible Space has expanded beyond housing projects to include a variety of land uses and has been refined as CPTED core concept with many other concept (Cozens et. al ,2015). CPTED is now widely accepted by the United Nations and by governments all over the world (Cozens 2014).

2.1 Principles of CPTED

CPTED principles focuses on design elements that make legitimate users of a space feel safe and can discourage unlawful users from carrying out unlawful acts (Cozens et. al ,2015). CPTED can be proactively effected at the design stage as reported by Cozens (2014), and highlighted the seven CPTED principles as: territorial reinforcement, natural surveillance, image management, access control, legitimate activity support, target hardening and geographical juxtaposition.

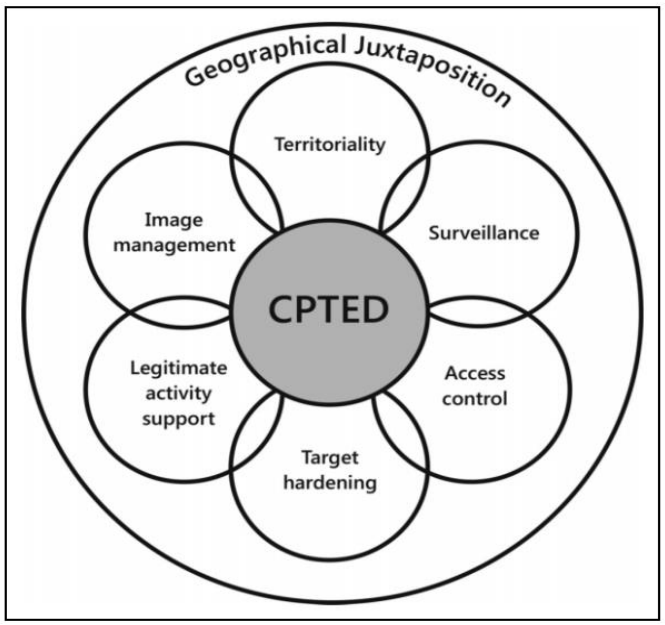


Figure 1: Principles of CPTED
Source: Adapted from Cozens (2014).

2.1.1 Natural surveillance

Natural surveillance utilises passives designs opportunities for residents, neighbours, and bystanders to observe their environment, as it enhances physical protection (Painter and Tilley, 1999). It supports good visibility in and around the buildings to limit concealment of criminal activities. Natural surveillance can be informal which requires the use of window placement and sizes of openings, formal or organised using security patrols or checkpoint (Cozens et. al, 2015).

East Carolina University (ECU, 2011) suggested design strategies for natural surveillance which includes; ensuring visible, clear and defined lines of sight through windows and doors. Parking lots arrangement should be perpendicular to buildings to maximize visibility. Landscape elements should be design to support surveillance and access control. Use baffle type wall in restroom to support visual surveillance. Other design strategies involve construction without large blank walls on buildings has it hinders visibility. And creating design that prevents dead-end corridors, isolated stairwells, and open areas under stairs as they can be used as hideout by offenders (ECU, 2011).

2.1.2 Territorial reinforcement

Territoriality is a concept that clearly delineates boundaries and helps to create a sense of ownership. It reduces level of fear of crime and crime when adequately utilized (Brown, 2001; Ratcliffe, 2003). It can be achieved by using physical elements such as fences or real barriers, pavement treatment, art, symbolic barriers, and good landscaping. ECU (2011) recommended design consideration for territoriality which include; provision of a defined boundary around the building, selection of walkways design, vegetation, and site features to delineate spaces. The use of signage to reinforce territoriality and to support way finding and adopting symbolic barriers to define a public space from private space.

2.1.3 Natural access control

Natural access control focus on reducing prospects for crime by denying entree to potential targets and forming a heightened view of risk in offenders (Cozens et. al, 2005). Access control can also be formal or organised access control (e.g. security personnel) and mechanical access

control (e.g. locks and bolts). Natural access control relies on doors, fences, shrubs, and other physical elements to keep unauthorised persons out of a particular place. Security design criteria that can be used for access control include; adoption of site features, building design, and pathways to direct pedestrians and vehicles into intended pathways. And restricting the number of entrances into a building without inhibiting its functionality (ECU, 2011).

2.1.4 Image management

Image management seeks to promote a positive image and routine maintenance of the built environment which transmits positive signals to all users. Based on Newman (1973) principle, poorly maintained urban space can attract crime and deter use by legitimate users. For example, vacant properties have been seen as crime ‘‘magnets’’ providing prospects for deviant and criminal offenses (Cozens et. al, 2015).

2.1.5 Target hardening

Target hardening reduces the risk associated with crime while increasing the effort and risk of offending. There is, however, much disagreement concerning whether or not target hardening should be considered as a component of CPTED (Cozens et. al, 2015). It focuses on denying access to a crime target through the use of physical barriers such as fences, gates, security doors, and locks.

2.1.6 Active support

Legitimate activity support uses design and signage to encourage acceptable behaviour in the usage of space. Cozens et. al (2015), described safe activities as an attractor for legitimate users who may then act to prevent offending. This technique has perfect links with territoriality, access control, and surveillance. Increasing the numbers of pedestrians may offer additional ‘‘eyes on the street’’ and possibly prevent some offenses.

2.1.7 Geographical juxtaposition

Newman (1973) referred to the impact of geographical juxtaposition with ‘safe zones’ and how ‘safe’ or ‘unsafe’ activity affects a residential environment or any area. Cozens (2014), argued that geographical juxtaposition is a forgotten principle of CPTED. Evidence indicates certain land uses and environmental settings can exhibit increased levels of crime linked to their mundane activities and can influence crime rates in nearby locations (Eck et al, 2007).

3.0 Methodology

The study adopts a descriptive survey research approach. A structured observation schedule was prepared to obtain relevant data for the study from fifteen (15) mixed-use building which are randomly selected from four local governments in Lagos state. The paper aimed at providing information on the level of availability of passive design element or considerations on mixed-use building in Lagos, with a view to proffer design solutions to enhance security in mixed-use building. The variables adopted for the study assessment are the four core CPTED principles based on defensible space (Newman, 1973; Cozens 2014). The core principle utilized are territorial reinforcement, natural surveillance, natural access control and image management.

Design elements observed in the collection of data under territorial reinforcement include; nature and type of gate, bollard, vegetation, retaining wall, boulders, and fence. The following element were also observed under natural surveillance; openings which allows for surveillance such as arch ways, windows, landscape element such as site furniture, and security light. Also nature of gates, doors, security checkpoints and signage were elements observed under natural access control. More-also well maintained landscape, well maintained built structure, presence

of litters/rubbish, evidence of vandalism/ graffiti and evidence of boarded up windows were closely assessed to measure image management which is also determines crime rate or fear of crime.

4.0 Discussion of result

The study adopted four key variable of crime prevention strategies through environmental design (CPTED) for its assessment. The data gathered was documented and analyzed using Microsoft Excel Package and the result was further developed into tables before it was graphically represented in charts as shown in the paper. A 5point Likert scale with the scale ranging from 0 - 4 were used as shown below;
0 - Non availability; 1- Inadequate; 2 - Fair; 3 - Adequate; 4 -Very Adequate.

The result is discussed under the four key variables of CPTED which forms the basis of the study assessment.

4.1 Territorial reinforcement

Most of the mixed-use building selected for observation adopt wall fence as a means of passive barrier which are adequate for security. Only few uses gate, vegetation, bollard for territorial reinforcement. While none uses retaining wall, water bodies and boulders to secure their territory.

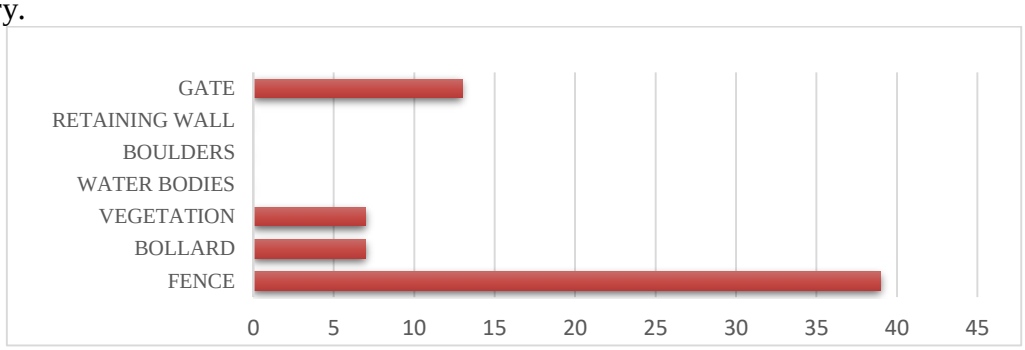


Figure 2: territorial reinforcement used at the selected sample



Figure 3: Use of bollard at Adesco Otuyo Plaza and the use of security post at Toscanini Plaza

4.2 Natural surveillance

Building openings such as arc-ways, and windows are adopted as a means of natural surveillance with security light and walkways. These passive elements are adequately used to observe the environment to ensure defensible space. None of the facilities studied utilizes street furniture which is very adequate for user to observe their environment.

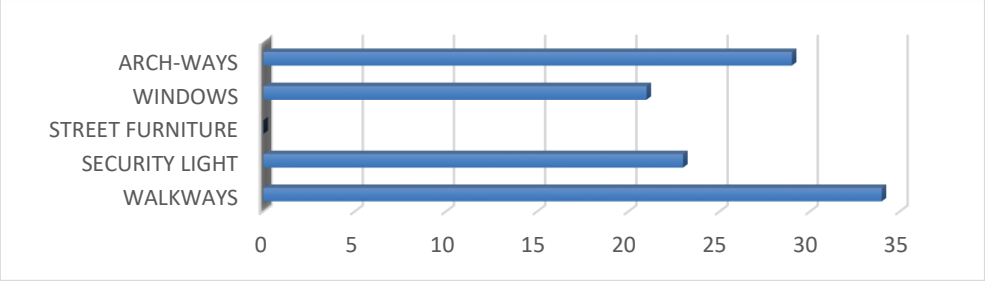


Figure 4: Natural surveillance element used at the selected sample



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Doors was very adequately used has a means of access control in the selected facilities. Gate, signage, and walkways were also adequately utilised while bollard and security check point are inadequately utilised in the selected mixed-use building.

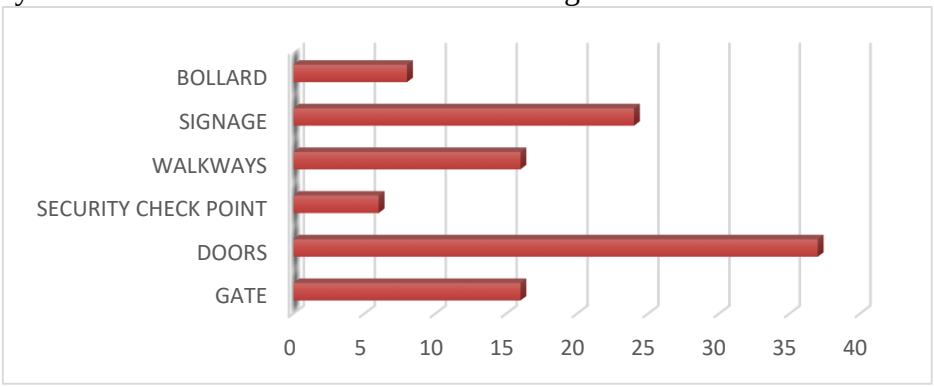


Figure 6: Natural access control element used at the selected sample



Figure 7: The use of doors and bollard for natural access control at Omonua Plaza, Tomade Street, Ikeja and Fero Plaza Mushin, Lagos.

4.4 Image management

The study reveals that 42% of the building structures accessed were adequately maintained, 25% maintained their landscape adequately, 19% shows an evidence of litters/rubbish within their facilities, 7% shows evidence of vandalism and boarded-up windows. Very few of the facilities selected are poorly-maintained and exhibits evidence of incivilities, including graffiti and some vandalism.

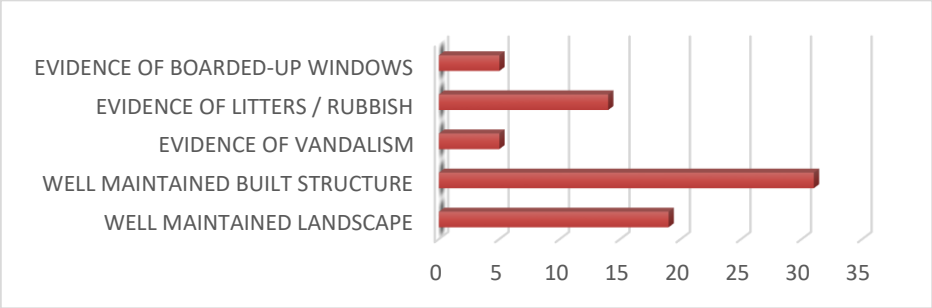


Figure 8: Level of image management within the facilities selected



Figure 9: Poor level of image management at Munirat Apena Plaza Ikeja and Ikebudu Plaza Agege, Lagos.

5.0 Discussion of Findings

The result shows that most of the facilities assessed adopt physical security element or barriers for defining territory only or to create a sense of ownership. 28% of the selected sample focus on territorial reinforcement, 23% utilizes means of natural surveillance, 23% also adopted passive element for access control while 26% focused on image management to deter offenders. Most of the element used for territorial reinforcement are adopted for aesthetic purpose rather than security functions. Some facilities lack anti- intrusion device such as gate and bollard to prevent an intruder from entering the site. Those facilities that utilise bollard

could not maintain a maximum spacing of 1.5 metres to deter unwanted cars from gaining access to site. However, windows and arch-ways are adequately used in most facility for natural surveillance while few utilises security post or checkpoint for formal surveillance to reduce fear of crime. Also, the access to most site is not restricted with gate and bollard. Fence is only adopted to secure the rear and side views of the site while the front is exposed to security threat.

6.0 Conclusion and Recommendation

This study has successfully shown that most mixed-use buildings have security design challenges and revealed the level of security offered at the selected facilities. The security considerations adopted at facilities studied are inadequate to deter offenders which makes them prone to attack. This is due to the inadequate placement of anti-intrusion barrier system. Security barriers are only adopted to create a sense of ownership and to delineate property boundaries. The research support CPTED audit by Cozens et.al (2016) and shows safety concerns among users and residents.

This study recommends that architects and urban planners adopt recreational play space using site furniture within the building territory to enhance natural surveillance. This will enhance observation of the property by its user. Also, landscape element such as trees, shrubs and hedges, should be planted to direct movement and also to improve image management. Effort should be made to ensure static bollard are placed with the standard spacing of 1.5meters maximum to improve access control on site. Security light should be provided at strategic point to enhance natural surveillance. Defining entrance for various land-use to ensure access control. Adopting signage to control movement within the site and creating a routine management plan to ensure image management.

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SECTION 2:

CONSTRUCTION ECONOMICS AND COST MANAGEMENT

INFLUENCE OF RISK FACTORS ON REDEVELOPMENT PROJECTS: A CASE STUDY OF YANKARI RESORT AND SAFARI PROJECT, BAUCHI STATE

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Abstract
Research has shown general low usage of formal risk management techniques in the UAE, Hong Kong, Kuwait, UK and Ghana. This study aimed to assess the influence of risk factors on redevelopment projects using an intrinsic case study of the Yankari resort and safari redevelopment scheme. Redevelopment construction projects have the unique features of unexpected additional works; latent defects and delay amongst others. The study utilized a qualitative approach with review of existing literature, semi-structured interview of five contractors using purposive sampling. Transcribed interview data was analysed using conceptual content analysis technique. The research found that, the contractors used informal risk management approach through the use of past experience, intuition and judgments in the delivery of redevelopment projects. This approach was found to be inadequate to the management of the contractors' project level risk and attainment of project objectives. The informal approach was however found to be successful in the management of environmental risk and some economic risk in the short term. Political, economic and contractual risks had the most adverse impact on the project objectives. This study further affirmed the necessity of risk management for the attainment of both client and contractors' project objectives and as a matter of importance recommends formal approaches to be explored as a panacea to the high incidences of project failures.

Keywords: Contractors, objectives, risks, redevelopment projects.

1 INTRODUCTION

Flanagan & Norman (2003) saw the act of commissioning a project by the construction client as a major investment decision which is not without its own risk. Construction risks are events that generally influence any or all of the project objectives (Akintoye & MacLeod, 1997; APM, 2006; PMI, 2000). Risk events could either be positive in terms of opportunities or negative in terms of threats to either or the entire project objectives (Hillson, 2002; Lehtiranta, 2014; Ward & Chapman, 2003). Wang, Dulaimi & Aguria (2004) classified all construction risks into three levels as follows, country level risks which are external to the project and a function of the political and macroeconomic stability; market level risk which include availability of construction resources, complexity of regulatory processes and attitude of local and foreign governments towards the construction industry; and project level risks are specific to construction sites and include logistic constraints, improper design, site safety, improper quality control and environmental protection, etc. Hence, the management of risks on construction projects requires a systematic methodology premised on knowledge and experience for the attainment of project objectives, minimising losses and enhancement of profitability (Haseeb, Bibi, Qureshi & Khan, 2014; More & Hirlekar, 2017). This is especially

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Aminu M. B, (2019). INFLUENCE OF RISK FACTORS ON REDEVELOPMENT PROJECTS: A CASE STUDY OF YANKARI RESORT AND SAFARI PROJECT, BAUCHI STATE. Collaboration for Sustainable Development in the Built Environment. International Conference of Environmental Sciences, ICES 2019. 1st International Conference of the Faculty of Environmental Sciences, University of Ilorin, Nigeria, 29th - 30th April 2019.

when contracts were awarded based on a fast track procurement system with a Guaranteed Maximum Price (GMP) and a uniform contract period was set for each contract package.

The unique nature of fast track projects which entails the concurrence of construction activities going on with the design process requires the contractors to put in place an appropriate risk management process for the project objectives to be realized. Unfortunately, the contract packages in the Yankari resort and safari project couldn't be delivered as required and the sole aim of increasing the internally generated revenue of the Government was not achieved. The magnitude of the project vis-a-vis its procurement route and the resultant failure of the project to deliver its set objectives make a study of the risk management approach adopted by the various contractors essential.

However, no study has reported on the influences of these identified risk factors on redevelopment projects which are characterized by unexpected additional work, excessive requirements, scope management issues, project funding not aligned with project plans, delay, structural failure, cost overrun, etcetera (Naaranoja & Uden, 2007). These problems or uncertainties, among others, increase the project risk and make their management crucial if success is desired (Bahamid & Doh, 2017). This study aims to answer the following research questions, (1) what are the major risk factors in redevelopment projects? (2) What are the influences of the risk factors on project delivery objectives? (3) What risk response measures were taken on the risks events? (4) How effective or otherwise were the risk response measures on the delivery of the project?

2 LITERATURE REVIEW

Studies have shown that most countries in the Middle East and some part of Africa do not practice formal project risk management in the delivery of construction projects (El-Sayegh, 2008; Laryea & Hughes, 2009). Low usage of formal risk management techniques was essentially due to lack of knowledge, lack of budget, lack of time, doubts on suitability of formal techniques, low profit margin, not economical, complexity of analytical tools, reliance on experience and intuition, competition among small and medium contractors (Akintoye & MacLeod, 1997; Bashir, Ibrahim, Ibrahim & Adogbo, 2011; Hwang et al., 2014; Kartam & Kartam, 2001; Laryea & Hughes, 2009; Serpella, Ferrada, Howard, & Rubio, 2014; Shen, 1997). This was supported by the findings of Shen (1997). Kartam & Kartam (2001) however attributed the low usage of risk analysis techniques to subjective judgment and contractor's reliance on their experience and intuition. El-Sayegh (2008) identified economic risk as the most significant in the Kuwaiti construction industry due to the boom in construction activities and inflationary trend of the market. El – Sayegh (2008) provided a more discrete classification of the various risks as given below:

Design Risk: changes in design, defective design, deficiency in drawings, documents not issued on time. Construction Risk: poor quality, lack or departure of qualified staff, technical problems, construction accidents. Economic Risk: inflation, currency fluctuation, shortages in material availability, shortages in manpower availability and shortages in equipment availability.

Environmental Risk: unexpected inclement weather, unforeseen site condition. Contractual Risk: breach of contract, improper intervention, delays in obtaining site access, sudden bankruptcy, delayed payments. Political Risk: changes in laws, changes in Government, delays in approvals, labour strikes. Social Risk: criminal acts, conflicts due to differences in culture, substance abuse.

Laryea and Hughes (2009) attempted to find how contractors' in Ghana include risk in their bid prices. The research showed that besides having risk allowances as lump sums or percentage allowances, the method used is neither scientific nor informed by any empirical evidence. Ojo (2010) found that design changes and inadequate specifications were the risk factors with most impacts on construction sites but the study did not highlight any Project risk management (PRM) technique used by Contractors to respond to such risks. Another research carried out in Nigeria on this subject was on the evaluation of key risk factors and the measures to mitigate their effects on construction projects (Dada, 2010). Though the research found financial, political and physical risks as the most significant, the use of contingency sum and insurance cover were adjudged to be the most effective means of mitigating risk.

3 MATERIALS AND METHODS

The Yankari Resort & Safari is a large wildlife park located in the south-central part of Bauchi State, in north eastern Nigeria covering an area of about 2,244 km² (224,400 hectares). It is home to several natural warm water springs, as well as a wide variety of flora and fauna. Its location in the heartland of the West African savannah makes it a unique way for tourists and holidaymakers to watch wildlife in its natural habitat and, as such, plays a crucial role in the development and promotion of tourism and ecotourism in Nigeria (KPMG, 2006). In 2006, Yankari game reserve was transferred back to the Bauchi State Government after intensive lobbying to the Federal Government. The State Government commenced a major redevelopment project at the reserve with the primary aim of boosting the internally generated revenue of the State. This involved award of various building and engineering infrastructure contracts to local and multinational companies with proven track records and expertise.

This study adopted an intrinsic case study to gain better understanding of the issues which focused on the Yankari redevelopment project & building/civil engineering contractors to obtain an in-depth spotlight on the major risk factors that affected the projects. From a population of twenty four contractors, purposive sampling technique was used to select five project managers of some contracting organisations who were interviewed using a semi-structured interview protocol. The contractors shared similar characteristics of project location, contract type (fast track procurement system with Guaranteed Maximum Price) and completion period. Interviews were recorded with audio tape and subsequently transcribed. The transcribed data was analysed using content analysis technique. The basic principles of content analysis entail coding the data into categories which are tested for reliability and validity. These categories or codes include words or themes, word senses, phrases or whole sentences. Once coded, the textual data were interpreted and the results of the analysis provided.

3.1 CHARACTERISTICS OF THE INTERVIEWEES

3.1.1 Professional Background of the interviewees

Project managers of the five contracting organisations interviewed comprise two Architects and three Quantity Surveyors.

3.1.2 Qualification of the interviewees

Of the five interviewees two have Master of Science in Architecture, one has Master of Science in Project Management and the remaining two have Bachelor of Technology in Quantity Surveying. Their level of education guarantees a relatively high quality of data for the study.

3.1.3 Years of experience of the interviewees

The two Architects have 10 – 15 years of experience while the three Quantity surveyors fall within 8 – 12 years of experience in the building industry. This further affirmed a high likelihood of qualitative data based on their collective experiences.

4 DATA ANALYSIS AND RESEARCH FINDINGS

4.1 Risk factors and response techniques

4.1.1 Contractor A

This contractor anticipated and approached project risk in an informal manner though aware of the existence of formal risk management techniques. The risks envisaged were buildability (construction), environmental and economic risks in terms of safety of their workmen, surrounding wild life and non-availability of materials within the site respectively. The Contractor used his intuition and judgement to manage these risks events. Though some of these risks events occurred during the project, the occurred risk that had the greatest impact on the contractor and the objectives was not envisaged at the beginning. This risk was a **political risk**. The contractor's informal strategy never envisaged the political risk much less the adverse implication it had on the project. This could be explained by the completion period of 6 months initially given for the project, promptness in payment, long term cordial relationship with the client and the use of fast track contracting system which has the concurrence of the design phase with construction activities.

The occurred risks impacted heavily on both client and contractor's objectives particularly cost and time. While the client suffered increased completion cost, loss of anticipated revenue from the facilities, the contractor also incurred losses that wouldn't be reimbursed and a loss of anticipated profit. Of all the contractor's envisaged **risk response strategies**, only that of **the environmental risk was effective**. No incidence of animal attack on any worker occurred. The usage of strong vehicles didn't prevent mechanical breakdown and neither did the unforeseen political risk passed unnoticed. The political risk that occurred had no response strategy in place. It triggered other risks factors such as **contractual and economic risks** through delayed payments and increased cost in prices due to the extended completion period. This affected the contractor tremendously and informed his opinion of the inadequacy of the informal approach of his organisation to the risk management process.

4.1.2 Contractor B

Experience from past project was generally used as the guiding approach to project risks. This approach was further determined by project factors such as location, type of project, nature of client and equally important timing of the project. Risks envisaged for the project were buildability **(construction), environmental, economic and contractual** even though this was done informally. The contractor put in place risk response strategy via sums in the preliminaries and contract rates in case these risks events occur. An unenvisaged **political risk** occurred during the project through a change in Government. This triggered the occurrence of the **contractual and environmental risks** of delay in payments and damages by animals due to project abandonment respectively. **The response strategy** worked initially because the company utilised the set fund in the rates and preliminaries to offset the cost implication of the occurred risk.

In the long run, the occurred risks impacted adversely on both Client and contractor's objectives as seen through completion after 3 years, at increased cost to the client, compromised

quality due to damages by baboons' and eventual loss in anticipated profit by the main contractor. A surprising response was the contractor's opinion that had they envisaged the political risk of a change in Government before completion with all the prevalent consequences it had on the project, they would not have approached it differently. This is because, as he stated, it would have made their tender uncompetitive and led to probable loss of the contract.

The contractor had no definite pattern in the evaluation of identified risk essentially because project risk are approached and managed informally. But they believed the type of client will greatly affect their attitude to project risk. It can be deduced therefore, that while **political risk** had the most impact on the project objectives, it triggered the occurrence of other risk factors and the situation may not have been better even if this political risk was envisaged before commencement of the project. Also, important to note was the provision of sums of money in the contract to tackle some of the occurred risk even though this provision was exhausted and became inadequate in the long run.

4.1.3 Contractor C

The contractor believes that the most singular important factor to determine project risk is project financing. And when the client offered 50% advance payment and pledged to honour payments as at when due (which was done initially), the contractor failed to put in place any risk response strategy. Several risk factors occurred during execution of the project ranging from that with the most adverse effect, **political risk to economic, environmental and contractual risks**. The change in Government triggered failure by the Government to honour contractual obligations, delayed payments of outstanding certificates, abandonment of the project, increase in prices of materials and subsequent damages of the abandoned structures by animals. The contractor initially resorted to bank loans and overdrafts to respond to the contractual risk event of delayed payments so as to keep the works going. But in the long run this proved to be unsustainable. The absence of adequate risk response strategy at the beginning of the contract made the contractor felt the full impact of these risks events. The contractor's resolve of not accepting any future contract at least one year to the end of any political regime is largely a result of the absence of any risk management technique which could serve as a 'shock-absorber' in the event of negative consequences. It can be deduced that the contractor's awareness of existence of formal risk management process and his belief that project financing is the singular most important determinant to project risk did not help in mitigating the adverse effect of the risks events that occurred. His belief and understanding are wrong as the main trigger was a **political risk** that led to the occurrence of such **economic, environmental and contractual risks** with all their attendant adverse consequences.

4.1.4 Contractor D

The company identifies probable project risks but do not document the risks for management, monitoring and control. They identified **environmental, economic and construction risks** while deliberately neglecting **contractual risk** due to the initial method of project funding i.e. 50% of the contract sum was advanced to the contractor. All the envisaged risk **except for environmental** and other unenvisaged risk in terms of **political, contractual, and economic risks** occurred during the construction stage. They manifested in form of excessive wastages in materials on the road (tiles), loss of workmen, change in Government, delayed payments, loss in anticipated profits, project abandonment and ultimately increase in prices of building materials.

The risk response strategy put in place by the contractor through monies put in contract rates and preliminaries were found to be inadequate especially considering that the unenvisaged risks

had the most impact in the project. Even for the envisaged risks, the impact (35% wastages) exceeded the response strategy allowed by the contractor before the work started (20% wastages). Besides the Client's procurement objectives of time, cost and quality, other significant project objectives such as increasing the State revenue generation and employment through the Yankari Resort & Safari project are still unrealised to date. Contractor's organisational objective for profit has also been grossly shattered by the occurred risks events. The fundamental trigger of most of these risks factors was the change in Government before the completion of the project (**political risk**).

The Contractor recorded success in adequately dealing with the **environmental risk** and also made provisions for other construction and economic risks events which were inadequate. The Contractor attributed his unfortunate situation to the absence of a very experienced project manager who would have anticipated the project risks and formally manage them at a broader level. It could be deduced that irrespective of the contractor's awareness of the approaches to risk management, his risk management techniques in form of identification, analysis and response were of little success in some areas and failed badly when some of the risks events occurred.

4.1.5 Contractor E

The interviewee stated expressly that experience from past projects is their guiding principle towards project risk of any present project. **Environmental, construction and economic risks** in terms of safety of workmen in a wild life environment, equipment failure, and delay in payments were those identified ab initio. Strategies in form of engagement of good management staff and heavy equipment were put in place.

Contractual, economic and construction risks occurred during the project execution through non-payment of outstanding certificates and increased scope of work for lump sum rates which became seriously inadequate. These risks affected the completion time and anticipated profit of the contractor and were partly triggered by an unforeseen political risk. The peculiarity of the project made the contractor's previous experience in managing other projects inadequate in dealing with project risk on this project. The absence of a formal risk management approach also explained their failure to evaluate identified risk on any given project. The undesirable consequences learnt by the Contractor on this project gave them a re-think on the need for critical project planning, involvement of very good project/risk management professionals and training of in-house staff for the purpose of future projects.

5 DISCUSSION OF FINDINGS

Though the contractors were aware of formal risk management techniques, the findings showed that they did not utilize formal risk management approaches. Rather, the contractors generally used informal approaches to manage project risks with experience from past projects as the leading tool. This finding supported the assertion made that contractors do not utilise formal risk management approaches essentially due to concerns that other competitors may be lower in their bid prices (Bashir *et al,* 2011; Hwang *et al,* 2014; Laryea & Hughes, 2009). Allowances for risks are normally included in the contractors' mark-up which includes profit and overheads. Dependent upon what percentage the company allows for its 'mark-up', additional allowances for envisaged risks factors could make such a contractor's overall bid price high and uncompetitive amongst other tenders. This is also in tandem with literature as to lack of knowledge in the formal techniques and doubts on their suitability to real life situations (Serpella *et al,* 2014). Envisaged and unenvisaged risks factors occurred during project execution and these had adverse effect on client's procurement and contractors' project

objectives of time, cost, quality, scope and profitability respectively. These affected project objectives were identified as the most important in terms of project performance that could be affected by the risk events (Akintoye and Macleod, 1997; Edwards and Bowen, 2009; Pawar, Jain & Patil; 2015). Other objectives such as increasing the revenue generation of the State were also affected notwithstanding.

Some of the informal risk response techniques used by the contractors were successful in the short term but became stretched and exhausted in the long run. This was especially concerning economic risk for some of the contractors. The absence of risk monitoring and control procedure deprived the contractor of knowledge of his overall risk exposure as the project progresses (Smith, Merna & Jobling, 2006). As such responses for economic risks became stretched and exhausted in the short term. Risk response strategies for environmental and economic risks were successful for two of the five contractors. **Political, economic and contractual risks** were found to have had the most impact on the projects. In due regard to the Nigerian business climate, these categories of risks are the most probable with high impact when they happen. This partly supported earlier studies on most significant risks in the Nigerian construction industry (Dada, 2010; Ojo, 2010). Design and social risks did not occur even though the former is highly associated with fast track procurement system. This is in contrast to what obtains in literature on redevelopment projects based on a fast track. The latter may be explained by the high number of local contractors & involvement of the local workmen on the projects.

Three of the contractors agreed that usage of formal risk management approaches will enhance attainment of project objectives. This agreed with the findings of past research on risk management practices (Akintoye and Macleod, 1997; Smith et al, 2006; Edwards and Bowen, 2009). However, two of the contractors expressed doubt about the success potential of formal risk management approaches especially where a change in Government is likely to happen within the contract period. This perspective was shared by other researchers though not particularly linked with change in Government (Shen, 1999; Kartam and kartam, 2001; El-Sayegh, 2008).

Some contractors were reluctant to use formal approaches due to the belief that if they make adequate risk provisions, their tenders would be high and uncompetitive for contract award. This position was aptly supported by the work of other researchers in Ghana, a neighbouring West African country that has similar business climate with that of Nigeria (Laryea and Hughes, 2009). For a public sector project, change in Government is a major determinant of project continuity in Nigeria. The Yankari redevelopment project suffered its major drawback with this occurrence in year 2007. This led to so many risk factors occurring with all their attendant consequences on the client's and contractors' project objectives.

6.0 CONCLUSION

This study revealed that the major risk factors in construction redevelopment projects are political, economic and contractual risks. Environmental risk in form of attack by animals equally occurred but essentially due to the nature of the site (camp within a game reserve). These risks usually affect both client and contractor's objectives of timely completion, quality standards, cost, profitability and use of resources. It further revealed that though some Contractors had response strategies by way of percentage additions and lump sums in the contract bills of quantities, the measures were generally inadequate to contain the risks events.

Consequently, the study recommends that Contracting organisations should as a matter of importance engage both formal and informal risk management approaches; anticipate all

possible classes of risk events with adequate management strategies in the delivery process of redevelopment projects. Client organisations should respect and adhere to any legal and contractual obligations entered by previous Governments on all subsisting contracts. This is to mitigate the high incidences of project abandonment and subsequent economic and contractual risks that affect Government projects.

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RISK MANAGEMENT STRATEGY IN PUBLIC PRIVATE PARTNERSHIP ON HOUSING DEVELOPMENT. A CASE OF NIGER STATE

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Abstract
Public Private Partnership (PPP) practices are being adopted as strategy for effective and efficient development of housing projects and others necessary infrastructure in Nigeria, like in any other country. However, the adoption of PPP in Niger state housing development have failed due to lack of management of risks in PPP. The aim of the paper is to assess the risk management in PPP housing development projects. A total of 100 numbers of questionnaires were distributed to the relevant professionals and Consultant in the Ministry of works, transport and housing in Niger State. The descriptive analysis was used to analyse the data obtained from the survey. The result shows the followings as main risk factors. These are: incomplete design; payment delays; contractor's experience; inadequate specification and corruption. The paper established the risk measures. These are: develop scope management plan and risk management policies and procedures; use experience QS for cost estimation to avoid any errors during the process of construction works; inclusion of contract clauses for penalties and avoid excessive contract variation. The paper therefore, recommended that there should transparency in projects conception before embark on the agreement with private sector, in order to avoid changes in design, scope and modification.

KEYWORDS: *Housing Development, Housing Failures, Public Private Partnership, Risk, and Risk Management*

[11]1.0 Introduction

The basic features of Public Private Partnership (PPP) are collaborations among public and private sectors in joint decision-making, resource commitment, sharing of responsibilities, risks and benefits, a division of labour and comparative advantage as well as interdependence (UNCHS, 1993). The basic assumption behind PPP is collaboration, the strength of one sector will help to overcome the weakness of the other sector thereby increasing efficiency and effectiveness in the delivery of basic services (Liu, *et al.*, 2014 & Hwang, Zhao and Gay, 2013). For instance, studies have revealed that the bureaucratic and hierarchical nature of public sector often presents a challenge to producing low-cost shelter; it also lacks the flexibility and ability to innovate and to respond quickly to new opportunities and circumstances but is good in setting the overall legal and regulatory framework within which other actors can play their part more effectively (Pyne, 1999; Smith *et al.* 2006 and Li, 2009). The private sector on the other hand, operates on the basis of adequate returns to investment which has limited its involvement in low-income shelter in the cities of developing countries (Li *et al* 2005 & Oyewobi, Ibrahim and Ibrahim, 2012). An effective risk management system in PPP projects not only brings a higher level of awareness of the consequences of risk but also focuses on a more structured approach, more effective centralised control and better transfer of risk information between parties. It can reduce long-term loss expenses and project time overruns (Ameyaw and Chan, 2013 & Feinberg and Gupta, 2009). Risk management in PPP projects can help assess and ascertain the viability of a project to ensure that it is worthwhile (Katrin *et al.*, 2010). Successful

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risk management in PPP projects should convert uncertainty to risk and convert risk to opportunity. The project and organisation would hence achieve more gains by maximising opportunity, minimising risk and reducing uncertainty.

However, it was on the basis of these mentioned above that the Niger State Government adopted the application of PPP on housing development which did not yielded the objectives of adoption as results of challenges of risk management approaches (NMOWH, 2018). Moreover, like any other construction business, PPP arrangement is not without risk. Carbonara, *et al.* (2011) reported that, PPP projects have more inherent risks than the traditional method of procurement due to the involvement of many stakeholders with varied interests in addition to the economic, political, social and cultural conditions where the projects are to be undertaken, that are traditional sources of risk. These PPP related risks need to be identified and managed. Hence, risk management is a necessary condition for a successful PPP projects which have been adjudged to be riskier than the traditionally procured projects (Andi, 2006, & Babatunde, Opawole, and Akinsiku, 2012).

The PPP on housing development in Niger State experienced the followings risks; project risks (time, cost, work quality, construction risks); political risk, business risk, land acquisition and compensation risk and environmental risk (NMOWH, 2018). These risks were not properly managed by the both parties which led to the abandonment of housing development projects in Minna, Bida and Kontagora. Moreover, Hodge and Greve, (2005) observed that the real success of PPP projects depends on the degree to which risk is genuinely transferred from the public to the private sector and optimally shared. Besides, PPP is generally underpinned by two related principles: transfer of many risks from the public to the private sector. The transfer of risks must be done optimally otherwise the value for money (VFM) goal will be threatened, because appropriate risk allocation between the public and private sectors is crucially key to achieving value for money on PPP projects.

The PPP in housing development in Niger State failed to achieved the VFM due to the challenges of risk management as mentioned above. The fundamental argument of this research is that; lack of proper management of risks are the major reason behind failures of PPP housing projects in Niger State. In other words, the quality and sustainability of PPP projects in Niger State will be achieved, if risks are better identified, evaluated, allocated and mitigated. Therefore, this paper intended to fill in the gap of ineffective risks management of PPP housing development in Niger State to achieve the VFM.

2.0 Risk Management in PPPs Projects

Berkely *et al.* (1991) suggested simple, common and systematic approach to risk management, and further outlined four distinct stages: (a) risk identification, (b) risk classification, (c) risk assessment, and (d) risk response. In the first stage, involves the identification of the risks pertaining to risk management. The second stage risks should be classified into different groups with certain criteria in order to clarify the relationships between them (Berkeley, *et al.*, 1991). The third stage is to assess and evaluate the effects of these risks. In the final stage, appropriate risk response, planning, monitoring and control policies should be developed to reduce and control the risks in projects (Ke, Wang and Chang, 2012 and Noor 2011).

2.1 Risk identification

Risk identification involves determining which risks might affect the project and documenting their characteristics (Dikmen *et al.*, 2007). Participants in risk identification need to be selected on their ability to identify risks in a given technical or management area and this generally includes a number of the following: the project team; the risk management team; subject matter experts, for instance, ground conditions engineers; customer(s); end users if they are different

from customer; other project managers with experience of similar project undertakings; outside experts such as public authority representatives. Risk identification is an iterative process and often the first pass is performed by a part of the project team or by the risk management team followed by a second iteration by the entire project team with the primary stakeholders (Li, 2009). In order to avoid bias in the process, persons who are not involved in the project can be used to perform a final iteration.

2.2 Risk classification

According to Zou, Zhang and Wang (2007), risk classification is an integral part of risk identification. Risks of different types are placed in different categories by considering their predetermined characteristics (Aleshin, 1999). It is necessary to set up a systematic framework for classifying project risks, because risk factors in projects cover such huge areas, and the linkages between them are so complicated. Burtonshaw-Gunn (2009) identified four ways in which risk can be classified; these are (1) project risks; (2) Business risks; (3) Environmental risks and (4) External change risks. The project risks are risks within the project scope of work that could affect the delivery of the business outcome that the project is set up to deliver (Dey and Ogunlana, 2004). The risks at the project level are those directly associated with cost overrun, schedule delay and physical work defects. Business risks on the other hand, are risks that affect the operation of the business outcome once it has been delivered by the project. Environmental risks are the external risk to the project (Burtonshaw-Gunn, 2009).

2.3 Risk assessment

Risk analysis is qualitative and comprises qualifying and prioritizing the risks that have been identified in terms of likelihood and impact on the construction project undertaking (Pott, 2008). Several criteria are used in judging whether the level of risk is high or low, such as the probability of an undesirable occurrence, the degree of seriousness, and the subsequent impact if it does occur. There are three approaches used in risk analysis, qualitative risk analysis, semi quantitative risk analysis and quantitative risk analysis (Loosemore *et al.*, 2006). The choice of approach depends on the type and size of the project, information available, the cost and time available, the expertise of the analysts, the extent of innovation and the ultimate use of the results (Shen *et al*., 2006).

2.4 Risk response, planning, monitoring and control

The six typical risk responses are retention, reduction, control, sharing, transfer and avoidance (Loosemore *et al.,* 2006). The selection of response must be appropriate to the significance of the risk; it must be cost effective and realistic with regard to the timing of the project; it also must be agreed upon by other involved parties. In the risk monitoring and control stage, it is essential to ensure that the desired effects of the implementation of risk responses are achieved throughout the project life cycle (Lee and Schaufelberger, 2016). Risk control does not attempt to remove the source of the risk, but seeks to reduce the risk itself (Ke, Wang and Chang, 2012).

However, Joseph, *et al.* (2015) expressed that effective risk management demands an active process of regular risk reviews and the commitment to followings: anticipate and influence events before they happen by taking a proactive approach; provide knowledge and information about predicted events; inform and, where possible, improve the quality of decision making; avoid covert assumptions and false definition of risks; make the project management process clear and transparent; assist in the delivery of project objectives in terms of benchmarked quality, time and cost thresholds; Roumboutsos and Anagnostopoulos (2008) further added the followings: allow the development of scenario planning in the event of the identification of a high-impact risk; provide improved contingency planning; provide verifiable records of risk planning and risk control. Li, (2009) asserted that several risk response strategies are often available for consideration by the project team and the strategy that is most likely to be effective

should be selected for each risk. Specific actions can then be developed to implement each strategy.

2.5 The risk management factors for success and failure in PPP projects

Public Private Partnerships is underpinned by a government's desire to resolve financial insufficiency by collaborating with the private sector to increase efficiency and effectiveness in the delivery of Public Services and facilities. At the same time as ensuring better risk control and management as well as increasing certainty of outcomes with ultimate aim of accelerating economic growth, development and infrastructure delivery. However, Ibrahim *et al*, (2006) highlighted certain risk factors that impede the success of PPP projects such as construction procedure, change in scope, payment delay, site condition, improper estimation, weather implication, force majeure and contractor experience. Ameyaw and Chan (2013) added that delay, site condition, communication problems, bribery/corruption, variation, improper estimate and inadequate specification are the risk factors that have tremendous effects with PPP projects. Noor, (2011) further added that significant delays in projects, lack of details working drawing, economic and security situation and corruption are major risk hinder the progress of PPP in Pakistan. Feinberg and Gupta (2009) with contrary opinion that private sector companies who participate in PPPs in high-risk countries are likely to deploy strategies to deal with the level of risks in PPPs. These strategies could serve to reduce the actual level of exogenous hazards that could lead to the projects failure. Katrin *et al.* (2010) asserted that there is a total lack of attention towards the managerial aspect of risk management in PPP projects. Hwan, Zhao and Gay (2013) outline the followings critical success factors for PPP. These are incomplete design, inadequate site investigation, bribery/corruption, labour disputes, natural disaster, site condition and change in scope.

2.6 Risk Mitigation Measures in PPP projects

Carbonara *et al*. (2015) suggested five mitigation measures to deal with the risk of land acquisition and compensation, this include: add every thinkable acquisition and compensation terms in an early stage, set enough capital for accidents and surety and recompense should be got from the government (Fabozzi & Nahlik, 2012 and Adeogun & Taiwo 2011). Carbonara *et al*. (2015) further added that the government should be responsible for the reimbursement of external obligation originated by abnormal exchange rate changes in order to mitigate the risk of exchange rate changes; to mitigate the legislation change risk, compensation promise from the government should be got; by defining the allocation of responsibility of varied design blemishes ahead of time in the contract agreement and design defect risk can be tackled. Others include: assurance of finishing the construction with the appointed time from the construction company should be achieved, otherwise, an increment will be asked for to prevent the time delay risk; margin money can be asked from the construction company to prevent the risk poor project quality (Hoffman, 2001; Lee and Schaufelberger 2016 and Marques & Berg, 2011). Pellegrino *et al*. (2013) further expressed that there are three ways to mitigate the budget overspent risk: further assets must be prepared, make an agreement on the expected budget amount at a set price, make a top cost for the private sector and the compensation terms if exceeds the cost; private company should get insurance from the government to mitigate the force majeure risks; to handle the contractor or supplier default risk, the concessionaire should set duties for them and the estimation of operation cost should be ensured ahead of schedule to prevent operating cost overspends risk (Padiyar *et al*. 2004 & Roumboutsos and Anagnostopoulos ,2008).

3.0 Research Method

This paper adopted a questionnaire survey approach to pull out public opinion, such as beliefs, perception, ideas, views and thought about the risk management in public private partnership on housing development in Niger State. In order to obtain the require population for this study, the stratified random sampling technique was adopted for the selection of the construction companies that participated in this study. The choice of stratified random sampling techniques was due to the fragmentation and diversification of the construction industry. And this was also in line with concept of Creswell and Tashakkori (2007) that respondents are arranged in strata for the convinienency in questionnaire distribution and assessment. In addition, the simple random sampling was adopted in each of the construction companies for the selection of construction players from the strata. The questionnaire that was used to record the responses of each respondent contained mainly closed ended questions using a five- point Likert scale ranged from none=1, low=2, moderate=3, high=4 and very high=5. The questionnaire was divided into two parts. First part is related to demographic profile of the respondents. The second part includes list of identified factors that causes reworks in building projects and mitigating measures to overcome the challenges of reworks in building projects in Abuja. However, a total of one hundred (100) number of questionnaires were distributed to Quantity Surveyors, Architects, Engineers, Project Managers, Construction Managers, Contractors, Consultants and client in the Ministry of works, transport and housing, housing cooperation, urban development, contracting firms and consulting firms in Niger State. Although, only 82 numbers of questionnaires distributed were filled correctly and returned, which represent 82% of the Questionnaires used for the analysis.

3.1 Data analysis

The descriptive method of analysis was adopted to summarise the sample, rather than use the data to learn about the population and sample. In this paper, descriptive analysis was used to present means score and standard deviation values as well as frequency counts on the data. The mean value was used to ranked the respondents' opinions or responses obtained.

4.0 Findings and Discussion of Results

The results of the demographic profile of the respondents that participated in this research work were presented in section 4.1 to 4.4 respectively.

4.1 Years of Experiences of Respondents in Construction Firms

Figure 1 shows that 35.94% of the respondents have 11-15 years of working experiences and 26.56% of the respondents have 6-10 years of working experiences. In addition, 16.41% of the respondents have years of working experiences within the age of 1-5 years. And 7.03% of the respondents have years of working experiences within 20 years and above. This indicates that the majority of the respondents have working experiences in PPP housing projects. This signify that the right people were selected for this research work.

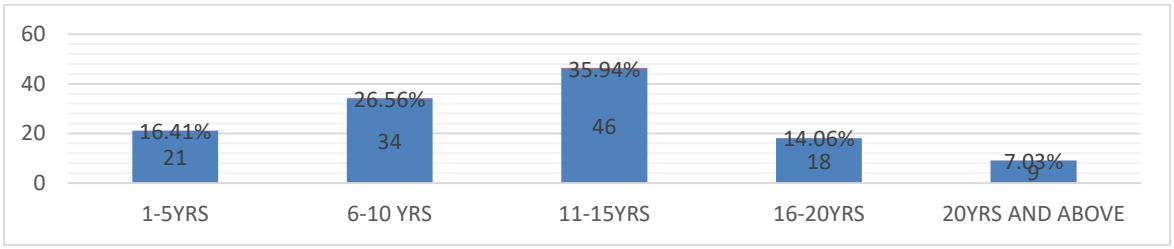


Figure 1: Years of experiences in construction (Field work, 2018)

4.2 Qualification of Respondents

Figure 2 shows the followings qualification of the respondents: 35.94% of the respondents have B.Sc/B.Tech degree, 25% of the respondents have HND, 17.97% have MSc degree and 6.25% respondents have ND. This reflect that the respondents have required qualification in different background of knowledge of construction industry.

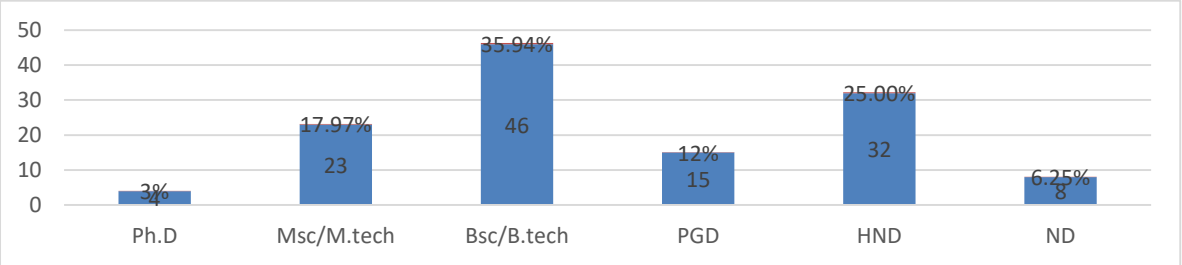


Figure 2: Qualification of Respondents (Field works, 2018)

4.3 Activities of Respondents

Figure 3 shows that 42.19% of the respondents are consultants, while 35.94% of the respondents are contractors. In addition, 21.88% of the respondents are client's representative. This implied that majority of the respondents that participated in this research work are contractors, consultants and clients. This indicates that the respondents are people that are actively involved in PPP housing projects.

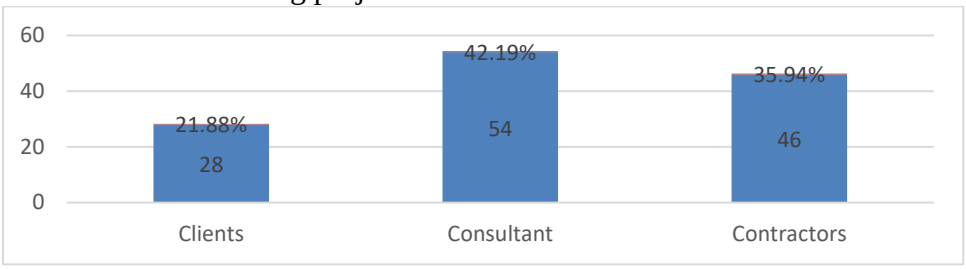


Figure 3: Activities of Respondents (Field work, 2018)

4.4 Profession of Respondents

The profession of respondents that participated in this research works were analysed in Figure 4 and the result show that 37.5% of respondents are Quantity Surveyors, 28.91% are Architect; 16.41% are Engineers and 14.06% are Builders. This reflect that the professions of the respondents are the thus that required in the PPP housing projects.

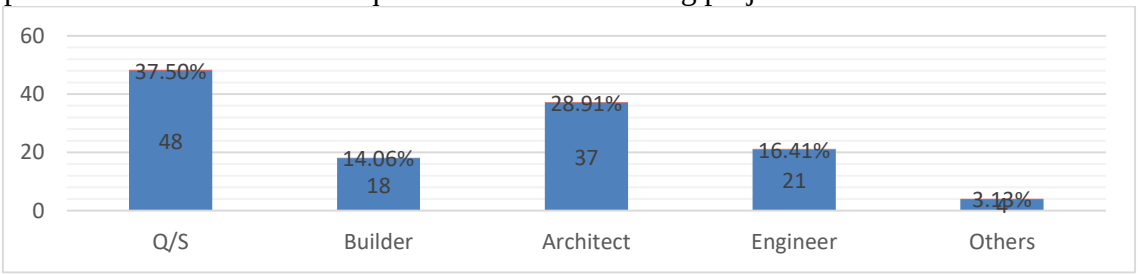


Figure 4: Profession of respondents (Field work, 2018)

Table 1: Risk factors that causes PPP housing development failures

Risk factors	Descriptive statistical values		
	Mean Score	**St. Deviation**	**Ranking**
Incomplete design	4.79	0.79	1
Payment delays	4.74	0.90	2
Contractors experience	4.68	0.78	3
Inadequate specification	4.66	0.83	4
Bribery/corruption	4.52	0.84	5
Inadequate site investigation	4.50	0.63	6
Change in scope	4.45	1.23	7
Design changes	4.42	0.96	8
Exchange rate fluctuation	4.31	1.02	9
Construction procedures	4.24	0.72	10
Improper estimation	4.18	0.88	11
Insufficient resource availability	3.89	1.01	12
Inexperience work force	3.74	1.16	13
Damage to structure	3.62	0.86	14
Damage to equipment	3.51	0.69	15
Labour injuries	3.44	0.92	16
Equipment and fire and theft	3.28	0.86	17
Labour productivity	3.04	1.03	18
Labour disputes	2.76	0.85	19
Site condition	2.84	1.10	20
Equipment failures	2.61	0.91	21
Communication problems	2.53	0.70	22
Quality standard	2.49	0.78	23
Increased in material cost	2.40	0.76	24
New technology	2.35	0.63	25
Contractual relations	2.28	0.81	26
Attitude of participants	2.21	0.66	27
Low market demand	2.16	1.24	28
Taxes	2.05	0.99	29
Change in laws and regulations	1.95	1.15	30
Pollution and safety rules	1.85	0.98	31
Requirement for permits and their approval.	1.80	1.11	32
Language/cultural barrier	1.80	0.87	33
Law and order	1.67	0.75	34
War and civil disorder	1.54	0.94	35
Natural disasters	1.52	1.09	36
Weather implication	1.49	1.26	37
Force majeure	1.45	0.93	38

Source: Fieldwork (2018)

Table 1 shows the followings: incomplete design, payment delays, contractor experiences, inadequate specification, bribery/corruption and inadequate site investigation as major risk factors that causes PPP housing failures. These were ranked 1st,2nd,3rd,4th,5th & 6th with the followings mean scores: 4.79, 4.74, 4.68, 4.66, 4.52 and 4.50 respectively. This indicate that the aforementioned factors are the main risk factors that causes PPP housing failures in Niger State. This result was in line with the outcome of Noor, (2011) result that significant delays in projects, lack of details working drawing, economic and security situation and corruption are major risk hinder the progress of PPP in Pakistan. In addition, change in scope, design changes, exchange rate fluctuation, construction procedure, improper estimation, insufficient resource availability, inexperience workforce, damage to structure and damage to equipment are the factors that causes PPP housing failures. These were ranked 7th,8th,9th,10th,11th,12th,13th,14, & 15th with the followings mean scores: 4.45, 4.42, 4.31, 4.24, 4.18, 3.89, 3.74, 3.62 and 3.51

respectively. This result reflects that, the aforementioned are also risk factors that causes PPP housing failures in Niger State. Katrin *et al.* (2010) argued that there is a total lack of attention towards the managerial aspect of risk management in PPP projects. However, the followings were ranked least as the risk factors that PPP failures: pollution and safety rules, requirement for permits and their approval, language/cultural barriers, law and order, war and civil disorder, natural disaster, weather implication and force majeure. These were ranked 31st,32nd,33rd 34th,35th,36th,37th, & 38th with followings mean scores:1.85,1.80, 1.67,1.54, 1.52, 1.49 and 1.45 respectively. This signifies that the above listed risk factors have little or none effects to the PPP housing failures in Niger State. Generally, the result was in agreement with the findings of Ameyaw and Chan (2013) that delay, site condition, communication problems, bribery/corruption, variation, improper estimate and inadequate specification are the risk factors that have tremendous effects with PPP projects. In addition, drawing from the insights provided in Feinberg and Gupta (2009), private sector companies who participate in PPPs in high-risk countries are likely to deploy strategies to deal with the level of risks in PPPs. These strategies could serve to reduce the actual level of exogenous hazards that could lead to the projects failure.

4.3 The Risk Mitigating Measures in PPP housing development projects:

Table 2: Risk Mitigating Measures in PPP housing development projects

Measures	Mean	Std. deviation	Ranked
Develop scope management plan and risk management policies and procedures	4.78	0.98	1
Use experience QS for cost estimation to avoid any errors during process of construction works	4.72	1.01	2
Including contract clauses for penalties, liquidated damages, performance bonus, completion/performance	4.64	0.53	3
Availability of funds	4.60	1.04	4
Avoid excessive variations	4.58	0.96	5
Uses of turnkey contract to getting work done	4.53	0.71	6
Allow an extension of time for delays beyond his control	4.49	0.49	7
Avoid changes and modification of design after the approval	4.41	0.83	8
Provide regular training of staff	4.25	0,64	9
Regular coordination with the team leaders	4.18	0.81	10
Maintain clear understanding of stakeholder needs and their relative prioritization	4.06	1.03	11
There should be close project monitoring and control throughout the phase of projects	3.82	0.92	12
Bridge the communication gap between customer	3.76	0.75	13
Avoid bribery/corruption	3.54	0.49	14
Provide sufficient legislation pertain the abandonment of housing projects	3.51	0.86	15
collaboration of original developers and consultants should encourage	3.34	1.04	16
Details information about the projects should be provided	3.29	1.21	17
Use every possible method to understand what user say and require	2.95	0.62	18
Ensure proper supervision in order to achieve quality standard projects	2.81	0.87	19
Driving the users into specific groups based upon organisational hierarchy and target each group separately	2.68	1.01	20

Sources: Field work (2018).

Table 2 shows the followings as the main mitigating measures to overcome the challenges of risk management in PPP housing development projects. These are: develop scope management plan and risk management policies and procedures, use experience QS for cost estimation to

avoid any errors during process of construction works, including contract clauses for penalties, liquidated damages, performance bonus, completion/performance, availability of funds, avoid excessive variations and uses of turnkey contract to getting work done. The aforementioned measures were ranked 1st,2nd,3rd,4th,5th & 6th with the mean score of 4.78, 4.72, 4.64, 4.60, 4.58 and 4.53 respectively with the standard deviation values of 0.98, 1.01,0.53,1.04,0.96 and 0.71 respectively. Lee and Schaufelberger (2016) conducted a similar study in Indonesia on risk mitigating strategy for PPP Airport projects and agreed with this finding that strategic management planning, risk management policies and procedures and uses of turnkey contract for the PPP projects reduce the challenges of risk management in PPP projects. In addition, the followings mitigating measures: allow an extension of time for delays beyond his control, avoid changes and modification of design after the approval, provide regular training of staff, regular coordination with the team leaders and maintain clear understanding of stakeholder needs and their relative prioritization were considered as vital measure to overcome the challenges of risk management in PPP on housing development projects. Roumboutsos and Anagnostopoulos (2008) conducted a similar research and outlined that adequate planning and control play a key role in management of risk management. These aforementioned measures were ranked 7th,8th,9th,10th & 11th with the mean scores of 4.49, 4.41, 4.25, 4.18 and 4.06 with the standard deviation values of 0.49,0.83, 0.64,0.81 and 1.03 respectively. Furthermore, the followings mitigating measures: use every possible method to understand what user say and require, ensure proper supervision in order to achieve quality standard projects, driving the users into specific groups based upon organisational hierarchy and target each group separately. These were ranked 18th,19th & 20th with the mean score of 2.95, 2.81 and 2.68 respectively with the standard deviation values of 0.62, 0.87 and 1.01 respectively. This was in agreement with Shen *et al.* (2006) that sharing the knowledge among the stakeholders, and understanding the needs of the contract players are essential measures to reduce the problems of risk management in construction projects. Hoffman (2001) with contrary opinion that corresponding laws should be established and perfected by the government to tackle the environmental risk; risk of high financial costs can be mitigated by setting the maximum cost level for the private company; the design program ought to be tested for feasibility and probability before the construction to cope with the risk of too late changes in design.

Conclusion

The conclusion was drawn from the findings by identifies nine (9) main risk factors that causes PPP housing development projects failures in Niger State. These are: (1) incomplete design; (2) payment delays; (3) contractor's experience; (4) inadequate specification; (5) bribery/corruption; (6) inadequate site investigation; (7) change in scope and (8) design change. In addition, the paper established the followings ten (10) risk management measures to overcome the challenges of PPP housing projects failure in Niger State. These are: (1) develop scope management plan and risk management policies and procedures; use experience QS for cost estimation to avoid any errors during the process of construction works; (3) inclusion of contract clauses for penalties, liquidated damages, performance bonus, completion/performance; (4) availability of funds; (5) avoid excessive contract variation; (6) uses of turnkey contract to getting work done; (7) allow an extension of time for delays beyond his control; (8) void changes and modification of design after the approval; (9) provide regular training of staff and (10) regular coordination with the team leaders. Therefore, the paper recommended that details working drawing and appropriate bill of quantities should be prepared by professionals before embark on the agreement with private sector, in order to avoid changes in design, scope and modification. The private sector should ensure there is sufficient and quality materials and experiences labour in order to avoid poor workmanship. There is

need for further empirical research on development of risk management model in PPP housing projects in Niger State.

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RISK FACTORS AFFECTING COST AND TIME PERFORMANCE OF CIVIL ENGINEERING PROJECTS IN KWARA STATE

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Abstract
The construction industry is known for being very poor compared to other industries in the identification, assessment and management of project related risks. Civil engineering projects in particular are more risky due to the nature, complexity and enormous amount of resources required conversely leading to cost and time overrun. This paper aimed at evaluating the potential risk factors associated with civil engineering projects with the view to achieving overall project objectives. A-31 risk factors were identified from the literature review and were used as basis for a questionnaire survey administered to the Architects, Quantity Surveyors and Engineers in Kwara State. Eighty (80) questionnaires were administered; fifty one (51) were retrieved and analysed using mean item score for the identified factors. Research findings showed that incomplete design, unstable inflationary trend, delay in progress payment, financial difficulties, improper project planning, inadequate programme planning and foreign exchange rate had greatest impact on civil engineering projects. Whereas factors such as Force majeure, labour dispute and strike and mistakes and discrepancies in contract documents has least impact. The study recommends that project team should identify and quantify project related risk at the initial stage and allocate the risks to party suitable to control them.

Keywords: *Civil engineering project, Construction industry, Construction project, Cost and time performance, Risk*

[12]1.0 Introduction

It is virtually not possible to have a risk-free construction project. The inherent nature of construction risks contributes to the inability in achieving the tripartite project objectives of time, cost and quality. Although the construction sector with its myriad of activities arguably is embedded more with risks and uncertainties compared with other industries (Mohammed, 2016), the risks are not dealt with adequately, consequently leading to cost and time overrun (Oyewobi, Ibrahim & Ganiyu, 2012). According to Building and Engineering Standard Method of Measurement 4 (2015), construction project is a conglomerate of building, civil and heavy/industrial engineering work. Considering this, Houghton (2004) defined civil engineering as professional engineering discipline that concerns with the design, construction and maintenance of physical and naturally built environment, such as roads, bridges, dams and buildings. Similarly, Akinmusire and Ologunagba (2016), defined civil engineering project as special project due to its nature, complexity and enormous amount of resources required. This is in line with the view of Barbara (2004) who stated that civil engineering project requires special engineering skill and a great technical know how to execute. However, civil engineering projects come into existence in form of structures and buildings of different types, shapes and complexity. Projects of this nature usually has client as the initiator and major financier, while the Civil/Structural Engineer is shouldered with the responsibility of designing and supervision of the project.

Although a plethora of researches (Ling & Liu, 2005; Odeyinka 2006; Amani, 2007; Towner and Baccarini, 2008; Anood, 2014; Mohammed, 2016 and Amuda-Yusuf *et al.*, 2017) revealed

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that extensive research has been carried out globally on construction risks, and several risk factors have been identified but mainly focused on examining the impacts of risks with respect to project cost overrun (Joshua & Jagboro 2007), Risk impact on construction cash flow forecast (Odeyinka *et al.,* 2008) and Risk and Price in the Bidding Process of Contractors (Laryea & Hughes, 2011). Some researchers investigated risk management in construction projects holistically (Smith *et al.,* 2014; Ijigal *et at.,* 2013; Isimemen, 2014). While others focused on risk in Electrical and Mechanical services project such as; risk management for planning and use of building service system (Heimonen *et at.,2000*), Managing building services maintenance risk with prediction theories (Lam 2006), and Risk factors impacting cost and time performance of mechanical and electrical services projects (Amuda-Yusuf *et al.,* 2017). On the flip side, there is a noticeable dearth of research that focuses on impact of risk on performance of civil engineering project. This research seeks to fill this gap in knowledge and the aim is to explore industry's practitioners' perception on the risk factors affecting cost and time performance of civil engineering projects. As part of a much larger project aiming to articulate and manage key risks associated with civil engineering projects, this research tend to identify and evaluate the potential key risks factors in civil engineering projects with a view to assessing relative importance of the risk factors affecting the cost and time performance of civil engineering project. Since project objectives are subject to risk and uncertainty. Therefore, it is important to examine the risk, risk factor; and their effect on projects in this area. This is with the aim of providing information that will enhance performance and efficient delivery of civil engineering project.

2.0 Literature Review

2.1 Construction Project Performance

Success of performance is a determinant of the success of construction projects (Akanni, Oke & Akpomiemie 2015). Construction project performance measurement is the process of appraising performance with project objectives in focus (Oke, Ogungbile, Oyewobi &Tengan, 2016). Traditionally, researchers and organisations have focused on the three critical project performance indicator of cost, time and quality (Dainty *et al.*, 2003, Chan & Chan, 2004; Swan & Khalfan, 2007). However, many studies have, also included other performance aspects, such as health and safety (Chan and Chan, 2004), environmental performance (Chan and Chan, 2004; Swan and Khalfan, 2007), customer satisfaction (Chan and Chan, 2004; Collins and Baccarini, 2004), and innovation (Harty, 2008); but the main client project objectives focus more on three factors critical to project success including cost, time and quality (Walker, 2007; Amuda-Yusuf *et al,* 2017). The study of Chua (1999) cited in Oke *et al* (2016) indicated that time, cost and quality objective together with project satisfaction have a tendency of becoming the most significant keys to measure the complete performance of a project. Furthermore, as remarked by many studies, most project records cost or time overrun during the period of execution (Oke *et al.,* 2016). Time is described according to Amuda-Yusuf *et al,* (2017) as the time from the inception to completion of the project up to the point the project is added into client business. While cost on the other hand is the capital cost including all associated cost of the project. Quality performance measure seeks to ensure that projects achieve the quality standard set out in the contract. Quality of a project can be measured in terms of adherence with stated specification and this can be difficult at times to measures because it is subjective (Samuel, 2017). However, construction project cost and time were the most common performance measurement in project management studies (Walker, 2007; Amuda-Yusuf *et al.,* 2017).

2.2 Project Cost Performance

This has traditionally been seen as one of the most important aspect of construction project, if the economy of the project is off, the project can rarely be seen as a success (Oke *et al*, 2016). Project cost performance is used to indicate whether the project adhere to the agreed budget (Cheung *et al.,* 2004). Cost is the major considerations throughout the project management life cycle and can be refers to as the most important factor for a successful project delivery (Emmanuel & Anjiba, 2015). A project is successful if it is completed within predetermined sum. Project cost performance is measured in terms of cost overrun i.e. final sum minus initial contract sum divided by the initial contract sum multiplied by 100 (Odusami,2002). Cost overruns can be a source of problems for an unsuccessful project as contractors are criticized for the common occurrence of cost overruns in construction project (Chan & Chan, 2004). Cost overrun is almost associated with all projects in construction industry. Project with percentage cost overrun above 20% is regarded as a poor project in terms of cost performance, project that fall within 10% and 20% is regarded as average project in terms of cost performance, while project with cost overrun of less than 10% is regarded as an outstanding project (Kometa, Olomolaiye & Harris, 1996). Construction projects in developing countries are mostly completed above the initial budget as a result of improper management of project related risk and this require an early assessment and evaluation of potential risk to achieve an effective cost performance of construction project.

2.3 Project Time Performance

Monitoring Project time is one of the many challenges for project team. Time monitoring seeks to assess how well the project adheres to the time schedule during the project execution. Project duration is simply the number of days/weeks/months/years from inception to completion of the project (Oke *et al*, 2016). Since time can be a critical issue for many clients, project duration is often of primary interest. Projects completed in time is an important indicator of project success and the construction industry is frequently criticised for project delays due to inherent risks present in all construction project (Odeh & Battaineh, 2002; Faridi & El-Sayegh, 2006; Swan & Khalfan, 2007; Isimemen, 2014). Project schedule or time performance according to Samuel (2017) is calculated in terms of the percentage increase in the actual completion period over initial completion period. i.e. the difference between the actual completion time and planned completion time multiple by 100. The projects with percentage delay less than 10% is regarded as an outstanding in terms of time or schedule performance, those projects that falls between 10% to 20% is regarded as average project while those above 20% is regarded as poor project (Samuel, 2017).

2.4 Construction Risk Management

Construction projects are always unique and risks raise from a number of the different sources (Oyegoke, 2006; Pheng & Chuan, 2006). Construction projects are inherently complex and dynamic, and involving multiple feedback processes (Sterman, 2012; Uher & Loosemore, 2004). A lot of participant - individuals and organisations are actively involved in the construction project, and there interests may be positively or negatively affected as a result of the project execution or project completion (PMI, 2014). Different participants with different experience and skills usually have different expectations and interests (Dey & Ogunlana 2004). Given the importance of construction in measures of national output, it is not surprising that government and many stakeholders are interested in increasing and improving project performance through effective risk management in terms of estimated cost, time and quality (Abdullahi, 2011). In countries such as United Kingdom, United States of America and Canada, risk management has become universal management process involving quality of thought,

process and action (Sesel, 2003). In contrast, the adoption of the risk management concept in Nigeria has been largely part of the banking and financial sectors of the economy arising from responses to crisis that evolved within the financial sector of the economy in the early 1990s (Kehinde & Falilat, 2015). The outcomes of project are, however, uncertain and there are many parameters and variable over which a company has little or no control (Herman, Getz & Michael, 2003). The successful completion of any project is most times assessed on the basis of three parameters, which constitute risk: Time, Cost and Quality performance (Nworuh &Nwachukwu, 2004).

Risk management in construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives (ICE, 2005 & PMI, 2007). The benefits of the risk management process include identifying and analyzing risks, and improvement of construction project management processes and effective use of resources.

2.4.1 Identification of Risks Factors in Construction Projects

Several researchers (Ahmed *et al.,* 2001; Kartam *et al.,* 2001; Odeyinka et *al.,* 2008; El-Sayegh, 2008; Isimemen, 2014 and Emmanuel & Anjiba, 2015) have studied potential risks in construction projects in developed and developing countries, looking at a range of projects from small to large scale. Various studies have considered risks relating to the three main parties in the construction industry; clients, consultants, and contractors. Others have used sub-categories of related factors, grouping together risks based on their nature. Table 1 presents relevant studies related to the identification of risk in construction projects.

Table 1: Identification of Risk factors in construction projects.

S/N.	RESEARCHERS(S) WORK	IDENTIFIED CRITICAL RISK FACTORS
1	Prasanta kumar dey,(2002)	Improper project planning, incomplete design, conflict between project participant, statutory clearance and approvals.
2	Ghosh and Jintanapakanont, (2004)	Unclear responsibility, inflation, country economic condition unavailability of funds. Financial failure construction delays.
3	Laryea, (2007)	Contractor's experience, variation, site condition and unknown geological condition, inflation, country economic condition and rules and regulation, unavailability of funds, financial failure and unavailability of required resources.
4	Enhassi and Mosa, (2008)	Poor information dissemination, misunderstanding of client requirement, site condition, inflation, country policy, unavailability of funds, financial failure and unavailability of required resources.
5	Sun and Meng (2009)	Scope and design changes, technology, site condition and unknown geological condition, inflation, country economic condition and rules and regulation, unavailability of funds, financial failure, inadequate managerial skill, lack of coordination between the project team and lack required resources
6	Wang *et al.,* (2004)	Inflation, country economic condition, statutory clearance and approvals, construction delays.
7	Eybpoosh, (2011)	Complexity of design, technology, site condition, inflation, country economic condition and rules and regulation and lack required resources
8	Rezakhani, (2012)	Scope and design changes, technology, unavailability of fund, financial, weather and climatic condition, poor safety procedures.
9	Goh *et al.,* (2013)	Scope and design changes, technology, site condition and unknown geological condition, inadequate managerial skill, lack of coordination between the project team and lack required resources and construction delays.
10	Luka, and Ibrahim (2015)	Tight project schedule, design team experience, inadequate program planning, quality of material and labour performance and productivity.

2.4.2 Risk Classification

Risk classification is defined according to PMI (2014) as a structure that provides an exhaustive process of systematic risk identification to a constant detailing and which match its contribution to the quality and effectiveness to the risk identification process.

Project risk can be classified in various ways depending on the purpose as shown in Table 2. For instance, some risks are generally categorised into internal and external risks, while others are classified in more detail as client risk, financial risk, design risk, contractor risk, material risk, etc. (Mustafa, 1991; Akinci and Fischer., 1998; Raftery, 1999; Dey, and Ogunlana, 2004; Ghosh and Jintanapakanont, 2004; Enshasi and Mosa, 2008; El-Sayegh, 2008; Razakhani, 2012; Goh *et al.*, 2013; Renuka *et al.*, 2014 and Mohammed, 2016)

Table 2: Risk Classification in Construction Projects

CATEGORY	DESCRIPTION
MANAGEMENT	In project management there are two major aspects: the art and the science of the project. The art deals with the people involved in the project, while the science deals with defining and coordinating the work to be done; for example, it involves the knowledge, understanding, and skilful application of a project management process (Heerkens, 2001)
DESIGN	One of the most important requirements to minimise time delay and cost overrun is the allocation of sufficient time and money at the design phase (Koushki et al., 2005). Design is one of the most critical categories because it related factors were identified as key risks in construction projects (Fereig and Kartam, 2006).
FINANCIAL	This category takes into account factors with respect to possible financial difficulties on the project, which may be due to cash flow problems, delayed payments, and external economic issues. (Alaghbari *et al*., 2007). Delayed payment for executed projects is the key related risk factor that affect the financial category as concluded by various studies (Sweis *et al.*, 2008) and (Aibinu and Odeyinka, 2006).
MATERIALS	The effect of risk factors can have a direct bearing on tasks and the cost implication on the project can be serious (Manavazhi and Adhikari, 2002). Type of materials, their availability and the selection time are critical risk factors when it comes to material issues.
LABOUR- AND EQUIPMENT	Shortage of workface and the existence of unskilled labour are risk factors in relation to Labour issues. (Sweis et al., 2008)
EXTERNAL	External risks are usually ranked low and do not have a contributory role in the delay of the project (Sugiharto and Keith, 2003). Most of the studies show that external risks, including weather and site conditions, have the lowest impact on the completion of a project (Alaghbari *et al.*, 2007).

The leading six categories related to risk factors were management, design, financial, materials, labour and equipment and external. The selection of the categories was based on the most often included categories in the relevant literature. However, these categories were presented to the practitioners to evaluate them and approved.

3.0 Materials and Methods

This section of the study describes in detail the research design, population and sampling method, in addition to the data collection and method of data analysis.

This study employed survey research design approach to achieve the objectives of the study. Since the study sought to find the risk factors and their impact on cost and time performance of civil engineering project, the survey research method was deemed appropriate (Emmanuel and Anjiba, 2015). Based on the review of extant literature, a preliminary list of risk factors in civil engineering project was prepared to investigate and evaluate the potential risk factors affecting the successful delivery of civil engineering projects. Considering the number of registered construction practitioners in the study area, this study purposively sampled 80 respondents resulting in 51 valid structured questionaire. A total of 31 risk factors were

obtained from previous studies and the respondents were asked if they consider the risk factors identified as contributing to poor cost and time performance of civil engineering project. Data were collected using a structured questionnaire on 31 previously identified risk factors from preliminary investigations. This study applied the weighted mean score which involves assigning numerical value to respondents' ratings of factors with respect to their probability and severity e.g. Very High, 5 points, High, 4 points, Moderate, 3 points, Low, 2 points and very low 1 point. The data collected were analyzed using SPSS version 20.0 and mean ranking technique was used to determine the most ranked risk factors affecting the cost and time performance of civil engineering projects.

4.0 Data Analysis and Research Findings

Table 3 indicated that 37.3% of the respondents are from consulting organization, 35.3% are from contracting, while 21.6% are from government ministry/parastatal and very few (5.9%) are from academia. In term of profession, about 26% are Architects, 24% Quantity Surveyors while 51% of the respondents have Engineering background. Majority (74.5%) are Associate members, while 21.6% are Fellow and very few are (3.9%) are probationers. About 15.7% of the respondents have between 11-16 years working expereince, while 23.5% have spent between 16-20 years in the industry and the remaining 60.8% of the respondent have spent more than 20 years in practice.

Table 3: Summary of Demographic Information of the Respondents

CATEGORIES	CLASSIFICATION	NUMBER	%
Type Of Organisation	Consulting	19	37.3
	Contracting	18	35.3
	Government Ministry	11	21.6
	Academia	3	5.9
Academic Qualification	HND	4	7.3
	B.Sc/ B.Tech	19	37.3
	M.sc	22	43.1
	Ph.d	6	11.8
Profession	Architect	13	25.5
	Quantity Surveyors	12	23.5
	Engineer	26	51
Professional Qualification	Probationer	2	3.9
	Corporate	38	74.5
	Fellow	11	21.6
Years Of Experience	11-15	8	15.7
	16-20	12	23.5
	Above 20	31	60.8
Age Of Respondents	41-50	9	17.6
	51-60	11	21.6
	61-70	31	60.8

Source: Field Survey (2018)

The result of the analysis shown in Table 4 revealed that based on the practitioners' perception, incomplete design was ranked highest with impact mean score of 4.57, follow by unstable inflationary trend and delay in progress payment with mean score of 4.47 and 4.37 respectively. Financial difficulties, improper project planning and Inadequate programme planning were ranked next with mean score of 4.35, 4.18 and 4.09 respectively, while foreign exchange rate, delay in material delivery and design team experience were ranked seventh, eighth and ninth with mean score of 4.08, 4.07 and 4.02 respectively.

On the flip side, Force majeure, labour dispute and strike and mistakes and discrepancies in contract documents were the factors ranked least by the respondents with mean score of 1.63, 1.97 and 2.00 respectively.

Table 4: Summary of Respondent's perceptions of Risk Factors affecting Cost and Time performance of civil engineering projects.

S/N	RISK FACTORS	RISK PROBABILITY	RISK SEVERITY	RISK IMPACT	RANK
1	Inadequate programme planning	4.59	3.61	4.09	6
2	Incomplete design	4.57	4.57	4.57	1
3	Delay in material delivery	4.53	3.67	4.07	8
4	Unstable inflationary trend	4.51	4.43	4.47	2
5	Financial difficulties	4.41	4.31	4.35	4
6	Delay in progress payment	4.39	4.35	4.37	3
7	Improper project planning	4.29	4.08	4.18	5
8	Design team experience	4.25	3.82	4.02	9
9	Foreign exchange rate	4.24	3.94	4.08	7
10	Variation	4.00	3.98	3.99	10
11	Change in government policy	4.00	3.78	3.88	11
12	Poor information dissemination	3.96	3.44	3.69	13
13	Project duration	3.88	3.62	3.75	12
14	Misunderstanding of client requirement	3.75	2.57	3.10	18
15	Site condition	3.65	3.41	3.52	15
16	Conflicts between project participants	3.57	3.57	3.57	14
17	Scope of the project	3.55	3.17	3.35	17
18	Shortage of material	3.55	3.37	3.46	16
19	Unclear responsibilities	3.47	2.35	2.86	19
20	Discrepancy between the designs	3.19	2.00	2.53	22
21	Contractor's experience	2.96	2.75	2.85	20
22	Availability of material in market	2.86	2.39	2.61	21
23	Unclear and inadequate information in the drawings	2.59	2.00	2.27	26
24	Civil disturbance	2.57	1.59	2.02	28
25	Poor specification	2.57	2.39	2.48	23
26	Inclement weather condition	2.56	1.98	2.25	27
27	Change in material specification and type	2.39	2.39	2.39	24
28	Poor communication and information dissemination between the design team	2.39	2.36	2.36	25
29	Force majeure	2.18	1.22	1.63	31
30	Mistakes and discrepancies in contract documents	2.02	2.00	2.00	29
31	Labour dispute and strike	2.01	1.94	1.97	30

5.0 Discussion of Findings

The study evaluates the risk factors affecting cost and time performance of civil engineering projects. Based on the research findings, 9 key risks factors were uncovered and 'Incomplete design' was ranked highest. Incomplete design may result from issues such as insufficient time allocated to designer, design team experience, Unclear and inadequate information during briefing; this may leads to Conflicts between project participants, Variation, Mistakes and discrepancies in contract documents and may subsequently lead to poor cost and time performance of civil engineering projects. To avoid incomplete design, the design team need not only to fully understand what the clients want during the project briefing, but also to establish efficient communication scheme among the designer (Luka & Ibrahim, 2015). Closely followed rated factor is 'Unstable inflationary trend' this is not surprising considering

the uncertainty nature of Nigeria construction industry coupled with high degree of instability in predicting economic and market condition in Nigeria. There is tendency that the price of material may increase before the completion of the project especially a project with long completion period and will no doubt affect the cost and time performance of civil engineering projects. This factor also reinforced by Lashinde, Ogunsemi & Awodele (2015), who lectured that the price of construction material mostly depend on foreign component and may lead to high degree of forecasting inflation rate and currency exchange rate which has multiplier effect on infrastructural projects in Nigeria. Closely followed factors ranked were delay in progress payment, financial difficulties, improper project planning and inadequate programme planning. All these factors can be avoided by ensuring payment on time, engage experience project manager and making use of relevant financial forecasting tools.

On other side, Force majeure, labour dispute and strike and mistakes and discrepancies in contract documents were the factors ranked least by the respondents, this indicates that these factors do not have significant effect on cost and time performance of civil engineering projects. Other factors ranked by the respondents based on their perception are between these extreme as shown in Table 4. This shows that the practitioners' perceived incomplete design and inadequate programme planning as the major factors affecting cost and time performance of civil engineering projects which may subsequently lead to cost and time overrun or even abandonment of the projects. The result also educated that when the financial need of the project is not align with programme, it can have serious implication on both cost and time performance of civil engineering project

6.0 Conclusion

This study investigated the risk factors affecting cost and time performance of civil engineering projects from the view of construction practitioners in Kwara State. The study established that the risk factors affecting cost and time performance of civil engineering projects are inherent within and outside the project environment. The risks can be categorized as management risk factors, design risk, finance, labour and external risk factors. The study conclude that the major risk factors affecting cost and time performance of civil engineering projects include incomplete design, unstable inflationary trend, delay in progress payment, financial difficulties, improper project planning and Inadequate programme planning, foreign exchange rate, delay in material delivery and design team experience. These factors are very critical to achieve overall project objectives of civil engineering projects. Apart from the fact that these factors are responsible in differential in the construction of civil engineering project, other factors could be variation, poor information dissemination, conflicts between project participants and change in government policy which may lead to project failure. However, the highly rated risk factors in this study may likely be ranked least in other clime; this is possible as a result of heterogeneous nature of construction industry. The practical implication of this study is that, the initial identification of the risk factors serves as a watch list of risk that the project team should watch out for, secondly, the evaluation of probability of occurrence and severity enables the project team to determine the level of impact the risk can have on cost and time performance of civil engineering projects. This study therefore recommends that the project team should identify and quantify the risks and allocate these risks to a party or parties suitable to control them. Competent contractor who can see the incident of these risks as an important aspect that requires quick attention and who can control them should be awarded the contract.

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APPRAISAL OF THE CAUSES OF INEFFECTIVENESS OF SKILLED TRADESMEN IN BUILDING CONSTRUCTION INDUSTRY IN LAGOS STATE

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The tradesmen in the building construction sector has been playing very essential role to the survival and development of the sector, as they are directly involved in construction operation. Even though Nigeria is endowed with ample manpower, the situation in the sector is at best sarcastic. It is on this reasons that this study appraised the causes of inadequacy of skilled tradesmen in the Lagos State building construction industry. Out of 130 copies of questionnaires that were set-out to Contractors and Sub-Contractors in the study area through electronics and manual means, 107 copies were retrieved. Percentiles and standard deviation were used to analyze the identified causes. The research revealed that there are ineffective training/retraining systems in the state, lack of appeal of the industry to potential youth, ageing of the skilled tradesmen, lack of commitment by government/professional bodies toward skills training and the technical colleges/vocational centers are not in good state. The research recommended that there is need to organize sensitization programme and work-shops, so as to enlighten the potential youths of the importance of undergoing skilled training in the building construction industry. Meanwhile, the government would need to support by provision/upgrading of technical colleges and vocational centers for training of tradesmen, whilst the professional bodies in the building industry should provide entrance levels for the potential youths that want to undergo career courses in trade skills so as to provide a formal setting for the training.

Keywords: *Appraisal, Building Construction Industry, Ineffectiveness, Tradesmen, Skilled,*

Introduction

Building construction can be identified as one of the labour-intensive industry which carries heavy reliance upon the skills of labourers. The tradesmen in the building construction sector has been playing very essential role to the survival and development of the sector, as they are directly involved in construction operation. Even though Nigeria is endowed with ample manpower, the situation in the sector is at best sarcastic. Fagbenle, *et al.* (2016) and other researchers reported that the industry is the highest employer of the nation's manpower after agriculture, whereas it is still faced with ineffective of technically skilled tradesmen which affect productivity, work quality, projects duration and overall organizational profit. Skilful labour force is one of the vital elements for the continuity and successful implementation of building construction projects.

According to the Institute of Management and Administration cited in Olsen, *et al.* (2012) the skilled tradesmen inadequate is not a shortage of workers rather it is a shortage of adequately trained skilled and productive workers available for certain operations. Inadequacy of skilled tradesmen occurs when the demand for workers' particular occupation is greater than the supply of those who are qualified. The building construction industry requiring some of the most highly skilled workforce to do some of the most sensitive jobs, which includes replacement

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Olanrewaju, R. A., Adebiyi, R. T. and Fasasi, A., (2019). APPRAISAL OF THE CAUSES OF INEFFECTIVENESS OF SKILLED TRADESMEN IN BUILDING CONSTRUCTION INDUSTRY IN LAGOS STATE. Collaboration for Sustainable Development in the Built Environment. International Conference of Environmental Sciences, ICES 2019. 1st International Conference of the Faculty of Environmental Sciences, University of Ilorin, Nigeria, 29th - 30th April 2019.

and refurbishment that requires high skill of delivery. Dantong *et al.* (2011) also concluded that skilled tradesmen inadequacy is not an inadequacy of workers rather it is an inadequacy of adequately trained, skilled, and productive workers available for certain jobs.
Tradesmen is one of the important elements in the continuity and implementation of building construction projects (Henny & Moh, 2012). The Nigerian building construction industry relies on informal, unsystematic training to educate and train its workforce. In addition, skilled tradesman also helps to raise productivity, reduction of accident, less supervision, increased organization stability and flexibility (Bilau, *et al.* 2015). The skilled tradesmen inadequacy impact different areas of construction activities and impact on time, cost and quality of work. He opined that this may also endanger the achievement of financial prosperity for which such projects are conceived. Nigeria as a country undergoing economic reform needs a productive, competent, and flexible workforce to further her economic growth (Medugu, *et al.,* 2011). The industry faces the challenge of acquiring sufficient tradesmen as well as retaining enough skilled tradesmen to respond the high demand of skilled workers due to rapid development of the industry. Furthermore, the skilled workers that are products of vocational training centres/institutes are not meeting the industry's needs (Oseghale, *et al.* 2015). Some of them left the industry, even after going through various training provided by building construction training organisations (Zaki *et al*. (2012). The industry lacks skilled masons, carpenters, iron benders, tilers, plumbers amongst others, posing a major challenge to the industry. It is on this reason the study appraises causes of ineffective of skilled tradesmen in the Lagos state building construction industry in other to increase the productivity of the tradesmen with in turn increase the productivity of the building construction industry.

Literature review

Study had shown that the skilled tradesmen inadequacy is not a new issue to the industry. Its effects have been felt for decades. The inadequacy of tradesmen in the construction industry will give negative impact towards the country's development. The term "tradesmen inadequacy" according to Barnow *et al.,* (2013) is subject to various interpretations rendered by different authors but basically, tradesmen ineffective is referred to as "absolute shortfall in the number of workers in the labour workforce" while at other times it also refers to a "mismatch between worker qualifications and the jobs which are available". According to Golden (2008), the supply forces within a labour market can be evaluated based on unemployment rate, number of workers unemployed, and job openings reported within the industry, meanwhile the gross domestic product, number of workers employed in the labour market and spending within the industry may be used to evaluate the demand forces. Tradesmen inadequacy are often portrayed as a major problem for the economies in many countries (Healy *et al.,* 2015). In line with its role in ensuring the sustainability of the construction industry, it is important to identify the chain of circumstances of tradesmen inadequacy in the construction project. Based on reported studies, the facts are well stated, clarifying the reasons for the inadequacy of tradesmen in the construction project. The most obvious reason for the inadequacy of tradesmen is due to the inability to attract new entrant when there is an increasing demand within the workforce thus resulting in the inadequacy of tradesmen (Hamid *et al.,* 2013). Salleh *et al.* (2014) identify many factors as having influence on local labour inadequacy, these include: poor images as reflected in the construction industry, poor working conditions, poor site accommodations and services, low wage structure for construction jobs, unattractive nature of the jobs, lack of training and skill formation, hence, the skilled workers were lured on same job overseas. Meanwhile, Healy *et al.* (2015) find that skilled tradesmen inadequacy gets influenced by causes such as lack of specialist knowledge, uncertainty on long-term demand for their products or service, lack of formal procedure in recruitment process, wages or salary as requested by the skilled tradesmen are too high, lack of availability of adequate training and geographic location of the projects.

Othman (2014) opined that skilled tradesmen inadequacy is one of the most important risks in construction projects that may affect the project performance, he went further to conclude that it is capable to change executed projects to those with excessive cost and schedule overruns. Inadequacy of

skilled tradesmen is among the major construction risks considered by general contractors, operating in Qatar (Jarkas & Haupt, 2015) as the factor contributing to construction delay.

However, various reports have indicated the existence of inadequacy and ineffectiveness of tradesmen in the Nigerian construction industry (Dantong *et al*. 2011; Long *et al.*, 2012a: Long *et al.*, 2012b). Some of the identified reasons attributed for such inadequacy includes; aging of skilled craft workers in the industry, decline in the number of new entrants into skilled trades, poor finding and ineffective state of vocational education and training / retraining system in the country. Others include: poor image associated with construction labour as work done by less intelligent people, lack of commitment by government and the construction industry towards skills training. In addition, the development, introduction of new technologies and materials requiring higher skills among others (Bokinni, 2005; Awe, 2010; Darren *et al.*, 2012). Sanni and Alabi (2008), revealed that the existing skilled tradesmen in the Nigerian building construction industry are aging-out and the rate of enrolment as apprentice artisans is fast dwindling. Attar *et al.* (2012) pointed out some reasons attributed for such inadequacy as lack of training and retraining, an aging workforce, and the construction industry that does not appeal to young, potentially qualified manpower. Furthermore, an increasingly poor image over the last couple of decades has discouraged young people from seeing the construction industry as a viable career path. Most prominent among the reasons proffered for the observed low enrolment as apprentice building artisans in the industry are: quest for overnight richness, preference for occupation with little physical/mental ability requirements, preference for occupation with daily benefits for the apprentice and perceived dirty nature of the occupation associated with this industry has indirectly discouraged many local and new graduates from entering the construction industry.

Research method

A structured questionnaire was administered to corporate and non-corporate building contractor or his/her representative in Lagos state, these contractors were selected on purposeful sampling technique. Eighty (80) questionnaires were administered through electronics means (E-mails and WhatsApps) while fifty (50) where administered by hand, making a One hundred and thirty (130) questionnaires in total. Sixty-Eight (68) were retrieved through the electronics means and thirty-nine (39) where recovered by hand which mean a total of one hundred and seven (107) questionnaires were recovered which indicate that the 82% of the questionnaires were retrieved. The structured questionnaire contained information on the social-demographic characteristics of the respondents, the information about the respondents' organization, the cause of inadequacy of skilled tradesmen in building construction industry and ways in which the levels of inadequacy of the tradesmen could be reduce in the building construction industry. data that were obtained from the questionnaire were analyzed using the statistical package for social science (SPSS). The simple percentage method for background information of the respondent and the respondent organization, the percentiles were used to analyze the identified causes of inadequacy of skilled tradesmen in the building construction industry, the effects it has on the building construction project. The standard deviation was also used for the analysis of the data in order to have clear ranking since some of the data in the research have mean score of the same value. Analyzed data were presented in text and tabular form.

Data analysis

The analysis of the respondent's characteristic shows that in the organizational type of respondents; 80% of them worked in contracting firm, 20% worked in the sub-contracting organization. Moreover, 68% of the respondents had 1-10 years of experience, 19% had 11-15 years of work experience, 12% of the respondents had 16-20 years of work experience. Most of the participants hold Higher National Diploma (37%), this was followed by those with Bachelor of Science/Bachelor of Technology degree (22%) and Master of Science/Master of Technology degree (22%), and lastly OND and PGD holders (13) and (6%) respectively. This implies that most of the respondents are experienced and academically qualified to give expert and reliable opinion in such building construction practices based on study.

Causes of Ineffectiveness of Skilled Tradesmen in Building Construction Industry.

Table 1 shows the various factors responsible for inadequacy of skilled tradesmen in the building construction industry. Using a likert scale of 1-3 ranking was done based on the perception of the respondents on the major cause of ineffectiveness of skilled tradesmen in the building construction industry.

Table 1: Causes of ineffectiveness of skilled tradesmen in building construction industry.

Factors	Means score	SD	Rank
Ineffective state of training/retraining system in the state/country	2.85	0.49	1
Lack of appeal to young and potential youth	2.83	0.57	2
Ageing of the skilled tradesmen	2.81	0.42	3
Lack of commitment by government/Professional bodies towards skilled training	2.74	0.52	4
Lack of worker-oriented career path	2.71	0.51	5
Ineffective state of vocational education	2.67	0.64	6
Decline in the number of new entrants into building construction skilled trades	2.54	0.49	7
Poor site safety/working environment	2.50	0.82	8
Lack of motivation of skilled tradesmen	2.50	0.84	9
Low wages	2.44	0.83	10
Fewer apprenticeship programs	2.38	0.65	11
Low social recognition of construction operatives	2.83	0.83	12
High skilled required	2.32	0.75	13
Workers reluctance to invest on their own training	2.32	0.83	14
Introduction of new technologies	2.26	0.94	15
Duration of apprenticeship programs	2.21	0.84	16
The type of work being perform by the tradesmen	2.16	0.73	17
Lack of standard methods of training adopted for construction tradesmen	2.16	0.86	18
High education level	2.03	0.88	19
The length of time the workers has to be on the job	2.02	0.93	20
The use of hazardous substances by the worker's	2.01	0.89	21
Boom in the building construction projects	1.96	0.93	22
Geographic location of Lagos	1.94	0.75	23

Sources: *Filed Survey (April, 2018 – July, 2018)*

How to Improve the Number of Skilled Tradesmen in Building Construction Industry.

The result of analysis below suggested the means of reducing the occurrence of inadequacy of tradesmen in building construction sector in Lagos state, Nigeria. Three points scale of 1, 2, and 3 were assigned to options of non-significant, neutrally significant and significant respectively. The decision rule is that any factors whose mean falls between 0.5-1.49, 1.5-2.49, and 2.5-3.0 is regarded as having non-significant, neutrally-significant and significant respectively. In view of increasing the number of skilled tradesmen in the building construction industry, all the suggested means of reducing the level of inadequacy of skilled tradesmen in the building construction industry are contained in Table 2 below.

Table 2: How to improve the number of skilled tradesmen in building construction industry.

Suggestions	Means score	SD	Rank
Public enlightenment	3.00	0.00	1
Provision/upgrade of technical college and vocational centres	3.00	0.00	1
Professional institutes should have entry levels for the operatives	2.98	0.14	3
Access to appropriate skilled education/programs	2.96	0.19	4
Improve worker's working conditions/environments	2.95	0.19	4
Improve worker's services and welfare	2.95	0.21	6
Regular conduction of training/retraining programs for the tradesmen	2.93	0.21	6
Improve worker's wages and allowances	2.90	0.25	8
Update jobs knowledge by continuous development	2.89	0.34	9
Proper record of trained tradesmen	2.82	0.32	10
Assessing the site workers training needs	2.79	0.88	11
Evaluation of training needs by the tradesmen	2.74	0.50	12

Sources: *Filed Survey (April, 2018 – July, 2018)*

Discussion of findings

The analysis revealed that the present ineffectiveness of the tradesmen in the construction industry are due to ineffective state of training/retraining system in the state/country ranked first followed by lack of appeal to young and potential youth, ageing of the skilled tradesmen, lack of commitment by government/building construction professional bodies toward skills training and lack of workers-oriented career path respectively. The least ranked factors that resulted to inadequacy of the skilled tradesmen are geographical location of the state, the booms in the building construction jobs, the use of hazardous substance by the workers and the length of time the workers have to be on the job. In view of increasing the number of skilled tradesmen in the building construction industry. The respondents called for public enlightenment of the potential youths, provision/upgrade of technical colleges and vocational centres by government. Other suggestions are; the built environment professional bodies should provide entrance levels for the potential youths that want to undergo career courses in trade skills so as to provide a formal setting for the training, improve workers working conditions/environments and improve worker's services and welfare. However, all the suggested means are of significant ways of increase the number of tradesmen in the building construction industry because the least means have index value 2.74, 2.79, 2.82 and these falls between the range of 2-50 - 3.00.

Conclusion

The research revealed that there are ineffective training/retraining system in the state, lack of appeal of the industry to potential youth, ageing of the skilled tradesmen, lack of commitment by government/professional bodies toward skills training and the technical colleges/vocational centers are not in good state. The research also showed that the safety/environmental condition of the workers working place is poor as a result of this the tradesmen are not motivated in working in the building construction industry. The research recommended that there is need to organize sensitization programmes and work-shops, so as to enlighten the potential youths of the importance of undergoing skilled training in the building construction industry. Meanwhile, the government would need to support by provision/upgrading of technical colleges and vocational centers for training of tradesmen, whilst the professional bodies in the building industry should provide entrance levels for the potential youths that want to undergo career courses in trade skills so as to provide a formal setting for the training. The employers of skilled tradesmen could make the industry more attractive by provision of some packages like insurance policies, overtime bonus and other safety policies for the skilled tradesmen who are exposed to lots of dangers in carrying out their work. Likewise, the employers of the workers in the Nigerian building construction industry should

take it as a responsibility to train skilled workers through a well-established skill acquisition programmes/centres and those aged skilled tradesmen should have an apprenticeship programs where the potential youth could benefit from their acquired skills.

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DRIVERS AND BARRIERS TO THE IMPLEMENTATION OF GREEN BUILDING DEVELOPMENT

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The dependent nature of the construction industry on energy and resources coupled with the unsustainable utilization of these resources has resulted in environmental and health hazards coupled with declining availability of resources. With a growing housing deficit, energy challenges and environmental hazards, developed economies are moving to more sustainable methods of building, however, it is unclear the preparedness of the Nigerian built environment in moving with the times. This paper presents an assessment of the preparedness of the Nigerian construction industry for the adoption of sustainable construction and green buildings by unearthing its drivers and barriers. The research employed a survey research method in data gathering and the population of the study comprises of construction professional. Convenience sampling technique was used in data administration with a response of 69 questionnaires used for the analysis. Descriptive statistical tools were used for analyses. The study revealed that a reluctance arising from the need to avoid risk and increased cost associated with green building is a major barrier to its adoption, lack of awareness, inadequate green products, absence of government support to drive the process and lack of green building tools were also identified as barriers. Also, it was found that the drivers to invigorate the adoption of sustainable building are; government's support, provision of labeling standard, financial incentives, increased awareness and a sustainable housing policy. The study concluded that while there is sparse knowledge on the life-cycle benefits of green building, a tripartite involvement of government, clients and professionals is vital to drive its implementation.

Keywords: Barriers, Drivers, Green buildings, Sustainable construction,

[14]1.0 INTRODUCTION

The world has seen in recent times, increasing global alert on the unsustainable consequences of human activities on the environment, though the blame has been shifted to a broad range of industrial activities, the construction industry is not left out of this quagmire. This is unsurprising as it has been discovered that the construction industry is directly responsible for a large portion of energy consumption, biodiversity loss, waste generation and pollution (CIOB, 2004). This challenge has surfaced at a time developing economies such as Nigeria and China are experiencing increasing construction project to cope with the high demands of a surge in population growth and growing economic activities (Zhang, Wu, Shen and Skitmore, 2013). Though there is an increasing housing deficit in the country, government efforts in combating this menace must however be done in an environmentally friendly, socially responsible and economically supportive way (Oni, 2015). This then calls for a need for governments to look beyond mass conventional building systems to adopting a much more sustainable approach to providing the much needed surplus housing. In response to this challenge, the construction industry has looked into processes, methods and means of revitalizing its construction activities and these efforts has led to the conception of green buildings. Constructing sustainable buildings reduces raw materials and lad, minimizes the consumption of energy and water and by extension reduces emission of hazardous pollutants in the environment (McMahon, Marks and Wallace 2015).

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However, though this new wave of construction process is taking on a growing popularity backed by government policies in advanced economies, it has been lethargic in developing economies such as Nigeria. Failure to accommodate sustainable principles in these current times renders any attempt at housing an exercise in futility in the long run as future generations will bear the consequences of unsustainable practices in vogue today (Oni, 2015). The apparent lack of preparedness for the adoption of green buildings in Nigeria has been associated with the would-be drivers of the system present in countries who have successfully adopted the new approach but might be absent in Nigeria (Aghimien, Adegbembo Awodele, & Aghimien, 2018), also there are barriers to the adoption of this system which threatens its survivability and dampens the preparedness of the Nigerian construction industry to adopt this new and environmentally friendly concept.

Though there is still a dearth of literature on the adoption of green buildings in the Nigerian built environment, this paper focused on examining drivers and barriers to the implementation of green building development. The result of this study will help inform policy makers in the construction industry on the strategy to adopt in ensuring the introduction of green building development into the Nigerian built environment.

2.0 LITERATURE REVIEW

Sustainability studies has attracted numerous and diverse interests since its inception both from the academics, professionals, government and the general public (Aghimien et al, 2018;) while these debates soar on, the impact of the construction industry in contributing to the unsustainable nature of global climate has undoubtedly be attributed to the construction industry as one of the contributing industries amongst many others. The construction industry is a tool used by governments to provide necessary infrastructural facilities for its citizens (Aghimien et al, 2018). The construction industry as stated by Ayodele and Alabi (2011) significantly contributes to the development of the economy of any nation, its activities; provision of infrastructure and economic contribution to the GDP makes it a force to reckon with. The construction Industry like other industries is not without significant impact on the environment.it has been revealed to be one of the largest contributor to indoor and outdoor environmental pollution (Ding, 2008; Geng and Doberstein, 2008. it is responsible for 36% of energy-related CO2 emissions in industrialized economies (Nassen et al. 2007), these issues of environmental pollution, use of energy and use of resources are growing concerns globally (Berg and BenDor 2011). The major environmental issue facing Nigeria can be highlighted as land degradation, air and water pollution (Fed.Min of Environment, 2012; Oladapo, 2008a, b). These adverse effects can be traced to the activities of the construction Industry. Ijigah et al (2013) listed these main areas of pollution as to air, water and noise pollution. During the building process, activities such as site preparation caused through land clearing causes soil erosion that leads to sediment pollution, the use of diesel engines of mechanical plants, demolition of works and use of toxic products pollutes the air, land and water (Ijigah et al 2013).

2.1 ENVIRONMENTAL SUSTAINABILITY

Sustainability or sustainable development is defined by the Brundtland Commission's Report as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The increasing clamour is a result of concerns that the ever rising population and resource utilization poses a tremendous threat to the fast declining natural resources as warranted calls for business to be socially and environmentally responsible necessitates the importance and significance of sustainable construction.

Table 1.0 Principles of Sustainability.

Principles of sustainability	Effects	References
Environmental	Land Shortages	Gavilan & Bernold (1994); Nagapan *et al.c* (2012)
	Environmental pollutions	Yunpeng (2011); Lu, Nagapan *et al.* (2012); Lihua *et al.* (2013).
	Excessive resource consumption	Jayamathan & Rameezdeen (2014);
	Illegal dumping	Gavilan & Bernold (1994); Guerrero *et al.* (2013); Yeheyis *et al,* (2013)
Economic	Increased cost of project	Fernández-Solis & Rybkowski, (2015).
	Time overrun	Ndihokubwayo & Haupt, (2009)
	Increased cost of materials	Jayamathan & Rameezdeen (2014)
	Increased cost of waste transportation	Nagapan *et al.* (2012); Fernández-Solis &Rybkowski, (2015).
	Reduction in the Gross Domestic Income (GDI) of the society	Guerrero, Maas, & Hogland (2013); Fernández-Solis & Rybkowski, (2015).
Social	Risk to human health	Nagapan *et al.* (2012)
	Reduction in the Gross Domestic Production (GDP) of the society	Yunpeng (2011); Ndihokubwayo & Haupt, (2009)

Source: Solanke (2015).

2.2`Green building

Green building can also be said to be a process which integrates techniques and processes that reduces buildings energy use and enhance human health (Qian, Chan, & Khalid, 2015).

Green building also known as sustainable construction is a subset of sustainable development. Green building as opined by Feltes (2007) is not a viable alternative if it is not economically efficient over other conventional construction methods. In a study carried out by Tsai, Lin, Lee, Chang and Hsu (2013), the following factors and criteria were deemed important to attain sustainability in green building;

2.2.1 Environmental Quality: Well-planned green buildings emphasize the quality of the indoor/outdoor environment which provide sustainable performance and reduce pollution (Kubba, 2010). The prefabrication method of construction has been found to reduce environmental impact compared to on the site construction works (Chen et al. 2010).

2.2.2 **Energy Efficiency:** Ensuring overall energy efficient products requires the use of renewable sources and energy saving devices (Kuba, 2010).

2.2.3 **Resource Conservation:** Waste minimization and resource conservation are increasingly important factors for sustainable construction processes (Jaillon et al, 2009). Different resources used on site have diverse impacts on the environment (Tsai et al, 2013).

2.2.4 **Cost Reduction:** cost reduction on a project is the focus of the client and the most critical factor when planning a building project (Wey and Wu, 2008; Jaillon et al, 2009).

Previous studies have shown, sustainability level in developing countries like Nigeria is low (Alabi, 2012; Aje, 2016; Baron and Donath, 2016).

2.3 Barriers and Drivers of Green Building

The campaign for stakeholders to adopt the sustainable building approach to developmental projects is not without hindrances; however, the hindrances are not as a result of lack of technologies and assessment methods as stated by Hakkinen & Belloni (2011). Previous researches on challenges of sustainable building in developing countries around the world have been carried out such Abolore 2012; Studer et al.

Table 2.0 Barriers of Green Building Implementation

Barriers of Green Building Implementation		
Hakkinen and Belloini(2011)	**Abolore (2012)**	**Studer *et al.***
Steering mechanisms	Lack of enforcement	Not a legal requirement
Cost	Lack of Government intervention	No demand from customers
Client understanding	Education vs. Experience	Not seen as priority by senior management
Process	Cost factor	Lack of incentives
Procurement and tendering	Pointing fingers	No demand from stakeholders
Timing	Passive culture	Lack of resources
Cooperation and networking		Costly
Underpinning knowledge		Corporate inertia
Knowledge and common language		Lack of in-house knowledge/skills
Availability of methods and tools		Creates competitive disadvantage
Innovation		

Table 3.0 Drivers of Green Building

DRIVERS OF GREEN BUILDING	
Pitt et al., (2009)	**Studer *et al.***
Financial incentives	Environmental management system
Building regulations	Designated staff for environmental matters
Client awareness	Published policy statement on environmental matters
Client demand	Supply chain management
Planning policy	Verification / accreditation of environmental performance
Taxes/levies	Extended producer responsibility initiatives
Investment	Engagement with stakeholders
Lack of labeling/ measurement standard	Voluntary initiatives with industry and/or government
	Support of local environmental initiatives
	Environmental, social or sustainability reporting

3.0 RESEARCH METHOD

This study investigates the drivers and barriers of sustainable construction/green buildings as to how it impacts the preparedness of the Nigerian construction industry in adopting the emerging construction method. The research is underpinned by a review of extant literature to extract taxonomy of variables in the relevant domains; and empirical survey using quantitative and techniques. The questionnaire survey aspect of this study was conducted through a self-administered questionnaire to 90 respondents drawn from construction professionals in the construction Industry. The sampling technique employed is convenience sampling with the population of the respondents been the construction professionals who are managing partners of consulting firms which included Architectural firms, mechanical and electrical engineering firms, quantity surveying firms, Estate surveying firms and builders. Lagos was chosen because it is the Centre of commercial activities in the country. In order to test the consistency of the

Construct variables, reliability test was conducted for variables adopted in the questionnaire which resulted in a. Cronbach's alpha values of 0.889 and 0.849 respectively indicating a good level of reliability and consistency of the construct validity (Doloi, Iyer and Sawhney, 2011). Data collected through the questionnaire survey were analyzed using basic descriptive statistical tools.

4.0 RESULTS, ANALYSIS AND DISCUSSION

4.1 Distribution of Questionnaires

The research instrument was administered to all construction professionals since they are involved in the execution of green buildings.

Table 4.0 Distribution of Questionnaires

Number Distributed	**90**
Number Properly Completed and Returned	69
Percentage Response	77%

Table 4.1 Profession of Respondents

Profession	**No of Response(s)**
Architects	20
Builders	9
Engineers	10
Estate Surveyors	7
Quantity Surveyors	20
Town Planners	3
Total	69

Table 4.1 shows the distribution of the response from the construction professionals. Architects and Quantity surveyors had an even number of response which was the highest followed by Engineers which are the services Engineers, followed by the Builders and the Town Planners.

4.2 Preparedness of the Nigerian construction industry to adopt green building

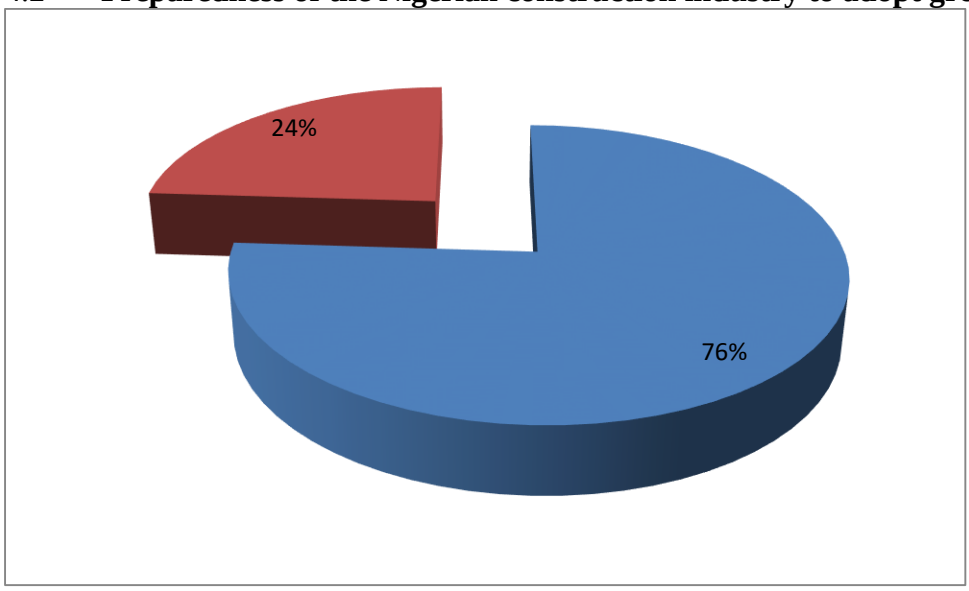


Figure 1: Preparedness of the Nigerian Construction Industry to adopt green building

Figure 1 shows diagrammatically the response of the respondents when asked if the Nigerian built environment is prepared for the adoption of green buildings. It is shown that 76% of the respondents feel the sector is unprepared while 24% opines otherwise.

4.3 Capacity building of professionals on the technicalities of green buildings

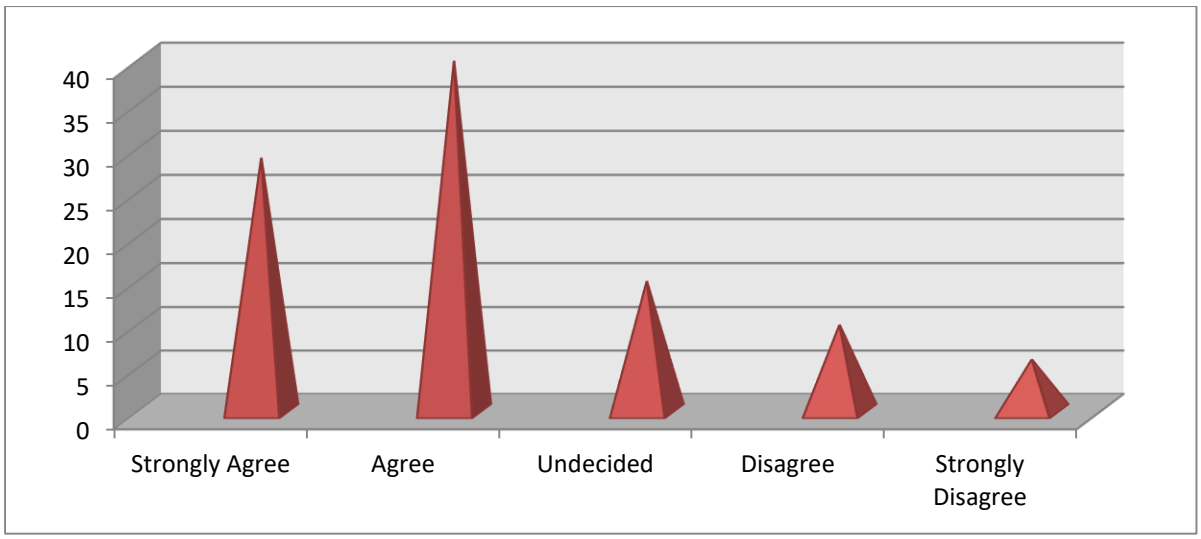


Figure 2: Capacity building of professionals on the technicalities of green buildings

When asked on the availability of a guiding policy or framework for improvising the capacity of professionals to provide technical advice on green building, most of the respondents agreed it is non-existent while few agreed otherwise.

Most of the respondents agree that there is low capacity building of professionals as regards the technicalities of green buildings.

4.4 Drivers of Sustainable/green buildings in Nigeria.

Table 4.2 Drivers of sustainable construction/green buildings with mean.

Drivers of Sustainable Construction/green building	Mean
Awareness on resources conservation	4.12
Government policy/regulations	4.06
Financial Incentives	3.99
Clients Requirements/Demand	3.91
Reduced long term cost	3.76
Environmental impact/management	3.52
Urban planning policies	3.33

In the table 4.2 above, the drivers of sustainable construction/green building from the respondents are awareness on resources conservation, government policy regulations, financial incentives, clients' requirements, reduced long term cost and urban planning policies.

4.5 Barriers to sustainable construction/green building with mean

Table 4.3: Barriers to sustainable construction/green building with mean

Barriers to Sustainable Construction/green building	Mean
Inadequate awareness/knowledge on green buildings	4.35
Perceived high cost of green buildings	4.28
Government attitude/policies	4.10
Low/limited client Demand	4.05
Absence of incentives	3.76
Poor knowledge of green building methods among professionals	3.62
Inadequate education/training on sustainability	3.56`
Reluctance to introduce it by Firm owners/managers	3.49
Supply chain management process	3.38
Unavailable legislation	

Table 4.3 highlights the barriers to the adoption of green building/sustainable construction in the Nigerian built environment. As indicated by the respondents, the barriers are; inadequate awareness, low client demand, absence of incentives, poor knowledge of green building methods among professionals, inadequate education, reluctance to introduce it by owners of firms, supply chain management process and unavailable legislation.

4.6 Strategies to prepare the Nigerian construction Industry for the adoption of green building/sustainable construction

Strategies	Mean
Increased awareness, publicity and campaign for green buildings	4.21
Reduced initial construction cost	4.11
Support and legislative framework from government	4.05
Provision of incentives such as reduced taxes	4.02
Participation and education of professionals	3.97
Provision of economically efficient alternative green products	3.87

Table 4.4 presents recommended strategies for the adoption of green buildings/sustainable construction in the Nigerian construction industry. The strategies includes, increased awareness, publicity and campaign for green buildings, reduced initial construction cost, support and legislative framework from government, provision of incentives such as reduced taxes, participation and education of professionals, provision of economically efficient alternative green products.

5.0 Discussion of Findings and Recommendations

A majority of the respondents agreed that the Nigerian built environment is unprepared for the adoption of green buildings/sustainable construction. This might be due to the absence of green building assessment tools, lack of legislation and an absence of government drive. Danla (2014) affirms this when he opined that the conditions to facilitate green building exist in Nigeria but the absence of an enabling environment might have a disparaging effect.

The study also discovered that there is little or no availability of a guiding policy to improve the technical capability of construction professionals in participating in green building as compared with their counterparts in developed economies. This is as a result of an absence of enthusiastic and visionary support from the government. More than half of the respondents agree that trainings, seminars, workshops and conferences on this new concept are not enough. There is no sufficient training, seminars, conferences and workshops on green building knowledge for professionals.

However, the drivers to enable the adoption of green buildings were found out to be most importantly, awareness on resources conservation, government policy regulations, financial incentives, clients' requirements, while others such as reduced long term cost and urban planning policies though not as important are necessary.

Also, likely mitigating factors such as inadequate awareness, low client demand, absence of incentives, poor knowledge of green building methods among professionals were found to be major barriers while others such as inadequate education, reluctance to introduce it by owners of firms, supply chain management process and unavailable legislation where identified by the respondents.

Therefore, to strategically prepare the Nigerian built environment for the infiltration of green/sustainable building, the government is advised to increase awareness, publicity and campaign for green buildings through active support and engagement of all stakeholders in the built sector. Support for legislative framework to enable strict compliance with a formidable green policy. Provisions of incentives to private clients, who build sustainably, education and training for professionals, provision of economically efficient alternative green products.

6.0 CONCLUSION

This study revealed the drivers and barriers of green building preparedness in Nigeria. The most critical drivers were found to be awareness on resources conservation, government policy regulations, financial incentives and clients' requirement while the most critical barriers highlighted are, inadequate awareness, low client demand, absence of incentives and poor knowledge of green building methods among professionals. However, to strategically prepare the country's built environment for sustainable building, it was fundamentally discovered that the government has to lead and take initiative. This is important as the listed strategies is vital to policy and decision makers in drafting a plan for the adoption of green building in the Nigerian built environment.

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APPRAISAL OF CAUSES AND EFFECTS OF DELAYED PAYMENT ON BUILDING CONSTRUCTION PROJECTS DELIVERY IN NIGER STATE

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Abstract

Delayed payments for work done affect contractors, consultants and others stakeholders involved in the construction projects, whether public or privately funded projects. It causes severe cash-flow problems especially to contractors and has a devastating knock-on effect down the contractual payment chain. The aim of this paper is to establish the causes and effects of delayed payment on building projects delivery. A total of 130 numbers of questionnaires were distributed to Engineers, Quantity surveyors, Builders and Architects in Niger State Ministry of Work, Housing and Transport. The descriptive analysis was used to analysed the data obtained from the survey. The shows the followings as main causes of delayed payment. These are: client poor financial management, contractor delay in submitting claims client delayed in certification and contractor failure to understand the contract agreement. The result also shows the following as main effects of delayed payment. These are: delay in project progress, prevent early completion of work, lead suspension of works and create financial hardship for the company. Therefore, the paper recommended that contract should always be awarded to the qualified contractors with wealth of experiences and financial capability in other to avoid the financial and administrative challenges during the course of building projects delivery.

Keywords: *Causes of Delayed Payment, Effects of Delayed Payment, Project Delivery, Project Performances, and Client Satisfaction.*[15]

1.0 Introduction

Delayed payments for work done affect contractors, consultants and others stakeholders Involved in the construction projects, whether public or privately funded projects. It causes severe cash-flow problems especially to contractors and has a devastating knock-on effect down the contractual payment chain. This problem could possibly lead to a formal dispute resolution such as 'arbitration' or 'litigation' and those processes that are very costly and take a long time. The problems of delayed payment are felt not only in a developing country like Nigeria, but also in developed countries, such as the United Kingdom US, Canada and Australia etc.

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Moreover, a survey was conducted in Britain construction industry on payment performance and result shown that the construction industry in particular is prone to a culture of late payment (Johnston, 1999). The payment of amount due to subcontractors and suppliers being made on average of 53 days after receipt of invoices or applications for payment have been rendered (Johnston, 1999 and Nazir, 2006). However, delay in payments of work done by clients on construction projects in Nigeria construction industry are considered to be a factor of significant concern. It causes severe cash-flow problems to contractors and this can have a devastating effect down the contractual payment chain. In Nigeria, most of the contractor or sub-contractor who has not been paid what is due to him threatening to suspend work under the contract until the balance due to him is paid in full. These are the motivating factor for this research work to identify the causes and effects of payment delayed in Nigeria construction industry with a view of improve efficient and timely payment of contractors and others in orders to improve the process success.

2.0 Payments in the Construction Industry

Payments which is said to be the life- blood of the construction industry, suffers default specifically delayed payment, remains a major problem (Ali, 2005). Contract period refers tithe duration for completing the construction project. When the contract period is delayed, it means the contract cannot be completed within the stipulated time. Payment delay will lead to: time overrun; delay in completion; termination of contract (Amoako, 2011). One contributing reason for payment delays was the contractor's, tracking and his accounting system and the manual entry of data into this. The subcontractor would issue reminders foray outstanding payments. The Payment condition patterns are seen to differ between the public sector and the private sector, the payments in time are said to be a key element of a contractor's profitability performance, the impact on specialist contractors of payment delay, contractors were dissatisfied with the time lag to receiving payment, contractor non-payments a cause of disputes escalating (Carmichael and Balatbat, 2010).

2.1 Delayed payment on Building Construction Projects

Delayed payment is a situation where payment is not made to contractors or subcontractors on time, in accordance with the timelines agreed between the parties to the contract. Shi, *et al* (2001), delayed payment may the form of under- payments, late or delayed payment and non-payment all together. Non-payment or under-payment refers to situations where an expected payment was never received, and would be considered bad debt, written off, or lost partially/fully. According to clause 14.8 (FIDIC 2005) delayed payment, If the contractor does not receive payment in accordance with sub-clause 14.7 [Payment], the contractor shall be entitled to receive financing charges compounded monthly on the amount unpaid during the period of delay. This period shall be deemed to commence on the date for payment specified in sub-clause 14.7 [Payment] irrespective (in the case of its sub-paragraph (b)) of the date on which any interim payment certificate is issued. Unless otherwise stated in the particular conditions, these financing charges shall be calculated at the annual rate of three percentage points above the discount rate of the central bank in the country of the currency of payment, or if not available, the interbank offered rate, and shall be paid in such currency. The contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy. In the event that the interim payment certificate (IPC) is not paid within the contractual stipulated time, then delay is said to have occurred and the contractor is entitled to receive interest on the total amount that was delayed in payment. The total amount of interest accrues a result of the days delayed in payment represents the delayed payment entitled by the contractor

2.2 Causes of Delayed Payment

There are many factors that are said to be causes of the delayed payment problems in construction industries (Nazir, 2006). Nasir (2006) identifies the followings causes of delayed.

These are: payment: employer's poor financial management, employers withholding of payment, conflicts among parties involved, use of 'pay when paid' clauses in sub-contracts, culture/attitude, short of current year project budget, delay in certification, disagreement on the valuation of work done. However, delayed payment causes by the key players in the construction industry were explained in section 2.2.1 to 2.2.3 respectively.

2.2.1 Delayed Payment Caused by Contractors

Reeves (2003) stated that one of the main reasons for delayed payment is when there are errors in submitting claims. This includes claims without adequate supporting documents, wrongly calculated claims and those submitted without using the correct procedures. Other factor contributing to delayed payment is when contractors fail to agree with the valuation of work on site (Adballaand Hussein, 2002).

2.2.2 Delayed Payment Caused by Clients

According to Reeves (2003), the main factor contributed by clients is when they take longer than the stipulated time in terms of the contract to certify the claim. This might be because they have become increasingly subject to claims arising out of their design and construction administration services. There are cases where clients are wrongfully withholding the payment. Most of them do this to obtain some kind of 'gift' from contractors once they disburse the payment (Adballaand Hussein, 2002).

2.2.3 Delayed Payment Caused by Contractual Matters

There are cases where contract agreements do not bring any justice to both main contractors and subcontractors (Artidi and Chotibongs, 2005). For instance, the 'pay-when-paid' clause is often used in contract agreements between main contractors and subcontractors or between housing developers and main contractors (Adballa and Hussein, 2002). 'Pay-when-paid, also known as 'back to back' method of payment never brings justice to the second parties (Artidi and Chotibongs, 2005).

2.3 Effects of Delayed Payments

Lack of payment to contractors is a common cause of disputes in the construction industry. Artidi and Chotibongs, (2005) all the problems in the construction industry begin when payment in the exact amount due by the date shown on the statement is not received. Disagreements then lead to arguments and conflict. Delayed payments never bring justice to contractors and subcontractors (Artidi and Chotibongs, (2005). It also effects the operation of the construction companies. Contractors often borrow working capital from banks in order to finance their construction operations and invariably have to pay interest on these borrowings. Contractors are highly dependent on regular interim payments from employers during the course of construction to help discharge the debt so accrued. Therefore, when a contractor does not receive interim payments on time or in accordance with the terms agreed, the interest rate in the capital borrowed from the bank increases. Delayed payment will also affect the contractor's performance. However, the efficient and prompt payment to the contractors and suppliers are key to the project's success. (CIOB, 2004). The followings possible effects of delayed payment have been identified by CIOB, (2004). These are: (1) creates financial hardship, (2) creates negative chain effect on other parties, (3) creates cash flow problems, (4) causes delay in completion of projects, (5) leads to bankruptcy or liquidation, (6) leads to Abandonment of projects, (7) causes formal dispute resolution and (8) create negative social impacts.

3.0 Research Method

This paper adopted a questionnaire survey approach to pull out public opinion, such as beliefs, perception, ideas, views and thought about the appraisal of causes and effects of delayed payment on building construction projects delivery in Niger State. In order to obtain the require population for this study, the stratified random sampling technique was adopted for the

selection of the construction companies that participated in this study. The choice of stratified random sampling techniques was due to the fragmentation and diversification of the construction industry. And this was also in line with concept of Creswell and Tashakkori (2007) that respondents are arranged in strata for the convinienency in questionnaire distribution and assessment. In addition, the simple random sampling was adopted in each of the construction companies for the selection of construction players from the strata.

The questionnaire that was used to record the responses of each respondent contained mainly closed ended questions using a five- point Likert scale ranged from none=1, low=2, moderate=3, high=4 and very high=5. The questionnaire was divided into two parts. First part is related to demographic profile of the respondents. The second part includes list of identified factors that causes reworks in building projects and mitigating measures to overcome the challenges of reworks in building projects in Abuja. However, a total of one hundred (100) number of questionnaires were distributed to Quantity Surveyors, Architects, Engineers, Project Managers, Construction Managers, Contractors, Consultants and client in the Ministry of works, transport and housing, housing cooperation, urban development, contracting firms and consulting firms in Niger State. Although, only 82 numbers of questionnaires distributed were filled correctly and returned, which represent 82% of the Questionnaires used for the analysis.

3.1 Data analysis

The descriptive method of analysis was adopted to summarise the sample, rather than use the data to learn about the population and sample. In this paper, descriptive analysis was used to present means score and standard deviation values as well as frequency counts on the data. The mean value was used to ranked the respondents' opinions or responses obtained.

4.0 Presentation of Results and Discussion

4.1 Demographic Survey

This section primarily offers cleared information concerning details of respondent in relation to the: Academic background, Position of respondent in the firm, Years of working experience within the construction industry, and Respondent's' academic qualification.

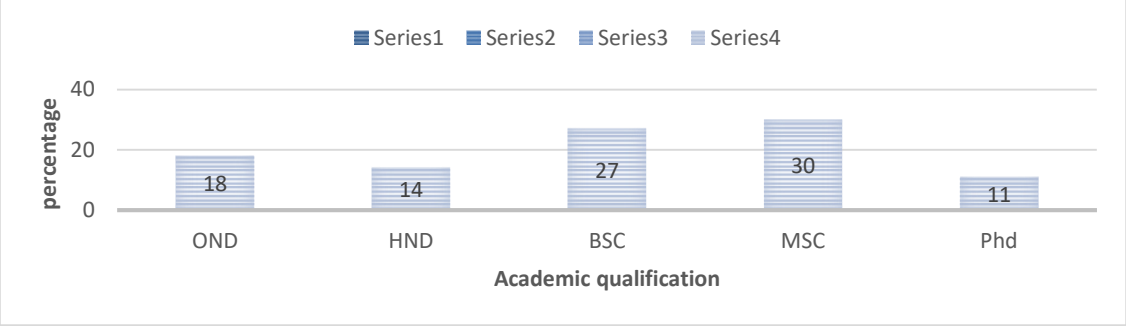


Figure 4.1: Academic qualification of respondents. (Field works, 2018)

The figure above indicates that 18% of respondents had National diploma, 14 % were holders of Higher National Diploma, and 27 % obtained Bsc. While 30 % and 11% were holders of M. Tech/MSC and Ph.D respectively. Inferences drawn from this was that the respondents sampled are knowledgeable enough to comprehend the contents of the questionnaires, thus providing suitable responses.

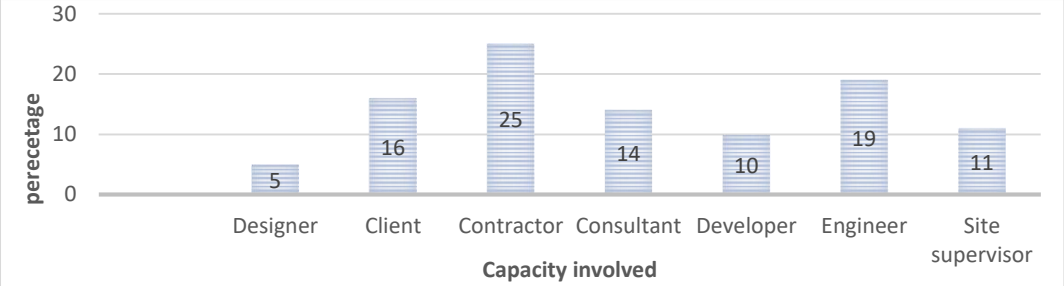


Figure 4.2: Respondents capacity involved in projects delivery. (Field works, 2018)

The Figure 4.2 shows the capacities in which respondents were involved in project delivery. From the analysis its was indicate that Five (5) percent of respondent's sample had involve in design aspect of construction, 16 percent were Clients, twenty-five (25) percent were contractors, fourteen (14) percent involved in consulting, ten (10) percent were developers, while Nineteen (19) percent and Seventeen (17) percent were Engineers and Site Supervisor respectively. This is an indication that the respondents had spent judicious period within the industry to have acquaints with issues of delayed payment in the building industry.

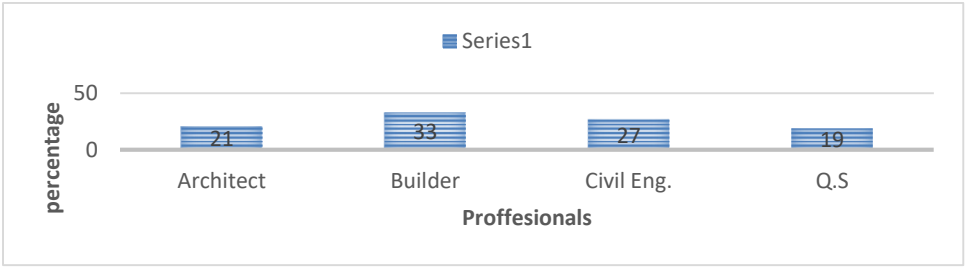


Figure 4.3: Respondents profession. (Field works, 2018)

The figure 4.3 above shows the various constructional professionals that constitute respondents for the study. The analysis revealed that 21% of respondents were Architect, 33% Builders, 27% comprises of Civil Engineers and 19% Quantity Surveyors. However, this provided a reliable inclusion of all professionals capable of providing valuable information required for the study.

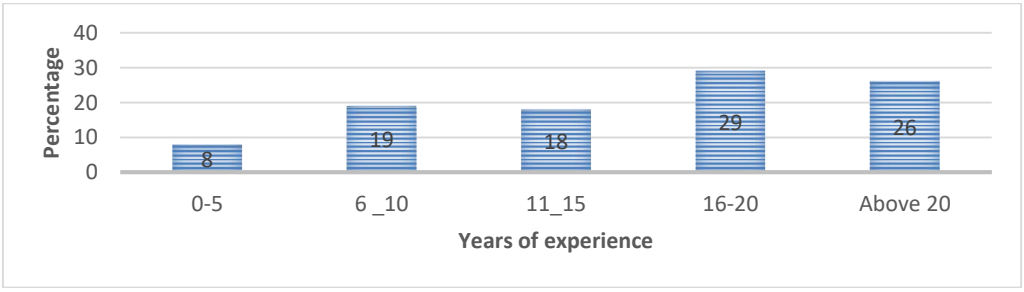


Figure 4.4: Respondents' years of experience. **(**Field works, 2018)

The Figure 4.4 shows that 8% of respondent's sample had working experience of 0 to 5 years in the building industry, 19% had between 6- 10 years' experience while 18% had spent 11 - 15 years, 29% had 16- 20 years' work experience and 26 % had above 20 years working experience in the building industry. This is an indication that the respondents had spent judicious period within the industry to have acquaints with issues of delayed payment in the building industry.

4.2 The causes of delayed payment in Buildings Projects

Table 4.1: Causes of Delayed Payment in Building Projects

Causes of delayed payments	Mean Sore	Standard dev.	Ranking	Decision
Client poor financial Management	4.64	0.77	1	Most
Contractor delay in submitting claims	4.56	1.53	2	Contributory
Client delay in certification	4.37	0.95	3	
Contractor failure to understand the contract agreement	4.21	1.25	4	More
Poor Financial sources/ condition of claims	4.00	.88	5	Contributory
Disagreement on valuation of work done	3.92	.96	6	
Involvement of too many parties in the process of honouring interim certificate	3.85	.95	7	
Client failure to cultivate a good payment	3.81		8	
Submission of claims by contractor without support	3.79	0.98	9	
Difficulties in reaching settlement	3.60	0.86	10	
Delay in releasing of settlement	3.41	0.99	11	
Clients deliberate delay for their own financial advantage	3.30	1.05	12	Average contributory
Clients underestimate the time period and cash flow from the investment	3.27	1.55	13	
Inflation	3.19	1.03	14	
Financial market increment of interest rate in repayment of loan in stability	2.86	1.46	15	
Increment of foreign exchange rate	2.75	1.44	16	
Contractor failure to follow certain procedure/guideline in claim	2.41	1.58	17	Slightly contributory

Source: Field works, (2018)

The table 4.1 above shows the factors that causes delayed payments in building industry. The statistical result of analysis via mean score substantiated the level these factors identified above contributed to delayed payment in building projects. It is shown clearly from the table that the two most contributory causes of delayed payments are: Client poor financial Management having a mean score value of 4.30 and ranked 1st, this is preceded by Contractor delay in submitting claims with a mean value of 4.12 and ranked 2nd. The high ranks assigned to these two variables were not surprising because the entire flow of work depends on the employer who is the financial resource of the project. However, findings were in congruous with the results of Abdul-Rahman *et al.* (2009) that delayed payment to causal factors, such as clients' poor financial and business management; financial impropriety and political interference; inaccurate valuation for completed works; as well as insufficient documentation and information for valuation, among other factors. Whereas causes of delays in the construction of infrastructural projects have attracted many studies, particularly in developing economies, the effects of such delays have not received as much attention (Sambasivan & Soon, 2007; Aziz, 2013 and Owolabi *et al.*, 2014).

While the eight (8) more contributory factors to delay payment as discovered from the study were: Client delay in certification with a mean score of 4.11 thus ranked 3rd, Contractor failure to understand d contract agreement (4.21) Poor Financial sources/ condition of claims (4.00) Disagreement on valuation of work done (3.92), Involvement of too many parties in the process of honouring interim certificate (3.85), Client failure to cultivate a good payment (3.81), Submission of claims by contractor without support (3.79), Difficulties in reaching settlement (3.60), with their corresponding ranks as 4th, 5th, 6th 7th, 8th 9th and 10th respectively. Findings from the study were in agreement with Borvon, (2012) which sought the views of clients, consultants and main contractors on the relative importance of the delay in payment factors in residential building projects in Bangkok, Thailand.

Similarly, the Delay in releasing of settlement was ranked 11th with a mean score of (3.41), Clients deliberate delay for their own financial advantage raked 12th and measured (3.30), Clients underestimate the time period and cash flow from the investment (3.27), Inflation (3.19) and Financial market increment of interest rate in repayment of loan in stability (2.86) and Increment of foreign exchange rate (2.76), thus ranked 15th 16th. However, these factors were discovered to have an averagely contributions to delayed of payment in building projects. The result was in agreement with Alaghbari *et al.* (2007) that late and inconsistent payment of contractors for completed works is one of the critical factors, causing delays in the completion of infrastructural projects in developing countries. Similarly, Delay in payment at the higher end of hierarchy is likely to trickle down the chain of contracts (Construction Industry Working Group on Payment, 2007). More specifically, delay in payment of completed works is likely to constrain contractors' cash flow, which in turn might affect timely payment of sub-contractors, workers, suppliers, and service providers.

4.3 The Effects of delayed payments in Building Projects

Table 4.2: Effects of delayed payments in building projects

Effects of delayed payments	RII	Ranking	Decision
Delay in project progress	0.946	1	Very high effect
Prevent early completion of work	0.907	2	
Lead suspension of work	0.88	3	
Create financial hardship for the company	0.830	4	
Extension of time of projects	0.811	5	
Create cash flow problems	0.80	6	
Create negative relationship among parties	0.778	7	High effect
Low quality of work done to contractors	0.76	8	
Cost overrun	0.74	9	
Loss of productivity and efficiency	0.67	10	
Causes rescheduling and re-sequencing	0.65	11	
Increase in time related cost	0.63	12	
Stakeholders not satisfied	0.62	13	
Delay in having expected benefits	0.61	14	
Increase in cost of consultancy services due to stoppage	0.58	15	Moderate effect
Difficult to procure materials	0.56	16	
increase in term relate cost	0.55	17	
Difficult to maintain equipment	0.52	18	
Termination of contractors contract	0.51	19	
Lead to payment of liquidated and ascertained damages	0.48	20	
Abandonment of projects	0.37	21	

Source: Field work, (2018)

From Table 4.2 several effects of delayed payment were identified from the survey undertaken. The results from the table indicated that: Delay in project progress with RII of (0.946) and ranked 1st, Prevent early completion of work (0.907), Lead suspension of work (0.88), Create financial hardship for the company (0.83), Extension of time of projects (0.811) and Create cash flow problems (0.80) with their ranking positions as 2nd, 3rd, 4th, 5th and 6th respectively. These six (6) variables were rank higher and reflected that delay of payment has a very high significance effects on them. While eight various areas or factors which includes: Create negative relationship among parties (0.778), Low quality of work done to contractors (0.76), Cost overrun (0.74), Loss of productivity and efficiency (0.67), Causes rescheduling and re-sequencing (0.65), Increase in time related cost (0.63), Stakeholders not satisfied (0.62), Delay in having expected benefits (0.61), were discovered to have a high effect as a results of delayed payment. Findings were related to Artidi and Chibongs (2005), that all problems in the construction industry begins when payment to Contractors in the exact amount and date were

not received. Disagreements emanated, loss of productivity, project cost escalation and low quality of works. Similarly, Increase in cost of consultancy services due to stoppage, Difficult to procure materials, Abandonment of projects, Difficult to maintain equipment, Termination of contractor's contract were ranked as moderate effect of delayed payment, with their relative R11 values ranges from 0.5 to 0.4 respectively. These were supported by the findings of Wu *et al.* (2008) that out of various effects of late and non-payment, which were classified into three (3) main effects, the effect with the lowest frequency and percentage (15%) were similar to those discovered in this study. Carmichael *et al.* (2010) agreed with the result that prolonged delays in payment with consequences, such as high risk of industrial disputes, wanton destruction of property, and a high turn-over of workers; while Raj and Kothai (2014) pointed out that timely payment of workers is necessary for maintaining motivation, willingness, confidence, discipline, and cheerfulness to perform work

Summary of Findings.

1. **Causes of delayed payment in the buildings projects**

The followings were established as main causes of delayed payment in buildings projects in Niger State. These are (1) client poor financial management (2) contractor delay in submitting claims (3) client delay in certification (4) contractor failure to understanding the contract agreement and (5) poor financial sources/condition of claims.

2. **The effects of delayed payments in buildings projects in Niger State**

The followings were identified as major effects of delayed payment in building projects in Niger State. These are (1) delay in project progress (2) prevent early completion of work (3) lead to suspension of work (4) create financial hardship for the company (5) extension of time of projects and (6) create cash flow problems.

5.0 Conclusion

The following conclusions were made based on the findings of the research work: (1) the Inadequate planning and commitment of the both parties lead to the causes of delayed payment such as client poor financial management, contractor delay in submitting claims, client delay in certification, contractor failure to understand the contract agreement and poor financial sources /condition of contract. Moreover, efficient and prompt payment of the contractors for completed works are crucial for ensuring the continuity of works and completion of construction projects within time and cost with good quality. (2) delayed in payment have effects on project progress, prevent early completion of work, lead to suspension of work, create financial hardship for the company, extension of time and create cash flow problems. Therefore, the paper recommended that there should be effective strategic planning right from the inception of projects to completion stage to avoid delayed payment. The contract should be awarded to the financial buoyant contractor in order to avoid slow project progress or suspension of work. The client should involve qualified professionals for proper monitoring and supervision. In articles of agreement it should state clearly that any overdue delayed in payment should be charge interest and percentage of interest should be stated. There should further research on the development of model for delayed in payment in building projects. In addition, the paper contributes to the knowledge that delayed payment can be avoided if not fully eliminated if the findings of this research work are adopted and implemented.

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EVALUATING METHODS OF TRAINING OF MASON FOR PRODUCTIVITY IMPROVEMENT IN NIGERIA CONSTRUCTION INDUSTRY

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Abstract
This research evaluated the methods of training of mason for productivity improvement in the Nigeria construction industry by identifying the various training methods for mason and the premium placed on further training programmes by the two categories of respondents in the study area. Simple random technique was used in administering questionnaires to both the management staff and masons who were randomly drawn from large, medium and small sized construction firms within Abuja metropolis. A total of 120 and 240 questionnaires were distributed to the respondents from which 80 and 180 questionnaires were filled and returned. Data were analysed using descriptive and mean score ratings. The result shows that informal training is the most preferred training method for small sized construction firms while large and medium sized firms placed formal training as the most preferred training methods for mason. On-the-job training programme is the most preferred training scheme by the two categories of respondents with mean scores of 2.32 and 2.33 respectively. Since majority of the mason received informal training, there is a need to enroll them in Government Technical Colleges and Vocational Schools to acquire sound theoretical training that will enable them to read and write as well interpreting contract drawings on construction site.
Keywords: *Construction, Evaluating, Mason, Productivity, Training*

[16]1.0 INTRODUCTION

The construction industry in any part of the world produces and maintains infrastructures and buildings that support various social, economic and industrial functions (Kuroshi and Lawal, 2014). Thereby making the industry a major factor in the drive for economic development (Achuenu, Izam and Bustani, 2000). The industry contributes immensely to the Gross Domestic Product (GDP) and employs substantial percentage of her workforce (Yisa, Holt and Zakari, 2000). This indicates that the construction industry requires and utilises huge amount of materials and human resources. Thus, its efficiency and effectiveness depends on factors such as the quality and availability of its workforce.

In the building construction Industry, skilled workers such as masons, iron benders, carpenters amongst others, form a large part of the site labour force whose input determine to a great extent, the quality of the industry's products (Obiegbu 2005). These skilled workers however, are most endangered in Nigeria as they lack inadequate training, technical education and experience to recommend them for work (Simire, 2010). Thereby, affecting their performance and productivity on construction projects which in turn could lead to cost and time overruns of the project.

This research was thus conducted to evaluate the methods of training of mason for productivity improvement in the Nigeria construction industry.

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Training offers the skilled workers the ability to perform adequately on a given task through a systematic development of knowledge, skill and attitude (Abiodun 2008). And these qualities are recipe for workers' productivity (Abiola, 2004). Hence, construction artisans when employed must be trained to the industries standards while those already employed must be constantly trained and retrained in order to improve on their performance and productivity (Bilau, Ajagbe, Kigbu and Sholanke, 2015).

2.0 LITERATURE REVIEW

Training have been defined in several ways by different author. However, workforce capability enhancement was the pivotal idea highlighted in their studies. Abiodun (2008) define training as a systematic development of knowledge, skill and attitude required by employee to perform adequately on a given task.

Productivity generally is widely known as a relationship between the inputs and the output. And often expressed as the ratio of a specific measure of output to a specific measure of input per unit of labour employed. It is measured as total output divided by the members of units of labour employed to produce that output (Aiyetan and Olotuah, 2006). Abiola (2004) added that inputs variables include all resources consumed to produce those outputs such as labour, capital, material, energy etc. In the construction industry however, labour productivity is mostly known as labour output and is measured as the amount of work done over a period of time (Bilau *et al*, 2015).

A better understanding of the different factors influencing labour productivity in the construction industry is necessary in determining the necessary steps for reducing project cost and time overruns (Kuroshi and Lawal, 2014). However, there improvement is not feasible without first understanding and identifying those factors that influence productivity. Many construction researchers, intrigued by the findings of low labour productivity, had in the past attempted to identify the factors affecting productivity (Chan, Puybaraud and Kaka, 2001). According to Attar, Gupta and Desai (2012) cited in Odesola and Idoro (2014), the identification and evaluation of factors affecting construction labour productivity have long been critical issues facing project managers with respect to increasing productivity in construction. However, understanding the critical factors that both positively and negatively affect productivity has been posited to be necessary for the enhancement of construction labour productivity and project performance (Attar *et al*, 2012).

Zou, Zhang and Wang (2007) identified unfair wages, lack of motivation and incentives, lack of training and re-training, inclement weather condition, design changes, use of low quality tools and equipment and delay in deliverance of materials to sites as the seven causes of low skilled workers' performance and productivity in large construction projects. Kazaz, Manisala and Ulubeyli (2008) and Odesola (2015) identified organisational factors, economic factors, physical factors, socio- psychological factors, management and project related factors, labour and natural related factors as causes of construction low productivity and low skilled workers performance.

Realising these facts however, making use of those factors that positively affect productivity and controlling factors that have a negative effect will ultimately improve productivity (Adnan, Sherif, Ziad and Peter, 2007). A vast empirical literature has investigated the effect of training as a proxy for productivity improvement. For instance, as cited in Ujene and Umoh (2014), Olateju (1992) studied the effect which training had on the productivity of construction artisans in south-western Nigeria, Olatunji, Ajibola and Coker (2000) studied the effects of training on the performance of construction craftsmen in south-western Nigeria, Lawal and Kolawole (2004) investigated the productivity of the Nigerian public service construction artisans, Eneh (2010) examined the implication of declining technical apprenticeship and artisan service on Nigeria's future development, Usman, Inuwa, Iro and Datong (2012) evaluated the training of contractors craftsmen for productivity improvement in Nigeria, Olabosipo, Phillip and Igartius (2012) studied the influence of training on Bricklayers' productivity in Nigeria, Odediran and Babalola (2013) investigated the employment structure of informal construction workers/artisans in Nigeria, Iro, Inuwa and Dating (2013) investigated into contractors craftsmen training in the Nigerian construction industry, Okuntade (2014) investigated the relevance of building

construction technician training to modern construction industry in Nigeria. Much emphasis from past literatures has not been directed on the influence and effectiveness of the skill acquisition through training on workers' performance and productivity level on construction projects. Likewise, vast empirical literatures have been on craftsmen/artisans in general. It is therefore, the intention of this research to evaluate the impact of training on the performance of mason productivity in the Nigerian construction industry with a view to appreciate the impact of training and development for improved construction projects.

Classification of Construction Firms

Construction firms can be classified based on the following criteria:

- Economic criteria: Classifies construction firms based on their turnover. That is, the profits accrued annually from projects executed.
- Technical criteria: Refers to the technological level of the firms. That is, its innovation in capital.
- Net asset criteria: This is based on the net assets the construction firm have. Such as assets, rights and obligations.
- Organizational criteria: Refers to the number of workers in the company and its organizational set up.

Table 2.1: Classification of Construction Firms in Nigeria

Construction Size	Number of Employees	Annual turnover (N)
Small Sized Firms	1 - 49	100,000,000.00
Medium Sized Firms	50 - 99	500,000,000.00
Large Sized Firms	Above 100	500,000,000.00

Source: Small and Medium Enterprises Development Agency of Nigeria (SMEDAN), Abuja, 2007

3.0 RESEARCH METHODOLOGY

The research design used comprise of both qualitative and quantitative methods commonly known as triangular technique. Two approaches were used in obtaining data in achieving the objectives of this study. The first approach involves review of relevant literature as a secondary source of data while the second approach involves the use of primary data collected through a well-structured questionnaire administration.

Two sets of questionnaires were prepared. One for the construction management staff and the other for the mason. Simple random sampling technique was used in administering questionnaire to both the management staff and masons in the large, medium and small sized construction firms in Abuja metropolis. Sample size for the study population was determined using Krejcie and Morgan table for finite populations. A total of 120 and 240 questionnaires were distributed to both the management staffs and masons respectively in the study area. Ratio 1:2:3 was used for the distribution of questionnaires to the large-sized, medium-sized and small-sized firms respectively. From this, 20, 40 and 60 questionnaires were distributed to the management of large, medium and small-sized firms while the mason distribution was 40, 80 and 120 questionnaires respectively. However, 80 and 180 questionnaires were filled and returned representing a percentage rate of 66.7% and 75% respectively.

To determine the premiums placed on each of the identified training types by the two categories of respondents, the scoring system is set as 3, 2 and 1 points for high, medium and low points respectively. The mean score(S) for each function is calculated by means of the following equation (Arditi and Mochtar, 2000) as cited in Olabosipo *et al* (2012):

$$S = \frac{3h + 2m + l}{h + m + l}$$

Where S is the mean score, h is the percentage of respondents that gave a "high" rating to the identified variable, while m and l are the percentage of respondents that gave a "medium and low" rating respectively to the identified variables.

4.0 Presentation and Discussion of Results

The paper first highlighted the questionnaire's distribution and the response rates of the respondents in the three categories of the sites visited.

Tables 4.1 shows the numbers of the questionnaires administered and the response rates in the large, medium and small sized firms for both management and masons respectively.

Table 4.3: Working Experience of Respondents for Management Staff in the Three Sites Categories

S/N	Working Experience	Large Firms	Medium Firms	Small Firms	All Firms	Percentage (%)
1	Less than 5 years	2	3	6	11	14
2	5 - 10 years	15	20	5	40	50
3	11 - 15 years	9	4	2	15	19
4	16 - 20 years	5	2	1	8	10
5	Above 21 years	5	1	0	6	7
	Total				80	100

Source: Field Survey, 2018

Table 4.1: Questionnaires Administered and Retrieved in the Three Site Categories for both Management Staff and Mason

Target Population	**Questionnaires Administered**				**Response Rates (%)**			
	Large Sized Firm	**Medium Sized Firm**	**Small Sized Firm**	**All**	**Large Sized Firm**	**Medium Sized Firm**	**Small Sized Firm**	**All**
Management	20	40	60	120	13(65%)	27(67.5%)	40(66.7%)	80(66.7%)
Mason	40	80	120	240	28(70%)	65(81.3%)	87(72.5%)	180(75%)
Total	60	120	180	360	41(68.3%)	92(76.7%)	127(70.6%)	260(72.2%)

Source: Field Survey, 2018

Table 4.2: Working Experience of Respondents for Mason in the Three Sites Categories

S/N	Working Experience	Large Firms	Medium Firms	Small Firms	All Firms	Percentage(%)
1	Less than 5 years	5	20	35	60	33
2	5 - 10 years	10	32	42	84	47
3	11 - 15 years	7	7	6	20	11
4	16 -20 years	4	3	3	10	6
5	Above 21 years	2	3	1	6	3
	Total				180	100

Source: Field Survey, 2018

Table 4.4: Position of Respondents for Management Staff in the Three Sites Categories

S/N	Management Staff	Large Firms	Medium Firms	Small Firms	All Firms	Percentage(%)
1	Architect	6	3	2	11	14
2	Builder	6	7	5	18	23
3	Engineer	7	10	13	30	37
4	Quantity Surveyor	6	9	5	21	26
	Total				80	100

Source: Field Survey, 2018

Table 4.5: Identification and Frequency Ratings of Training Methods for Masons

Training	**Management**									**Mason**								
Avenues	**Large**			**Medium**			**Small**			**Large**			**Medium**			**Small**		
	Sized Firm			**Sized Firm**			**Sized Firm**			**Sized Firm**			**Sized Firm**			**Sized Firm**		
Ratings	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**
Formal training	3	2	1	3	4	2	3	7	5	4	2	2	7	9	3	2	6	22
Informal training	3	3	4	5	6	4	15	7	3	7	4	15	10	18	7	40	18	5

Source: Field Survey, 2018

Table 4.6: Relative Index of Mean Score Placed on the Formal and Informal Training Methods for Masons

Training	**Management**				**Mason**			
Avenues	**Large**	**Medium**	**Small**	**All**	**Large**	**Medium**	**Small**	**All**
	Sized Firm	**Sized Firm**	**Sized Firm**		**Sized Firm**	**Sized Firm**	**Sized**	
Firm								
Formal training	2.33	2.11	1.87	2.10	2.25	2.21	1.33	1.93
Informal training	1.90	2.07	2.48	2.15	1.69	2.09	2.56	2.11

Source: Field Survey, 2018

The result in Table 4.1 shows that thirteen (13) out of the twenty (20) management staff in large sized firm filled and returned their questionnaires. Twenty-seven (27) and fourty (40) respondents did same in medium and small sized firms respectively. These represents an approximate percentage rates of 65%, 67.5% and 66.7% respectively for the three sites categories. Also, twenty-eight (28) out of the fourty (40) masons in large sized firm filled and returned their questionnaires. Sixty-five (65) and eighty-seven (87) respondents did same in medium and small sized firms respectively. These represents an approximate percentage rates of 70%, 81.3% and 72.5% respectively for the three sites categories.

From Table 4.2 above, it can be seen that over 80% of the respondents in the three sites categories have work experience of 5 years and above. Thus, it can be concluded that vast majority of the respondents in the three sites categories have good and reasonable working experience in practice of their trades. categories have work experience of 10 years and above. Hence, it can be concluded that majority of the respondents in the three sites categories have good and reasonable working experience in their various professional fields. The result in Table 4.4 above shows that 14% of the respondents in the three sites categories are Architect. While, 23%, 37%, and 26% of the total respondents are Builder, Engineer and Quantity Surveyor respectively. This implies that majority of the respondents in the three site categories are Engineers.

Training Methods for Masons

The major training methods for mason from literature are formal training in terms of technical/vocational training and informal training in terms of apprenticeship or on-the-job training. Table 4.5 below shows the ratings of training avenues for masons in the three categories of site. While Table 4.6 shows the mean scores placed on the formal and informal training avenues for masons.

The results in Table 4.6 above shows that informal training are highly preferred by the management of small sized construction firms with mean score of 2.48. This was followed by formal training with mean scores of 2.33 and 2.11 respectively for both large and medium sized construction firms. The higher premium placed on formal training by the management of large and medium sized construction firms might not be unconnected to the nature of their organization settings. They are more organized and formal in their recruitment approach and a certificate indicating the training received are always required of their skilled workmen before engagement. Mason on the other hand, shows that informal training is highly preferred by the management of small sized construction firms with mean score of 2.56. Followed by formal training with mean scores of 2.25 and 2.21 respectively for both large and medium sized construction firms. The result therefore made it possible to examine further training programmes that are available for masons in the construction industry.

Further Training Programmes for Masons

Table 4.7 and 4.8 below shows the ratings and premium placed on further training programs for mason in the three categories of sites.

Table 4.7: Identification and Frequency Ratings Attached to Further Training Programmes for Masons

Training Programmes	Management									Mason								
	Large Sized Firm			Medium Sized Firm			Small Sized Firm			Large Sized Firm			Medium Sized Firm			Small Sized Firm		
Ratings	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**
Workshop Avenue	2	2	1	3	2	1	1	2	1	8	6	4	5	4	3	3	3	2
Induction training	1	2	1	2	1	1	1	2	2	2	1	1	1	2	2	1	1	1
On-the-job	4	3	1	3	2	1	2	1	1	15	10	5	6	4	3	4	2	1
Refresher training	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	2	2	4
Skill Upgrading	1	1	2	1	3	2	1	1	2	1	2	2	1	3	2	4	3	2
Practical Demonstration	2	1	1	1	1	1	1	1	1	10	6	4	7	5	3	5	3	2

Source: Field Survey, 2018

Table 4.8: Relative Index of Mean Score Placed on Further Training Programmes for Masons

Training Programmes	Management				Mason			
	Large Sized Firm	Medium Sized Firm	Small Sized Firm	All	Large Sized Firm	Medium Sized Firm	Small Sized Firm	All
Workshop Avenue	2.20	2.33	2.00	2.18	2.22	2.17	2.13	2.17
Induction training	2.00	2.25	1.80	2.02	2.25	1.80	2.00	2.02
On-the-job	2.38	2.33	2.25	2.32	2.33	2.23	2.43	2.33
Refresher training	2.00	2.00	2.00	2.00	1.75	2.00	1.75	1.83
Skill Upgrading	1.75	1.83	1.75	1.78	1.80	1.83	2.22	1.95
Practical Demonstration	2.25	2.00	2.00	2.08	2.30	2.27	2.30	2.29

Source: Field Survey, 2018

The result from the Table 4.8 above revealed that on-the-job training is the most preferred type of training programme available for masons with mean score of 2.32 and 2.33 by both management staff and masons respectively. The two categories of respondents placed higher premium on the training scheme above other training for the skilled workmen. This might not be unconnected with the principle that operatives are equally productive during the course of training. Also, management staff of all firms ranked workshop avenue second with mean score of 2.18. While practical demonstration, induction training, refresher training and skill upgrading with mean scores of 2.08, 2.02, 2.00, and 1.78 were ranked third, fourth, fifth and sixth respectively.

Mason on the other hand, ranked practical demonstration, workshop avenue, induction training, skill upgrading and refresher training second, third, fourth, fifth and sixth respectively with mean scores of 2.29, 2.17, 2.02, 1.95 and 1.83 respectively. The least mode of training by the two categories of respondents are refresher training and skill upgrading. This might not be unconnected with the fact that construction projects are always executed within a contract period and this factor do not favour the retention of skilled workmen permanently by the management of medium and small sized construction firms unlike the large sized firms who are confident of continual patronage by the government as the largest clients in the industry. These, however, discourage the idea of sending operatives for training that will take a considerably lengthy time and money. Also, the nomadic nature of the operatives does not favour the retraining of the skilled workmen on permanent basis.

5.0 CONCLUSION

The study has evaluated the methods of training of mason for productivity improvement in Nigeria construction industry. The study concluded that small sized construction firms placed higher premium on informal training as the most preferred training method by the two categories of respondents in the study area. While large and medium sized construction firms placed formal training as their preferred training method for masons. The study also revealed that on-the-job training programme is the most preferred training scheme by the two categories of respondents.

Consequently, since majority of the mason are believed to have received informal training, there is a need to enroll them in Government Technical Colleges and Vocational Schools to acquire sound theoretical training that will enable them to read and write as well interpreting contract drawings on construction site.

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SECTION 3:

REAL ESTATE DEVELOPMENT AND PROPERTY MANAGEMENT

THE IMPACT OF EMOTIONAL INTELLIGENCE ON THE PERFORMANCE OF CONSULTANT ESTATE SURVEYORS AND VALUERS IN NIGERIA

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In real estate consultancy service, emotions underpin all clients' actions in decision making. As a result, emotional intelligence competencies are essential in determining consultant's performance in real estate service delivery. This study is aimed at evaluating the performance of consultant's emotional intelligence skills in Nigerian real estate consultancy service. Structured questionnaires were purposively administered to 236 real estate customers while 207 (88%) questionnaires were retrieved and found suitable for analysis. Data collected were rated on a five-point Likert scale and analyzed using exploratory factor analysis to determine the factor structure. Findings revealed that critical factors such as empathy skill, self –awareness and management skills, social skills, and motivational skill has an influence on the performance of consultant Estate Surveyors and Valuers in service delivery. The four critical factors produced a cumulative loading of 81.31%. The use of empathy and self-management skills being the foremost critical factors could be adopted as an approach to sustainable real estate service. However, the study recommends that NIESV should include training on emotional intelligence competencies in faculty curriculum for professional licensing for real estate consultancy service.

Keywords: Consultancy Service, Emotional Intelligence, Performance Evaluation, Real Estate Professionals, Nigeria

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1. Introduction

In real estate field, the very challenging demand for adoption of global best practice and standards in real estate services has unveiled the need for professionals to empower themselves with the requisite management and business consulting knowledge and skills. However, professionals should be capable of delivering better business consulting services to its clients. Studies has revealed that real estate business is not meeting the needs of the parties involved in real estate transactions (Haag *et al*., 2000; NIESV Newsletter, 2014). Clients consult real estate professionals for advice and may get emotional when considering transactions that are beyond their control. This can create an emotional meltdown or an emotional hijacking (Blocker, 2010). It is therefore crucial that real estate professionals are prepared to deal with requests and queries influenced by a broad spectrum of emotions.

In a number of situations, Goleman (1998) expressed that decisions on real estate transactions are based on elements (such as the pressure caused by an economic bubble) out of the control of the parties involved. Furthermore, the study of Blocker (2010) stated that the use of emotions was one of the three most popular methods chosen by real estate professionals to influence clients. It was concluded in the study that 46% of real estate agent-client relations lacked an appropriate emotional communication while only 26% of the real estate agents knew how to adapt to the emotional state of the client.

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Social and personal competencies such as self-awareness, optimism, and empathy have been shown to enhance both satisfaction and productivity at work (Yi and Andrew, 2007). These competencies were referred to as 'Emotional Intelligence' (EI). However, EI competency have been shown to differentiate leading professionals from less able performers. While EI performance has been associated with overall intelligence, adaptability, personality, satisfaction, and emotional disorders (Naghavi and Redzuan, 2011). Therefore, EI competencies are essential in determining not only employee job commitment and job satisfaction, but also includes the level of clients' satisfaction in service delivery. According to Yaya *et al.* (2016) EI enhances higher level of inter-relationships, mutual understanding and greater productivity at the work place. . In light of this, real estate professional with high EI could be better prepared to cope with emotional situations in real estate consultancy service.
Most empirical research have shown the positive impact of emotional intelligence on individuals' leadership ability (Butler and Chinowsky, 2006), work performance (Wong and Law, 2002), management ability (Zhou and George, 2003), academic performance (Parker *et al.*, 2005), and in their ability to perform cognitive tasks (Schutte *et al.*, 2001). In order to achieve a strong relationship between EI and performance, Multi-Health Systems (2001) advocated on the adoption of EI tests for personnel selection and development in service delivery
The study of Weisinger (2012) applied the importance of EI as it specifically related to real estate professional and their individual success. It was concluded that developing ones' EI through self-awareness and reacting appropriately in sensitive emotional situations are key to success for anyone in the real estate profession. The study of Blocker (2010) found that being on the same emotional wavelength with a client is an important factor to creating value and fostering positive relationships. However, when real estate professionals are not in the same wavelength, the relationship can deteriorate depending on which party possesses greater emotional intelligence. To foster positive relationship and enhance clients' satisfaction in service delivery, this research is set to evaluate the performance of consultant's emotional intelligence skills in Nigerian real estate consultancy service. This study will provide useful information for real estate professionals to sustain real estate consultancy service by recommending EI competencies on how to better serve their clients innovatively.

2. Literature Review

The importance of emotional intelligence has been well-documented in many literatures (Butler and Chinowsky, 2006; Weisinger, 2012; Yaya *et al.*, 2016). EI skills have gradually become more relevant to both workplace growth and people improvement (Khokhar & Kush, 2009). Emotional Intelligence is the ability to identify and manage your own emotions and to harness those emotions when applying them to tasks like thinking and problem solving (Yaya, 2007). Goleman (1995) declared Emotional Intelligence tools as follow:

i. **Self-awareness:** refers to knowing one's internal states, preferences, resources and intuition.
ii. **Self-management:** refers to the ability to manage one's internal states, impulses and resources
iii. **Motivation**: refers to the emotional tendencies that guide or facilitates reaching goal.
iv. Empathy: refers to awareness of other's feelings and perspectives.
v. Social skills: refers to adeptness at inducing desirable responses in others.

McEvoy (2008) assumed that the abilities and traits connected with emotional intelligence influence individual's aptitude to relate and interact well with others, communicate, negotiate effectively, manage stress, and resolve conflict perform in pressurized environments while

creating positive and supportive working conditions. Lopes, Cote and Salovey (2006) believe that all the processes derive from the connection between EI and individual's aptitude are likely to contribute to increase performance at work. Studies have supported the claim that individuals with high levels of emotional intelligence are more likely to achieve higher level of performance at work (Sy, Tram & O'Hara, 2006; Rode, Mooney, Arthaud-Day, Near, Baldwin, Rubin & Bommer, 2007). However, few of the research has indicated a significant link (Lopes *et al*., 2006; Mount, 2006). In contrast, Mayer, Salovey & Caruso (2000) argued that EI can only give the foundation for competencies that can predict job performance.

Many studies have attempted to prove the link between EI and job performance (Kathungu, 2010; Zainal, Zawawi, Aziz and Ali, 2017). The result of Janovics & Christiansen (as cited in Lopes *et al*, 2006) indicated that while emotional intelligence plays a role in job performance, other factors (such as personality traits) also reflects in individual's ability to perform at work. The study of Mount (2006) found that cognitive ability (IQ) only accounted for 19% of overall work performance, EI competencies accounted for 44% while skills and knowledge accounted for 38%. However, superior performers scored higher than average performers on many of the emotional intelligence competencies results generated. The findings of Bar-on *et al.* (2006) are in consistent with these results, even though the natures of work performance are significantly different. The study of Rode *et al.* (2007) found that the presence of both EI and conscientiousness established a strong positive relationship with individual performance while EI alone was not a strong predictor of individual performance.
Emotional intelligence competencies of service providers as a role to play in quality service delivery to achieve and sustain a competitive advantage between firms (CEL and Associates Inc, 1996; Lee and Dean, 1998), as determinant of business success (Araloyin and Olatoye, 2011) and as a barometer of corporate performance (Javitch *et al*, 1995). Ziv (2014) stressed further that emotional intelligence competences are what result and enhance personal, relational and professional performance, and what ultimately help attaining an overall increase in service quality for clients' satisfaction.

The study of Ogunbayo (2013) on the impact of builder's Emotional Intelligence on site workers performance in Nigeria Construction Industry highlighted some professionals EI attributes. These attributes are:

- Recognizing and meeting clients' need;
- the ability to manage oneself and responsibility;
- Understanding organizational politics to make decision;
- Keep disruptive positions and impulses under control
- Adjusting to the changing situation and overcoming obstacles.
- Sensing Artisans' emotions and understanding their perspective.
- Meeting internal standard of Excellence.
- Readiness to seize opportunities.
- Understanding your position emotionally.
- Consistent display of honesty and Integrity.
- Listening and sending a clear message.
- Realistic evaluation of your strength and limitation.
- Strong and positive sense of self-worth.
- Change and inspire with a compelling vision.
- Having propensity to bolster abilities through feedback and guidance.
- Initiating new ideas and leading artisans in a new direction.
- Wield range of persuasive tactics.
- Competency in promoting cooperation for building team.

- Ability to stop and solve the conflict.
- Good at cultivating and maintaining a web of relationship.

In the service industry like real estate consultancy, knowledge and skill required for specialized practice of management consultancy among the professionals is essential. Several past studies have attempted to study the EI among real estate professionals e.g. Swanson and Zobisch (2014) carried out a pilot survey on the understanding of EI in the field of real estate. Professionals stated that EI training is valuable and could be implemented in the overall training for the real estate profession. Swanson, Hamilton and Zobisch (2015) studied establishing best practices for including EI in real estate professionals. Findings revealed that EI could improve productivity and performance. Therefore, the need to evaluate the performance of professionals' emotional intelligence skills in delivery of quality service is imperative in order to retain customer and differentiate one firm from another in consultancy service.

3. Methodology

The study area for this research work is Lagos Metropolis. Lagos State is one of the prominent commercial centre, as well as the fastest growing urban area in Africa (Onwuanyi and Oyetunji, 2015). The restriction to Lagos metropolis was based on the fact that the vast majority of Nigeria's real estate profession pools here. Over 50% of Nigerian real estate professionals practice within the state due to its prominence as the foremost property market in Nigeria (Babawale, 2012). The membership directory of the NIESV (2002 edition) suggested that approximately 52% of real estate professionals' firms in Nigeria are based in Lagos metropolis. As a result of this, more than half of the real estate consultancy firms in Nigeria locate their head offices or branch offices within the metropolis (Amidu, Aluko & Hansz, 2008).

The target population for this study is mainly real estate service customers. These comprise of real estate investors, home owners, home buyers and tenants who employ the services of professionals/ consultants in real estate transaction. The professionals/consultants considered for real estate consultancy service in this study are the Estate Surveyors and Valuers (ESVs). The rationale for the adoption of ESVs lies in the fact that they are the professionals created by virtue of law to carry out real estate duties, with stamp and seal, for execution of real estate consultancy jobs in the country. One hundred and eighteen (118) real estate consultancy firms were randomly selected representing 50% of the total number of estate surveying and valuation firms in the study area. According to Araloyin and Olatoye (2011) it is believed to be a fair representation of the entire population. From each real estate consultancy firms, two (2) service customers were purposively selected given rise to a total number of 236 real estate service customers. Self-administered questionnaire was adopted as data collection instrument.

The questionnaire centres on 20 variables that could influence the performance of professional's emotional intelligence skills in real estate consultancy service. These variables were gotten from the highlighted professionals EI attributes in the study of Ogunbayo (2013). The variables derived from literature were related to the NIESV faulty curriculum of real estate consultancy service. More specifically, customers were asked to give their opinion on the importance of each variable that affect the performance of professional's emotional intelligence skills on a five point Likert scale: Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4, Strongly Agree = 5. The variables which are consider to affect the performance of professional's EI skills to render effective real estate consultancy service to their customers/ clients are stated below.

a) Recognizing and meeting clients' need.
b) Keeping client informed about matters of concern to them.

c) Sensing clients' emotions and understanding their perspective
d) Good at cultivating and maintaining a web of relationship
e) Competency in promoting cooperation building team
f) Propensity to bolster abilities through feedback and guidance
g) Ability to solve conflicts and improve quality of services
h) Understanding organizational politics to make decision
i) Readiness to seize opportunities
j) Ability to manage oneself and responsibility
k) Keeping disruptive positions and Impulses under control
l) Adjusting to the changing situation and overcoming obstacles
m) Meeting internal standard of Excellence
n) Realistic evaluation of your strength and limitation
o) Having a strong and positive sense of self-worth
p) Consistent display of honesty and Integrity
q) Listening and sending a clear message
r) Changing and inspiring with a compelling vision
s) Understanding your position emotionally
t) Wield a range of persuasive tactics

Exploratory Factor Analysis (EFA) by principal Components was adopted in the data analysis for the purpose of partitioning the variables into factors that influence performance in Nigeria real estate consultancy service provision. The exploratory factor analysis is to summarize the interrelationship and establish levels of variance in decision variables as they influence the given phenomenon.

4. Results and Discussion

A total number of 236 questionnaires were administered to real estate customers while 207 (88%) questionnaires were retrieved and found suitable for analysis. The sample is fairly represented the population surveyed. The KMO obtained for this study is 0.938 at a significant level of 0.000. This result coupled with a chi-square of 6142.897, shows that the use of factor analysis for the data gathered is appropriate in table 1 shown below.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.938
Bartlett's Test of Sphericity	Approx. Chi-Square	6142.897
	Df	190
	Sig.	.000

Source: Field Survey, 2018.

The communalities are shown in Table 2 reveals the proportion of the variance explained by the common factors. The communalities are in the range of 0 and 1 while 0 indicates that the common factors explain all the variance in the variable. However, communalities can be expressed as a percentage. For instance, recognizing and meeting clients' need with 0.933 indicates that 93.3% of the variance is accounted for by the common factors while the remaining 6.7% is accounted for by unique (unexplained) factors. The initial communalities are always 1.00 before the extraction of factors because at that initial stage every variable is regarded as a factor with a mean of 0 and standard deviation of 1.

Table 2. Communalities

Factors	Communalities
Recognizes and meet clients' need.	.933
Keeps you informed about matters of concern to you.	.932
Senses clients' emotions and understanding their perspective	.952
Good at cultivating and maintaining a web of relationship	.858
Competency in promoting cooperation building team	.864
Propensity to bolster abilities through feedback and guidance	.910
Ability to solve conflicts and improve quality of services	.758
Understanding organizational politics to make decision	.901
Readiness to seize opportunities	.925
Ability to manage oneself and responsibility	.836
Keep disruptive positions and Impulses under control	.961
Adjusting to the changing situation and overcoming obstacles	.914
Meeting internal standard of Excellence	.959
Realistic evaluation of your strength and limitation	.963
Have strong and positive sense of self-worth	.809
Consistent display of honesty and Integrity	.925
Listening and sending a clear message	.921
Change and inspire with a compelling vision	.899
Understanding your position emotionally	.877
Wield a range of persuasive tactics	.766

Source: Field Survey, 2018.

Social science rule state that only the variable with a loading equal to or greater than 0.4 in absolute terms and percentage of Variance greater than 1 should be considered meaningful and extracted for factor analysis (Akinwamide, 2018).

Table 3. Rotated Component Matrix Varimax

Variables	Factor groupings			
	1	2	3	4
Recognizes and meet clients' need.	.821			
Keeps you informed about matters of concern to you.	.863			
Senses clients' emotions and understanding their perspective	.867			
Good at cultivating and maintaining a web of relationship	.580			
Competency in promoting cooperation building team	.628			
Propensity to bolster abilities through feedback and guidance	.787			
Ability to solve conflicts and improve quality of services	.597			
Understanding organizational politics to make decision		.561		
Readiness to seize opportunities		.814		
Ability to manage oneself and responsibility		.538		.549
Keep disruptive positions and Impulses under control		.800		
Adjusting to the changing situation and overcoming obstacles		.802		
Meeting internal standard of Excellence		.724		
Realistic evaluation of your strength and limitation		.808		
Have strong and positive sense of self-worth		.544	.667	
Consistent display of honesty and Integrity			.693	
Listening and sending a clear message			.672	
Change and inspire with a compelling vision			.798	
Understanding your position emotionally				.595
Wield a range of persuasive tactics				.580
Eigen Values	**5.839**	**5.544**	**4.104**	**2.375**
% of Variance	**29.197**	**27.721**	**20.519**	**11.873**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 11 iterations.

The result presented in Table 3 was obtained based on social science rule. A total of four factors were extracted and the following four factor groupings were obtained.

Factor 1: Empathy Skill

Seven variables cluster in Factor 1. All the variables deal with consultant's ability to sense clients' feeling and perspective while taking an active interest in their concerns. However, this is referred to as "empathy" in EI competencies to achieve success in real estate consultancy service. These are:

i. Recognizing and meet clients' need.
ii. Keeping clients informed about matters of concern to them.
iii. Sensing clients' emotions and understanding their perspective
iv. Good at cultivating and maintaining a web of relationship
v. Competency in promoting cooperation building team
vi. Propensity to bolster abilities through feedback and guidance
vii. Ability to solve conflicts and improve quality of services

Factor 2: Self –Awareness and Management Skills

Eight variables cluster in Factor 2. All the variables deal with consultant's ability to know and manage their internal state, performance, preferences, resources and intuition in delivering professional advice as real estate consultant. However, this is referred to as 'Self –Awareness and Management Skills' in EI competencies to achieve success in real estate consultancy service. These are:

i. Understanding organizational politics to make decision
ii. Readiness to seize opportunities
iii. Ability to manage oneself and responsibility
iv. Keep disruptive positions and Impulses under control
v. Adjusting to the changing situation and overcoming obstacles
vi. Meeting internal standard of Excellence
vii. Realistic evaluation of your strength and limitation
viii. Have strong and positive sense of self-worth

Factor 3: Social skills

Four variables cluster in Factor 3. All the variables deal with consultant's ability to manage the relationship with clients effectively and adeptness at inducing desirable responses in others. However, this is referred to as ''Social Skills' in EI competencies to achieve success in real estate consultancy service. These are:

i. Have strong and positive sense of self-worth
ii. Consistent display of honesty and Integrity
iii. Listening and sending a clear message
iv. Change and inspire with a compelling vision

Factor 4: Motivational Skill

Three variables cluster in Factor 4. All the variables deal with emotional tendencies that guide or facilitates consultants in reaching goal when engaged in the real estate services. However, this is referred to as ''Motivation" in EI competencies to achieve success in real estate consultancy service. These are:

i. Ability to manage oneself and responsibility

ii. Understanding your position emotionally

iii. Wield a range of persuasive tactics

It was also observed in Table 3 that Empathy skill (factor) contributes 29.197% to performance of consultant ESV in real estate consultancy service. Self –Awareness and Management Skills, Social skills and Motivational Skill (factors) contribute 27.721%, 20.519% and 11.873% respectively. The four factors contribute a total cumulative percentage of 81.311%. However, the remaining 18.689% is accounted for by extraneous factors which are unique to the variable and other variables outside the control of the research.

5. Summary of Findings

The following were the summary of findings:

i. The research revealed that Consultant ESVs has little knowledge of EI for quality service delivery in the study area.
ii. EI competencies has a strong influence on the performance of Consultant ESV.
iii. The use of empathy and self-management skills were the foremost critical factors influencing the performance of Consultant Estate Surveyors and Valuers.
iv. Motivation skills among EI competencies account for the least influence on the performance of Consultant ESV in the study area.

6. Conclusion

This research has evaluated the performance of professional's emotional intelligence skills in Nigerian real estate consultancy service. Twenty factors were highlighted from the literature. These factors were assessed by respondents in relation to their influence on the performance of professional's emotional intelligence skill in Nigerian real estate consultancy service. The factor analysis results clustered these variables into four factors, namely empathy skill; self – awareness and management skills; social skill; and motivational skill. The four factors produced a cumulative loading of 81.31%. These critical factors emanating from intrapersonal and interpersonal skills contribute to the performance of professionals' emotional intelligence competencies in real estate consultancy service. This integrated approach to performance evaluation would help consultants achieve customers' satisfaction in real estate consultancy service.

7. Recommendations

The study therefore presents the following recommendations;

i. The utilization of EI skill should be encouraged among Consultant ESVs in capacity building for quality service delivery through training and research.
ii. The use of empathy and self-management skills being the foremost critical factors should be adopted as an approach to sustainable real estate consultancy service.
iii. NIESV should also include training on emotional intelligence competencies in their faculty curriculum for professional licensing for real estate consultancy service.
iv. Researchers should also research more on the use of EI to enhance collaboration for sustainable development in built environment.

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EMERGING BARRIERS TO EFFICIENT URBAN LAND ACQUISITION PROCESS FOR REAL ESTATE AND FACILITIES DEVELOPMENT IN NIGERIA

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It goes without saying that the bedrock upon which all man's endeavours as well as survival rest, is land. Thus, sustainable urban development, as it relates to real estate development thrives on enduring and efficient process through which land, as the most competitive of all components for property procurement is acquired, so as ensure its accessibility, affordability and less time consuming. It is quite disturbing that contemporary ills that have plagued the process of land acquisition, continue to retard the anticipated pace of the quantum of real estate development. Therefore, it is with a resolve to address these very emerging challenges, that this study was conducted. An admixture of probabilistic and non-probabilistic techniques of simple random and purposive sampling were employed for the administration of five-point Likert scale designed questionnaires, among 93 respondents that were considered sufficient for the sample frame, with enlistment of relevant officials of concerned land agencies within the six states of the southwestern Nigeria, together with land consultants such as estate surveyors and valuers, town planners, land surveyors, lawyers and NGOs with focus on land matters, as well as some categories of land developers and users. 81 questionnaires were collected and screened, validity tests confirmed 77 of these screened questionnaires to be of acceptable integrity, thus formed the basis for the analyses. The results showed as the highest amongst other things that slimness in the demographics of logistical strength in terms of human, material and financial resources of land agencies and selectivity in the application and compliance to statutes, laws and policies by land officers with 70 out of 77 respondents translating to cumulative average of 90.9% who are in unanimity to the adversities that these factors have on efficiency of land acquisition process. Hence, it is recommended among other things that the present configuration of land agencies of government to be role-specific by adopting single-task organisational design format to remove duplication and reduce cost and time associated with the present bureaucratically heavy set-up, as well incorporation of due diligence unit that checks all forms of abuse of office such as shifting of preference to political godfathers as against serving the interests of the citizens who genuinely need lands for developmental purposes, with a view to considerably increasing the stock of real estate assets in Nigeria.

Keywords: *Emerging barriers, efficient process, urban land acquisition, real estate, facilities development, Nigeria*

1.0 INTRODUCTION

It is becoming increasingly noteworthy, that there are emerging and disturbing experiences with which individuals and groups, that require land and its vast resources for one developmental purposes or the other, are made to pass through before they could acquire them, However, much as it remains highly incomprehensible to untangle most of the reasons for this ugly situation, it becomes clearer that some salient triggers are responsible for some, if not all of the inefficiencies bedevilling the process of land acquisition, especially within urban centres in Nigeria, as the case globally (Akinbola, 2017). It is indeed most worrisome to observe that conscious efforts of government, that are directed at making the acquisition of land clog-less have not yielded tremendous results, due to some lack of genuine commitment and weak

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political will to possibly step on toes if need be. Therefore, it must be further stressed that one of the several platforms with which the twin chord, that joins responsible governance with meaningful development can be understood, measured and appreciated, is surely an unhindered access to land and its vast resources (Yaghi, 2008; Xu and Yeh, 2009). Also**,** along the same scenario, is the assertion, as put forward that irrespective of multiplicity of socio-cultural structure and politico-economic system that are being institutionalised, the degree to which citizens are progressing as well as general prosperity in all fronts, are driven by the vibrancy of activities that are recorded via the land use and development spectrum, which is best made possible through an elegant acquisition processes (World Bank, 2008; Akinbola and Yassin, 2016).

Furthermore, it is pertinent to acknowledge the undercurrents besetting the process with which lands especially within the urban sphere is delivered, simply because the cost, time and general resource implications of clogged processes on the demographics of real estate investment in particular and overall urban development in general could be adversely phenomenal (Winter and Lobley, 2009). Also, it requires conscious efforts especially on the parts of government, in whose lies the authority to supply developable lands among teeming citizens, to ensure the pathways through which acquisition is done is made less bureaucratic, thus removing the avoidable lengthiness that usually greets all attempts being made to access sizeable lands for real estate development. It is needless to stress that, this ugly situation has consistently been having negative impact on the overall tenure arrangement in Nigeria, as it invariably pushes people to seek for faster route of acquiring lands, with little or no guarantee for good title, thus putting the so called owners at the risk of unfounded tenure and sometimes absence of rights of ownership on the land they so acquired (Akinbola and Salau, 2018)

Therefore, it is pressing more than ever before that there is every need, to urgently convoke a deeper and better understanding of some of these ugly *predators*, which cannibalise the chord that links the supply and demand sides of land acquisition spectrum, thereby creating an almost impossibility for a clog free acquisition pathways for acquiring lands for various development, especially real estate, deserves urgent attention. Hence, this study explored efforts such as proper contextualisation of the issues via literature excursion, with a view to distil and sieve the multifaceted undercurrents, as well as consolidating on gap that has been established with further empirical undertakings, by capturing revealed gap and subjecting them to consideration of respected opinions among relevant stakeholders. These attempts are necessary with a view to unravel such issues and thereby proffering solutions to them, in such a manner that is holistic, so as to eminently tackle both the immediate and mediate sources of such predators in a manner that is efficient, less resource consuming, yet sustainable. It is hope that a coherent implementation of some of these suggestions from this study stands to largely and enduringly address the ugly situation that is being experienced especially by citizens who are desirous of acquiring lands for one developmental concern or the other, most especially its overall effect on real estate development in Nigeria.

2.0 LITERATURE REVIEW.

It is pertinent to remark that the extent of cloglessness with which lands are acquired depends greatly on the degree of elegance of process which ostensibly wedges out all the undercurrents that are naturally acting as retardants in the land delivery pathways. Land and its vast resources continue to act as bastion upon which human survival rests; this makes it most imperative that a process that is devoid of hitches be evolved, so as to have an enduring spectrum that supports all round development. It is noteworthy that, much as it is being controvertibly held generally that finance is the most difficult as well as scarcest of all the components that constitute

ingredient for real estate development, land eminently has overtaken that trend in more recent times, due to demographic burst and non-commensurate deployment of commitment from the stakeholders, making the process so inefficient (Gough and Yankson, 2000; Akinbola *et al*, 2018). The level of efficiency with which government land agencies deploy relevant arsenals that are requisite to fast-paced acquisition of land is central to volumes of time and cost that are attendant to the frequency of development which resultantly culminates to the stock of real estate development in particular and urban development in general.

Hence, it is becoming increasingly clear that, officials of government land agencies in whose shoulders lie the driving of the process through which lands are acquired, but sadly that these officials by default of the organisational structure and sometimes their individual self-centredness have continued to perennially clog the process for which they are engaged to manage and sustain (Struyk *et al*, 1990; McAuslan and Farvaque, 1992). It is also worrisome to observe that this very ugly trend has no doubt resulted to gradual sickening of the system of land management as core and peripheral functions are being wrongly prioritised, thus leading to inefficiencies and ineffectiveness of the entire process, due partly to lack of focus and losing of patriotism that should surround career driven system that is expected to promote life dependent functions such as lands in all its ramifications, which incontrovertibly drives several other actions of citizens towards survival and development, but which state's officials are sadly not giving the cherished ideals that are expected (Akinbola, 2017).

Furthermore, it goes without saying that general level of uncertainty that pervades the society has permeated into the operational framework of the government land agencies, thus it clearly paints a picture of slowness on those considered to be drivers of urban land market, especially as their actions and inactions impact negatively on urban land use and development (Kombe, 2000; Akinbola and Salau, 2018). Along similar vein, it was being opined, that the lower-than-standard outputs of relevant agencies of government saddled with responsibilities of delivering lands would remain unimproved, as long as there is existence of *willful gang-up* as it is being exhibited by officials of land agencies with its anti-progressive effects in deepening the obvious unproductive working tradition that is anti-people, as it beneficial only to the selected few within the *clique* while unfortunately the process continues to fall short of its role of easing lands acquisition, thus furthering the sufferings of the citizens whose real estate's needs remain unsolvable or at best ill-solved (Emueze, 2000; UNESCAP, 2000).

Also, as enthused from a corollary that is akin to challenges that thwarts the supposed efficiencies with which lands would have been acquired, draw their base and strength from the loopholes in Nigeria's policy frameworks around which overall management and regulation of lands and its resources revolve. The situation is getting increasingly uncertain as to the exactitude of the rationale behind the consistent non-compliance with well stipulated provisions of relevant legal framework, which would have tremendously eased the speed of delivering lands. In addition to this is the retardation that is being ushered by poor implementation of various efficiency-driven statutory instruments of government by the land agencies' officials, thus clogging the process by making it inexplicably costly and lengthy, with their resultant effects on shrinking the anticipated demographics of real estate stock in particular and urban lands development in general (Kwame and Antwi, 2004 and Akinbola and Md Yassin, 2016).

Moreover, vivid consideration of the standpoints from researches by Agunbiade (2012) and Samsuddin, (2014), government land agencies that are saddled with twin responsibilities of controlling the use to which lands are put as well as managing the quantum of land resources together with prudent allocation in such a manner that is considered egalitarian, have sadly become so poorly performing and of low effectiveness, as a result of absence of elegance in emotional and psychological positivism of the players that drive government land agencies, which naturally bottom-line on dynamics of value system within which the players are

operating. Also, it was further stressed that, convoluted mental frame and thought process of the core drivers to properly visualise all currents assignments that are associated with management and control of land within the purview of larger developmental agenda of government in serving the citizens, are to a considerable extent impacting adversely on the processes of land acquisition [Alden, 2008; Meinzen-Dick, 2009].

Furthermore, it must also be emphasised that there abound series of well documented findings, which succinctly finger the dysfunctional performance of government land agencies due to the lack of deep understanding of the nexus that connects the socio-economic wherewithal of the citizens to land development potentials, thus creating a sort of inappropriate policies to govern land and its resources (Mabogunje, 2003; Vanderbrink *et al*, 2010). It is not a gainsaying that land acquisition processes will be made sleepy and finally become sick and dead if volume of transactions which are supposedly tradeable are shrunk due to inactivity of the stakeholders especially the land developers, due to disconnect between the eco-financial realities of the players and sustained efficiency of the acquisition process, as deepened by the policy framework's overstating of utopian standards and requirement that are way beyond the capacity of the majority of citizens, with a concomitant adverse impacts on the developmental tempo that commensurate with the demographic strength of Nigerians, especially within the urban centres (Omirin, 2003; UNECE, 2005a; Mabogunje, 2005; Agbato, 2006).

Therefore, it is against the above background, as it was reflected through the arrays of issues involved, that the contemporary challenges which are emerging, such as the dynamics of citizens' demographics cum overgrown expectations from them as well as the endemic *lukewarmness* from all stakeholders. especially the government land agencies, upon whose shoulders falls eminently the mandate of driving the process with which lands are acquired, together with other mundanely established factors such as non-readiness and uncooperative body languages of the land developers with due diligence, with overall effects of the totality of these challenges on the real estate and urban development generally, are the thrusts around which the essence of this study revolves.

3.0 MATERIALS AND METHOD

3.1 Data Collection

The surveys began with a pilot study among all the actors across the length and breadth of relevant ministry, department and agencies of government, who were acknowledged to be internal players in the spectrum of land acquisition process, as well as independent land processing consultants, together with various classes of property developers and general land users plus few not-for-profit organisations with land and shelter inclined mandates, were considered as external players to land acquisition architecture, so as to have a better grasp of empirical dimension of the work, by revealing exactitude of those that qualify as respondents and to test the veracity of some of the undercurrents that are revolving around the issues involved in this study through literature. Therefore, with the use of an admixture of simple random with purposive sampling techniques, with a view to achieving a fair, balanced and unbiased empirical outcomes from these two-opposing sets of internal and external players (respondents), upon which 93 annotated questionnaire, which are comprised of 36 brain raving research queries that were calibrated and subsumed into 12 summarised measuring constructs, for crisp and deeper appreciation by the targeted respondents, were distributed. Hence, 81 questionnaires were successfully retrieved, but 77 were considered valid after integrity screening.

3.2 Data Analysis

The gathered data were analysed, with the aid of statistical methods of frequency and simple percentages in tabular forms via a 5-point Likert measurement scale, from where verifiably strong inferences were adduced, leading to the final interpretation of the outcomes from this study through results and discussion of findings. Table 1 sheds light on some of the responses of the targeted stakeholders, as distilled from the returned questionnaires for analyses, with the application of averages of responses from the two determinant statements of each of the measuring parameters, to draw necessary inferences and judgement from the data displayed on the tables, thus:

Table 1 – Outputs of Frequency and Percentile Analysis of Gathered Data

S/N	**Constructs of Contemporary Debacle From Calibrated Research Queries on Land Acquisition Processes and Their Scaled Responses from Land Agencies' Officials, Independent Land Consultants, Land / Shelter NGOs and Land Developers / Users.**					
	Constructs Summary	No Effects	Minimal Effects	Uncertain Effects	Some Effects	Great Effects
1	Discordance and Rivalry in Interrelationship: C_1R_{LS}	(4) 5.19%	(9) 11.69%	(3) 3.89%	(33) 42.85%	(28) 36.36%
2	Wieldy Organisational and Administrative Structure: C_2R_{LS}	(5) 6.49%	(7) 9.09%	(2) 2.59%	(36) 46.75%	(27) 35.06%
3	Poor Sophistication in Human Capital Base: C_3R_{LS}	(7) 9.09%	(15) 19.48%	(3) 3.89%	(32) 41.55%	(20) 25.97%
4	Slim Demographics in Agencies Logistical Strength: C_4R_{LS}	(2) 2.59%	(4) 5.19%	(1) 1.30%	(42) 54.54%	(28) 36.36%
5	Poorly Wand Psychological Worldview: C_5R_{LS}	(4) 5.19%	(10) 12.99%	(2) 2.59%	(31) 40.25%	(30) 38.96%
6	Schemed and Selective Compliance with Policies:C_6R_{LS}	(1) 1.29%	(4) 5.19%	(2) 2.59%	(43) 55.84%	(27) 35.06%
7	Superiority Versus Inferiority Complexities: C_7R_{LS}	(2) 2.59%	(5) 6.49%	(3) 3.89%	(37) 48.05%	(30) 38.96%
8	Poorly Constructed Sociological Dynamics: C_8R_{LS}	(3) 3.89%	(8) 10.39%	(3) 3.89%	(35) 45.45%	(28) 36.36%
9	Government's Utopian Land-based Fiscal Dependence: C_9R_{LS}	(2) 2.59%	(5) 6.49%	(4) 5.19%	(39) 50.64%	(27) 35.06%
10	Mentorship Failure and Gap in Civil Service Culture: $C_{10}R_{LS}$	(9) 11.68%	(8) 10.38%	(3) 3.89%	(32) 41.55%	(25) 32.46%
11	Multi-Dimensional Corruption and Related Practices: $C_{11}R_{LS}$	(5) 6.49%	(7) 9.09%	(2) 2.59%	(40) 51.94%	(23) 29.87%
12	Favouritism and Preference for Politicians: $C_{12}R_{LS}$	(4) 5.19%	(10) 12.99%	(2) 2.59%	(31) 40.25%	(30) 38.96%

Source: Authors' Field Survey, 2019

4.0 INTERPRETATION OF RESULTS AND DISCUSSION OF FINDINGS.

Table 1 exclusively captures the scaled responses of various stakeholders. The following are the interpretations of all the summarised research queries that are calibrated into 12 measurable constructs, against which the efficiency or otherwise of the processes through which urban lands are being acquired in Nigeria. Essentially, this is with a view to gauge the overall impacts of these inferences on the development and stock of real estate assets in Nigeria. The interpretation are as follows, viz:

1. Responses to the first summarised construct, that is, discordance and rivalry in interrelationship among land agencies, with average of 33 respondents, which translates to 42.85 and 28 respondents which translates to 36.36% are saying there are some levels of effects as well as great levels of effects respectively, which such serious issues of rivalry and discordance of interrelationship among the government land agencies have on Nigeria's land acquisition processes and thus make it debacled. Thence, it often leads to all sorts of difficulties that are being faced by citizens in acquiring lands

especially within urban sphere, which results to continual retardation of the development of real estate assets in Nigeria.

2. Responses to the second summarised construct, that is, wieldy organi-administrative structure of land agencies, with average of 36 respondents, which translates to 46.75 and 27 respondents which translates to 35.06% are saying there are some levels of effects as well as great levels of effects respectively, which important factor such as wieldy organi-administrative structure of the government land agencies has on Nigeria's land acquisition processes and thus make it endangered. Therefore, it often leads to all some of challenges that are being faced by citizens in acquiring lands especially within urban sphere, which results to continual downward trend in the development of real estate assets in Nigeria.

3. Responses to the third summarised construct, that is, poor sophistication in human capital base among officials of government land agencies, with average of 33 respondents, which translates to 42.85 and 28 respondents which translates to 30.44% are saying there are some levels of effects as well as great levels of effects respectively, which serious issues such as lack of desired sophistication in technical capacity of the officials of government land agencies have on Nigeria's land acquisition processes and thus makes it less of capacity and capability that are commensurate with the intensity of tasks involved. Thence, it copiously contributes arrays of hick-ups that are being experienced by citizens in their bid to acquiring lands especially within urban sphere, which culminates in perennial low ebb that surrounds the development of real estate assets in Nigeria.

4. Responses to the fourth summarised construct, that is, slim demographics in logistical strength of government land agencies, with average of 42 respondents, which translates to 54.54% and 28 respondents which translates to 36.36% are saying there are some levels of effects as well as great levels of effects respectively, which serious factor such as insufficient logistics in terms of quantum of human and material resources shortage that bedevils government land agencies have on Nigeria's land acquisition processes and thus make it highly overburdened with workload. Thence, it often leads to diversities of hardship which citizens are made to go through, such as lengthiness of processing time and additional to be borne by various categories of applicants in their strive to acquiring lands, especially within urban sphere, which results to long term dampened tempo in the development of real estate assets in Nigeria.

5. Responses to the fifth summarised construct, that is, poorly wand psychological worldview of sizeable population of the stakeholders that are driving government land agencies, with average of 31 respondents, which translates to 40.25 and 30 respondents which translates to 38.96% are saying that there are some levels of effects as well as great levels of effects respectively, which a serious issue such as illness in thought process of the officials of government land agencies has on Nigeria's land acquisition processes, partly because it touches their perceptual position on issues of administration vis-à-vis avowed resolve to serve larger society's goodness as an assumed mandate for which they are on such role(s). Sadly, this kind of unfortunate scenario adversely impacts on entire system and process, which often snowballs to all sorts of difficulties that are being faced by citizens in acquiring lands especially within urban sphere, hence, it results to continual downward trend in the development of real estate assets in Nigeria.

6. Responses to the sixth summarised construct, that is, schemed and selective compliance of policies among officials of government land agencies, with average of 43 respondents, which translates to 55.84 and 27 respondents which translates to 35.06% are saying that, there are some levels of effects as well as great levels of effects respectively, which an unwholesome situation such as decision to jettison some stipulations of policies by land agencies officials while applying them towards guiding the manner with which lands are managed and controlled for development, for reasons of safeguarding of their personal interests at the expense of the general good of the entire citizenry. This has undoubtedly affected level of performance in terms of speed and coverage in the discharge of functions of government land agencies in Nigeria, which leads to all sorts of untold hardship that are being faced by applicants in their efforts to acquire lands, especially within the urban milieu, thus burgeons into serious trend of reduction in the volume of development of the real estate assets in Nigeria.

7. Responses to the seventh summarised construct, that is, superiority versus inferiority complexities among officials of various departments and units of government land agencies, with average of 37 respondents, which translates to 48.05% and 30 respondents which translates to 38.96% are saying that there are some levels of effects as well as great levels of effects respectively, which ugly factor such as

an un-esteemed treatment and bi-directionality of low-level regards among those that are considered core drivers of the government land agencies have on Nigeria's land acquisition processes, as this makes the system highly unpleasant for productivity that is desirable for a twenty-first century operations that are needed to truly address several land developments request of Nigerians. This scenario indisputably contributes to all sorts of hick-ups which citizens are made to go through in their efforts to acquiring lands, especially within urban sphere, as it resultantly leads to shrinking of the activities that push the development frontiers of real estate assets in Nigeria.

8. Responses to the eighth summarised construct, that is, poorly constructed sociological dynamics, upon which teamwork that a task-inclined job function such as land management and control are templated, is being exhibited by sufficient number of land agencies officials, with average of 35 respondents, which translates to 45.45% and 28 respondents which translates to 36.36% are saying that there are some levels of effects as well as great levels of effects respectively, which a serious issue such as disjointed group spirit has on the cherished discharge of the duties of the land officials in such a manner that is smooth and effective towards making acquisition process very proactive. Unfortunately, this kind of situation negatively impacts on the entire acquisition process, with attendant effects manifesting as challenges that are being faced by developers in acquiring lands especially within urban sphere, hence, it culminates in unceasing downturn in the development of real estate assets in Nigeria.

9. Responses to the ninth summarised construct, that is, government utopian land-based fiscal dependence, with average of 39 respondents, which translates to 50.84 and 27 respondents which translates to 35.06% are saying that, there are some levels of effects as well as great levels of effects respectively, which an unfortunate scenario such as reduction in the desirable budgetary allocation to the concerned agencies, but instead government in turn expects much of revenue to finance her public responsibilities from land related revenue sources, thus leading to serious shortage of funds to efficiently drive the multidimensional operations of the agency. Incontrovertibly, this affects level of performance in terms of quality and quantity of service being rendered, which leads to all sorts of unimaginable setbacks that are being faced by all stakeholders in their efforts to deliver and acquire lands, especially within the urban milieu, which ultimately contributes to retarded tempo in the development of the real estate assets in Nigeria.

10. Responses to the tenth summarised construct, that is, mentoring failure and gap in civil service culture, sufficient presence of which provides broad chord of experience and hands on wizardry with which an innovative driven tasks involved in land administration, management and control require. Unfortunately this is lacking in majority of the land agencies and are sufficient number of land agencies officials, with average of 32 respondents, which translates to 41.55% and 25 respondents which translates to 32.46% are saying that there are some levels of effects as well as great levels of effects respectively, which a serious issue such as non-pragmatic platform through which culture of mentorship can be deepened, with attendant adverse effects on sustenance of rich ideals and virtues associated with integrity and hardwork with its propensity for breeding of new ideas, has on stakeholders especially the core drivers of land management and control functions. Sadly, this trend adversely impacts on the entire acquisition process, with attendant effects being experienced as difficulties that are being faced by applicants in their strive towards acquiring lands especially within urban sphere, hence, it burgeons into serious trend of reduction in the volume of development of the real estate assets in Nigeria.

11. Responses to the eleventh summarised construct, that is, multi-dimensional corruption and related practices, among various categories of stakeholders especially officials of government land agencies, with average of 40 respondents, which translates to 51.94% and 23 respondents which translates to 29.87% are saying there are some levels of effects as well as great levels of effects respectively, which seriously despicable factor such as abuse of office for pursuit of personal goals and interests that are considered inordinate and very prejudicial to the cherished goodness of all citizens, as it they have grossly affected the entire formal system of land delivery through which acquisition of land especially within the urban milieu is processed in Nigeria and thus make it highly endangered so much that productivity and efficiency are clearly absent in some of these land agencies, when compared with the enormity of tasks they are saddled to handle.. This has clearly culminated in immeasurable difficulties on several complexions which citizens are conditioned to go through, such as wilful delay or outright non-processing of land development applications of common citizens that are considered to be low bidders, thus resulting to long term shrunk tempo in the development of real estate assets in Nigeria.

12. Responses to the twelfth summarised construct, that is, favouritism and preference for politicians by officials of government land agencies at the expense of general citizenry who they are supposed to serve have impacted land agencies that are responsible for processing of land development applications of several categories of users and developers very adversely, with average of 31 respondents, which translates to 40.25 and 30 respondents which translates to 38.96% are saying that, there are some levels of effects as well as great levels of effects respectively, which an unfortunate scenario such as misplacement of the interests of citizens at the service of the few political gladiators by core drivers of government services have on the overall acquisition process with which lands especially within the urban sphere is being accessed. This has undebatably affected the efficiency and effectiveness of land agencies, in terms of missing the targets around which government development programmes in the area of accessibility of land and affordable shelter revolve, as against serving the interests of the few influential cronies for possible return of favour, etc. Thence, this very inexplicable trend leads to all sorts of unprecedented drawbacks that lay in the pathways of land acquisition which all stakeholders, especially land development applicants are made to experience in their efforts to acquire lands, especially within the urban milieu, as it ultimately contributes to considerable reduction in the development of the real estate assets in Nigeria.

5.0 CONCLUSION AND RECOMMENDATION.

5.1 Conclusion

Foremost, it is being clearly established from the findings of this study that, land acquisition process in Nigeria is truly not as efficient as it is desired, this without much ado is due to some systemic as well as external factors, among which slim demographics of logistics strength of land agencies, as well as selective and schemed application and compliance of policies by land officials rank very high. It is noteworthy to state with emphasis that nonetheless the presence of these damning challenges, all stakeholders, especially at the governmental level are taking every necessary step to inject breath of life into some of the several organs that hold the fabrics upon which process of land acquisition rests. Further to this is the fact that, efforts are being made to step up partnership and collaborations with regulatory and research organisations that have mandates in strengthening institutions that are of low performance, with a view to bringing them to parity in all ramifications of effectiveness and efficiency among other parameters. It is confident to state that, if these are sustained, these present not-so-tasteful trends and scenarios will be reversed in no distant time and it is no doubt that, such improvement shall birth cherished level of efficiency of the process with which acquisition of lands is being made, with commensurate increase in the stock of real estate and facilities in Nigeria.

5.2 Recommendation

It is very expedient to acknowledge the series of challenges which findings from this study have revealed. Thence, it behoves on every single patriotic citizen to crave for ways of making the process of acquiring lands anywhere in the country most especially in the urban centres faster, more efficient and more cost effective than it was in the past. The following are some of the steps suggested for making land acquisition process in Nigeria more efficient and to address some of the challenges emanated from the findings of this study, viz:

1. Decisive efforts are urgently craved to reawaken the spirit of collectivism in the midst of land officials and infill the system with a mechanism that removes instability in the official intra-departmental dealings among units and divisions of land agencies. It is no doubt that redirecting of roles by reconfiguring the entire land agencies of government to a specific-role design format will drastically reduce or totally remove rivalry and discordance among officials of several departments of land agencies, this shall improve the process with which lands are acquired.
2. Government institutions that are saddled with the responsibilities of evolving and maintaining public systems, especially a people system such as land agency, should endeavour to institute benchmarks with which such systems can be objectively evaluated by the citizens

they are created to serve, so as to generate timely feedbacks for overall efficiency and effectiveness.

3. There is urgent need for the creation of a platform that allows partnerships and collaboration among various departments and units of land agencies, with a view to share experiences and practices, with a view to incorporate spirit of commonness in goal achievement and progress focused thinking. This will surely assist in exploiting the numerous enlightenment and knowledge sharing motives that are offered by similar agencies in other regions of the world, with a view to make Nigeria's land agencies global in orientation and operations.

4. More than ever before, there is a need for a vibrant mechanism through which officials of government institutions such land agencies are consistently monitored and assessed to ensure strict, total and non-selectivity in the application and compliance with relevant statutes and policies in the discharge of their duties to the public. This will surely drive the process of land acquisition in a manner that is enviable.

5. Government should consciously make it a policy position that adequate provision in terms of sufficient budgetary allocation for financial, material and human resources are adequately made available to truly drive the process of land acquisition via these land agencies on the one hand, as well as discontinuance in the culture of overreliance on the revenue that are accruable from land-based sources to finance public responsibilities, which more often do make land agencies to be of little or low demographics in logistics with respect to the three elements of human, material and finance, as this makes it extremely difficult for them to achieve desirable level of efficiency.

6. It is needless to stress the need for government to constantly be overhauling her public institutions including the land agencies, with a view to achieving efficiency, operational optimality, saving of man hour wastage, increase in turn over-job delivery-wise and revenue generation-wise. This will in turn culminates in long term growth and development of the system in terms of the human and other assets of such organisations, so as to measure up with enviable dexterity that is with global best practices parity.

7. There is every need to also ensure modalities to recalibrate the minds and standpoints of land agencies officials in terms of total value rebirth which instils into them a completely changed socio-psychological perspective to life, with a view to making them see the work they are saddled to discharge as that one to serve humanity, thus there won't be a culture of giving favourable disposition and preference to political gladiators and others with powers and / or influence at the expense of the citizens. This ostensibly removes the conspicuous level of corruption and other related practices, thus increases the efficiency of land acquisition process.

8. Holistic re-configuration of land agencies to remove lopsided role and job allocation cum supremacy for some cadres and professions, with attendant gravy consequences of overbearing tendencies which births dichotomy of inferiority and superiority among the land agencies officials is very timely and important. This could be by way of set among the organisational rules, a sort of modalities for engagement among all professions involved in land management and administration, with a view to improving on individual's level of performance and overall effectiveness of land agencies for all-round efficiency of land acquisition process in Nigeria.

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CHALLENGES OF ACCESSING AFFORDABLE HOUSING BY LOW-INCOME CIVIL SERVANTS IN ABUJA, NIGERIA

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Abstract
The influx of civil servants into Abuja the Federal Capital Territory (FCT) of Nigeria has made housing a major challenge for the civil servants in FCT. Government was not fully prepared to combat the effect of such growth in population in the area of housing. Thus, accessing affordable housing for the teeming population, particularly the low –income civil servants has been a major challenge in Abuja. This study presents a part of a larger research work which is on-going that aims at examining affordability and accessibility of the housing for low-income civil servants' residents in the FCT, Abuja. At present, this study used a comprehensive literature to identify various challenges confronting the low-income civil servants in accessing affordable housing in Abuja. The study revealed that the low-income civil servants resident in Abuja could not access decent housing due to the unchecked population growth, negligence in the area of sustainability, lack of appropriate pricing mechanism, unproductive government regulations/policies on housing, poor procurement method, land acquisition problem and funding/payment constraint, which incredibly has a resultant effect on their performance and productivity. Based on these findings, the study concluded by recommending that government should intensifies effort on provision/delivery of sustainable affordable housing, adopt a workable pricing mechanism that can address the needs of this class of civil servants, simplify the procurement method by adopting E-procurement, allocate lands to low-income civil servants and channelled the deduction from source to their Pay point/National Housing Fund, and lastly government should adopt own a house with your rent approach in combating funding/payment challenges.

Keywords: *Abuja, affordable housing, challenges, civil servants, low-income*

Introduction

Housing is universally accepted as the second most important human need after food, it is more than shelter i.e. it is more than providing a roof over one's head Akinmoladun *et al* (2007). Also, Nubi (2000) stated that housing is also one of the best indicators of a person's standard of living, provides investment opportunities, offers shelter and privacy and enhances one's social and cultural status in the society. Housing is an important indicator of the physical, economic and social development of any nation, representing one of the most basic human needs Nicholas *et al (*2015). A house provides the 'necessary foundation' for every being to live during the social and physical actions Byrne *et al* (2007). As a unit of the environment, it has a profound influence on the health, efficiency, social behaviour, satisfaction and general welfare of the community Onibokun (1990). Housing provides a link between the physical development of a city, and its social and economic outcomes. The availability of decent housing for each family defines the level of development which the country has reached. This is because the social and economic wealth of the country can only co-exist with good housing Alao (2009).

National Bureau of Statistics (2017) reported that Nigeria has an approximate population of 197 million. However, the Federal Ministry of Power, Works and Housing (2017) reported a housing deficit of 17 million, despite the several housing policies the government have

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formulated. Past succeeding governments in Nigeria since independence had highlighted housing as a major priority. Unfortunately, Nigeria is yet to develop a vibrant mortgage market and houses continue to be provided through the tortuous traditional method of buying land and building over some years, which could be an individual's entire life time. In many cases such buildings are left uncompleted or individuals have to deplete their entire life savings in order to build a home Akeju (2007). After the World War II, the price of real estate market became more unstable because the economy of many countries has increased dramatically. Houses thus became 'more expensive' in many countries from the beginning of 21st century Haffner *et al* (2010). The gap between high-income and low-income group is so wide. Thus, for low-income group, to own a reasonably comfortable house is like day dreaming.

Although, there is no official definition of 'affordable housing' yet, however, there is a wide acceptable definition about the 'target group' of affordable housing that was defined by Wallace (1995) that if a family's total monthly cost is less than 30% of householder's income (United States life cost level), the affordable housing policy would be applicable. Different countries have difference affordable housing policies. For instance, in Canada and United States, local governments seem firmly committed to increasing the availability of affordable housing through a variety of innovative subsidy programs; In China, affordable housing involves the national construction program and it was organized by the real estate department of province government to provide a suitable housing environment for the low-income families. The development history of affordable housing showed that western countries and eastern countries are in different situations and cannot share the same policies. The affordable housing system development started very early in the U.S. and Europe, but in Asian countries, it started from the middle of 20th century. Some of the high developed countries and areas in Asia like Singapore and Hong Kong started their affordable housing project from 1950s, which seemed quite early in Asian area. In the recent decades, China government made very hard efforts to develop affordable housing for the low-income earners in order to keep the growth of society stable.

Abuja, the FCT of Nigeria has been described to be one of the fastest growing cities in Africa, with a census population of 776, 298 in 2006, and an approximate present population of 3.4 million NBS (2017), occupying approximately 8,000km2, this has led to a massive over population, high cost of housing and the creation of squatter settlements and slums. Olanrewaju *et al* (2016) revealed that the increase in house prices has outpaced the income of individuals by a significant margin, leaving mostly the medium and lower-income groups out, because affordability and accessibility has become a serious problem. Previous studies such as Aribigbola (2008) revealed the lack of contribution of the housing policy due to the unaffordability of the houses to vast low income earners. Adedeji *et al (*2009) observed the low level of access to housing finance by low-income earners, although there are few interventions of private developers and cooperative societies. Olotuah *et al* (2009) in a critique of the past public sector housing policies in Nigeria iterated that the government have the wrong perception of housing needs of the low-income earners, who incidentally constitute the vast majority of urban dwellers. Ukwayi *et al* (2012) noted the increase in the fund mobilization by mortgage finance banks but they were done without proper government monitoring, thus, hindering its effectiveness and impacts.

Despite these previous studies, accessing affordable housing by low-income civil servants in Nigeria particularly Abuja is still a mirage. It is on this premise that this study becomes imperative with a view to identifying the challenges in accessing affordable housing by low-income civil servants in FCT, Abuja. It is believed that this study will provide a greater insight

to the challenges in accessing affordable housing, which will enable the policy makers to formulate policies that make affordable housing accessible to civil servants in Nigeria at large.
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Literature Review

Overview of Global Housing Challenge

Shelter is a fundamental need and right of every citizen, but housing is more than shelter. Decent and affordable housing provides a platform for lots of things. These include: conducive environments for education for children, access to jobs for the adults, increase for economic prospects, epidemic and diseases control, crime and security measures Habitat for Humanity (2011). Housing has been a long term focus in urban developments, social and economic policy, some countries such as USA, Sweden, UK, have achieved tremendous feat in meeting the housing needs of their countries; while others still face huge deficit of housing shortage, substandard housing and slums. McKinsey Global Institute (2014) conducted a survey and found out that an estimated figure of 330 million urban households live in substandard housing and are equally stretched financially by housing costs, in the developing countries, 200 million live in slums, and these statistics will be worsening by 2025 based on the urban migration and income growth (1.6 billion people would occupy crowded, inadequate and unsafe housing and will be financially stretched).

The greatest challenge for fast growing cities is keeping pace with the demand for housing and services, the United Nation projects the next two decades, 90 percent of urbanization will take place in developing countries, whose total populations are expected to grow at an estimated figure of 70 million per annum. Despite the several private developers in the housing market, the economics of real estate has compelled developers to focus on upper or middle income households, and mortgage finance rarely extends to households with incomes below 60 percent of the local area median income.

Housing Provision in the FCT, Abuja

Abuja is located in the central part of Nigeria, lies at a latitude of 9° 07N and longitude 7° 48'E It became the Federal Capital Territory (FCT) as the new administrative capital of Nigeria on the 12th December, 1991. It was established to battle the problems experienced with Lagos as the then capitals, problems like housing shortage, traffic congestion and overstressed infrastructure Muhammad *et al* (2015). The Abuja master plan envisaged a population of 3.2 million residents with a target year of 2000; however this population target was exceeded as a result of a population explosion before its development was completed. The city has witnessed a massive influx of people due to social, economic, and political factors Muhammad *et al* (2015). With less than 50% of the developmental plan achieved, the population of the city stands at an estimated figure of 5 Million NBS (2017). Within a span of twenty six years (1991-2017), the city has grown from 387,671 in 1991 to a projected figure of 4,984,381 in 2017 NBS (2017). With an estimated growth rate of 9.3% Elaigwu (2009). Abuja city is facing an acute housing shortage, compelled by the spontaneous relation of federal employees without adequate accommodation provision and the constant influx of people since 1991 Abubakar (2014).

The Federal Government was involved in the provision of houses, infrastructure and service, for instance, 22,000 housing units in phase 1 and 2, and the Gwarimpa Housing Estate were constructed. A dwindling allocation of funds has made the FCTA unable to develop the city to a level of accommodating the abnormal rate of population influx. As at December 2012; the FCTA had an existing infrastructure liability of over N420 billion as against the budgetary allocation of N50 billion Muhammad *et al* (2015). In an attempt to bridge the housing deficits and need in the city, the FCTA initiated the Mass Housing Scheme in the year 2000 under its

Public-Private Partnership (PPP) program. It focuses on creating an enabling environment for more active private sector participation, under this scheme, the government is to provide primary infrastructure and allocate land to private developers. In turn the private developers will provide the secondary and tertiary infrastructures, develop and sell completed houses to members of the general public Waziri and Roosli (2013).

Research Methods

This paper presents a part of a larger research work which is on-going that aims at examining affordability and accessibility of the housing for low income civil servants residents in the Federal Capital Territory, Abuja. The study area is restricted to Abuja because the vast majority of civil servants resident there cannot afford to pay their rents not to talk of buying the houses in the property market in Abuja Abubakar (2014). This has given rise to series of slums within Abuja metropolis. The research covers within the period of 1999-2018 being the era the country transits from military rule to democratic government. At present, this paper used a comprehensive review of literature to identify various challenges confronting the low-income civil servants in accessing affordable housing in Abuja.

Findings

Table 1 shows the challenges confronting the low-income civil servants in accessing affordable housing. It can be seen from Table 1 that 28 challenges were identified, which was categorised into six main categories. These include: population, sustainability, pricing mechanism, regulations/policies, procurement method, land acquisition, and funding/ payment. It is evident from the Table 1 that challenges associated with funding/ payment, followed by regulations/policies related challenges, and land acquisition issues respectively were prevalent challenges confronting the low-income civil servants in accessing affordable housing in major cities at large.

Table 1: Identified challenges in accessing affordable housing by low-income earners

Category	Challenges	Total
C01 Population	• Increase in population • High rate of urbanisation	2
C02 Sustainability	• Poor consideration of sustainability in housing delivery • Substandard quality of housing units	2
C03 Pricing mechanism	• Lack of appropriate pricing mechanisms • Unsustainable home price appreciation	2
C04 Regulations/Policies	• Conflicting legal requirements • Harsh housing regulatory • Lack of effective implementations of the housing policies • Lack of continuity in government policies • Fragmented housing policies • Low compliance to regulatory and environmental laws • Duplication of roles between state and federal regulatory bodies	7
C04 Method of Procurement	• Late delivery	1
C05 Land acquisition	• Inefficient land market • Land acquisition uncertainty • Land ownership problems • Rising cost of land • Complex land acquisition process	5
	• Lack of access to finance • Poor capital and budgetary allocation • Lack of access to long term funding for affordable housing • High costs in title and property registration	

Category	Challenges	Total
C06 Funding/ Payment	• Lack of sufficient funding for developers • High interest rate on mortgage • Excessive down payment • Non-payment of housing loans • Increased Rent	9
	Total	**28**

Below is a brief discussion on these identified challenges as depicted in table 1 above;

Population

Abuja before the advent of federal capital territory used to be a settlement of agrarian Gbagyi people. Abuja is located in the central part of Nigeria, lies at a latitude of 9° 07N and longitude 7° 48'E It became the Federal Capital Territory (FCT) as the new administrative capital of Nigeria on the 12th December, 1991. It was established to battle the problems experienced with Lagos as the then capitals, problems like housing shortage, traffic congestion and overstressed infrastructure Muhammad *et al (*2015). The Abuja master plan envisaged a population of 3.2 million residents with a target year of 2000; however this population target was exceeded as a result of a population explosion before its development was completed. The city has witnessed a massive influx of people due to social, economic, and political factors Muhammad *et al (*2015). With less than 50% of the developmental plan achieved, the population of the city stands at an estimated figure of 5 Million NBS (2017), within a span of twenty six years (1991-2017), the city has grown from 387,671 in 1991 to a projected figure of 4,984,381 in 2017 (Muhammad *et ai.*2015, NBS (2017). With an estimated growth rate of 9.3% Elaigwu, (2009), Abuja city is facing an acute housing shortage, compelled by the spontaneous relation of federal employees without adequate accommodation provision and the constant influx of people since 1991 Abubakar (2014).

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Sustainability

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In an attempt to bridge the housing deficits and need in the city, the FCTA initiated the Mass Housing Scheme in the year 2000 under its Public-Private Partnership (PPP) program. It focuses on creating an enabling environment for more active private sector participation, under this scheme, the government is to provide primary infrastructure and allocate land to private developers. In turn the private developers will provide the secondary and tertiary infrastructures, develop and sell completed houses to members of the general public Waziri and Rossli (2013). In spite of all these efforts, lesser achievements were recorded. It is absolutely essential for the housing delivery process to be implemented on a sustainable basis, paying due regard to social, historical, economic and ecological concerns. Consequently, it is important that short-term housing solutions do not undermine the opportunities for future generations to circumvent the viability of any long-term interventions aimed at sustainable growth. Environmental, economic, fiscal, social, cultural, financial and political sustainability

are imperative to facilitate an effective housing delivery process. Sustainability is necessary to satisfactorily meet the requirements of all citizens throughout their lifetime. Makinde (2014)

Pricing Mechanism

There are several factors responsible for high house prices. These include land allocation costs, the high cost of funding, the high cost of building materials (cement and steel), logistical challenges and the dearth of skilled artisans. The price of land is beyond the reach of most individuals and even where government partners with developers, the land allocation costs and charges make it impossible to deliver the housing units at an affordable price for the low-income market. The site and services land acquisition programme in Nigeria has not been as effective as planned. House prices in Nigeria are also a function of location of the property. Both sales and rental prices are higher in urban areas than rural areas. This is why most low-income housing is located in suburbs of major cities. However, as the cities expand, these suburbs soon become part of the cities. In the past 10 years, values of properties have generally been on the increase (15 % a year for both sales and rental) until 2008 and early 2009 when prices in the middle- and upper-income segment fell by 30 to 40 % depending on the location. Since then, they have stabilised around the crashed prices Timothy (2000).

Government Regulations/Policies

Frequent changes in government and its associated challenges militate against sustainable hosing delivery in Nigeria. The Land Use Act of 1978 has become hindrance to making land accessible for housing. This issue has been responsible for the lengthy administrative procedure of securing the Certificate of Occupancy, the document that confers ownership of the land to the individual from the government. Also, the Act has not assured security of title, and cost remains prohibitive, while access to titled and registered land is problematic and burdensome. The levy problem on housing provision and development in Nigeria is huge. Value added tax (VAT), which is deducted at numerous stages of the building approval, adds as much as 30 % to the total cost of a house. This is exclusive of titling fees and stamp duties. This eventually places the sales price of the item beyond the reach of low-income recipients. Registering property and building approval is generally slow, burdensome and expensive. However, there has been some improvement since 2008 when the new reforms had led to a reduction in the time required to complete the process from 274 to 80 days. Makinde (2014)

Procurement Method

The bureaucracies associated with traditional tendering methods have created a very serious problem in housing delivery in Nigeria. The time it takes to complete the procurement cycle going by these analogue methods has made housing delivery cumbersome and delivered mostly behind scheduled time (late delivery). The flaws in the system and the probable litigation that may arise in the process all contributed to the challenge of accessing affordable housing by low-income civil servants.

Land Acquisition

The relatively small size of the land resource base coupled with its historical and current pattern of ownership presents a serious constraint to housing. At every focus group discussion held in the various communities, the high price of land was identified as one of the major constraint to housing production. Therefore, land availability problem appears to be critical and deserving of special consideration. In particular, the various policy makers will need to address the challenge of improving the supply of affordable housing given a small finite land resource base.

Consistent with the draft Land Use Policy, specific strategies and action plans relating to government's acquisition of available lands within communities will need to be examined in order to create housing land banks and consequentially focus on the needs of their residents. The acquisition of lands within communities for residential purposes should also be viewed within the sociological context of maintaining the community's cultural base Aribigbola (2008).

Funding/Payment

The Federal Mortgage Bank of Nigeria (FMBN) is the apex mortgage institution in Nigeria with a broad mandate as of linking the capital market with the housing markets, encouraging the emergence and promoting the growth of viable primary mortgage loan originators to serve the needs for housing delivery in Nigeria, mobilising domestic and foreign funds into the housing sector; collecting and administering the National Housing Fund (NHF) in accordance with the provisions of the NHF Act. The NHF, established in 1992, was aimed at addressing housing finance challenges in the low-income sector. It was formulated taking into consideration the housing demand gap and the difficulty of accessing finance Anugwom (2005) and Bichi (1997). Through commercial banks and other financial institutions, it was granted a take-off fund of N250 million (US$1.7 m). Key objectives of the fund include ensuring the provision of housing units is based on realistic standards that house-owners can afford, giving priority to housing programmed designed to benefit the low-income group and encouraging every household to own its house through the provision of credit or funding Enuenwosu (1985); Akinlusi (2007); Nubi and Omirin (2007). The impact of FMBN is however not seriously felt by this class of civil servants. The Nigerian housing finance market is organised along informal and formal areas. The formal sub-division has two components: the upper-income groups, whose undertakings are located in the urban areas, and the lower-income groups which depend on the subsidised NHTF for access to housing. The informal area includes the rotating savings and loan associations, the traditional co-operative system, credit co-operatives and individual and family savings Okonkwo (1999) and Bichi (1997). Several factors make the environment for mortgage lending difficult, including the absence of clear property and security rights, mandatory governor's consent, high interest rates and inadequate sources of long-term funding. Generally, there is indication of decreasing activities in housing finance: the average share of gross domestic product (GDP) invested in housing dropped from 3.6 % in the 1970s to less than 1.7 % in the 1990s Pison Housing Company (2010). The insufficient resources and capital base of most primary mortgages limits their ability to deliver needed finance to meet housing demand Okonkwo (1999).

Conclusions

Accessing affordable housing for the teeming population, particularly the low –income civil servants has been a major challenge in Abuja. This study presents a part of a larger research work which is on-going that aimed at examining affordability and accessibility of the housing for low income civil servants residents in the FCT, Abuja. At present, this study used a comprehensive literature to identify various challenges confronting the low-income civil servants in accessing affordable housing. The study identified 28 challenges that were categorised into six major categories to include: population, sustainability, pricing mechanism, regulations/policies, method of procurement, land acquisition, and funding/payment. Out of these categories, challenges associated with funding/payment, regulations/policies, and land acquisition issues respectively were prevalent challenges confronting the low-income civil servants in accessing affordable housing in most of the cities in the developing countries at large. Based on these study findings, the study concluded by recommending that government should intensifies effort on provision/delivery of sustainable affordable housing, adopt a

workable pricing mechanism that can address the needs of this class of civil servants, simplify the procurement method by adopting E-procurement, allocate lands to low-income civil servants and channeled the deduction from source to their Pay point/National Housing Fund and lastly, government should adopt own a house with your rent approach in combating funding/payment challenge while allocating houses to civil servants in dare need. If this is done by the three tiers of government comprising federal, state and local government in Nigeria it will enable the low income civil servants have access to affordable housing, particularly in major cities.

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COLLABORATIVE WORKING RELATIONSHIP AMONG NIGERIAN BUILT ENVIRONMENT PROFESSIONALS: FACTORS AND BENEFITS

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The built-environment has some sequential roles and non-overlapping duties towards a successful take off and delivery of the built-environment products- the real estate. However, these roles appeared to be uncoordinated because of conflict of interest, isolation and collaboration gap among the Built Environment Professionals (BEP). This may be at a disadvantage to the BEP and subsequently hinders the sustainability of the built environment practice and products. This study investigates the factors responsible for, possible areas and latent benefits derivable from collaborative working relationship among the BEP and how such relationship may gladiate sustainability of the built environment practice and products. Primary data were collected from a sample of 133 fellows of all the BEP bodies through the use of hard and soft copies of a structured questionnaire and telephone interview. The study discovered that the BEP safeguard individual profession against encroachment rather than all professions in the built-environment and the main factor responsible for weak collaboration among the BEP is working in isolation. It was also discovered that there exists a potential benefit from deliberate joint actions against usurping by non-professionals. The main benefit of working collaboration among the BEP is that it will enhance good and reliable practice and built-environment products towards sustainable built-environment. It was recommended that BEP should exploit the identified potential benefits of collaboration as a reliable way of ensuring an improved real estate practice and products towards a sustainable built-environment in Nigeria.

Keywords: *Built Environment Professionals (BEPs); Collaboration; Real estate; Sustainable-built-environment; Real estate.*

1.0 Introduction

Built environment activities require the efforts of people who use their hands or skills directly in accomplishing the tasks lined up to produce real estate. This involvement of human resources in the built-environment is physical and non-physical perspectives and spans through the conception/preparation/site acquisition, project construction and property management stages.

In the built-environment, human resources are composed of two main sets: the tradesmen and the professionals. Tradesmen are craft operatives who are skilled in a particular trade such as metal work, bricklaying, plumbing, painting, woodwork, tiling, electrification, just to name a few.

The source of tradesmen skill are through technical education, otherwise called apprenticeship whereby the apprentice learns the trade by having several contracts or interactions with the already skilled tradesmen; while the vocational education have its root from primitive age whereby intended learners learn successfully to carry on a gainful

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occupation not merely by imitation, observation or incidental participation, but through organized instruction from the skilled tradesmen (Olaitan, 1986).

Professionals unlike the tradesmen are usually having formal education, guided with conventions, standards and shared experience (Agbola, 2002). However, it has to be noted that past work on collaboration among the construction staff abounds, but not on all the core professionals in the built environment.

The focus of most past studies on collaboration of professionals was limited to the construction aspect of the three stages of development; little mention was made of the pre-construction and post-construction. It is unusual to find a study that extended to all the stages of development involving all the BEP. This is a conspicuous gap in the body of knowledge which this study is focused on.

There is a need for a work that will span the whole stages of property development i.e. preconstruction, construction and post construction, without limiting to construction stage. This is with the hope of including all the roles of all the core professionals in the built-environment. This study therefore examined the achievable benefits in collaborative working relationship among the BEP in all stages of development, towards having sustainable practice and built-environment products. The objectives of achieving this aim are to: determine who are the core professionals in the built-environment; examine the current nature and causes of collaboration among the BEP; determine the potentials of collaboration among the BEP and investigate the possible effects of collaboration among the BEP in Nigeria.

2.0 Literature Review

Profession according to Mosher (1976) is a reasonably clear cut occupational field which ordinarily requires higher education at least through the bachelor's level and which offers a lifetime career to its members. In view of Marcuse (1977), profession is an activity which utilizes technical methods and esoteric knowledge, the acquisition of which typically requires advanced education.

The expected benefits derivable from membership of a profession otherwise called professional bargains (given certain rights and privileges in return for certain commitments to self-regulation in the service of the system with which its bargain is made) include: legally enforced restrictions on entry into the product of activity and monopoly on the undertaking of certain activities of those permitted entry (Agbola, 2002). The professional bargain also requires those undertaking the professional activity to police their conduct so as to make certain it contributes efficiently to the maintenance of the system with which it struck the bargain.

Professionals unlike the tradesmen usually have formal education and guided with conventions, standards and shared experience (Agbola, 2002). The profession according to Agbola (2002) often exhibits commonalities of the continuing drive to elevate its stature and strengthen its public image, establishment of the boundary of work scope with exclusive prerogatives to operate.

Other commonalities include the assurance and protection of career opportunities, the establishment and continuous elevation of the standard of education and entrance into the profession, the upgrading of rewards and improvement of their prestige among other profession as well as the public at large. Entrance into the profession obviously requires the legal

registration by state power to a board that is exclusively and predominantly made up of members of the profession.

The term professional is used to signify persons working within a chosen profession, in the case of a built-environment such include: Architects, Land Surveyors, Builders, Estate Surveyors and Valuers, Quantity Surveyors, Urban and Regional Planners.

In Nigeria, each of these professionals has both association and regulatory bodies. For instance, Architects have Nigerian Institute of Architects (NIA) and Architects Registration Council of Nigeria (ARCON); Land Surveyors have the Nigerian Institution of Surveyors (NIS) and Surveyors Registration Council of Nigeria (SURCON); Builders have the Nigerian Institute of Builders (NIOB); and Council of Registered Builders of Nigeria (CORBON). Estate Surveyors and Valuers have the Nigerian Institution of Estate Surveyors and Valuers (NIESV) and Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON).

The Quantity Surveyors have the Nigerian Institution of Quantity Surveyors (NIQS) and Quantity Surveyors Registration Board of Nigeria (QSRBN), while the Urban and Regional Planners have the Nigerian Institute of Town Planners (NITP) and Town Planners Registration Council of Nigeria (TOPREC).

According to Saiv and Sagi (2016), the professional association is saddled with the responsibilities of giving marketing platforms to members; gateway to work and ensure career development; organizing continued professional development training and workshops, providing professional indemnity insurance; enhancement of networking opportunities; peer recognition and professional networks; access to information, resources and advisory notes; ensuring compliance with standards and ethics and creating the opportunity to participate in enhancing and expansion of the profession.

Generally, the statutory registration bodies of the built-environment professionals are established to license professionals according to specified standards and to protect the public from errant practitioners (Saiv & Sagi, 2016).

Collaboration according to Cambridge dictionary is the act of working together with other people or organizations to create or achieve something: the action of working with someone else in order to create something or produce something. It takes the form of two or more people or organizations working together to complete a task or achieve a goal. Collaboration is the same as cooperation or team working.

Teams that work collaboratively often access greater resources, recognition and rewards when facing competition for finite resources. Collaboration skills will enable the built-environment professionals to interface productively with other professional colleagues either in the same profession or other sister professions. Successful collaboration however, requires a cooperative spirit and mutual respect.

Saiv and Sagi (2016) formalize the platform for collaboration among the built environment professional in South Africa as involving networking between the respective professions; education and knowledge sharing about professional specialists competences; working on industry standards and practice notes towards improving service delivery; participation in trade shows/conferences within the built environment and consistency in the registration requirements for professionals across the respective professional associations.

In a bid to investigate the factors propelling the willingness to collaborate among the BEP, AbdullRahman et al (2014) identified those factors to include: encouragement of teamwork, similar racial collaboration, development of co-operation, information sharing simulation, and improvement of quality of project in timely manner and better communication. Stiles (1995) identified that the factors influencing global collaboration include: demand occasion by globalization, competition, risk and uncertainty within the business environment.

Buys and Ludwaba (2012) identified the problems that may associate with lack of collaboration among the BEP to include: poor productivity, decline in construction quality, decreases in client's satisfaction of the built-environment products, conflicts and late completion of the built-environment products. Specifically, the main problem of collaboration among the built-environment in South Africa is that of the organ of Government generally not using professionals properly in the right space (Saiv and Sagi, 2016).

Identified potential benefits of collaboration in the construction industry according to Siti et al., (2013) include; encouragement of teamwork, development of cooperation, stimulation of information sharing, improvement in quality and project completion time, enhancement of service quality, and better communication among project members. Akintan and Morledge (2013) highlighted the benefits of collaboration on construction to include: delivering lower building cost for the client and higher profits for the contractor; increase in value and predictability of work; reduces the number and severity of contractual disputes; encourages continuous improvements and; results in shorter overall project time amongst others. These highlighted benefits impact positively on project delivery.

Professionals in the built-environment are now realizing that collaboration is critical to the success and sustainability of the built-environment (AbdullRahman et al, 2014). According to Abiola (2017), professional bodies in the built-environment need to collaborate among themselves for effective delivery of housing projects as well as elimination of quackery.

3.0 Methodology

The target population for this research constitutes fellows of each of the BEP in Nigeria as obtained from their national secretariat. As at December 2018, the record put the total as 500 for Architecture (ARC); 282 for Building (BLD), 360 for the Estate Management (ESM); 363 for Urban and Regional Planning (URP); 302 for the Quantity Surveying (QTS) and 316 for the Surveying and Geo-informatics (SVG), bringing the total of fellows in the built-environment profession to 2123.

The choice of relying on fellowship category is borne out of tenure of post qualification and volume of gathered experience by this cadre of professionals. A stratum of 10%[1] was randomly taken (using Table of random numbers) as sample size from the list of fellows in each profession to have a total of 212 (50 for ARC; 28 for BLD; 36 for ESM; 36 for URP; 30 for QTS and 32 for SVG).

The questionnaires were administered through the use of hard copy questionnaires, e-mailing and telephoning as conveniently applicable to the respondents. However, of 212 questionnaires distributed 133 were successfully retrieved and administered representing 62.74% response rate. Responses from the administered questionnaires were analyzed to produce descriptive statistics of frequency and summation scaling of 5 points as previously adopted by Ayedun et al (2017) among others.

Five (5) points embraced SA, A, N, D, SD, representing strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1) respectively. The frequency of each response is multiplied by the point allocated to the response to have the frequency weight (FW) used to calculate the Relative Importance Index (RII).

4.0 Results and findings

Most of the fellows of the built-environment professions, 96 (72%) have attained the status of fellow of their professional bodies between 10 and 20 years while 37 representing 28% are fellow of more than 20 years. The current level of collaboration among the built-environment professionals is shown in Table 1.

Table 1 Collaboration level among the BEP

OPTIONS	SA	A	N	D	SD
Selling out of one profession cheaply	07	06	03	52	65
Selling out of sister's profession cheaply	49	55	05	18	06
Safeguarding my profession from encroachment by other professionals	58	49	04	07	15
Safeguarding of other professions in the built-environment	03	08	07	52	64

Source: Authors' Field Work (2018)

Sixty five respondents strongly disagreed that professional members are selling out their profession cheaply, 55 respondents agreed that they sell out the sister professions cheaply. Fifty eight of the respondents strongly agreed that they safeguard their professions from encroachment by other professionals while 64 respondents strongly disagreed that they do safeguard encroachment of other professions in the built-environment.

This is confirmed by the summation scaling in Table 2, where collaborative efforts towards safeguarding of one profession from encroachment by other professions was ranked first with RII of 3.96, while safeguarding of other sister professions in the built environment was ranked the least with RII of 1.76.

Table 2: Summation scaling of response of current collaboration level among the BEP

OPTIONS	SA FW (5)	A FW (4)	N FW (3)	D FW (2)	SD FW (1)	TFW	Mean (RII)	Rank
Selling out of one's profession cheaply	35	24	09	104	65	237	1.78	3RD
Selling out of sister's profession cheaply	245	220	15	36	06	522	3.92	2ND
Safeguarding my profession from encroachment by other professionals	290	196	12	14	15	527	3.96	1ST
Safeguarding of other professions in the built environment	15	32	21	102	64	234	1.76	4TH

Source: Authors' Field Work (2018)

Table 3 exhibited the frequency of factors responsible for the existing state of collaboration among the built-environment professionals. In the Table, it was exhibited that 41 respondents strongly agreed that personal greed of the professionals was responsible for the current level of collaboration, 43 strongly disagreed that lack of proper regulation by the professional regulatory bodies is the factor for the level of collaboration while 43 disagreed that lack of clear

cut Government policies on operating boundaries among the BEP is the factor responsible for the level of collaboration among the BEP.

Table 3: Factors responsible for the current level of collaboration

OPTIONS	SA	A	N	D	SD
Personal greed of the professionals	41	38	11	21	22
Lack of proper regulations by the professional regulatory bodies	18	32	02	38	43
Lack of clear cut Government policies on operating boundaries among the built environment professionals	14	31	07	43	38
Working in isolation among the professionals	40	62	04	18	09
Working in isolation among the professionals bodies	61	42	03	22	05
Clients'(Government, Corporate or individual) patronage of the inappropriate professionals for the built environment briefs	56	48	07	12	10

Source: Authors' Field Work (2018)

The responses further revealed that 62 of respondents agreed that working in isolation among the professionals is the main factor for the state of collaboration among the BEP, but 61 strongly agreed that the main factor is working in isolation among the professional bodies while 56 strongly agreed that it is the clients' patronage of inappropriate professionals in the BEP that is actually responsible for the poor state of collaboration among the BEP.

The finding in Table 4 is very specific by identifying working in isolation among the professional bodies as the main factor as ranked first with RII of 3.99 while lack of proper regulations by the professional regulatory bodies is ranked the least being the 6th position with the RII of 2.57.
These findings suggest that there is appropriate regulation of practice by the regulatory bodies in the BEP, but there is isolation among the regulatory bodies that eventually lead to weak working collaboration among these professional regulatory bodies.

Table 4: Summation scaling of factors responsible for the current level of collaboration

OPTIONS	SA FW (5)	A FW (4)	N FW (3)	D FW (2)	SD FW (1)	TFW	Mean (RII)	Rank
Personal greed of professionals	205	152	33	42	22	454	3.41	3rd
Lack of proper regulations by the professional regulatory bodies	90	128	06	76	43	343	2.57	6th
Lack of clear cut Government policies on operating boundaries among the built environment professionals	70	124	21	86	38	339	2.54	5th
Working in isolation among the professionals	200	248	12	36	09	505	3.79	3rd
Working in isolation among the professionals bodies	305	168	09	44	05	531	3.99	1st
Clients'(Government, Corporate or individual) patronage of the inappropriate professionals for the built environment briefs	280	192	21	24	10	527	3.96	2nd

Source: Authors' Field Work (2018)

As regard the potentials that are latent in working collaboration among the BEP, Table 5 reflects that 55 professional fellows agreed that splitting of voluminous work among professionals has untapped potential collaboration, 57 agreed that joint execution of built-environment project, 48 agreed that rotating retainer-ship among the BEP is an untapped potential source of collaboration among the BEP. However, 48 responded disagreed that a potential collaboration is derivable from ordering of professional services in a sequentially.

Table 5: Frequency of untapped potential collaboration among the BEP

OPTIONS	SA	A	N	D	SD
Split of voluminous work among the professional members	18	55	33	17	10
Joint execution of built environment project	23	57	17	16	30
Rotational retainer-ship among professionals	41	48	23	11	10
Sequential ordering of professional services	15	33	18	48	19
Deliberate joint actions against usurping by non-professionals	68	42	01	13	09
Formation of Consortium of built environment professionals	20	26	06	68	13
Recommendation of sister professionals to the client in need of services of sister professionals	56	50	07	15	05

Source: Authors' Field Work (2018)

Sixty eight respondents strongly agreed that deliberate joint actions against usurping by non-professionals are an untapped potential of collaboration among the BEP. Formation of consortium of BEP was disagreed to by 68 respondents while recommendation of sister professionals to a client was perceived to have potential collaboration by 56 respondents.

These findings revealed that deliberate cooperation against the quacks has the greatest potential of BEP collaboration, but there is no potential of collaboration in the formation of the Consortium firm among the BEP. Summation scaling in Table 6 also confirmed the finding that there is great element of potential collaboration if there is a joint action against the non-professionals in the built-environment as reflected by its RII of 4.11 ranking first. However, sequential ordering of professional services was ranked the least unexploited potential of collaboration among the BEP.

Table 6: Summation scaling of untapped potential collaboration among the BEP

OPTIONS	SA (5)	A (4)	N (3)	D (2)	SD (1)	TFW	Mean (RII)	Rank
Split of voluminous work among the professional members	90	220	99	34	10	453	3.41	5TH
Joint execution of built environment project	115	228	51	32	30	456	3.43	4TH
Rotational retainer-ship among professionals	205	192	69	22	10	498	3.74	3RD
Sequential ordering of professional services	75	132	54	96	19	376	2.83	7TH
Deliberate joint actions against usurping by non-professionals	340	168	03	26	09	546	4.11	1ST
Formation of Consortium of built environment professionals	100	104	18	136	13	371	2.79	6TH
Recommendation of sister professionals to the client in need of services of sister professionals	280	200	21	30	05	536	403	2ND

Source: Authors' Field Work (2018)

As reflected in Table 7, 63 respondents strongly agreed that the main benefit of collaboration among the BEP is that it enhance good and reliable built-environment products towards sustainable-built-environment while 71 respondents strongly disagreed that there may not be any benefits derivable from working relationship collaboration among the BEP.

Table 7: Benefits derivable from collaboration among BEP

OPTIONS	SA	A	N	D	SD
Enhance and sustain increment in the volume of professional briefs	49	58	13	09	04
Enhance the improvement in the volume of professional fees	28	53	18	19	15
Reduces quackery for improved professionalism	53	49	11	07	13
Accord due regards to built-environment professionals by the corporate and Government entities	33	50	31	08	11
Enhance good and reliable built environment products towards sustainable built environment	63	51	08	04	07
There may not be any benefits achievable from working relationship collaboration.	11	16	07	28	71

Source: Authors' Field Work (2018)

The summation scaling of the benefits derivable is presented in Table 8 where the enhancement of good and reliable built-environment products towards sustainable built-environment is ranked first with RII of 4.20 and that there may not be any achievable working relationship collaboration is ranked sixth and the least confirming that there are benefits achievable from the working collaboration among the BEP and that such working collaboration will enhance good and reliable built-environment products which in turn will ensure the sustainability of the built-environment.

Table 8: Summation scaling of benefits achievable from collaboration among BEP

OPTIONS	SA (5)	A (4)	N (3)	D (2)	SD (1)	TFW	Mean (RII)	Rank
Enhance and sustain increment in the volume of professional briefs	245	232	39	18	04	538	4.05	2nd
Enhance the improvement in the volume of professional fees	140	212	54	38	15	459	3.45	5th
Reduces quackery for improved professionalism	265	196	33	14	13	521	3.91	3rd
Accord due regards to built environment professionals by the corporate and Government entities	165	200	93	16	11	485	3.64	4th
Enhance good and reliable built-environment products towards sustainable built environment	315	204	24	08	07	558	4.20	1st
There may not be any benefits achievable from working relationship collaboration.	55	64	21	56	71	267	2.01	6th

Source: Authors' Field Work (2018)

5.0 Discussion of findings

Findings on the state of collaboration among the BEP implied that professionals in the built-environment safeguard the encroachment of their own professions but they are not much concerned about the safeguard of other sister professions. This isolation gap demonstrates one of the various ways by which quacks and non-professionals in the BEP penetrate the practice of built-environment professions.

A situation where land surveyor is not bothered who is going to design the building to be constructed on the land surveyed by him or where an Architect is less concerned about who cost or builds the structure he designed, or builder does not care if the completed product of the built-environment activities is given to road side mechanic to handle its post occupation management, but each of the distinct professions is only concerned about which aspects of the profession will not be beneficial to the BEP, it will rather be at a great disadvantage to the clients as well as the end product of the built-environment activities.

The implication of findings on factors affecting the collaboration among the BEPs suggests that there is appropriate regulation of practice by the regulatory bodies of the BEP in Nigeria, but there is an isolation among the regulatory bodies that eventually leads to weak working collaboration among these professional regulatory bodies. These findings revealed that deliberate cooperation against the quacks has the greatest potential of BEP collaboration, but there is no potential of collaboration in the formation of the Consortium firm among the BEP.
It is also implied that there are evidently some benefits achievable from working collaboration among the BEP and the prominent one is that it will enhance reliable practice among the BEP as well as reliable built environment products that will be to the satisfaction of the built-environment owners and investors.
There are benefits achievable from the working collaboration among the BEP and such working collaboration will enhance good and reliable built-environment products which in turn will ensure the sustainability of the built-environment. This is possible, because an effective collaboration will ensure not only the sustainability of practice among the professionals; it will also ensure well finished built-environment products and its sustainability to the satisfaction of the clients.

6.0 Conclusion and recommendations

Professionals in the built-environment should maintain the status quo and attempt not to dabble into other profession's areas of competence, and bear only their noted name in the built environment. This should be the first attempt towards collaboration among the BEP.
Since the finding of this research indicated that each professional affiliate prefer to safeguard the encroachment of his profession, it is advised that such safeguarding should be extended to other professional affiliates in the BEP and a fight against quackery should be a joint battle of all the professionals in the built environment.

Government at all levels should understand clearly the scope of each professional disipline, give it due regards and avoid legislation, policies or actions that can cause overlap or conflict of duties among the BEP. Further, Government should accept it a point of duty to always recognize each professional members for patronage on a matter relating to each profession specifically instead of giving what belong to one profession to another profession.
In conclusion, BEP should also be guided by the scope of their working limit and be restricted to it, greed, selfishness and personal materialistic at the expense of one's profession should not be tolerated by any of the built-environment professional bodies.

Endnote:

[1]Adopting the sample size graph of Bartlett, Kotrlik & Higgins (2001) which is statistically adequate for analysis and generalization

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CONVENTIONAL APPROACHES AND MECHANISM TO HOUSING MARKET ANALYSIS

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Abstract.
Housing market mechanism and conventional approaches to housing market analysis depends on different scenarios. Therefore, this paper review previous literature on housing market analysis in order to establish factors that determines housing prices in different scenarios. Hence, a total of 60 published academic journals, conference papers, thesis and others obtained through secondary sources were reviewed. It was found out that structural attributes, environmental/neighbourhood factors, urban form, location, socioeconomic characteristics, national economic performance (micro and macro) and policy were major determinants of housing prices. It was also found out that little has been done on urban form in relation to housing price determinant. It therefore concluded that hedonic model was the most used conventional approach to housing market analysis, particularly regarding structural attributes and environmental/neighbourhood attributes, while Artificial Neural Network is given less preference. These form basis for further researches on housing market.
Keyword: *Conventional approaches, Housing market, Housing price, Mechanism, Modelling*

1.0 Introduction

As early as 13th and 14th century, Ibn Taymiyyah (1962) and Ibn Khaldun (1958) had explained the determinants of rent which is rarely found in the contemporary housing market literature. Indeed the central role of housing market to the national economy due to its direct impact and contribution to the Gross Domestic Product (GDP) essentially made its study worthwhile (Seo, 2008; Hu, Cheng, Wang & Xu, 2013).

Housing is a special kind of commodity that cannot be moved from place to place (Renigier-Biłozor, Biłozor & Wisniewski, 2017). Consequently, the location of the house is of utmost importance, since, basically, this feature cannot be changed (Cichociński & Dąbrowski, 2013). The importance of housing to the broader economy has also been demonstrated by the global financial crisis of 2007–2011, which began in the U.S. housing market. Although, there are several factors that determines housing prices (Xiao, 2017). It is essential that governments, central banks and market participants are well informed of trends in house prices (Hill & Scholz, 2017).

The degree to which internal and external factors affect house prices is not unique, but highly variable over space. There are indeterminable number of factors (internal and external) which inflate the given location (Wang et al., 2017; Tupenaite, Kanapeckiene, & Naimaviciene, 2017; Liu & Li, 2018). The issue of changing house prices is important. For example, if there is an increase in asset values (creates positive equity), it can lead to housing equity withdrawal and rising confidence. Instead, falling house prices reduce the equity and may create negative equity, especially for new homeowners, which creates negative consumer sentiment and is likely to lead to lower household spending. Changes in house prices also affect the distribution

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of wealth in the economy. During times of rapidly rising prices, those who own property will experience an increase in their wealth relative to those who rent accommodation (Zmölnig, Tomintz, & Fotheringham, 2015).

It is therefore imperative to further review empirical literature on housing market. The purpose of this study is to review empirical literature on housing price determinants and conventional approaches to housing market analysis in order to examine better approaches adopted in analysing various housing market determinants in the previous researches and to illuminate gap in the literature that would form basis for housing market modelling using conventional approaches and further research in housing market.

2.0 Literature Review

Housing market is an organised meeting place where there are buyers and sellers of housing goods and services, and are demanded and supplied (Sulyman, 2015). There exists a large body of literature on housing market. For example, Leung (2004) examined housing–Macroeconomic nexus issues pertaining to housing taxation, housing cycles, and housing market–urban structural form. Wu, Deng, & Liu (2014) developed house price index for nascent housing market. Yang, Hu, Li, Zhang, & Torres (2017) assess spatiotemporal effects of main impact factors on residential land price in major cities of China. Cheung, Wetherell, & Whitaker (2018) examined the impact of earthquakes on residential property values using sales data from Oklahoma from 2006 to 2014. Wang, Wang, & Wang (2018) focused on the effect og land prices on the spatial differentiation of housing prices. Xiao (2012) studied urban morphology and housing market with emphasis on street network pattern as a fundamental determinant of house prices since street network pattern influences accessibility. In the same vein, Wang, Wang and Wang (2018) analyse the spatial patterns and driving forces of housing prices in China where multiple theoretical perspectives on housing demand, supply and market, are combined to establish a housing price model to explore the impact of land prices on housing prices.

Price in the housing market is determined by many factors, ranging from structural attributes of the house (Debrezion, Pels, & Rietveld, 2006; Wu et al., 2014a); environmental/neighbourhood factors (Antoniucci & Marella, 2017a; Liu & Li, 2018); urban forms (Xiao, 2012; Xiao, Orford, & Webster, 2016) and external factors such as the national economic performance (Gulyani, Talukdar, & Bassett, 2018; Killins, Egly, & Escobari, 2017). This has attracted a large body of literature on various determinants of price in the housing market (Alkali, Sipan, & Razali, 2018).

3.0 Materials and Methods

This study adopted an archival research methodology where it focuses basically on review of empirical literatures on housing price mechanism and conventional approaches to housing market analysis. A total of 60 recent empirical research works were presented in tabular form descriptively (see Appendix). The methodology employed in collecting the required data was based on secondary sources obtained from academic journals, conference papers, thesis and textbooks from both printed and online sources.

4.0 Data Analysis and Research Findings

Findings of this study reveals that determinants of housing prices are based on structural attributes, environmental/neighbourhood attributes, location, socioeconomic characteristics, urban form, national economy or policy (see Appendix).

4.1 Structural Attributes as Determinants of Housing Prices

Numerous researches have been conducted on the relationship between structural attributes and housing price. For instance Archer et al. (2010) examined the influence of structural attributes on housing price using spatial variation method. The study found out that housing characteristics offer decidedly the strongest power in explaining the segmentation which gives explanation of housing price. Another study by Ajayi et al. (2015) assesses the relationship

between housing condition and rental value. The study adopted spatial approach where it found out that building condition has weak relationship with rental values. Gulyani et al. (2018) examined the relationship between living conditions and housing value. The study adopted hedonic model in analysing its data. It found out that relative value of housing features with electricity, kitchen and number of rooms emerging as important drivers of rent. It was also found out by Abdullahi, Usman, & Ibrahim (2018) who use multiple regression analysis that type of house, availability of swimming pool, availability of security post, type of door and location of the property were significant in determining house price. Bolton (2018) also used hedonic model to find out that green-certified houses that are third-party verified will carry a higher price premium than green-certified houses without this verification.

Iliopoulou & Stratakis (2018) conducted spatial analysis of housing prices in Athens region of Greece where Geographically Weighted Regression method was adopted and found out that structural attributes contribute immensely to the housing price determination. Also, in another separate studies by Lu (2018) and Saenko, Kushina, & Pukhova (2018) considered building orientation (in China) and depreciation (in Russia) to have positive relationship with housing price. Lu (2018) adopted hedonic model while Saenko, Kushina, & Pukhova (2018) used correlation-regression analysis. Another study from China by Cui, Gu, Shen, & Feng (2018) suggest that houses with large numbers of rooms commands higher rental value using spatial approach, hedonic price model and quantile regression model.

4.2 Environmental/Neighbourhood Attributes as Determinants of Housing Prices

The study found out from previous empirical studies that pollution, gas risk, flood hazard, neighbourhood facilities, conflicts, vices, crime among others have negative relationship with housing price. A study by Yusuf & Resosudarmo (2009) uses hedonic model to establish relationship between air pollutant and housing rental price. Their study found out that in the cases of lead, total hydro carbon (THC), and SO2, air pollutants have a negative association with property value. Bin et al. (2008), Jung & Yoon (2018) and Razali et al. (2018) observed that location within a flood zone lowers property value. The study also employed hedonic model. Muehlenbachs et al. (2015) found out using hedonic model that Shale gas development has large negative impacts nearby ground water which has negative effect on the housing value. Aliyu (2012) observed that there exists relationship between intangible location attributes and provision, availability and maintenance of neighbourhood facilities in the study area with the rental value. The study employed regression analysis. It was also observed by Chen & Li (2017) using 3-D spatial hedonic model, that homebuyers would like to pay an extra premium for an apartment located farther away from polluted streams.

Wu et al. (2017) and Xiao, Li, & Webster (2016) found out, using hedonic model, that the effect of parks on the housing price is statistically significant. Gambo (2012) uses hedonic model to observe that conflict-free area is the most influential variable determining rent. Kemiki, Ojetunde, & Ayoola (2014) also use hedonic model to establish that rental value tend to decrease with decreasing distance to Lafarge cement factory due to severity of dust and noise. Using Machine Learning Methods Aderibigbe & Chi (2018) observed that housing price is impacted by natural disasters factors such as hurricane. Paz & McGreal (2018) adopted Price index and Hedonic model to establish that improvements in neighbourhood quality affect house price. These improvements also include converting the abandoned railway into a greenway as observed by Noh (2019).

4.3 Location as Determinants of Housing Prices

Previous studies have shown that proximity to major employment centre, transit network, schools, parks and hospitals, major landmarks, major junctions and city centre among others, determines housing price at a given location. For instance, Wickramaarachchi (2016) and Oluwadamilola (2017) use multiple regression model to find out that distance to main junction

is the most significant variable in the types of properties. Liang et al. (2018) uses regression analysis and geographic field model to analyse the effects of locational factors on the housing prices of residential communities. The study found out that proximity to externalities of parks, lakes, department stores, banks, secondary schools and rail transit have significance but spatially non-stationary effects on housing prices. This is also confirmed by Li et al. (2018) and Kim et al. (2019) using hedonic model. However, in line with monocentric model of Alonso (1964), D'Acci (2018) found out that housing value decreases with increasing distance from the city centre.

4.4 Socioeconomic Characteristics as Determinants of Housing Prices

Socioeconomic characteristics have been given much attention as determinant of housing price. For example, a study conducted in Singapore by Li & Tang (2018) using dynamic general equilibrium model and counter-factual experiments suggests that the native population growth can generate more of private housing price than growth of the foreign population. Oluwadamilola (2017) in his study using multivariate regression found out that income have significant effect on rental value of accommodation. Using search-and-matching model, Gan et al. (2018) confirm unemployment influences on the housing market. Flage (2018) adopted meta-analysis method to found out that ethnic and gender discrimination have impact rental housing market. In South Korea, Kim & Lee (2018) use locally weighted non-parametric regression to found out that housing market respond to potential crime risk. In terms of fertility rate and housing price, Zhao (2018) uses cross weight coefficient and regression models to found out obvious positive correlation between housing price and fertility rate.

4.5 Urban Form as Determinants of Housing Prices

The impact of urban form on housing price has attracted many researches in recent decades. For instance, Xiao, Webster, & Orford (2016) examine house price effects of changes in urban street configuration using spatial-network analysis. They found out that improved accessibility leads to higher property prices. In contrast, a study by Devaux, Berthold, & Dubé (2018) suggest that reorganization of the street had no significant impact on the closest properties' prices, but had negative effects for properties located within 150 to 450 meters off the street. However, Xiao (2012) investigate relationship between urban morphology and housing market using space syntax method. The study captured two cities; Cardiff in UK and Nanjing in China where the results show that urban morphology have a statistically significant impact on housing price in these two distinctly different housing markets.

4.6 National Economy (Micro and Macro) as Determinants of Housing Prices

Scholars have considered national economic performance indicators in terms of both micro and macroeconomics to be determinants of housing market. For example, Killins et al. (2017) studied the impact of oil shocks on the housing market of USA and Canada. Their study use structural vector autoregressive model and found out that reaction of housing markets to oil price shocks varies significantly depending on whether the change in oil prices is prompted by demand or supply shocks in the oil market and on country oil trading status. Similar study was conducted by Cameron (2018) using local projection method and found out that house price in regions respond heterogeneously to oil price shocks. In another perspective, Antoniucci & Marella (2017b), Ge (2017) and White & Papastamos (2018) uses multivariate regression, agent–based model and LSDVC model respectively to found out that economic recession and financial crises have significant impact on housing price. Chen (2018) assess spatial heterogeneity of housing price in Guangdong Province during 1995-2014 and the spatial heterogeneity of its impact factors using Geographical Weighted Regression (GWR). The study found out that GDP per capita have impact on housing prices. In terms of inflation rate and interest rate, Than-Thi, Dong, & Chen (2019) use autoregressive model to found out that the

inflation rate has a negative impact on the U.S. housing market in an economic downturn (including the global financial crisis), but no strong relationship for the other periods, while interest rates have a reverse influence on the U.K. housing market in a recession only and are insignificant in other periods.

4.7 Policy as Determinants of Housing Prices

Government policies such as development control, energy control, urban renewal policy, tax, tenure security, government intervention on rent, housing supply policy, economic policy and bank credit have been considered as housing market determinants in the literature. For instance, Zhang & Zhao (2018) use ordinary least squares and multi-level hedonic models to found out that a higher tenure security increases the housing price. Zhou (2018) using Principal component and lagged sentiment proxies suggest that government interventions have impact on housing market. Similar result was recorded by Chung, Seo, & Kim (2018) using spatial approach and Hedonic Model. In a study by Huang, Lin, & Ning (2018) using regression model suggest that housing market is prosperous when economic policy is stable and there is a positive relationship between housing price variation and economic policy uncertainty, which means housing market risk grows under unstable economic policies. Bérard & Trannoy (2018) using month-based model and hedonic model found out that increase in the real estate transfer tax sizable have short-term effect – but no medium or long-run effect on the housing price. In another perspective, He, Cai, & Hamori (2018) studied relationship between housing prices and bank credit using vector autoregression (VAR) model with stochastic volatility found out that all kinds of bank credit influences of housing prices.

5.0 Discussion of Findings

From empirical studies, various determinants of housing prices in different scenarios have been established. These determinants include structural attributes, environmental/neighbourhood attributes, location, socioeconomic characteristics, urban form, national economy and policy.

Findings from various researches revealed that variables under structural attributes as housing price determinant includes housing type, building materials (type of roof etc.), obsolescence, age of building, building condition, building facilities (electricity, toilet, water, dining, size of rooms, type and size of doors and windows, security etc.), building orientation, green certified housing. For environmental/neighbourhood attributes as housing price determinant, the variables include pollution (water, air, noise and land), flood risk, gas development risk, parks, neighbourhood facilities (sewage, street light, road, drainage, public water, energy etc), conflict, vices, crime, densities, green space and greenway. natural disaster (hurricane, tsunami, typhoon, etc.), spatial growth rate and environmental quality. Variables for location as determinant of price include proximity to major employment centre, proximity to transit network, proximity to schools, parks and hospitals, proximity to major landmarks, proximity to major junctions and proximity to city centre.

Findings from various studies also revealed that variables for socioeconomic characteristics as determinant of housing price include household size, income, marriage entry, discrimination, native and tribe, household unemployment, crime offenders, fertility rate, gender and ethnic discrimination. Variables for urban form as determinant of housing price include street pattern, land use pattern and density. National economy as determinant of housing price have land value, market spillovers, oil price, exchange rate, GDP, economic recession, financial crises, speculation, disposable income rate and inflation rate as variables. For policy as determinant of housing price, the variables are; development control, energy control, urban renewal policy, tax, tenure security, government intervention on rent, housing supply policy, economic policy and bank credit.

These determinants have been approached with difference method, which include; hedonic model, hazard model, spatial variation, logit model, matched pair audits, spatial approach, space syntax, dynamic general equilibrium model, counter-factual experiments, structural vector autoregressive model, multivariate regression, agent–based model, analytic hierarchy process, local projection method, exploratory data analysis, geographical weighted regression, search-and-matching model, ordinary least squares, spatial-network analysis, meta-analysis, cluster analysis and causality test, month-based model, price index, random-intercept multilevel model and mahalanobis-metric matching model. Hedonic

model is the most used method from the findings, which is seen to be the better method in terms of structural attributes as determinant of housing price. These methods were applied to housing price analysis but little among the researches combined spatial and non-spatial method of analysis.

6.0 Conclusion

In conclusion, determinants of housing price include structural attributes, environmental/neighbourhood attributes, location, socioeconomic characteristics, urban form, national economy and policy. From the study, knowledge gap established was that little have been done on urban form in relation to housing price determinant. More specifically, urban densification as a determinant of housing price is not given adequate attention. Also, hedonic model is the most used method in housing price analysis from the previous literature while Artificial Neural Network is given less preference. This establish basis for further researches in the housing market.

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CHALLENGES AND OPPORTUNITIES OF RESOLVING LAND USE CONFLICTS THROUGH MEDIATION IN NIGERIA

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Abstract
One of the major functions of traditional political institutions in Nigeria is to resolve land use conflicts through mediation, whether at the urban, village, neighbourhood or household level.
The initial conflict and problem resolvers (mediators) were the headmen of the lineages or the eldest male or patriarchs of families. They resolved conflicts by sitting together to settle disputes through restoration of social harmony and, seeking truth. The process was to ensure social harmony between lineages, professional team in the built environment and social order throughout Nigeria ethnicities. The methodology of this paper is based on reviewed literature and it assesses the institution of mediators in land use conflict resolution using examples across Nigerian ethnicities with the view of providing information to policy makers in passing the decisions of mediators into law. The process of mediation in land use dispute in the three Nigerian ethnic groups Yoruba, Igbo and Hausa were examined, impacts of land use conflicts were equally identified, benefits of mediation in land conflicts were identified. However, there are problems that emanate from this process (mediation) and they were examined and identified .In conclusion, this paper recommended some measures to be taken in order to make mediation process more acceptable in resolving land use conflicts for sustainable development.

Keywords: *Challenges, Conflicts, Land use, Mediation, Resolving*[22]

1.0 Introduction

1.1 Background to the study

Land use conflicts are disputes, disagreement and controversy resulting from land use. Many conflicts perceived to be clashes between different cultures are actually conflicts over land and related natural resources. Land conflicts are widespread phenomenon that can occur at any time and place. The need, greed, scarcity and increase in land value can make things worse(Fayemi,2009).Land conflicts normally occur when there is a chance to obtain land for free, whether the land is state, common or someone's private property(Wehrman,2008).Conflict is equally a phenomenon that is inevitable in all human society due to differences in interests, goals, values and aims among people (Nyamasege,et.al, 2017).

Most conflicts arise in the basic units of society such as within families, clans, villages, locations or other small units. A study done by Yamano (2005) revealed that, land is increasingly becoming a source of conflicts in Africa. This is because land plays a big role in sustainable economic development whereby large population depends on it for industry, urban life and agricultural livelihood. It remains the fundamental importance to majority of people. Land provides the means of existence and without it, man is poor (Gulliver, 2013). This is also true in Nigeria, whereby majority of her population especially the rural areas depend on land for agriculture and other activities (Chukwuemeka,2012).

Amongst Nigerian communities, there are frameworks that are in place for the resolution of conflicts and for preventing their escalation into violence, thus threatening the social fabric. Disputes on land use are provided under the land use Act,1978 to be capable of settlement by the courts through litigation, see sections 39-41 of the land use Act, 1978.Where the land is in

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an urban area, the high court having jurisdiction where the land situates is the appropriate court, and where the land is in non- urban , the area court or customary court having jurisdiction where the land situates is the appropriate court (Ezejiofor,1997).

The above notwithstanding, the land use Act,1978 does not preclude alternative dispute resolution of land dispute. There are three kinds of alternative dispute resolution and they are Arbitration, Mediation and conciliation. These three are alternative to litigation, but their mode of operation are different and distinction from one another. The relevant mode circumscribed for this paper is mediation.

A mediator is a person who is trusted and accepted by both parties to a dispute. His role is to assist the parties to reach an agreed settlement of the dispute. The procedure he adopts to achieve this is to meet each party privately, so as to understand that party's own side of the story. Thereafter, he tries to bring the parties together so that they may themselves work out a compromise solution to the dispute and he does not compel them to reach a settlement(Ayoade,1989).The institution of mediators is one of the crucial institutions for conflict resolution in most societies in Nigeria. The paper aims to highlight the role and challenges of mediators in resolving land use conflicts in Nigeria While the objectives are as follows:

a. identify the impacts of land use conflicts in Nigeria

b. examine the process of mediation in Nigeria communities

c. identify some of the challenges faced by mediators, and opportunities offered by the institution in enhancing access to justice among communities in the built environment

Methodology: This work is mainly base on reviewed literature.

1.2 A General Overview on Dispute Resolution by Elders (Mediators) in the Societies

The basic and most important unit of socialization in Africa especially in Nigeria society traditionally was the extended family. Status within the society was divided along gender and was dependent on lineage for socialization (Ingelaere,2008;Nyamasege, et. al.,2017).

The initial conflict and problem resolvers were the headmen of the lineages or the eldest male or patriarchs of families. They resolved conflicts by sitting together to settle disputes through restoration of social harmony, seeking truth, punishing perpetrators. The aim of this process was to ensure social harmony between lineages and social order throughout Nigeria ethnicities which includes collaboration among the professionals in built environment that resulted to increase in development of landed properties. However, with the advent of colonialism, western ideals of justice influenced and limited some aspects of this alternative to litigation process. Although colonialists introduced Western legal systems in Nigeria, the local process operated at the lower levels, especially in most customary conflicts. Moreover, the Government institutionalized customary courts and alternative to litigation as a means to obtain justice and deal with majority of the cases such as land use disputes that does not want to pass through the formal Courts (Yamano, 2005).

This mediation process emphasized on bringing people together to talk about their problems including land use conflicts and to foster social harmony and restoration (Kariuki,2015;Fayemi,2009).Once this is done, progress attains in the built environment hence new constructions spring up without vandalism of ongoing construction or completed ones. Traditional dispute resolution with particular reference to Mediation in Nigeria is based on their norms and practices of the people. There are different actors depending on the social organization of any community. At the lower family levels are family leaders, the headmen of records, headmen, the chief's representative and finally the paramount chief.

Dispute resolution starts at the household level. If a dispute especially that concerning land cannot be resolved at the household level, it is taken to the extended family level where elders from the extended family act as mediators, sit and listen to the matter. The elders emphasize

mediation of disputes. If they were not able to resolve the dispute, the disputants take the matter to a customary court with formal court like procedure (Kariuki,2015;Fayemi,2009;Okonjo,1965). It consists of the chief at the village level and the paramount chief at the regional levels. The chiefs are public officials and handle both civil and criminal matters. However, the customary court does not deal with land disputes as its role is merely advisory.

The main actor in the traditional justice system is the traditional leader of the community, who is often an elder. Chiefs, headmen and other traditional leaders can deal with certain offences including issues pertaining to land with the Minister's authorization.

1.3 Theoretical Foundations of Conflict Resolution by Mediators in Nigeria

Before colonialism, most African societies including Nigeria, were living communally and were organized along clan, village, tribal and ethnic lines. Being part of a community was important, due to the vicissitudes of life in primal or communal societies. Social ties, values, norms, beliefs and the threat of excommunication from the society provided mediators with legitimacy and sanctions to ensure their decisions were complied with. Consequently, social theories have been fronted that try to explain why the mediators were able to resolve disputes in such contexts(Balytsky,el.al,2015).

Agreed building techniques such as mediation has been used for almost two decades to resolve land use disputes in the United States and that resulted to cooperation among the professionals in the built environment that brought about much development therein. Mediators have good substantive involvement (without seizing control of the outcome from the parties). In general, mediators help the parties to move from a zero-sum mind-set to integrative bargaining (Deng and Zartman, 2000). It has been shown through research that these techniques can produce outcomes that are more satisfying to the parties and leave them in a better position to deal with their differences in the future. Indeed, experience with public dispute resolution in Africa, with particular reference to Nigeria indicates that consensual approaches to handling resource allocation conflicts often yield outcomes that are fairer and more stable. The process of land use conflicts resolution in the Nigerian three ethnic groups as follows:

1.3.1 Yoruba

The smallest political unit within Yoruba towns is the idile, which corresponds roughly to the nuclear family; followed by the ebi, the extended family. Each idile is headed by a baálé, while the ebi is headed by a mogaji. In Ibadan, the mogaji is formally recognised as the head of an ebi, by the hierarchical power structure (Ayoade ,1989). As the head of his household he is also a mediator whose judgment in disputes among members of his family must be respected. He keeps peace and order in his household, and he is the chief law-giver and magistrate of the compound. He also controls the relationships between members of his family and outsiders (Fayemi, 2009).

Cases that cannot be resolved at the inter-personal or family level are usually taken to the head of the ebi, the mogaji or to the baálè (ward chiefs). Such cases are usually given immediate attention to prevent any escalation into violence that can threaten the survival of the entire lineage or ward. Each person, starting with the plaintiff, states his/her case. Once the matter is resolved, emphasis is put on how good neighbourliness can be achieved and preserved (Mokola ,1995).

Land in the city is owned by families and lineages, although by the Land Use Act of 1978, land is vested on the governor (Ezejiofor, 1997; Ayoade, 1989) .The persons most knowledgeable about land issues in the city are, therefore, the mogajis as the custodians of family traditions. Conflicts on land often result when a recalcitrant member of a family chooses

to sell family land without the consent of other members of the lineage. Troubles start as soon as the news of the illegal sale of the land becomes known. The family members or their representative will approach the illegal seller of the piece of land, asking for compensation or demanding that the 'squatter' (i.e., the buyer of the piece of land) should stop 'trespassing' on family land. Usually a signpost stating that the land belongs to a particular family is quickly erected with the warning that trespassers will be prosecuted (taken to court).This means that, the activities of the professionals and their clients connected to land stop immediately, the reason being that anybody who builds on such land faces a greater risk of having his building knocked down by bulldozers than of receiving any court summons. It is in fact the so-called 'trespassers', whose buildings have been pulled down, that seek redress in the formal court. Where land ownership is in dispute, the affected land buyers generally do not wait until their buildings are pulled down before approaching the collective owners of the land to resolve the conflict.(Fadipe, 1970).

To resolve such a case at ward level, some people will approach the mogaji or baálè, if they have not been partial in handling such cases in the past. It is the duty of the mogaji or baálè to summon the disputants and, if necessary, members of the appropriate lineage, with a view to resolving the matter. Each of the disputants is allowed to state his case. The matter is subsequently judged. In some cases, some of the disputants are asked to make concessions to facilitate speedy settlement. In some instances, the family members may request a share of the payment of the land from the person who sold it. On the other hand, they might accept nothing but a complete recovery of the family land from the person to whom it had been 'illegally' sold (Ayoade ,1989). When reconciliation efforts fail at this level, people either stubbornly remain on the land or go to the formal court to argue their case. If the seller of the land is adamant that he is the only person entitled to the proceeds from the land, the case may also end up in formal court. Such a case is no longer between the buyer and the seller of the land, but rather between the seller and the other members of his extended family who consider themselves entitled to some share of the proceeds. Such a case could end up in the Supreme Court, the highest court in the country, as a result of appeals and counter-motions filed by the parties.

1.3.2 Igbo

The Igbo, have vibrant traditional judicial processes to which much respect and awe are attached. This means that the Igbo people have less reason for taking their cases to the formal courts. Much has been written on this by Gluckman, Elias and Nzimiro. Judicial powers in Igboland are hierarchical; the Obi, Eze and other traditional rulers have the sole right to decide cases. Disputes are also resolved at lineage, age-grade, women's group, cult and association levels(Nzimiro, 1972).Reconciliation is the hallmark of the traditional judicial system of the Igbo (Okonjo,1967; Nzimiro1965) Kinsmen in dispute are usually helped by mediators to resume and maintain kinship solidarity. In some cases, judges make the disputants take oaths promising the resumption of cordial relationships. The Igbo can be found in virtually all parts of Nigeria practicing diverse trades.
In Nigeria, judicial authority among Igbo migrants is exercised by elders and officials of the many villages and town unions from Anambra, Imo, Enugu, Abiaand Eboyistates. There are several hundreds of such town unions in Nigeria.

1.3.3 Hausa

Wherever the Hausa migrate, they always appoint from among themselves a leader called the sarkin Hausawa, (ruler of the Hausa people) who normally functions as the official intermediary between the Hausa migrants and their host community. The sarki also settles disputes among the immigrants. Conflicts, that cannot be resolved at the ward level, are referred to the sarkin Hausawa's court. When resolving such a conflict, the sarkin usually summons his chiefs and a committee of elders called ubangari. The disputants sit on a mat in front of the sarki and the elders.(Albert,1993;1994a&b). The case is carefully listened to and resolved as dictated by Islamic law. The judgment of the sarki is highly respected by the Hausa immigrants, no matter how harsh it may be. His subjects do not only see him as a political leader but also as a religious leader whose decisions are divine. These leaders resolve conflicts at the minor level and refer complex cases to the palace of the sarkinHausaw.(Albert,1993)

1.4 Impacts of Land Conflict among the Community

There are several impacts that are resulted from land conflicts in Community. Among of them were the destruction of peace in the community, distortion of relationship among the professionals in the built environment and the community members which leads to enemity, depression to people, death, injuries, depopulation and stagnation of the activities of professionals because nobody will want to be involved in a disputed land. In Albert (1994a) One of the clan elders stated that, once land conflict occurs, the parties involved had no friendly relations until the matter is resolved.

land conflict led to the destruction of property, the killing of livestock and stagnation of economic activities due to the fact that, instead of engaging in production and construction, people including the professional team in the built environment runs away for security purposes, hence, the parties involved in the conflict suffered from famine. Sometimes people lost their building materials in the site, fertile lands for both agriculture and animal keeping. This land conflict finally, made the people to be poorer.(Emanuel and Ndimbwa,2013).

1.5 Benefits of mediation

Some of the benefits claimed by supporters are that mediation:

Fosters more efficient use of resources and better compliance among the professionals in the built environment and the clients. It creates conducive atmosphere to work on ,no vandalism of properties nor stoppage of ongoing construction of professional team in the built environment which led to increase in building development as well as economic activities.This in line with(Susskind at.al, 2000).

Resolves underlying issues and develops a shared base of knowledge among the professionals in the building industry and the community.

Achieves more creative, longer-lasting outcomes that take account of the best available technical information; and increases confidence and offering greater overall satisfaction with the mediated outcomes. (Susskind at.al, 2000; Rabinovitz, 1989; Rodwin,1982).

1.6 Challenges of Dispute Resolution through Mediation in Modern Societies

Nevertheless, critics of the mediation process argue that its benefits have been exaggerated and that it is nothing more than traditional politics in a new guise. Their primary arguments are that :

Informal justice system such as mediation is regarded as inferior in comparison to formal justice system. The inferiority is as a result of the subjugation of customary law, which is the

undergirding normative framework providing the norms, values, and beliefs that underlie traditional dispute resolution. The decision or conclusion made through mediation can not be enforced (Ezejiofor,1997). The concept of repugnancy to justice or immorality introduced by colonialists to limit the application of Nigeria customary law remains in most part of the countries even in the post-independence era. (Nathan, 2009).

Again, modernity has had its fair share of negative impacts on Nigeria justice systems. In pre-colonial period, elders acting as mediators were the rich and wealthiest people as they held land and livestock. Their wealth and respect enabled them to be independent during dispute resolution processes. However, in modern societies now, younger people have accumulated wealth and in most cases, older people rely on the younger people. This has enabled dispute resolution by elders (mediators) to be affected by bribery, corruption and favoritism.This will not allow the professional team to carry out their activities effectively hence, the unfavoured party will lose faith in them(mediators) thereby, seeking for redress in the court of law. For instance, there are reports that many communities have been corrupted by bribes therefore limiting people's faith in them (Emanuel and Ndimbwa, 2013). Apart from corruption and bribery, modernity and westernization have broken down the close social ties and social capital between families and kinsmen.Once harmony is lacking over family or community land, hardly will professionals in the built environment cooperate to take risk to carry out construction work in such land.

Migration: Migration to urban areas and an increasingly individualistic society have broken down the communal or extended family system and thereby reducing the influence of mediators. In addition, the superiority of the Westernized judicial and legal system has further reduced the influence; elders as mediator have in resolution of disputes (Emanuel and Ndimbwa, 2013).

Culture: Different cultures provide both opportunities and impediments to mediation. Where different people with different cultural background are involved in land disput,resolving the conflict through mediatin,could be difficult (Fisher, 1990).This will bring setback to development of such land.

Mediator Quality and Credibility: Mediation, in many cases is damaged by a reputation for poor quality and lack of credibility. Addressing these issues is critical to building greater support for mediation.

1.7 Conclusion

This paper concludes that, land resource is an opportunity if it is properly managed and put into used by professionals in the built environment but it is also a source of conflict and unproductive in many communities in Nigeria .Unequal distribution of land, greed and land scarcity are among the causes of land conflict in the Nigeria. .The traditional mechanism (Mediation) is among the approaches of resolving land conflict in Nigeria thereby uniting the professional team in the built environment and making the land to be productive .Some of the challenges of mediation include; regarded as inferior in comparison to formal justice system because the decision or conclusion made through mediation cannot be enforced, poverty, bribery and corruption in the system also has limited people's faith in them-These hinders the activities of professional team in such land hence, construction and development hardly take place therein.

1.8 Recommendations

There is need to develop a clear legal and policy framework for the application of traditional dispute resolution by mediators. This will help in no small measure in settling land disputes and allowing the professionals in the building industry to carry on their work effectively unhindered.

Emphasis should be placed on traditional dispute resolution as the first option in resolving land use disputes or any form of dispute. This has been well used in Nigeria before colonization.
There is need to give elders (mediators) engaged in the process adequate remuneration to prevent chances and opportunity for corruption. This would prevent corruption as has been observed in Albert (1994b) that corruption of elders among the communities have influenced the dispute resolution process. Mediators can establish best practices and standards as a way to improve quality. This will simply stimulate the cooperation of professionals in the built environment into making the land productive . Mediation may gain credibility through strong community ownership and through mediators who are honest and are representative of the community.
There is need for a framework for appealing the decision of elders (mediators) in the traditional dispute resolution mechanisms. For instance, among the ethnic groups, the hierarchy of traditional dispute resolution mechanism begins at the household level, then goes to the extended family level, to the formal customary court, and lastly to the customary court of appeal, with the status of the High court.
There is need to develop an enforcement mechanism for traditional dispute resolution mechanisms by mediators.This will help to settle land dispute quickly thereby encouraging the cooperation and activities of professionals in the land.

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USER SATISFACTION OF SOCIAL HOUSING IN KADUNA METROPOLIS

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Abstract
The aim of this research was to carry out a post occupancy evaluation of the social houses spread within the Kaduna Metropolis namely: S.M.C Quarters, Stephen Shekari Estate, Makarfi Estates, Shagari Estates, Malali Low cost. With a view to determine the satisfaction of the occupants in the overall design, space layout, fixtures and fittings, materials use and amenities provided. Data was elicited using semi-structured questionnaires targeted at the occupants of the social houses. Occupants were selected randomly at the 95% confidence level. The data collected was analyze using Simple descriptive statistics of Total score, mean score and ranking. The results show that the houses were design and constructed without due regards to the end users, especially as regards the space layout, amenities and the fittings, and the types of materials. The paper concludes by making a recommendation on how social housing should be done to meet end users satisfaction.

Keywords: *User satisfaction, Evaluation, Social, Housing, Metropolis.*

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INTRODUCTION

In the design of individual houses that are commissioned by the house owners the architect usually has no challenge in determining the user preferences which would have been obtained at the briefing stage and then translated into the design. In the case of mass housing scheme the preferences of the house occupants are usually assumed in Nigeria since there is no post occupancy evaluation carried on these houses by the developers. In the case of developed countries, the developers usually seek out the preferences of the prospective house owners and hence build houses along these preferences. According to a Victorian Auditor-General's Report (2012) on access to public housing in Australia there is a division within the housing authority that collects data on housing occupants' characteristics and preferences which is now used to develop future houses. It implies that there should be a system of collection and collating the data on user preferences in housing. The determination of user preferences is usually a difficult task for the architects because they vary and could be very diverse.

Users' satisfaction has been a subject of investigation by scholars, various interest groups and researchers in the field of housing. It has been viewed as an assessment of the extent to which the current housing environment of residents met their needs, expectations and aspirations (Mohit, Ibrahim, & Rashid, 2010). In view of this, Fatoye and Odusami (2009) suggested that for the housing sector to improve the quality of housing estate it produces, it must explore and understand users' needs and expectations as well as the extent to which such needs and expectations are met through regular performance evaluation. Teck-Hong (2011) shared similar view by noting that one possible way to meet households' housing needs is to examine factors which account for users' satisfaction or dissatisfaction

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using their housing conditions for appraisal. These views no doubt underscore the need for studies on users' satisfaction in the quest to provide housing estates that will be able to meet the daily needs, expectations and preferences of the occupants. For most nations, housing commands a larger share of the household budget than any other good or service consumed (Sylvia & Kinsey, 2002). Generally, the top bracket of high income earners lives in very expensive houses on spacious plots and has adopted styles of living characteristics of colonial administrators. These include top civil servants (policy formulators), employees and entrepreneurs in the private sectors who use their often inappropriately acquired positions and/or wealth from exploitation of the majority to obtain these high standards of accommodation (Olateju, 1991). While the Low income earners who are supposed to be the end users of the low cost houses are which are mostly of poor standards .Hence the need to carry out this study to find out the level of satisfaction with both the functional and aesthetics form of the Low cost Houses.

LITERATURE REVIEW

User Preferences in Housing Selection

In the design of individual houses that are commissioned by the house owners the architect usually has no challenge in determining the user preferences which would have been obtained at the briefing stage and then translated into the design. Preferences of the house occupants are usually assumed in Nigeria since there is no post occupancy evaluation carried on these houses by the developers. In the case of developed countries, the developers usually seek out the preferences of the prospective house owners and hence build houses along these preferences. According to a Victorian Auditor-General's Report (2012) on access to public housing in Australia there is a division within the housing authority that collects data on housing occupants' characteristics and preferences which is now used to develop future houses. It implies that there should be a system of collection and collating the data on user preferences in housing. The determination of user preferences is usually a difficult task for the architects because they vary and could be very diverse.

According to Timmermans, Molin, and Noortwijk, (1994), though it is difficult to interpret the preferences of users with regards to housing, choice models could be used to express these choices. In doing this the preferences could be categorized and offered as options for them to select from. Leishman, Aspinall, Munro, and Warren, (2004), stated that the preferences within the house could be the size of the spaces, the nature of fittings and some cases arrangements of adjoining spaces. In determining user preferences the various aspects of the house have to be divided into sections and the user be made to rate the options that they have interest in participating. This action would help assist the architect or developer determine which aspects of the house the preferences would have significant impact on. According to Zinas, and MohdJusan, (2010), "Every person lives and operates within the framework of choosing from alternatives of life's endeavors in whatever area." This implies that in handling house owners' preferences in mass housing schemes there is a need to provide options for them to choose from after collating their preferences. It should be noted that not all the preferences of the users can be provided for in attempting to meet their needs. However it is important to seek these preferences out and this can only be done through either a post-occupancy evaluation or before the construction of the houses.

MATERIALS AND METHODS

The questionnaire were open ended and coded on a lickert scale of 1-5 as follows;
Very satisfied (VS) - 5, Satisfied (S) - 4, Unsatisfied (U) - 3, Very unsatisfied (VU)-2
Not sure(NS) -1 for the functional and aesthetics from of the user satisfaction.
The responses frequency was used to calculate the Total Score (TS) from which the Mean Score was also computed and then rank as follows;

$TS = \sum fLS$ where

f= frequency
LS=Lickert Scale
Then Mean =TS/N
Where N= Number of returned questionnaires.

Descriptive studies was adopted for this research since the aim was to find out the characteristics of the variables of interest e. g. to describe the age and educational level (Naoum,2013) Quantitative method was used to identify the occupants satisfaction of the social housing through the use of close ended questionnaires, allowing for exploration of the relationships amongst the variables i.e. design, space layout, fixtures, fittings, materials use in the construction and amenities provide. Cohen et al (2007) pointed out 'where measurement is sought then a quantitative approach might be more suitable. Quantitative method such as Amaratunga and Baldry (2000) and Naoum (2013), allows for research that involves a strategy with a detailed exploration. Sample size was determined using formula as proposed by Yamane 1973 at the 95% confidence level, making a total of 305 questionnaires, the occupants were randomly selected out of which 166 were returned representing 82% response rate, and the estates were built by the State Government. In Ungwan Dosa S.m.c quarters 50 units. Kurmin Mashi, 30 units. Barnawa, 100 units. Sabo 25 unit's and Malali 100 units in the Central Senatorial District and they were considered as a single unit in arriving at our sample size. The estates are a combination of 2 and 3 bedrooms' prototype Houses only.

DATA ANALYSIS AND RESEARCH FINDINGS

Table 1: Showing the level of satisfaction with the Design and space layout in the housing estates.

Question	**VS**	**S**	**U**	**VU**	**NS**	**TOTAL**
Are you satisfied with the design of the houses?	63(38%)	84(51%)	5(3%)	5(3%)	9(5%)	166 (100%)
Are you satisfied with the size of the living and dining space?	17 (10.24%)	24 (14.46%)	79 (47.59%)	46 (27.71%)	-	166 (100%)
Are you satisfied with the size of the bedrooms?	38 (22.89%)	69 (41.566%)	25 (15.06%)	30 (18.07%)	4 (2.41%)	166 (100%)
Are you satisfied with the size of cooking and storage space?	24 (14.46%)	23 (13.86%)	64 (38.55%)	53 (31.93%)	2 (1.2%)	166 (100%)
Are you satisfied with the number of baths and toilets?	15 (9.04%)	32 (19.28%)	76 (45.78%)	43 (25.9%)	(0%)	166 (100%)
Total	**157**	**232**	**249**	**177**	**15**	

SOURCE: Field survey, 2017

As shown in table 1, 63 occupants were very satisfied with the design of the houses, 84 were satisfied, 5 were unsatisfied, only 5 were very unsatisfied and the remaining 9 occupants were not sure if they were satisfied with the design of the houses. On the satisfaction with the size of the living space and dining space only 17 occupants were very satisfied, 24 others were satisfied and 79 of the occupants were unsatisfied, 46 were very unsatisfied. For the size of the bedrooms, 38 occupants were satisfied, 69 other occupants were satisfied, only 25 of the occupants were unsatisfied, 30 were very unsatisfied and the remaining 4 were not sure. As regards the size of the cooking and storage space, 24 occupants were satisfied, only 23 occupants were satisfied, 64 other occupants were not satisfied, 53 were very unsatisfied and the remaining 2 were not sure. Concerning the number of baths and toilets 15 of the occupants were very satisfied, 32 other occupants were satisfied, only 76 occupants were not satisfied and the remaining 43 occupants were very unsatisfied.

Table 2 showing the level of satisfaction with fixtures and fittings in the housing estates

Question	VS	S	U	VU	NS	TOTAL
Are you satisfied with the sanitary services?	30 (18.1%)	29 (17.5%)	64 (38.6%)	41 (24.6%)	2 (1.2%)	166 (100%)
Are you satisfied with the water supply?	83 (50%)	51 (30.72%)	18 (10.84%)	11 (6.63%)	3 (1.81%)	166 (100%)
Are you satisfied with the electrical sockets?	74 (44.58%)	26 (15.67%)	11 (6.63%)	35 (21.08%)	20 (12.04%)	166 (100%)
Are you satisfied with the lamp holder?	64 (38.55%)	53 (31.93%)	36 (21.69%)	9 (5.42%)	4 (2.41%)	166 (100%)

SOURCE: Field survey, 2017

As shown in table 2 on the level of satisfaction with fixtures and fittings, only 30 occupants were very satisfied with the sanitary services, 29 others were satisfied, only 64 occupants were unsatisfied, 41 were very unsatisfied and the remaining 2 were not sure.

For water supply 83 of the occupants were very satisfied, 51 other occupants were satisfied, only 18 occupants were unsatisfied and 11 others were very unsatisfied and the remaining 3 were not sure. For electrical sockets 74 of the occupants were very satisfied with the electrical sockets, 26 others were satisfied, only 11 occupants were unsatisfied,35 other occupants were very unsatisfied while the remaining 20 were not sure. On the satisfaction with the lamp holder, 64 of the occupants were very satisfied, 53 others were satisfied, only 36 of the occupants were unsatisfied, 9 others were very unsatisfied and the remaining 4 were not sure.

Table 3 showing the level of satisfaction with the materials use in the housing estates

Question	VS	S	U	VU	NS	TOTAL
Are you satisfied with the interior paintings?	83 (50%)	45 (27.11%)	22 (13.25%)	16 (9.64%)	(0%)	166 (100%)
Are you satisfied with the exterior paintings?	28(16.87%)	80(48.19%)	45(27.11%)	13 (7.83%	(0%)	166 (100%)
Are you satisfied with the roofing materials?	57(34.3%)	66(39.7%)	19(11.5%)	21(12.7%)	3(1.8%)	166 (100%)
Are you satisfied with the type of ceiling?	99(59.64%)	11(6.63%)	42(25.3%)	14(8.43%)	-	166 (100%)
Are you satisfied with the floor finishing?	35(21.1%)	53(31.9%)	47(28.3%)	30(18.1%)	1(0.6%)	166 (100%)

Source: Field survey, 2017

As shown in table 3 above, on the satisfaction with materials use, on whether the occupants are satisfied with the interior paintings. 83 of the occupants were very satisfied, while 45 other occupants were satisfied, only 22 of the occupants were unsatisfied with the interior paintings, 16 others were very unsatisfied. For satisfaction with the exterior paintings, 26 of the occupants were very satisfied, 80 others were satisfied, only 45 of the occupants were unsatisfied and the remaining 13 occupants were very unsatisfied. As to whether they are satisfied with the roofing materials, 57 of the occupants were very satisfied, 66 others were satisfied, while 19 other occupants were unsatisfied, only 21 of the occupants were very unsatisfied, and the remaining3 were not sure. On satisfaction with the type of ceiling, 99 of the occupants were very satisfied, 11 others were satisfied, while 42 other occupants were unsatisfied and the remaining 14occupants were very unsatisfied. Regarding satisfaction with the floor finishing, only 35 occupants were very satisfied, 53 others were satisfied,47 occupants were unsatisfied, and only 30 occupants were very unsatisfied while the remaining1 occupant was not sure.

Table 4 showing level of satisfaction with amenities provided

Question	VS	S	U	VU	NS	TOTAL
Are you satisfied with the provision of recreational facilities?	9 (5.42%)	12 (7.23%)	94 (56.63%)	38 (22.89%)	13 (7.83%)	166 (100%)
Are you satisfied with the refuse collection?	74 (44.58%)	33 (19.88%)	26 (15.66%)	15 (9.04%)	18 (10.84%)	166 (100%)
Are you satisfied with the cleanliness of the housing estate?	52(31.3%)	24(14.5%)	58(34.9%)	27(16.3%)	5(3%)	166(100%)
Are you satisfied with the road network in the housing estate?	15(9%)	40(24%)	63(38%)	31(19%)	17(10%)	166(100%)
Are you satisfied with the drainages in the housing estate?	34(20.48%)	78(46.99%)	39(23.49%)	11(6.63%)	4(2.41%)	166(100%)

SOURCE: Field survey, 2017

As shown in table 4 above on level of satisfaction with amenities provided, for satisfaction with recreational facilities provided in the housing estates, 9 occupants were very satisfied,12 other occupants were satisfied, only 94 occupants were unsatisfied, 38 others were very unsatisfied and the remaining 13 occupants were not sure. On whether they were satisfied with the refuse collection in the housing estates, 74 occupants were very satisfied with the refuse collection in the housing estates, only 33 other occupants were satisfied, 26 of the occupants were unsatisfied,only15 occupants were very unsatisfied, while the remaining 18 occupants were not sure. On whether they are satisfied with the cleanliness of the housing estates, 52 occupants were very satisfied with the cleanliness of the housing estates,only24 of the occupants were satisfied,58 other occupants were unsatisfied, only 27 occupants were very unsatisfied while the remaining5 occupants were not sure. For satisfaction with the road network in the housing estates,15 occupants were very satisfied with the road network in the housing estates, only 40 occupants were satisfied,63 other occupants were unsatisfied, 31 occupants were very unsatisfied, and the remaining 17 occupants were not sure. As regards satisfaction with the drainages in the housing estates, 34 occupants were very satisfied, only 78 occupants were satisfied with the drainages in the housing estates, 39 other occupants were unsatisfied, 11 occupants were very unsatisfied and the remaining 4 occupants were not sure.

DISCUSSIONS OF FINDINGS

Table 5 showing the ranking of the satisfaction levels of the occupants

QUESTION	TS	MEAN SCORE	RANK
Are you satisfied with the design of the houses?	681	4.15	3
Are you satisfied with the size of the living and dining space?	502	3.06	14
Are you satisfied with the size of the bedrooms?	597	3.64	9
Are you satisfied with the size of cooking and storage space?	499	3.04	15
Are you satisfied with the number of baths and toilets?	511	3.11	13
Are you satisfied with the sanitary services?	542	3.30	12
Are you satisfied with the water supply?	619	3.77	7
Are you satisfied with the electrical sockets?	597	3.64	9
Are you satisfied with the lamp holder?	668	4.07	4
Are you satisfied with the interior paintings?	685	4.17	1
Are you satisfied with the exterior paintings?	611	3.72	8
Are you satisfied with the roofing materials?	643	3.92	5
Are you satisfied with the type of ceiling?	683	4.16	2
Are you satisfied with the floor finishing?	589	3.59	10

Are you satisfied with the provision of recreational facilities?	464	2.82	16
Are you satisfied with the refuse collection?	628	3.82	6
Are you satisfied with the cleanliness of the housing estate?	587	3.57	11
Are you satisfied with the road network in the housing estate?	501	3.05	14
Are you satisfied with the drainages in the housing estate?	623	3.79	6

As shown in table 5 showing the ranking of the satisfaction levels of the occupants. The occupants were very satisfied the interior paintings which had a Total Score of 685,Mean Score(MS) of 4.17 which rank 1st.Then type of ceiling provided in the housing estates had a TS of 683 and MS 4.16 which rank 2nd.Design of the houses had a TS of 681 and MS 4.15 which rank 3rd.Satisfaction with lamp holder had a TS of 668 with a MS of 4.07 which rank 4th.Satisfaction with the roofing materials had a TS 643 with a MS of 3.92 which was rank 5th.Satisfaction with the drainages provided in the housing estate had a TS of 623 with a MS of 3.79 which rank 6th.Satisfaction with water supply had a TS of 619,with a MS of 3.77 which rank 7.Satisfaction with the exterior paintings had a TS of 611 with a MS of 3.72 which rank 8.Satisfaction with the size of the bedrooms and Electrical Sockets both had a TS of 597 with a MS of 3.64 which rank 9.Satisfaction with the floor finishing had a TS of 589 with a MS of 3.59 was rank 10. Cleanliness of the housing estate had a TS of 587 and a MS of 3.57 which rank 11.Next is the sanitary services which had a TS of 542 and MS of 3.30 which rank 12.Satisfaction with the number of baths and toilets had a TS of 511 with a MS of 3.11 which rank 13.Satisfaction with the size of the living and dining area had a TS of 502 with a MS of 3.06 which rank 14,satiafaction with the size of cooking and storage area had a TS of 495 with a MS of 3.04 which rank 15 and lastly is satisfaction with the provision of recreational facilities in the housing estates which had TS of 464 and a MS of 2.82 which rank 16.This ranking can be attributed to the fact that some of the occupants have large family(polygamy),which was not considered at the initial stage off the housing development.

CONCLUSION AND RECOMMENDATIONS

The aim of this research was to carry out a post occupancy evaluation of social housing in Kaduna metropolis, using survey methods for data collection. The response from the occupants showed that the design, space layout, materials use and the amenities provided were not in consonant with the user's preferences. However, since housing is a necessity for mankind, it is expected that the minimum requirements as par user satisfaction should be inculcated in the design and construction of social housing, There should be inclusive consideration of the end users in the initial stage before embarking on social housing provision.

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EFFECT OF PUBLIC BUDGETING ON NEIGHBOURHOOD QUALITY AND RENTAL VALUES IN ILORIN

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Abstract

This study examined the effect of public budgeting on neighbourhood quality and rental values in Ilorin. Budgetary allocations to states by federal government do not found to express relationship with quality of infrastructures in the study area. The condition of infrastructural quality ultimately affects rental income of residential properties. Structured questionnaires were administered across the study area. Descriptive and inferential statistical techniques were adopted to analyse the data. The study revealed that budgetary allocations for infrastructures only have significant effect on low density areas, while medium and high density areas do not feel the impact. The neighbourhood quality indices influenced the rental value in Ilorin by 35.4%- 50.6%. The study also revealed that, there is relationship between condition of neighbourhood quality and rent passing in the study area. The study therefore recommends that, government should channel funds appropriately for infrastructures like; road, power, health and water in the study area.

Key words: Budgeting, Neighbourhood Quality, Rental Values.[24]

Introduction

Budgeting in government establishment identifies how long and medium term planning interrelates and also signifies how budgeting can be effectively used in the provision of necessary infrastructures for general public. Budget for the public has focus on policy development, performance, monitoring and statutory objectives which include: planning expenditure to meet up with policy requirements, implementation of policy and control, performance measurement and monitoring (Khan and Hildreth, 2002). Government budget and sectorial allocations especially for infrastructural facilities such as roads, culverts, bridges, electricity, potable water, telecommunication facilities, street lighting, sewerage, drains, and public transport have tremendous effects on neighbourhood outlook. Social infrastructures like health centres, schools and other communal facilities equally contributed immensely to the neighbourhood quality which invariably affects the social and economic style of the residents (Rabe, *et al*., 2009). The quality of a particular neighbourhood also affects stream of income generated from the properties located in the area. The influence of these will have impact on rental value of property in any location. It is on this premise that this study aims to look at the effect which government budgeting and fund allocation has on neighbourhood quality and rental value in Ilorin. To a large extent, the physical development of any country is usually measured in terms of its infrastructural development. As a quest for developmental growth, country and states require to commit very huge investment to infrastructural development to enhance economic integration as it is being practice by the advance countries of the world.

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Literature Review

Conceptual Framework

Many scholars view budget from different perspectives. Omolehinwa (2003) views budget simply as a plan of dominant of individuals in an organisation. It can be used to achieve an individual goal and tailored toward the organisation's priorities. Meigs and Meigs (2004) in their own word define budget as a simply comprehensive financial arrangement or plan that set forth as well as expected route in order to achieve both the financial and operational goals of an organisation. At the early beginning of budget it was designed primarily to concern with helping or serving for the purpose of legislative accountability (Johnson, 1992). Bendlebury (2005) submitted that the origin or source of budget can be linked or traced to Britain, during the period when the parliament made an attempt to exercise control over the activities of central government of the country.

Budget components are budget headings which depicts the amount of fund earmarked for infrastructure developments. Public budget is a plan of government on expected incomes and expenditures on how to government resources to achieve certain objectives to improve the overall condition of the people. Baba (2006) asserted that budgeting is a financial plan of monetary action that is expressed in term of quantitative and monetary spending of financial resources, and which also describes proposed expenditures and means of financing them. It further described as legal document which authorized the government to carry out capital project. Akinkungbe (2004) described budget as planning in monetary form, stating income and expenditure in a defined period of time in order to achieve specific goal.

O'Sullivan (2009) asserted that budget as a financial plan contains a list of all planned expenses and proposed revenue to government. It is also regarded as planning tool for economic planning, compulsory saving, borrowing for investment and spending for well-being. Public budgeting is aimed at addressing the best way to manage the allocation of scarce resources on the face of diverse opinions that are complex which need to be decided within limited space of time.

Neighborhood Quality: Theoretical Framework

The term "quality", just like housing, has several uses and it is difficult to determine the exact meaning. Estate surveyors define real estate and market psychologists define people and their individual personality. Sociologists define social institutes and processes. Geographers define weather and climate. Architects are responsible for defining buildings and open environments perspective and so on (Fatemeh, 2013). According to Golkar (2000), the quality of each object is the collection of specific characteristics or traits that distinguish every object from other objects and provides judgment possibility about advantages or similarity or disadvantage or humility of an object compared with others. "There is a fundamental quality that is the principal basis of life and soul of every human being, city, building or wild nature", this kind of quality is objective and exact. Alexander (2007). The quality is not natural or inherent feature of the neighbourhood environment, but kind of related and interacted behaviour between environmental and individual nature Pacione (2003). Neighbourhood quality is an abstract concept determined by the result of human activity and nature in different manners. Nichol (2005) consider the neighbourhood environmental quality as a pervasive concept and believe that different perspective of environmental quality is multi-dimension concepts because it has different layers. Empiricist theorists of urban designing like lynch (1983), Eldredge (1967) and Neilson (2004) consider urban environment quality as a phenomenon or even that is formed by the interactions of physical characteristics on one hand and cultural patterns and symbols and mental abilities of the observer on the other hand (Fatemeh, 2013).

Thus Neilson's defines urban environment quality as a concept that provides tangible characteristic of physical environment and also the perception, recognition and evaluation by the individual observer. Kevin Lynch in his theory "The Shape of Good City" notes that neighbourhood quality is the result of impact of architecture and Urbanisation between place and the community. Chapman (2007) also believes that different places have different needs and qualities. The neighbourhood quality depends on the quality of infrastructures and their appropriate management. Neighbourhood quality is the result of economic activities that can influence the environment directly or indirectly (Kamruzzaman *et al.,* 2007). Jiboye (2004) observed that appropriate definition of quality depends not only on standards but also depends on what the user desires as quality, and also depends on the product being considered.

Therefore, quality is subjective term arises from the perception which an individual holds towards a thing that is seen as the significant objects at a particular point in time. Anantharajan (1983); (Olayiwola *et al.,* 2006). Neighbourhood environmental quality has attracted a lot of attention in environmental sciences and also theoretical and empirical perspectives.

Budgetary Allocation, Neighbourhood Quality and Rental Value

Afolabi (1999) argued that, when public expenditure (Budget) is made on long-run infrastructures such as road constructions, railways, power, irrigation and water supply. Government is trying to divert resources from their present to future uses, which are more productive. The objective of government expenditure at any particular time will dictate the proportion of the budgetary allocation that will be spent on particular sector which is bound to react to the dynamics of social and national priorities. Neighbourhood quality is related to the concept of housing infrastructure, and rental value is a function of neighbourhood quality.

Ajayi (2011) in his work opined that; government of different states in Nigeria have been involved in the provision of infrastructural facilities for the general populace through the annual budget allocation. He also reiterates that government of the states should place more emphasis on the use of population and population density to distribute resources for infrastructures to enhance neighbourhood outlook. Many states in Nigeria are battling with weak economic base coupled with lack of social amenities. It is as a result of absence or non-functional infrastructural facilities to enhance healthy living and conducive environment, with high rate of dilapidation in infrastructures like water provision, good roads, health facilities, educational facilities and problem of waste management.

Aluko (2011) studied the locational effect of neighbourhood attribute on housing values in metropolitan Lagos. Using the analysis of variance and multiple regression model analysis method, the study concluded that location attributes and neighbourhood showed more important on house value when small geographical housing units are examined. Like Coker *et al.,* (2007), the study used penalty scoring to identify the quality of housing and neighbourhoods. Using descriptive statistics, the study revealed a significant gap in quality between the medium and low – income estates investigated. Ogedengbe and Oyedele (2006)examined the effect of this waste on property values in a Nigerian city (Ibadan) based on the present method being adopted to manage the waste, using systematic random sampling technique and stratified random sampling technique, The data collected were analysed using chi-square, frequency distribution, mean and percentages. The results show that the waste dumps have significant negative impact on the values of the properties in the area, the paper recommended among others that government should try to revamp the Ibadan Waste Management Authority by procuring the vital equipment for collection, recycling, processing and disposal of wastes for them to function efficiently. Akinola (2007) was of the opinion that infrastructure services have taken on a new urgency in part because they have a direct bearing on economic growth. She stresses further that studied have shown that adequate infrastructure

reduces the cost of production, which in turn affects profitability, level of output and employment; particularly in small-scale businesses.

Study Area

Ilorin is located on latitude 8º 30'N and on longitude 4º 33'E at an average altitude elevation of about 290 metres. Ilorin climatic condition is of two distinct seasons, rainy season and dry season is being experienced every year. It experienced average rainfall of 1454 mm (55 inches) with peak of average rainfall in the month of September up to 340 mm (11.7 inches). Rain period commenced in April and lasts till November. The average monthly temperature is at the peak in the month of March at 29.5 C (87^0F) while lowest temperature is in August at 24.1 C (77^0F). Figure 1 shows the map of Kwara State indicating the study area (Ilorin Metropolis) in red colour.

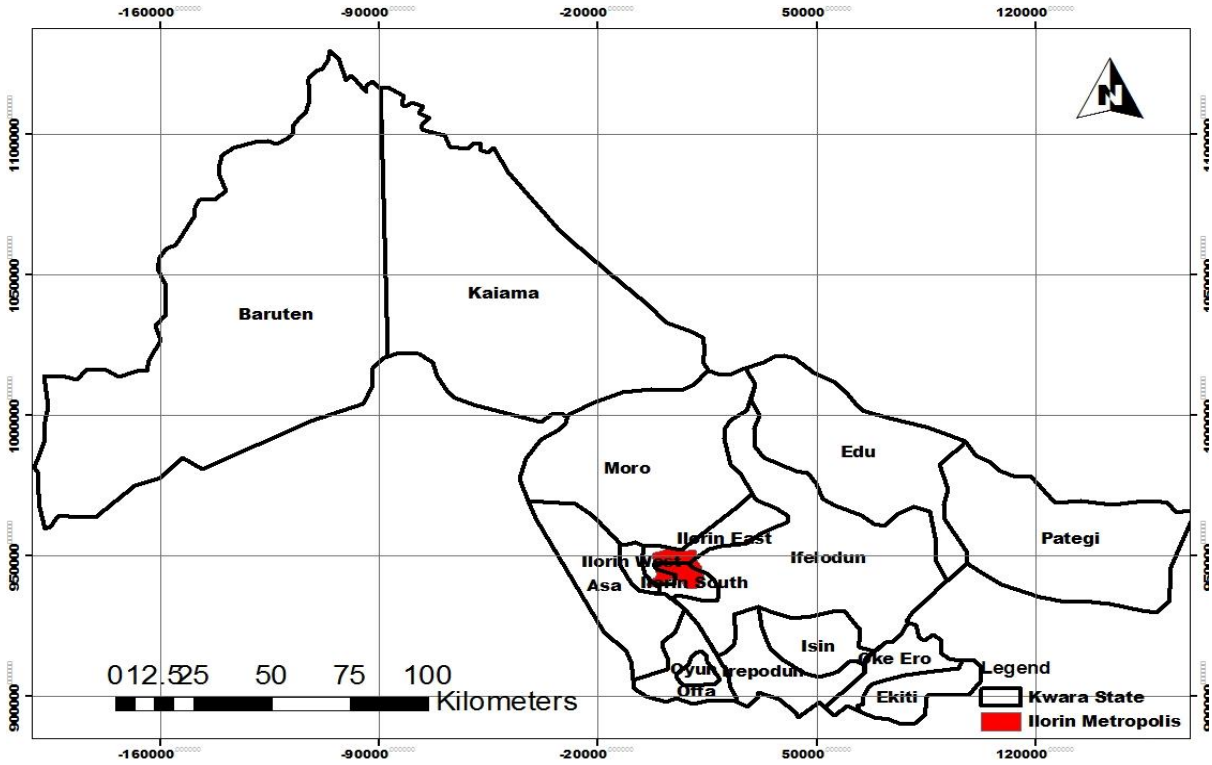


Figure 1: Kwara State showing Ilorin
Source: Ministry of Lands and Housing, Ilorin, 2018

Methodology

The study adopted both purposive and stratified random sampling techniques. Purposive sampling technique was adopted for estate surveyors and valuers in Ilorin due to relative small number of firms,. Stratified random sampling technique was used to select the sample from population that exhibits different characteristics in the neighbourhood. Therefore the neighbourhood is further sub-divided into low, medium and high densities and simple random technique were adopted to select sample population from each of the density area.

Table 1**: SAMPLE SIZE TABLE**

The sample for this study was extracted using the sample size table developed by Salant and Dillman (1994) and Dillman (2007) as presented below:

	Sample Size for 95% Confidence Level					
Population	**3% Sampling Error**		**5% Sampling Error**		**10% Sampling Error**	
	50/50 Split	**80/20 Split**	**50/50 Split**	**80/20 Split**	**50/50 Split**	**80/20 Split**

100	92	87	80	71	49	38
200	169	155	132	111	65	47
400	291	253	196	153	78	53
600	384	320	234	175	83	56
800	458	369	260	188	86	57
1,000	517	406	278	198	88	58
2,000	696	509	322	219	92	60
4,000	843	584	351	232	94	61
6,000	906	613	361	236	95	61
8,000	942	629	367	239	95	61
10,000	965	640	370	240	95	61
20,000	1.013	661	377	243	96	61
40,000	1,040	672	381	244	96	61
100,000	1,056	679	383	245	96	61
1,000,000	1,066	683	384	246	96	61
1,000,000,000	1,067	683	384	246	96	61

Sources: Salant and Dillman (1994) updated by Dillman (2007)

Table 2: Population and Sample Size Determination

Study Area	Household Population	Sampled population	% of sampled population
Ilorin			
Low density	4,661	361	32.8
Medium density	5,548	361	32.8
High density	10,910	377	34.3
Total	**21,119**	**1099**	**100**

Source: Field Survey 2017.

The sampled population is computed from sample size table developed by (Salant and Dillman, 1994).

Table 3: Questionnaires Administration

Location	Density	No of Questionnaire Administered	Total questionnaires not Returned and Wrongly filled	Total Questionnaires Returned
Ilorin	Low	361	61	300
	Medium	361	101	260
	High	377	174	203
	Total	1099	336	763

Source: Author's computation, 2018

Likert scale: the used 5-point scale to rank the mean condition of neighbourhood infrastructure. The index and parameter for the ranking and interpretation of ranking is presented in table 3. Analysis of variance: was employed to examine the extent of variation in the amount budgeted for infrastructure in Ilorin and Lagos. Also it was adopted to examine the extent of variation in rental values in Ilorin. Regression analysis was employed to examine the effect of budget on rental value of residential housing infrastructure in Ilorin.

Results

The trend in budgetary allocation for infrastructure in Ilorin is presented in Figure 2. The annual amount budgeted for road infrastructure increased progressively from 2007 to 2008 and after which the amount began to fluctuate downward till 2013 when there was slight increase. Amount budgeted for road overlapped amount budgeted for other infrastructures, amount budgeted for public water supply rose in 2008 to 2010 after which there was decrease in the amount. The annual amount allocated for health fluctuated and reached its peak in 2013 after which it started falling. The annual amount maintained gradual increase and reached its peak in 2014.

Table 4: Kwara State Budget Headings and Components

YEARS	ROAD (₦)	Health (₦)	Water (₦)	POWER (₦)
2006	2,210,526,067	1,105,141,021	954,000,000	360,175,505
2007	1,819,186,059	200,019,128	526,110,328	545,759,423
2008	12,077,383,254	773,000,000	1,208,000,000	1,373,000,000
2009	9,196,385,000	2,523,000,000	3,539,320,000	1,037,104,000
2010	10,761,126,440	1,105,141,021	4,644,923,200	2,027,700,000
2011	9,011,619,427	1,266,090,934	1,169,488,131	1,125,478,121
2012	8,776,010,377	3,362,217,116	749,457,540	2,256,337,537
2013	10,508,385,665	5,378,445,900	1,402,465,289	1,135,902,000
2014	10,662,278,838	2,177,354,194	2,781,367,900	3,661,405,240
2015	10,850,350,250	3,150,200,750	2,950,450,151	3,700,250,000
2016	11,340,230,234	4,190,350,120	3,012,234,122	3,934,450,200
2017	10,762,378,838	2,377,454,194	2,881,367,930	3,761,445,540

Source: Extracted from Kwara State Budget, 2017

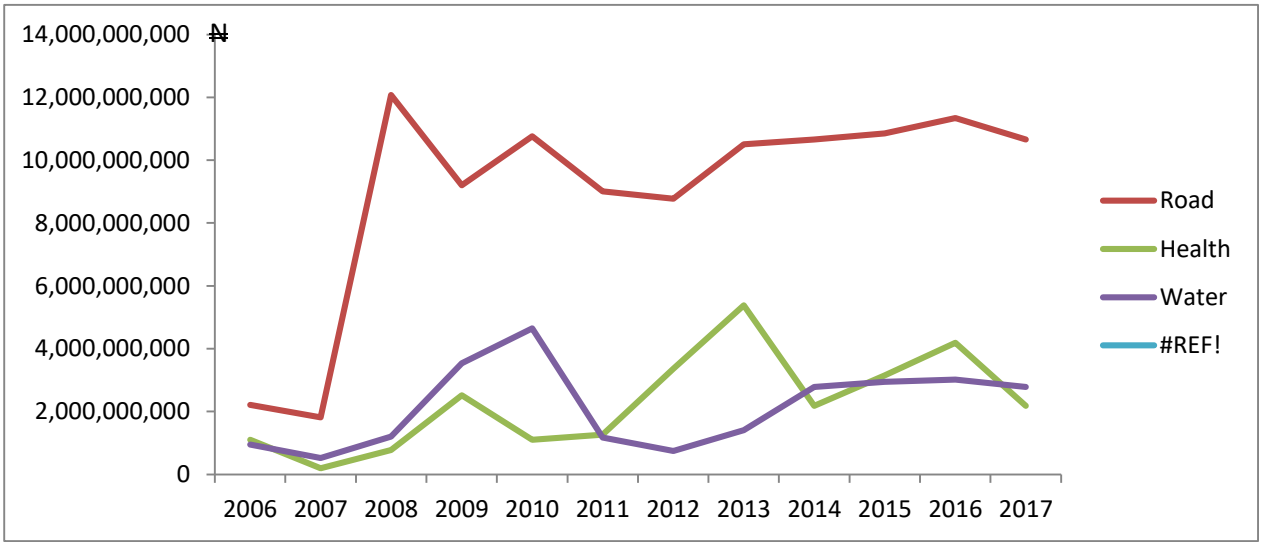


Figure 2: Trends in Budgetary Allocation for Neighborhood Infrastructure in Ilorin

The analysis of variance in the amount budgeted for infrastructure Ilorin density areas is presented in Table 5. The result of analysis of variance in the annual amount budgeted for infrastructure shows that the f-statistic at 23.627 is significant at p-value (0.000) is less than 0.05 level of significant, it therefore indicates that there is statistical significant difference in the annual amount budgeted for infrastructure in Ilorin. The trend in budget indicated amount allocated to road overlapped others, this is an indication that road infrastructure constitute large amount of budget for the infrastructure.

Table 5: Budgetary Allocation for Neighborhood Infrastructure in Ilorin

Source of Variation	SS	DF	MS	F	P-value	F crit
Between Groups	332.2082	3	110.7361	23.6278	0.000	2.8663
Within Groups	168.7207	36	4.686686			
Total	500.9289	39				

Source: Author's computation, 2018

The trend analysis of rental value of residential property in Ilorin is presented in Figure 3. The rental movement of residential properties in medium density of Ilorin showed a gradual step-up or upward trend over the period under study, the rental value of 3B/R gradually move with other between 2006-2008 properties thereby overlapped all other rental values of residential properties and 3B/R trend progressively above others, there is a wider gap between 3B/R and 2B/R, 1B/R rental values and Tenement, rental value of 2B/R, 1B/R and Tenement rental values gradually moving together between 2006-2013 and after which 2B/R shoot up progressively in 2014. There is a little gap between 2B/R and 1B/R rental values as indicated by the trend. 1B/R and tenement maintain a parallel movement over the period; this showed that there is no difference in rental movement between 1B/R and tenement.

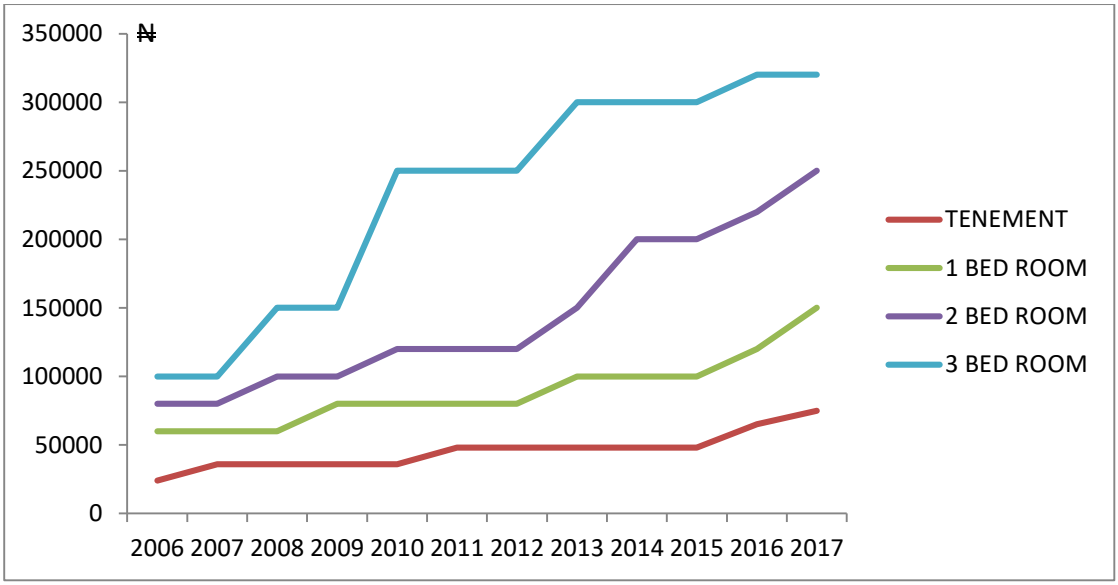


Figure 3: Trends in Rental Values of Residential Areas in Ilorin

The condition of neighborhood infrastructural quality in Ilorin low density areas is presented in Table 6. The reliability statistics (Cronbach Alpha) at 0.816 (81.6%) suggested that the infrastructural items under study said to have maintained internally consistent, in other word, the responses of the respondents towards the condition neighborhood variables is consistent and reliable. Four neighborhood infrastructures (access road, security equipment, health and school facilities) are said to be in fair state of condition. All other infrastructures are said be in good state. But the overall state of neighborhood quality condition is said to be good at average mean respondent of 3.04 which interpreted the neighborhood condition to be good. This result showed that the neighborhood quality in low density residential area of Ilorin is good.

Table 6: Condition of Neighbourhood Infrastructural Quality In Low Density Area Of Ilorin

Reliability test @ 0.816 Variable	N	Sum	Mean	Index	RII	Quality Ranking
Water Supply	300	903	3.01	3.00-3.99	0.602	Good
Power Supply	300	1003	3.34	3.00-3.99	0.668	Good
Access Road condition	300	780	2.60	2.00-2.99	0.52	Fair
Waste Disposal System	300	990	3.30	3.00-3.99	0.66	Good
Sewage Disposal System	300	970	3.23	3.00-3.99	0.646	Good
Drainage System	300	1087	3.62	3.00-3.99	0.724	Good
Security Equipment and tool	300	780	2.60	2.00-2.99	0.52	Fair
General Sanitary Condition	300	960	3.20	3.00-3.99	0.64	Good
Recreational Facilities	300	904	3.01	3.00-3.99	0.602	Good
Health infrastructure	300	780	2.60	2.00-2.99	0.52	Fair
Streetlight condition	300	990	3.30	3.00-3.99	0.66	Good
School Facilities	300	788	2.63	2.00-2.99	0.526	Fair
Average Neighborhood Quality	300		3.04	3.00-3.99	0.608	Good

Source: Author's computation, 2018

The condition of neighborhood infrastructural quality in Ilorin medium density areas is presented in Table 7. The reliability statistics (Cronbach Alpha) at 0.755 (75.5%) suggested that the infrastructural items under study said to have maintained internally consistent, in other

word, the responses of the respondents towards the condition neighborhood variables is consistent and reliable. Eight neighborhood infrastructures (power supply access road, sewage, security equipment, sanitation, health and school facilities) are said to be in fair state of condition and only recreational facility is in poor condition. All other infrastructures are said be in good state. But the overall state of neighborhood quality condition is said to be fair at average mean respondent of 2.79 which is interpreted the neighborhood condition to be fair. This result showed that the neighborhood quality in medium density residential area of Ilorin is good.

Table 7: Condition of Neighbourhood Infrastructural Quality in Medium Density Area of Ilorin

Reliability test @ 0.755 Variable	N	Sum	Mean	Index	RII	Quality Ranking
Water Supply	260	805	3.10	3.00-3.99	0.62	Good
Power Supply	260	678	2.60	2.00-2.99	0.52	Fair
Access Road condition	260	700	2.69	2.00-2.99	0.538	Fair
Waste Disposal System	260	765	3.33	3.00-3.99	0.666	Good
Sewage Disposal System	260	639	2.46	2.00-2.99	0.492	Fair
Drainage System	260	935	3.57	3.00-3.99	0.714	Good
Security Equipment and tool	260	700	2.69	2.00-2.99	0.538	Fair
General Sanitary Condition	260	635	2.44	2.00-2.99	0.488	Fair
Recreational Facilities	260	488	1.88	1.00.1.99	0.376	Poor
Health infrastructure	260	699	2.69	2.00-2.99	0.538	Fair
Streetlight condition	260	865	3.33	3.00-3.99	0.666	Good
School Facilities	260	704	2.71	2.00-2.99	0.542	Fair
Average Neighborhood Quality	260		2.79	2.00-2.99		Fair

Source: Author computation, 2018

The condition of neighborhood infrastructural quality in Ilorin high density areas is presented in Table 8. The reliability statistics (Cronbach Alpha) at 0.765 (76.5%) suggested that the infrastructural items under study said to have maintained internally consistent, in other word, the responses of the respondents towards the condition neighborhood variables is consistent and reliable. five neighborhood infrastructures (access road, sewage, security equipment, health and school facilities) are said to be in fair state of condition. All other infrastructures are said be in poor state. But the overall state of neighborhood quality condition is therefore said to be good at average mean respondent of 1.98 which is interpreted the neighborhood condition to be poor. This result showed that the neighborhood quality in high density residential area of Ilorin is poor.

Table 8: Condition of Neighbourhood Infrastructural Quality in High Density Area of Ilorin

Reliability test @ 0.765 Variable	N	Sum	Mean	Index	RII	Quality Ranking
Water Supply	203	307	1.51	1.00-1.99	0.302	Poor
Power Supply	203	401	1.97	1.00-1.99	0.394	Poor
Access Road condition	203	507	2.49	2.00-2.99	0.552	Fair
Waste Disposal System	203	403	1.98	1.00-1.99	0.396	Poor
Sewage Disposal System	203	341	1.67	2.00-2.99	0.334	Fair
Drainage System	203	401	1.97	1.00-1.99	0.394	Poor

Security Equipment and tool	203	301	1.48	2.00-2.99	0.552	Fair
General Sanitary Condition	203	403	1.48	1.00-1.99	0.296	Poor
Recreational Facilities	203	345	1.69	1.00-1.99	0.338	Poor
Health infrastructure	203	561	2.76	2.00-2.99	0.552	Fair
Streetlight condition	203	398	1.96	1.00-1.99	0.392	Poor
School Facilities	203	565	2.78	2.00-2.99	0.556	Fair
Valid N (list wise)	203		1.98		0.396	

Source: Author's computation, 2018

The result of regression analysis presented in Table 4.19 showed that 34.4% variation in rental value explained neighborhood infrastructure indices. Only water quality has significant influence on rental value of property in Ilorin high density area, such that an additional increase in the quality of water supply significantly increases rental value in high density area by 21.6%. All other infrastructures insignificantly influenced rental value such that an additional improvement in power, access road, waste management, sewage system, security, sanitation, recreational facilities, health and school facilities insignificantly increase rental value by 17.9%, 28.6%, 4.7%, 77.4, 25.6%, 41.7, 40.5, 23.6, 0.9% and 44.4% respectively.

Result of Regression Analysis in Ilorin

Model	Unstandardized Coefficients		T	Sig.	Collinearity Statistics	R^2
	B	Std. Error			Tolerance	
(Constant)	4.681	2.903	1.612	.115		0.344
Water Supply	.216	.693	.312	.046	.727	
Power Supply	.179	.241	-.741	.463	.796	
Access Road	.286	.721	.396	.694	.875	
Waste Disposal	.047	.544	.086	.932	.607	
Sewage Disposal	.774	.742	1.043	.303	.715	
Drainage System	.256	.302	.850	.401	.568	
Security system	.417	.404	1.033	.308	.610	
Sanitary Condition	.405	.574	.705	.485	.841	
Recreational Facilities	.236	.161	1.463	.152	.976	
Health infrastructure	.009	.135	.068	.946	.959	
School Facilities	.444	1.012	.439	.433	.721	

Source: author's computation, 2018

Conclusion and Recommendation

The study has provided an insight into the effect of budgetary allocation for infrastructure on neighbourhood quality and rental values, from all indication from findings of this study, it was therefore revealed that amount allocated or budgeted for infrastructure over the period of the study thus insignificantly influenced rental values. Despite the annual progressive increase in budgeted amount for infrastructural development, there is no corresponding improvement in quality of the neighbourhood infrastructure. In other words, the amount budgeted for these infrastructures is purely a piece of paper work and it has not been transferred on the ground and at same time it has no influence on the quality of the neighbourhood and at same time it has no effect on rental values. The fact that government budget is statutory, there is need to channel the fund appropriately especially the fund budgeted for road, power and water infrastructures, because the budget made for these infrastructure was only on paper not on

ground, and this will have an influence on the quality of life in the neighbourhood. The study also discovered that annual increase in budget failed to commensurate with quality of neighbourhood infrastructure; it is recommended that there is need for accountability in execution of fund meant for infrastructure provision.

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SECTION 4:

REMOTE SENSING AND DIGITAL INFORMATION SYSTEMS

ASSESSMENT OF USERS' SATISFACTION ON MANUAL AND DIGITAL LAND INFORMATION SYSTEM IN KWARA STATE, NIGERIA

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Abstract

The development and implementation of digital land information management system in Kwara State lands registry is buttressed by the growth of population seeking for land title which necessitated inefficient integrated land information management system. With the rapid growth in information technology, manual land information system became inefficient, time-consuming and prone to abuses, hence, the need for digital approach to facilitate the land information management in the registry. This has been achieved with the establishment of Kwara Geographical Information System (KWAGIS) in order to convert existing land related information into functional digital format. This paper compared the level of users' satisfaction between the paper based and digital system of land information management in Kwara State. A close-ended questionnaire was administered on the four hundred (400) landowners selected from the two hundred and sixteen thousand two hundred and thirty-three (216,233) target population and One hundred and forty-six (146) registered professionals in the built environment for the study. The findings revealed that time of completion, cost involved in transaction process, ease of transaction, speed of access and removal of bureaucracy were the most successful predictors of users' satisfaction with method of job execution within the land registry. The study recommended that government should provide adequate funding and investment in database software development and application of information communication technology (ICT) in order to meet the basic infrastructural facilities needed in the registry for efficient service delivery.

Keywords: *Geographical Information System, Land Information Management System, Lands Registry, Software, Users'*[25]

INTRODUCTION

Land is the most important resource in the world. Individuals and organizations interested in development within their own capacity will therefore require clear guidelines on all land issues to help them in their planning and investment decisions as they relate to land acquisition and development, therefore, it is apparent that any information concerning land is valuable. Up-to date information on rights that subsist in land such as ownership, occupancy, lease, mortgage, etc. are created in lands registry, hence, ensures confident dealings in property and security of title.

In a developing country such as Nigeria, virtually all aspects of land administration in some of the states are done manually. Galadima (2006) stated categorically that the former Department of Land Administration and Resettlement, Federal Capital Territory (FCT) was operating a manual system of land information management. These were plagued by numerous bottlenecks, cumbersome process, widespread forgeries, document laundering and racketeering of land. According to him, other problems of land administration include cases of

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multiple allocation, unattended applications, allocations from "parallel Ministry" mismatches in land use, encroachment, inefficient revenue generation and collection and as well as delays in perfecting transactions in land.

With the advent of Geographical Information System (GIS) which is based on designing and creating on line database management system, the burden becomes lessened. The primary function of this tool is to graphically display aggregate data managed by software application as maps with layers of information (Zeferino, Marcia & Inalda, 2012). GIS helps in the creation of more flexible cadastral in an interactive system that allows for the storage of large volumes of data, manipulation and retrieval at relatively lesser time and cost. With GIS therefore, cadastral management becomes less tedious and disregards analogue equipment. Also, its use for supporting decision-making is not only limited to combining the different datasets, but to efficiently access, retrieve and apply land data and indicators without substantial effort to rummage around map storages or visiting sources or, conducting many diverse queries, merging different data and bringing all the data into the same map view (Zeferino *et al*., 2012). However, despite its benefits the implementation has been proved as complex for both technical and institutional reasons (Saugene & Sahay, 2011). Technically, the complexity is caused by difficulty in handling emerging problems, the ability to deal with the advanced JavaScript frameworks such as ArcGIS, AutoCAD, ArcView, OpenLayers, ExtJS and GEoExt and the conversion of geodata between coordinate systems and format. Institutionally, tensions arise from various sources including the need for consensus on standards and the inclusion of users in the standardization activities (Saugene & Sahay, 2011).

The adoption of GIS technology in the area of land management and administration is a challenge to developing countries such as Nigeria. The introduction aims at improving land administration system by fast-tracking the issuance of title documents – Certificate of Occupancy (C of O) and other transactions in lands such as assignments, mortgages, etc. and the process of title registration as well as improving access to land information (Egbenta, Ndukwu & Adisa, 2012). It is a transactional system which has been helpful for revenue generation and monitoring of land information operations.



Figure1: Digitilization of Kwara State Land Registry
Source: Kwara Geographical Information System (KWAGIS), 2011.

Kwara state which was created in 1967 out of the former Northern Region with about 36,825 Square kilometres, little was known then about the influx of population that is currently being experienced. People seeking for accommodation and land for construction of building requires land, which hitherto necessitated the acquisition of land without title. Land title then

was beclouded with delay due to bureaucratic process, corruption and relatively expensive (Ukaejiofor, 2007). This led to the establishment of computerized Land Data and Spatial based information infrastructure in 2008 by former Governor, His Excellency, Dr. Abubakar Bukola Saraki which today is known as Kwara Geographic Information System with "KWAGIS" as its acronym. KWAGIS is a system that captures information on all Kwara State Lands in a functional format. It is a more flexible system of recording and administering Land Information against the hitherto manual system. The system is designed to link up with the cadastral system at the Survey Department.

This study is therefore carried out to assess the performance of the former manual and new Digital Land Information System in Kwara State lands registry in terms of users' satisfaction with special reference to Kwara Geographic Information System with a view to improving the existing system of managing land information.

STATEMENT OF HYPOTHESIS

The hypothesis for this study is postulated as follows:

i. H_o: There is no significant difference in the level of users' satisfaction before and after the introduction of digital land information system.

LITERATURE REVIEW

Land registries create and maintain precious resources on property rights. They also secure land tenure, facilitate land transactions and provide important land information that is needed for a successful land market transaction (Dale & McLaughlin, 1988; Zenenbergen, 2002). Land Information on ownership, parcel information, and transaction information that are created in the land registry are significant data on which transparent land market transactions and performance depends on for good governance.

According to a study conducted by Ojo (2014), the professionals who are the major user of Akure Land Registry are satisfied with the land title registration process in the areas of "Mode of payment for service provided" and "Cost of service provided". The reasons for this are not far-fetched.; Given the modern e-banking system in Nigeria, the stress associated with payment for various services, including land-related services, has been reduced drastically, which has made "Mode of payment for service provided" to be satisfactory to the respondents. Also, since the clients are mostly urban residents earning income, the professionals did not express dissatisfaction with the "Cost of service provided" which implies that the clients who actually bear the cost of land services being provided can still afford the cost as required by the land registry.

The study further reveals that the respondents are grossly dissatisfied with land title registration process of Akure land registry in the areas of "accessibility to land services through modern technology", "time taken to obtain required service" and "level of transparency in land registration process". It was discovered that the land registry is yet to adopt modern information technology in the ways of doing its business which has made land service accessibility to be difficult.

A final project report conducted by the Republic of Croatia in 2010 on Real Property Registration and Cadastre Project revealed that the land registers are fully digitalized apart from the damaged Land Registration (LR) files that are being repaired or are part of sporadic corrective proceedings. For the purpose of monitoring the development of the project and its impact on society, researches were conducted in 2006 and 2009 regarding user satisfaction. In

2006, the research was presented at a press conference and internally to all cadastral offices and courts, whereas the research in 2009 was prepared in a form of a brochure for all participants. Even though the research methodology in 2009 was somewhat different, it is possible to notice similar trends from the research in 2006. More than half of users processed their case (registration of construction, deletion of life-long usufruct) in one day. As in the previous research, some types of cases required a longer period of time. A large majority of users are satisfied with the service. The grades are somewhat lower than in the previous research, but this is primarily due to the methodology change (exit polls instead of filling in the questionnaire) and due to the reduction in the number of locations to only two main County seats which mostly have more demanding and critical parties.

The great majority of Land Registry Office (LRO) users (71%) believe that the costs are appropriate; however, 57% of cadastral office users believe the costs are appropriate. About 61% of users state that the quality of LRO services is improving, and the same is stated by 62% of cadastral office users. About $^{1}/_{3}$ of those who use both types of offices have noticed the brochure issued within the project activity of Public Awareness Campaign.

The user satisfaction and public perception survey in 2006 found that the awareness of the Campaign was 60%, whereas 80% of respondents correctly understood the Campaign message about the land administration reform. The number of requests directed towards the land registry significantly increased in 2006 and 2007 and field reports testify to the growing number of people coming to the cadastral and land registry offices with the intent of double-checking the records on their real property and undertaking the actions necessary to update the records; the main goal of the Campaign. The positive impact of the Campaign, especially its information and education content (brochures, leaflets, Internet, press clippings, etc.) is also visible in more complete applications filed by the parties and the reduction in the number of rejected or refused applications.

MATERIALS AND METHODS

Survey research design was applied which involved the administration of questionnaires to the target population so as to extract necessary information for the study using Ilorin, Kwara State as the case study. The data used for the study was derived from primary source by means of a structured questionnaire. The research population provided by the National Population Commission Census was based on the housing unit projection from year 2006 (168,068 housing units) (NPC, 2006) to 2014 which consists of 216,233 residential properties/housing units of Ilorin city (both individual and family land owners) and 146 Professionals in the built environment that makes use of Kwara State Lands Registry. The professionals comprises of 8 Architects, 20 Estate surveyors and valuers, 25 land surveyors, 85 lawyers and 8 town planners operating in Ilorin. The list of these registered professional firms having private practice and who belong to their respective professional bodies as at 2015 in Kwara State were obtained from each of their respective official professional website of year 2015 professional directory lists. This population is considered sizable and a structured questionnaire was administered on them. The questionnaire centres on 12 variables that could influence the satisfaction level of the respondents with the registry.

Ilorin city was stratified into the traditional centre / core areas (High density category), The Transitional/Mixed areas (Medium Density category), the Government Reservation Areas and the peripheral/suburb and well planned areas (Low Density category) based on Ilorin Urban Landscape population density. Specific areas were used for data collection otherwise referred to in this study as Data Delineation Area (DDA). Systematic-random sampling technique was adopted for data collection on residential properties and their owners. Within each Data

Delineation Area, streets was selected at random. In each street within these areas, the 1st house along the street was selected, and thereafter every 10th house was automatically included in the sampling until maximum number of respondents was covered in each Data Delineation Area as used by Ojo (2014).

Paired Samples T-Test was adopted in the data analysis for the purpose of comparing the level of users' satisfaction before and after the introduction of digital Land Information System in Kwara State Lands Registry. Paired-samples (also referred to as repeated measures techniques) are used to test the same people on more than one occasion, or having matched pairs. A paired-samples t-test is used when a researcher has only one group of people and collects data from them on two different occasions or under two different conditions. Pre-test/post-test experimental designs are an example of the type of situation where this technique is appropriate. Each person is assessed on some continuous measure at Time 1 and then again at Time 2, after exposing them to some experimental manipulation or intervention. This approach is also used to assess matched pairs of participants on specific criteria such as age, sex. One of the pair is exposed to Intervention 1 and the other is exposed to Intervention 2. Scores on a continuous measure are then compared for each pair. A paired-samples t-test will tell the researcher whether there is a statistically significant difference in the mean scores for Time 1 and Time 2.

VARIABLES USED IN THE ANALYSIS

The following variables, which were considered to determine the level of users' satisfaction with the Kwara State Land Registry were used:

Table 1: DEFINITION OF VARIABLES USED

VARIABLE CODE	DEFINITION OF VARIABLE	MEASUREMENT SCALE
USATIS	User Satisfaction **(Dependent Variable)**	1 (Satisfied), 0 (Not Satisfied)
TIME	Time	Days
COST	Cost	Naira
MODOPAY	Mode of payment	1 (e-payment), 0 (No e-payment)
SPEED	Speed of access	1 (Fast), 0 (Not Fast)
ETRANS	Ease of transaction	1 (Yes), 0 (No)
LEFAP	Level of facilities provided	0 (Inadequate), 1 (Adequate)
TRANS	Transparency	1 (Transparent), 0 (Not Transparent)
REMOVAD	Removal of unnecessary overlap and duplication	1 (Yes), 0 (No)
SECODA	Security of data	1 (Cases of data loss), 0 (No cases of data loss)
REMOB	Removal of Bureaucracy	1 (Yes), 0 (No)
TIMALIN	Timely access to land information	Days
CORRUPT	Corruption	1 (Demand for Unofficial money), 0 (Non demand for Unofficial money)

Source: Field Survey, 2015.

DATA ANALYSIS AND DISCUSSION OF RESULT

Paired Sample T-test was performed to ascertain any difference in the satisfaction level of users' (Landowners/Direct Users' and Professionals) before and after the introduction of Digital Land Information System. The result of the findings was presented in Tables 2, 3, 4 and 5.

Table 2: PAIRED SAMPLE STATISTICS OF LANDOWNERS' SATISFACTION BEFORE AND AFTER THE INTRODUCTION OF DIGITAL LAND INFORMATION SYSTEM.

Pair	Variables	Before			After		
		Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean
Pair 1	Time of Completion	2.57	1.316	.081	1.67	.876	.054
Pair 2	Cost Involved	1.07	.253	.016	1.27	.443	.027
Pair 3	Mode of Payment	1.60	.490	.030	1.16	.364	.022
Pair 4	Ease of Transaction	1.70	.460	.028	1.30	.460	.028
Pair 5	Level of Transparency	1.69	.461	.029	1.22	.413	.026
Pair 6	Removal of unnecessary overlap and duplication of title	1.46	.499	.031	1.44	.497	.031
Pair 7	Any case of data loss	1.60	.491	.030	2.00	.000	.000
Pair 8	Removal of bureaucracy	1.61	.489	.030	1.54	.499	.031
Pair 9	Access to information	1.64	.576	.036	1.23	.506	.031
Pair 10	Demand for unofficial money	1.52	.501	.031	1.98	.150	.009
Pair 11	Speed of the system	1.66	.476	.029	1.30	.460	.028
Pair 12	Level of facilities provided	1.71	.453	.028	1.44	.497	.031

Source: Field Survey, 2015.

Table 2 showed the overall mean value of the paired sample statistics of the factors determining the level of satisfaction of the landowners before and after the introduction of digital land information management system. The result shows that the mean scores of time of completion (1.67), Mode of payment (1.16), Ease of transaction (1.30), Level of transparency (1.22), removal of unnecessary overlap and duplication of title (1.44), removal of bureaucracy (1.54), access to information (1.23), speed of the system (1.30) and Level of facilities provided (1.44) after the introduction of digital system are lesser than their mean score before the introduction of digital system while other variable mean scores i.e. cost involved (1.27), cases of data loss (2.00) and demand for unofficial money (1.98) after the introduction of digital system are greater than their mean scores before the introduction of digital system. This suggested that the time of completing a transaction in days by Landowners after the introduction of digital system is now shorter, the mode of payment of cost involved and the ease of transaction is much easier, the introduction of digital system is more transparent and has removed unnecessary overlap and duplication of title. The digital system has also reduced bureaucracy, access to information

in days is now timely while the speed of the digital system is now faster but the digital system is now associated with high cost of transaction, there are still cases of loss of data and some of the officials of the registry are corrupt. The greater mean score of high cost of transaction, cases of data loss and demand for unofficial money after digitalization could be as a result of relative huge investment of the digitalization, the operation of the registry which still involves the analogue filling system despite the computerization of the registry, the reduction of filling stages by human effort and total eradication of cash payment in the registry by the digitalization and so makes the few officials involved in the process to be corrupt.

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Time of Completion before digital - Time of Completion after digital	.905	.702	.043	.819	.990	20.858	261	.000
Pair 2	Cost involved Before digital - Cost involved after digital	-.198	.400	.025	-.247	-.150	-8.039	261	.000
Pair 3	Mode of Payment before digital - Mode of payment after digital	.447	.498	.031	.386	.507	14.512	261	.000
Pair 4	Ease of Transaction before Digital - Ease of Transaction after Digital	.397	.490	.030	.337	.457	13.107	261	.000
Pair 5	Level of transparency before digital - Level of transparency after digital	.477	.500	.031	.416	.538	15.432	261	.000
Pair 6	Removal of unnecessary overlap and duplication of title before digital - Removal of unnecessary overlap and duplication of title after digital	.019	.137	.008	.002	.036	2.253	261	.025
Pair 7	Any case of data loss before digital - Any case of data loss after digital	-.401	.491	.030	-.460	-.341	-13.212	261	.000
Pair 8	Removal of bureaucracy before digital - Removal of bureaucracy after digital	.073	.260	.016	.041	.104	4.517	261	.000
Pair 9	Access to information before digital - Access to information after digital	.405	.492	.030	.345	.464	13.317	261	.000
Pair 10	Demand for unofficial Money before digital - Demand for unofficial Money after digital	-.458	.499	.031	-.519	-.397`	-14.851	261	.000
Pair 11	Speed of the System before digital - Speed of the System after digital	.355	.479	.030	.297	.413	11.984	261	.000
Pair 12	Level of facilities provided before digital - Level of facilities provided after digital	.275	.447	.028	.220	.329	9.945	261	.000

Source: Field Survey, 2015.

Table 3: The mean paired differences and significant level of Landowners' satisfaction before and after the introduction of Digital Land Information system.

Table 3 showed the comparative analysis employed in ascertaining the significant difference between the satisfaction level of landowners before and after the introduction of digital land information management system. The paired differences mean of all the factors determining the satisfaction level of users' before and after the introduction of digital land information management system showed a large significant positive value, the result also showed a large positive *t*-values and their significant values is less than the level of significance alpha (p) = 0.05 (two-tailed) except the paired difference mean and *t*-values of cost involved (-.198) (-

8.039), any cases of data loss (-.401) (-13.212) and demand for unofficial money (-.458) (-14.851). With 95% confidence interval of the difference and with degree of freedom (df) 261, the actual mean difference of all the factors are between the lower and upper mean difference as shown in table 3 which means that the satisfaction level score of all the factors determining the satisfaction level of users' after the introduction of digital land information management system except the cost involved, any cases of data loss and demand for unofficial money is always going to be lesser than their satisfaction level score before the introduction.

Therefore it can be concluded from the paired sample t-test on the two groups (satisfied and not satisfied) that landowners are more satisfied with the digital land information management system i.e. there is significant difference in the level of users' satisfaction before and after the introduction of digital land information system by both groups of respondents.

Therefore the hypothesis (H_0) which states that there is no significant difference in the level of users' satisfaction before and after the introduction of digital land information system is rejected.

Table 4: PAIRED SAMPLE STATISTICS OF PROFESSIONALS' SATISFACTION BEFORE AND AFTER THE INTRODUCTION OF DIGITAL LAND INFORMATION SYSTEM.

Pair	Variables	Before			After		
		Mean	**Std. Deviation**	**Std. Error Mean**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Pair 1	Time of Completion	1.53	.502	.050	1.19	.502	.050
Pair 2	Cost Involved	1.04	.195	.019	1.01	.099	.010
Pair 3	Mode of Payment	1.97	.170	.017	1.00	.000	.000
Pair 4	Ease of Transaction	1.68	.470	.047	1.04	.195	.019
Pair 5	Level of Transparency	1.13	.335	.033	1.00	.000	.000
Pair 6	Removal of unnecessary overlap and duplication of title	1.74	.443	.044	1.01	.099	.010
Pair 7	Any case of data loss	1.88	.324	.032	2.00	.000	.000
Pair 8	Removal of bureaucracy	1.00	.000	.000	1.85	.356	.035
Pair 9	Access to information	1.75	.438	.043	1.10	.299	.030
Pair 10	Demand for unofficial money	1.94	.236	.023	1.99	.099	.010
Pair 11	Speed of the system	1.43	.498	.049	1.12	.324	.032
Pair 12	Level of facilities provided	1.99	.099	.010	1.86	.346	.034

Source: Field Survey, 2015.

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Time of Completion before digital - Time of Completion after digital	.343	.572	.057	.231	.455	6.064	101	.000
Pair 2	Cost involved Before digital - Cost involved after digital	.029	.170	.017	-.004	.063	1.749	101	.083
Pair 3	Mode of Payment before digital - Mode of payment after digital	..971	.170	.017	.937	1.004	57.732	101	.000
Pair 4	Ease of Transaction before Digital - Ease of Transaction after Digital	.637	.483	.048	.542	.732	13.320	101	.000
Pair 5	Level of transparency before digital - Level of transparency after digital	.127	.335	.033	.062	.193	3.841	101	.000
Pair 6	Removal of unnecessary overlap and duplication of title before digital - Removal of unnecessary overlap and duplication of title after digital	.725	.448	.044	.637	.814	16.338	101	0.00
Pair 7	Any case of data loss before digital - Any case of data loss after digital	-.118	.324	.032	-.181	-.054	-3.670	101	.000
Pair 8	Removal of bureaucracy before digital - Removal of bureaucracy after digital	-.847	-.853	.356	.035	-.923	-.783	101	.000
Pair 9	Access to information before digital - Access to information after digital	.647	.480	.048	.553	.741	13.603	101	.000
Pair 10	Demand for unofficial Money before digital - Demand for unofficial Money after digital	-.049	.217	.021	-.092	-.006	-2.282	101	0.25
Pair 11	Speed of the System before digital - Speed of the System after digital	.314	.466	.046	.222	.405	6.795	101	.000
Pair 12	Level of facilities provided before digital - Level of facilities provided after digital	.127	.335	.033	.062	.193	3.841	101	.000

Table 4 showed the overall mean value of the paired sample statistics of the factors determining the level of satisfaction of the professionals before and after the introduction of digital land information management system. The result shows that the mean scores of time of completion (1.19), Cost involved (1.01), Mode of payment (1.00), Ease of transaction (1.04), Level of transparency (1.00), removal of unnecessary overlap and duplication of title (1.01), access to information (1.10), speed of the system (1.12) and Level of facilities provided (1.86) after the introduction of digital system are lesser than their mean score before the introduction of digital system while other variables mean score i.e. cases of data loss (2.00), removal of bureaucracy (1.85) and demand for unofficial money (1.99) after the introduction of digital system are greater than their mean scores before the introduction of digital system. This result is in corroboration with response of the landowners in the result of Tables 2 and 3 which also

suggested that the time of completing a transaction in days by professionals after the introduction of digital system is now shorter, the cost involved in any transaction with digital system is affordable for the professionals, the mode of payment of cost involved and the ease of transaction is much easier, the introduction of digital system is more transparent and has removed unnecessary overlap and duplication of title. The result also shows that access to information in days is now timely, the speed of the digital system is now faster while the level of facilities provided for the digital system is adequate but the digital system in consonance with response of the landowners has not reduced bureaucracy, there are still cases of loss of data and some of the officials of the registry are corrupt. The greater mean score of cases of data loss, removal of bureaucracy and demand for unofficial money after digitalization could also be as a result of the operation of the registry which still involves the analogue filling system despite the computerization of the registry, the reduction of filling stages by human effort and total eradication of cash payment in the registry by the digitalization and so makes the few officials involved in the process to be corrupt.

Table 5: The mean paired differences and significant level of Professionals' satisfaction before and after the introduction of digital land information system.
Source: Field Survey, 2015.

Table 5 showed the comparative analysis employed in ascertaining the significant difference between the satisfaction level of professionals before and after the introduction of digital land information management system. The paired differences mean of all the factors determining the satisfaction level of professionals before and after the introduction of digital land information management system also showed a significant positive value, the result showed positive *t*-values and their significant values is less than the level of significance alpha (p) = 0.05 (two-tailed) except the paired difference mean and *t*-values of any cases of data loss (-.118)(-3.670), removal of bureaucracy (-.847)(-7.83) and demand for unofficial money (-.049)(-2.282). With 95% confidence interval of the difference and with degree of freedom (df) 101, the actual mean difference of all the factors are between the lower and upper mean difference as shown in table 5 which means that the satisfaction level score of all the factors determining the satisfaction level of professionals after the introduction of digital land information management system except the cost involved, any cases of data loss and demand for unofficial money is always going to be lesser than their satisfaction level score before the introduction.

Therefore it can be concluded from the paired sample t-test on the two groups (satisfied and not satisfied) that professionals are also more satisfied with the digital land information management system i.e. there is significant difference in the level of users' satisfaction before and after the introduction of digital land information system by both groups of respondents (satisfied and not satisfied).

Therefore the hypothesis (H_0) which states that there is no significant difference in the level of users' satisfaction before and after the introduction of digital land information system is rejected.

CONCLUSIONS AND RECOMMENDATIONS

The paired sample t-test statistics on the two groups (satisfied and not satisfied users) shows that users' (landowners and professionals) of Kwara State land registry are more satisfied with

the registry after the digitalization because the time of completing a transaction in days after the introduction of digital system is now shorter, the cost involved is more affordable to professionals though not really affordable for landowners (Direct Users'), the mode of payment of cost involved and the ease of transaction is much easier, the introduction of digital system is more transparent and has removed unnecessary overlap and duplication of title.

The result also shows that the level of facilities provided for the digital system is adequate, access to information in days is now timely while the speed of access to land information by the digital system is now faster but the digital system has not removed bureaucracy, there are still cases of loss of data and some of the officials of the registry are demanding for unofficial money. Therefore, there is significant difference between the users' satisfaction before and after the introduction of digital land information management system.

The study recommends the need for automation and upgrade of database software development/advanced JavaScript frameworks such as ArcGIS, AutoCAD, ArcView, OpenLayers, ExtJS and GEoExt etc which will not only capture data in digital format only as obtainable currently with the existing Kwara State digital land registry but also make available internet access to the services of the registry anywhere in the world in terms of filling application, payment of cost involved in transaction with the registry and other activities and enhance service delivery thereby eradicating the analogue/manual filling system completely.

Adequate security measures that will protect users' information online should be put in place in order to avoid unauthorized/unwanted internet access such as hacking, forgery and other criminal acts. Government should put in place machineries that will reduce corruption by the registry staffs, need to create a better awareness on GIS and its tools and literacy levels of the man power in hardware and software usage should be enhanced through capacity building of on-the job training and re-training programme on hardware installation maintenance and GIS software application. There should be adequate funding and huge investment by the government to meet the basic infrastructural facilities needed in the registry for efficient service delivery.

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SPATIO-TEMPORAL ANALYSIS OF BIDA HOUSING MARKET USING GEOGRAPHIC INFORMATION SYSTEM

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Abstract
Previous studies show importance of spatial distribution of housing price and its variability over time, but did not cover various types of houses with their prices over time. This study therefore focused on examining spatial and temporal changes in Bida housing market from 2008 to 2018 using Geographic Information System (GIS). In particular, it focuses on the spatio-temporal auto-correlation of spatial distribution of residential housing prices over ten year period. Ordinary Kriging (OK) model was used to carry out the analysis. This model is consistently estimated by the maximum likelihood approach and they were compared with respect to the changes that occur within the period. For each model, geospatial layers were produce in order to ascertain the changes that occur. This paper establish the benefits associated with the use of GIS technology in housing research and the substantial benefits obtained by modelling the spatial as well as the temporal dependence of the data. Specifically approaches to trends and changes in the housing market, which can also extend to various aspects of housing studies.

Keywords: *Geographic Information System, Housing market, Interpolation, Spatial, Temporal*

[26]1.0 Introduction

The recent experience and the crisis of housing in the developing world have shown that price fluctuations and the cyclical character of the housing market are risk factors that can threaten the stability of the financial and banking sectors dynamics (Olszewski, Waszczuk, & Widłak, 2017). The accumulation of risks can lead to uncertainty in the market that can worsen the economic situation because of the links between the housing, banking, and finance sectors. Price changes can have an impact on the whole country and this is the reason why government and its agencies should monitor house price dynamics (Olszewski, Waszczuk, & Widłak, 2017). However, the housing market has provided an active application area for spatial-temporal modelling and analysis (Yao & Fotheringham, 2016; Wu, Ye, Du, & Luo, 2017; Li, Ye, Lee, Gong, & Qin, 2017).

Spatial relationships between objects that can be identified in relation to the earth are the basic tasks performed by Geographic Information Systems (GIS). These systems provide a number of tools for analysing the characteristics and relationship of spatially defined objects (Cichociński & Dąbrowski, 2013). All geographic phenomena evolve over time, both the spatial and temporal characteristics are key to the understanding of geographic processes and events. Furthermore, knowledge extracted from spatio-temporal data will help to better predict the spatial processes and events. Therefore, it is important to carry out analysis on the spatio-temporal data sets (Cichociński & Dąbrowski, 2013). This study examines the dynamics in Bida housing market using space and time approach.

2.0 Literature Review

Considerable literatures have formed spatial and geospatial housing price modelling in urban settings most especially, spatial interpolation (e.g., Dale-Johnson & Jan Brzeski, 2001; Zhang

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& Tang, 2016; Zmölnig, Tomintz, & Fotheringham, 2015; Hill & Scholz, 2017; Chen & Li, 2017; Wang *et al*., 2017; Battaglia, Borruso, & Porceddu, 2010; Olszewski *et al*., 2017; Wu *et al*., 2017; Seo, 2008; Hu, Yang, Li, Zhang, & Xu, 2016; Schernthanner, Asche, Gonschorek, & Scheele, 2016; Seo, Sohn, Choi, & Kim, 2016; McCluskey, Deddis, & Lamont, 1998; McCluskey, Deddis, Lamont, & Borst, 2000; Clauw, 2007). A fraction of which measures it using geostatistical approach (e.g. Kuntz & Helbich, 2014; Montero & Larraz, 2011; Hu, Cheng, Wang, & Xu, 2013). Importantly, the majority of the studies mentioned above did not take into account spatio-temporal analysis of housing market (e.g. Yao & Fotheringham, 2016; Li *et al*., 2017).

However, (Li *et al*., 2017) examine the space-time dynamics of how housing prices fluctuated from a big data perspective. The paper uses spatial data analytics and modelling techniques to identify the spatial distribution of housing prices. Yao & Fotheringham (2016) applies a mixed model approach, semi-parametric geographically weighted regression (GWR) with 3D model to explore, model and analyse the spatiotemporal variations in the relationships between house prices and associated determinants, but did not consider different types of housing prices. Also, Cichociński & Dąbrowski (2013) analyses spatial and temporal aspects of the real estate market. In particular, it focuses on the graphical presentation of the spatial distribution of price and its variability over time, but also did not consider various types of houses with their prices over time. This is the basis for this research and tends to fill the gap in the literature.

2.1 Conceptual Model

Spatial interpolation is the process of using points with known values to estimate values at other unknown points. As geographic information systems (GIS) and modelling techniques are becoming powerful tools in natural resource management and biological conservation, spatial continuous data of environmental variables are increasingly required (Collins & Bolstad, 1996; Hartkamp, De Beurs, Stein, & White, 1999). Thus, the values of an attribute at unsampled points need to be estimated, meaning that spatial interpolation from point data to spatial continuous data is necessary (Li & Heap, 2008).

Application of spatial interpolation earlier was typically based on elevations, climatic phenomena, soil properties, population densities, fluxes of matter, etc. While most of these phenomena are characterised by measured or digitised point data, often irregularly distributed in space and time, visualisation, analysis, and modelling within a GIS are usually based on a raster representation (Mitas & Mitasova, 1999). But recently applied in environmental sciences most especially, housing market analyses (Montero & Larraz, 2011; Zmölnig *et al*., 2015). Stochastic data-driven interpolation methods are generally used to estimate the spatial distribution of geographical phenomena from the ground-based point data. However, Ordinary Kriging (OK) is relevant to this study.

Ordinary Kriging is a method of interpolation for which the interpolated values are modelled by a Gaussian process governed by prior covariances. Kriging is a stochastic interpolation technique offer important advantages over the deterministic methods, which have been extensively applied for geographical element interpolation (e.g., Moral, 2008; Delbari, Afrasiab, & Jahani, 2013; Abo-Monasar & Al-Zahrani, 2014). Kriging has been increasingly preferred because it takes into account the spatial correlation between neighbouring observations and desired location where the estimation is to be made. In this research, OK is used to model temporal sequence. The temporal sequence is converted into a spatial sequence. It is a versatile technique, suitable for use with any type of spatio-temporal data.

3.0 Materials and Methods

3.1 Study Area

Bida town is a Local Government Headquarter in Niger State, located on the A124 highway (a regional road) linked Ilorin to Minna and Abuja. The LGA has an area of 1.698 km² and a population of 266,008 (NPC, 2006) with 9°05′N, 6°01′E, 9.083°N, 6.017°E, Coordinates. Bida

is the second largest town in Niger State. It is located southwest of Minna, capital of Niger State, and is a dry, arid town. The major ethnic group is the Nupe. Bida is the headquarters of the Nupe Kingdom led by the Etsu Nupe and consisting of many districts, such as Katcha, Lapai, Mokwa, Enagi, Baddeggi, Agaie, Pategi, Lemu, Kutigi, and others. The leadership style of the ancient town of Bida is emirship, and the head of the town is addressed as Etsu Nupe. The town is known for its production of traditional crafts, notably glass and brassware. Bida is also known for its Durbar festival. It is also the home of the Federal Polytechnic, Bida (Faruk, Mohammed, & Mohammed, 2016). The locational map of the study area showing sampled houses is shown in Figure 1.

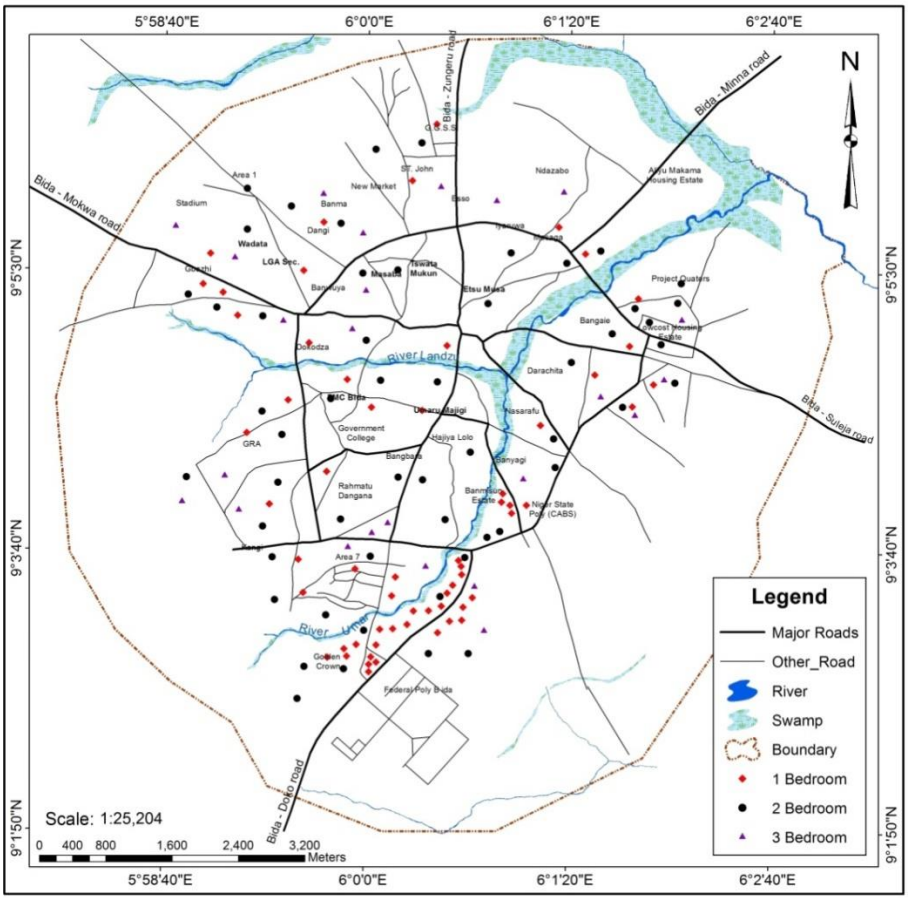


Figure 1: Bida, showing Sampled Houses
Source: Field Survey, 2018

3.2 Methodology

Total number of 138 houses managed by the 3 active estate firms in Bida; Usman Maishera & Associates, Okoh Okuoma & Co. and Pat Egbeduma & Partners was sampled. The sampled houses includes; 60 one bedroom, 54 two bedroom and 24 three bedroom (see Table 1).

Table 1: Number of Sample Houses Managed by Estate Firms in the Study Area

Estate Firms	1 Bedroom	2 Bedroom	3 Bedroom
Okoh Okuoma & Co.	9	3	2
Pat Egbeduma & Partners	8	15	5
Usman Maishera & Associates	43	36	17
Total	60	54	24

Source: Authors' Compilation, 2018

Data needed for this research were acquired through both primary and secondary sources. Primary sources include; coordinate of the sampled residential houses using hand-held GPS and their annual rent between year 2008 to 2018, while secondary sources include; satellite image from Google Earth and related historical studies on spatial and temporal analyses on housing market. However, vector data model was adopted in the mapping and building of the geodatabase.

The position of the sampled houses in terms of X and Y coordinates were taken using hand-held GPS before on-screen digitization in order to provide spatial information about the position of the study area. The coordinates were taken using the WGS 1984 with Minna as the Datum. Satellite image of the study area was georeferenced and onscreen digitization of spatial elements was also conducted using ArcGIS 10.5. Geodatabase was created where attributes of sampled houses were stored to allow interpolation. The main attribute data for this work is annual rent of the houses and stored in the relational database called theme table.

Spatial interpolation methods were used to generate models for housing market. The interpolation methods used was Ordinary Kriging (OK). Most of the tools for performing interpolation require only one value subjected to interpolation, associated with a single point. Geostatistical Wizard, a part of the Geospatial Analyst extension of Esri's ArcGIS software was used to automatically select the interpolation parameters of the examined data.

4.0 Data Analysis and Research Findings

Using OK spatial interpolation method with combination of growing number of housing transaction database records from year 2008 to 2018 and three categories of housing (i.e. 1 bedroom, 2 bedroom and 3 bedroom), the spatiotemporal modelling of housing prices are presented as follow;

4.1 Spatiotemporal dynamics in 1 bedroom housing prices

The interpolation results in Figure 3, Figure 4 and Figure 5 revealed the pattern of space and time changes that occurred in the housing prices of one bedroom apartment in the study area. It can be observed that rental price for one bedroom apartment was lower in the Central Business District (CBD) and eastern part of the town and higher to the south in the year 2008. Changes began to manifest in the year 2013 and became obvious in the year 2018. However, in the CBD, little changes were observed.

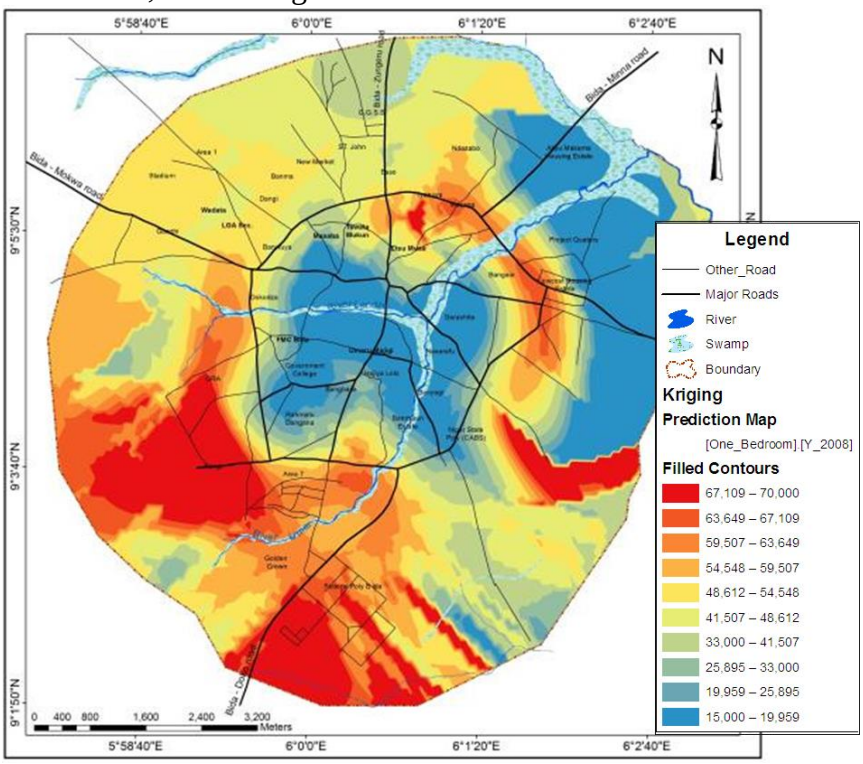


Figure 2: Spatial Interpolation of One Bedroom Housing Prices for 2008
Source: Field survey, 2018

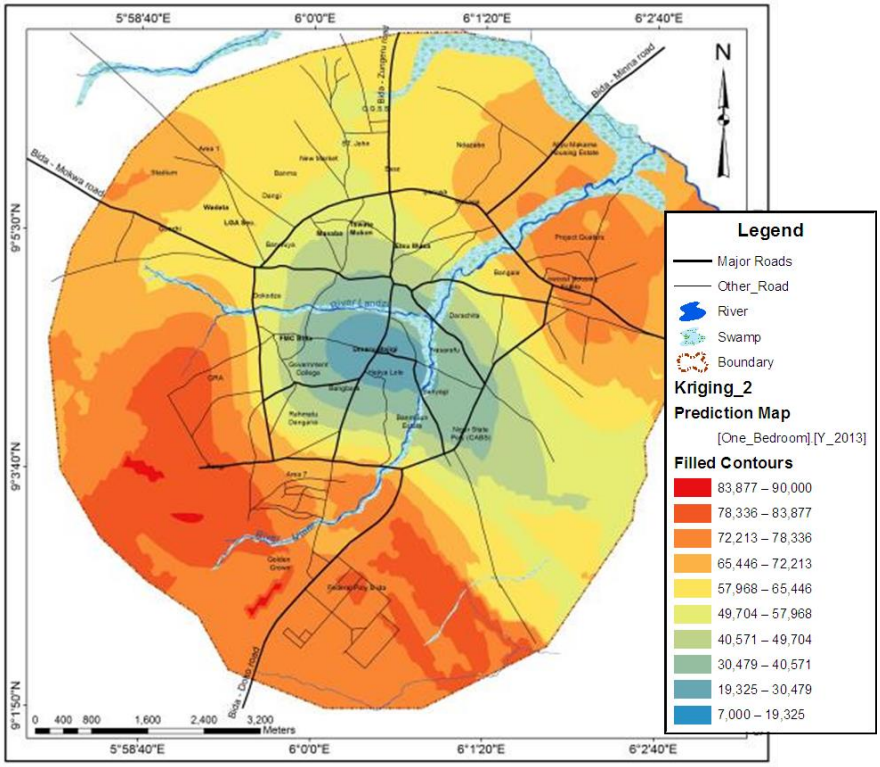


Figure 3: Spatial Interpolation of One Bedroom Housing Prices for 2013
Source: Field survey, 2018

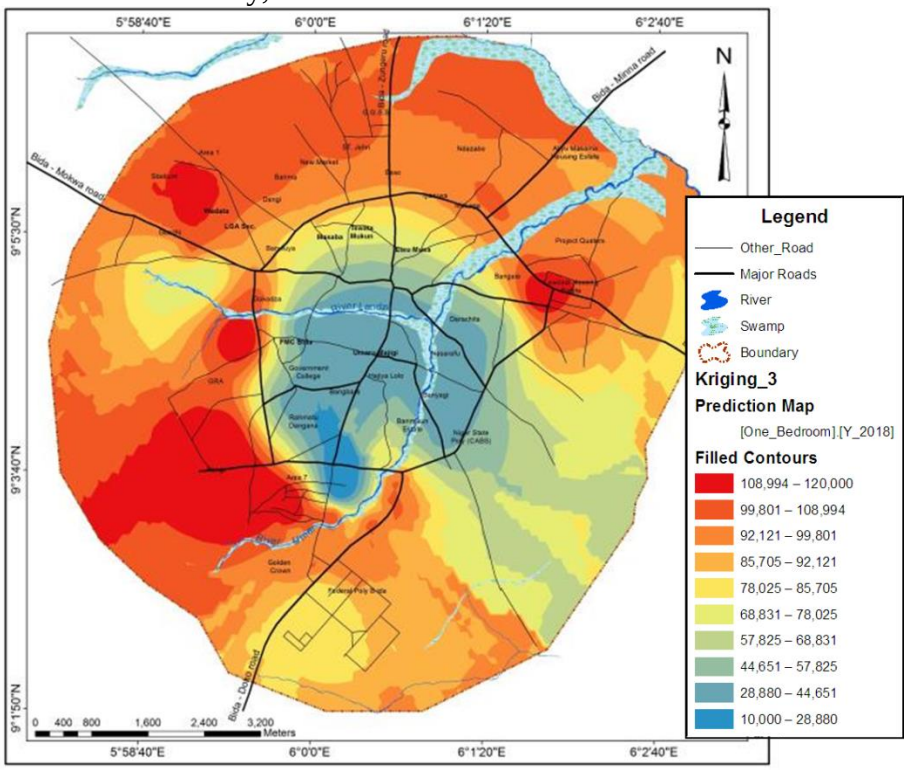


Figure 4: Spatial Interpolation of One Bedroom Housing Prices for 2018
Source: Field survey, 2018

4.2 Spatiotemporal dynamics in 2 bedroom housing prices

Spatial and temporal dynamics in the housing prices of two bedroom in the study area shows that CBD region have low rental value in the year 2008, while it increases in the area but still lower compare to other areas in the year 2018. However, to the west and south, the rental value of two bedroom apartments was high throughout the study period. These are spatially represented in Figure 5, Figure 6 and Figure 7 respectively.

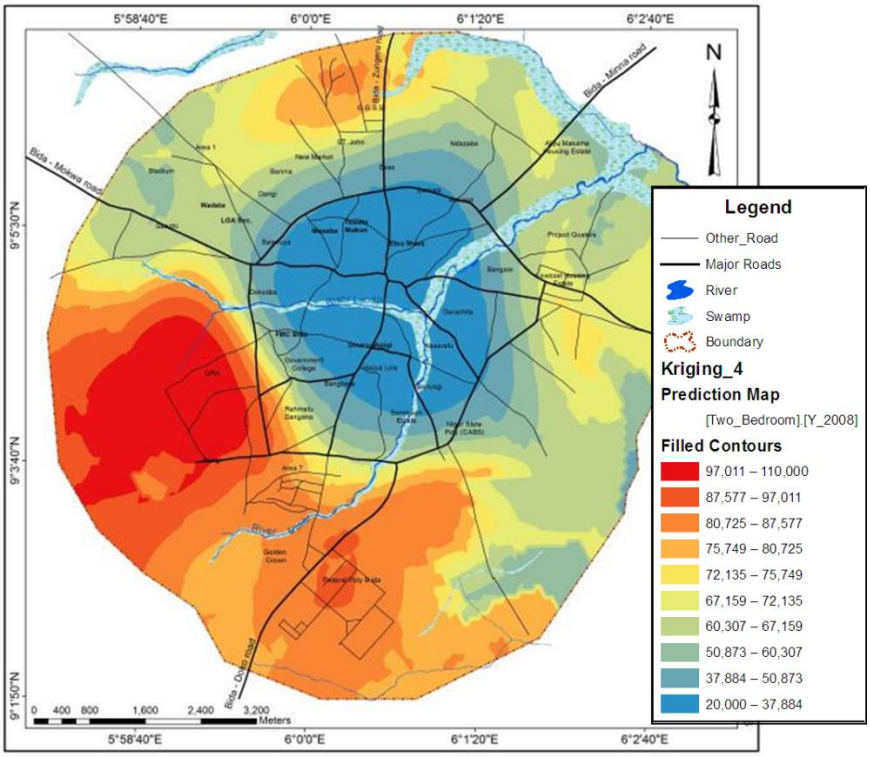


Figure 5: Spatial Interpolation of Two Bedroom Housing Prices for 2008
Source: Field survey, 2018

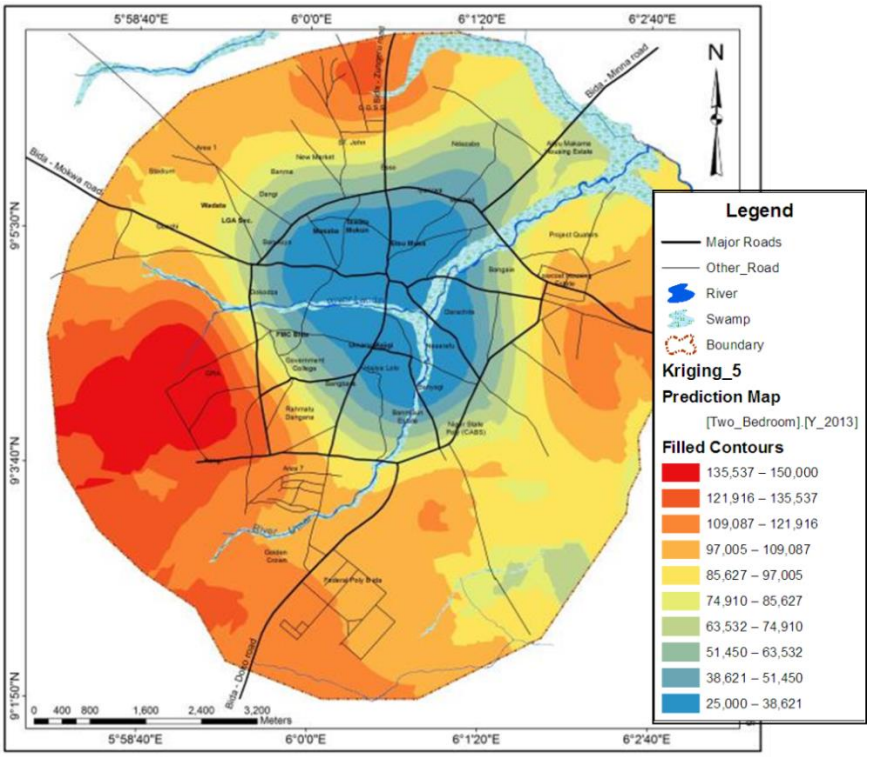


Figure 6: Spatial Interpolation of Two Bedroom Housing Prices for 2013
Source: Field survey, 2018

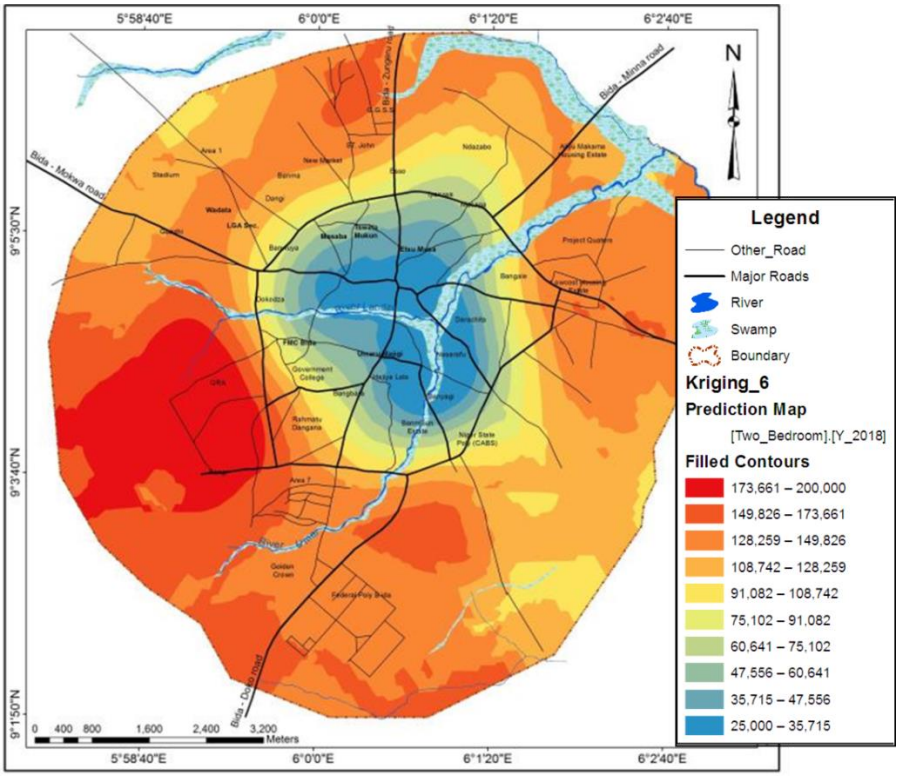


Figure 7: Spatial Interpolation of Two Bedroom Housing Prices for 2018
Source: Field survey, 2018

4.3 Spatiotemporal dynamics in 3 bedroom housing prices

For three bedroom apartments, space and time series analysis of rental prices records little changes between the year 2008 and 2013 while in 2018 significant changes have been observed. However, CBD and other regions surrounding it records lower rental value in 2018. This is graphically presented in Figure 4.8, Figure 4.9 and Figure 4.10 respectively.

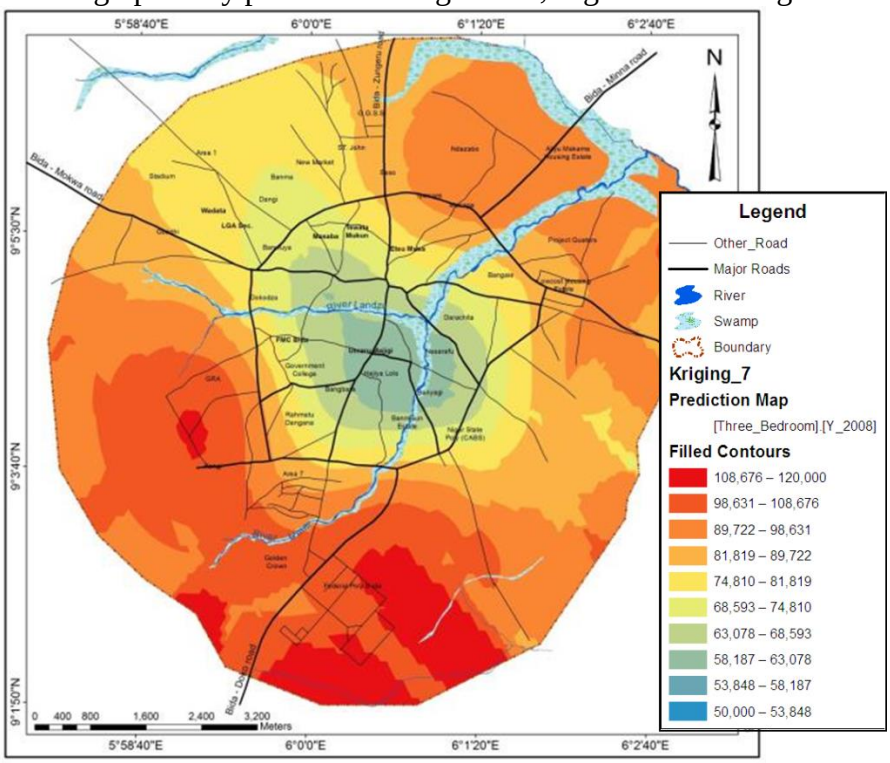


Figure 8: Spatial Interpolation of Three Bedroom Housing Prices for 2008
Source: Field survey, 2018

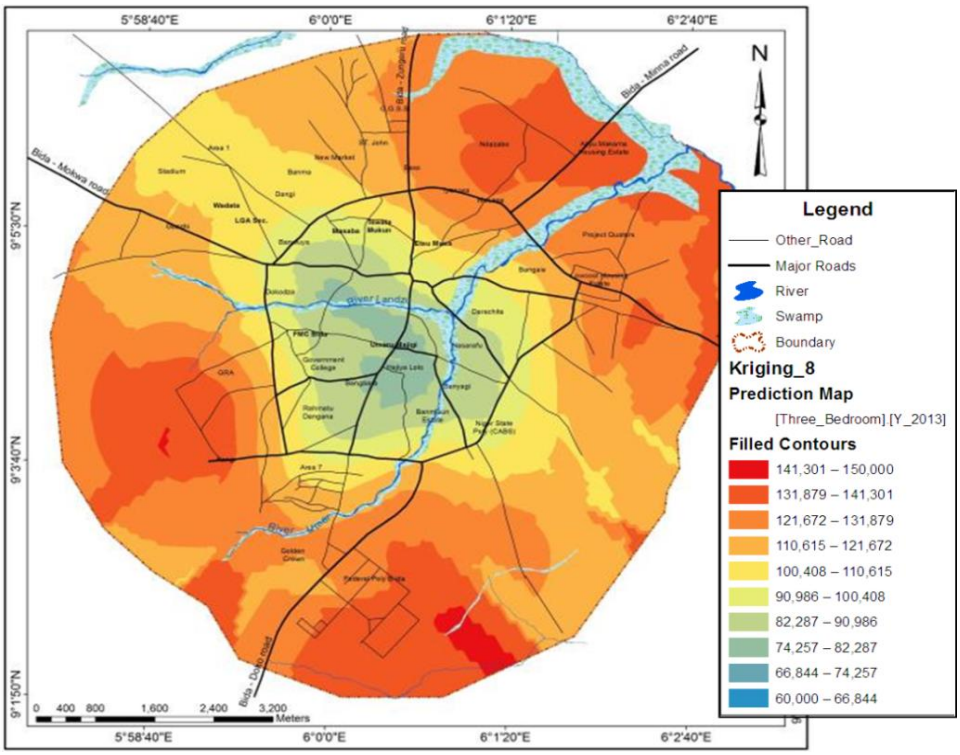


Figure 9: Spatial Interpolation of Three Bedroom Housing Prices for 2013
Source: Field survey, 2018

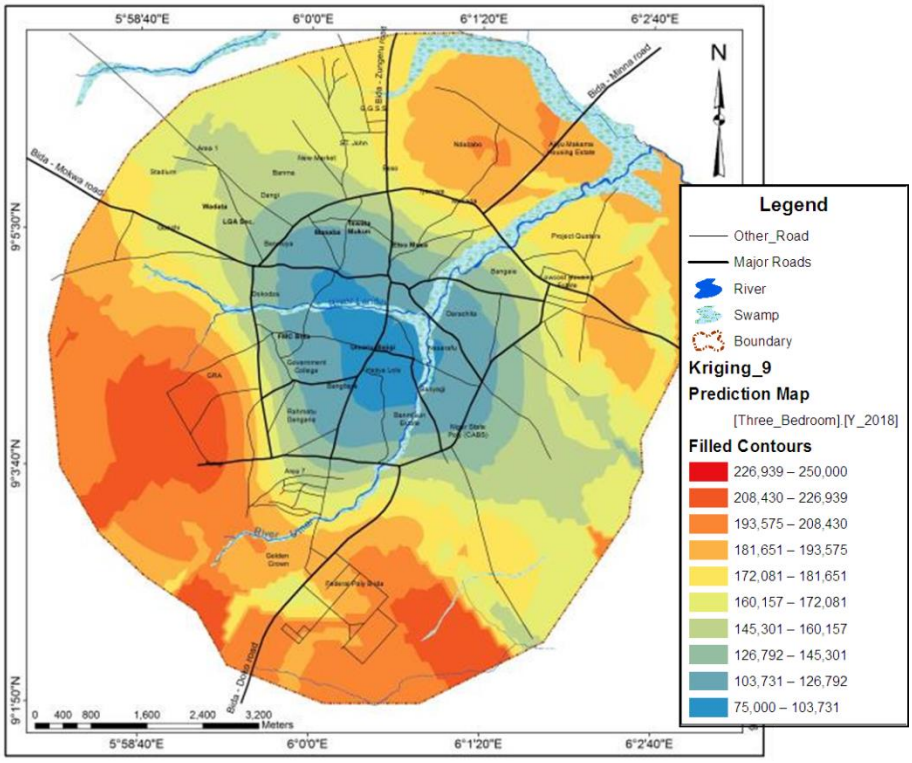


Figure 10: Spatial Interpolation of Three Bedroom Housing Prices for 2018
Source: Field survey, 2018

5.0 Discussion of Findings

Findings of this study revealed that there is unique pattern of housing prices across the study period in most part of the town. The city centre which is referred to the CBD in this study have the lowest rental value through the study period. The study also shows the differences in rental value of apartments between the CBD and other neighbourhoods continue to widen. For

example, One bedroom apartments, in the year 2008 commands rental value of around ₦70,000 in GRA area and in the CBD it was around ₦15,000 to ₦20,000. Ten years later, rental value for one bedroom apartment increases to around ₦120,000 in GRA area and ₦28,000 around the CBD. This conform with the result by Cichociński and Dąbrowski (2013) but contrary to findings by D'Acci (2018) whose findings shows that housing value decreases with the increase of the distance from the city centre. D'Acci' findings confirms Alonso's monocentric model.
However, general pattern from the geospatial model of this study demonstrate a unique housing prices pattern for the CBD while a divergence pattern for other areas. The model shows that housing prices in the Polytechnic region increases more than other regions for all types of houses under study and throughout the study period. Consequently, the model disconfirm Alonso's monocentric model which suggest that housing prices decreases with increasing distance to the city centre.

6.0 Conclusion

This study demonstrate the benefits associated with the use of GIS technology in housing research and the substantial benefits obtained by modelling the spatial as well as the temporal dependence of housing price data. Specifically approaches to trends and changes in the housing market, which can also extend to various aspects of housing studies. The knowledge gap filled in the study is that it considered various types of houses with their prices over time. The study therefore recommends the use geospatial techniques such as Ordinary Kriging in modelling housing market studies, particularly, trends in the housing market.

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ESTABLISHMENT OF DEFORMATION AND SUBSIDENCE MONITORING BASELINE IN THE COASTAL ENVIRONMENT: A CASE STUDY OF UNIVERSITY OF LAGOS

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Abstract

Deformation and subsidence measurements are very vital for stability of structures and buildings. Deformation and subsidence monitoring are easily carried out with the aid of established baselines. This study focuses on the establishment of baseline for monitoring deformation and subsidence within university of Lagos. Geodetic method of control establishment was adopted, where five (5) control stations were established on stable grounds across the university of Lagos main campus with Differential GPS observation carried out on them and data obtained were processed and analysed statistically. The result of the findings shows that the baseline established is very reliable, given that the vertical controls have their relative redundancy number r_{ij} ranging between $0.1 < r_{ij} < 1.0$, and the standard deviations ranges from 0.002 to 0.005. Also, the relative precision of the established baselines fell within the range of $7.36E-06ppm - 2.54E-05ppm$. From the findings of this research, deformation and subsidence studies can be reliably monitored within the University of Lagos and its environ using the baseline established through this research in order to safeguard lives and properties – including high rise structures within the university's main campus.

Keywords: Deformation, Coastal environment, Reference points, Monitoring, Subsidence[27]

1. Introduction

Ground subsidence can be caused by several geological factors, climatic processes and anthropogenic sources, or by mixture of the above factors. Subsidence is frequently linked to intense faulting and opening of fissures in urban areas, generating a significant geologic hazard that needs to be accurately assessed and monitored (Ferretti et al., 2004; Mazzotti et al., 2009; Brunori et al., 2015). Recent researches have demonstrated the applicability of Global Positioning System (GPS) techniques to precisely determine the 3-D coordinates of moving points in the field of natural hazards. Indeed, the detailed analysis of the motion of a landslide, in particular for a near real-time warning system, requires the combination of accurate positioning in three dimensions (infracentimetric) and fine temporal resolution (hourly or less) (Malet et al, 2002.)

Techniques of positioning on various time and space scales have made a lot of progress in the last decade, in particular in the field of geomorphological mapping, or in the realization of Digital Elevation Model (DEM) by numerical photogrammetry (Girault, 1992; Miyazawa et al., 2000; Weber and Herrmann, 2000). As a result of the constantly growing technological progress in all fields of engineering, the increasing demand for higher accuracy, efficiency, and

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sophistication of the deformation measurements, geodetic engineers have continuously search for better monitoring techniques and have to refine their methods of deformation analysis. The infiltration of space techniques such as GPS has opened a new dimension in data acquisition which involves offshore structures such as gas and oil platforms which are situated hundreds of kilometers offshore (Setan & Othman, 2006). A suitable technique of data acquisition has to be identified in order that high accuracy observation can be obtained and its results can be used for deformation analysis.
In order to detect and measure the vertical displacement or subsidence of offshore platforms, GPS is considered as the best tool to determine relative position between control stations because GPS allows us to achieve a desirable precision (i.e. +0.1ppm) that is necessary for subsidence monitoring (Leick, 1995; Krijnen & Hues 1995).
A research like this is highly justified in the coastal area like that of University of Lagos because there is need to provide accurate, wide area ground deformation data to complement accurate ground survey data of generally more limited spatial coverage, identify areas of high differential settlement for potential damage to surface infrastructure, provide historic ground movement for baseline and monitoring, identify subsidence depressions that may pose flood risk potential and identify areas of high seismic risk (ground shaking, liquefaction, fault rupture). Coastal environments tend to have weak soil structure resulting from the nature of the vegetation such as mangrove swamps logged with water, hence, the need to monitor structural facilities built in the area using subsidence monitoring baseline (Kirwan & Megonigal, 2013)

This paper focuses on the establishment of a baseline for the purpose of monitoring cases of subsidence and deformation that could likely happen within coastal environment of University of Lagos since population and human activities are increasing geometrically in the area.

2. Literature Review

Over the last decade, interest has grown among civil engineers and building professionals in monitoring the movement of different types of structure both during and after completion of construction. In different parts of the city of Lagos, numerous cases of building collapse have been recorded (Akpan, 2017; Olowopejo, 2018). It is well known that the foundations of large buildings are affected by changes in ground conditions, and also walls of heavy structures change shape with varying pressure (Tasci, 2008). For all these, deformation surveys can be used to measure the amount by which a structure moves both vertically and horizontally over regular time intervals. Although all the principle of many of the techniques used for doing this are recognizable as those used for site surveying and setting out, however, continuous updating of very precise periodic measurements either on structure or a define location distinguish a deformation survey from other types of survey (Uren and Price, 1994).

There are several techniques for measuring the deformations. These can be grouped mainly into two as (i) Geodetic techniques (ii) and Non-Geodetic (Geo-Technical) techniques (Erol et al, 1999).

Geodetic techniques make use of measuring devices that measure geo-referenced displacements or movements in one, two or three dimensions. It includes the use of instruments such as total stations, levels and global navigation satellite system receivers. In the geodetic technique, there are two types of geodetic networks, namely the reference (absolute) and relative network (Chrzanowski et. al., 1986).

Non-Geodetic techniques make use of measuring devices that measure non-georeferenced displacements or movements and related environmental effects or conditions. It includes the

use of instruments such as extensometers, piezo-meters, rain gauges, thermometers, barometers, tilt-meters, accelerometers, and seismometers.

2.1 Study Area

The University of Lagos, Akoka, Lagos State, is located at appropriately latitude 6.505° N to 6.522°N and longitude 3.385°E to 3.405°E on the geographical globe (Adeniran & Oyelowo, 201). The University of Lagos, Akoka, is a Federal Government owned University in Nigeria (University of Lagos, 2019). The University of Lagos founded in 1962 is made up of two campuses, the main campus at Akoka, Yaba and the College of Medicine in Idi-Araba, Surulere (University of Lagos, 2019). Both sites are on Lagos Mainland. The main campus is largely surrounded by the scenic view of the Lagos lagoon and is located on 802 acres (3.25 km^2) of land in Akoka, North Eastern part of Yaba, Lagos (Figure 1). This study is focused on the main campus at Akoka.

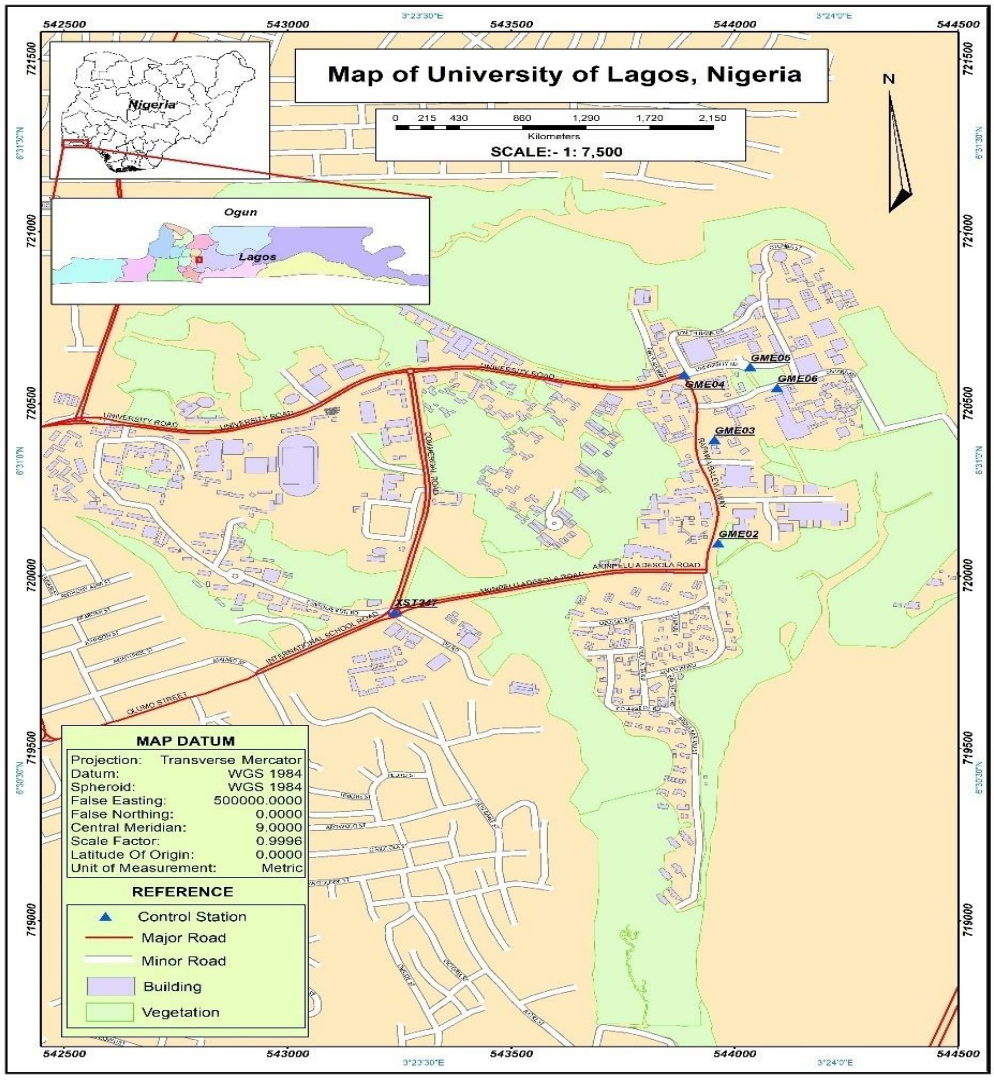


Figure 1: Study Area

3. Materials and Methods

The equipment used in the study includes Leica 1200 Differential GPS System and Leica DNA 03 Automatic level for field observation. Methodology employed in this study is divided into three sections: data collection, data processing and coordinate transformation which are briefly discussed below.

3.1.Data Collection

Data collection efforts with GPS equipment require a moderate level of planning and coordination. The following data collection scheme according to USACE (2002) was used at each station to conduct the monitoring survey.

- Session length: A session length of 45 minutes (L1/L2 GPS carrier phase data) was done and this is required to meet minimum positioning accuracies using one observed reference station.
- Coverage: A minimum of five (5) visible satellites were tracked at all times. GPS mission planning software was used to maximize the number of continuously tracked satellites in each session.
- Station data: Specific information related to the data collection was noted and recorded on the appropriate log sheets. These include: station name, receiver name, receiver and antenna models, observer name, date of survey, start and stop times of each session, entered filename, antenna height and sketch of area beacon is located.
- Recording interval: A five (5) second data logging rate was used in all data collected for monitoring surveys. The logging rate is defined as the time interval (in seconds) between each data value recorded in the receiver's internal memory or written to an external storage device.

The Leica DNA03 digital level was used to transfer height (Orthometric) from a stable reference point (XST 347) to the GPS monument reference points.

3.2.Data Processing

Data obtained was subject to post processing for better accuracy. The software used was Leica Geo Office. The processing parameters were set with the cut-off angle set to 12° from the original 15° for higher accuracy. The Lagos Geoid model was loaded and used to evaluate the orthometric heights of points. Processing was done both in the Automatic and Manual modes.

3.3.Coordinate Transformation

Coordinates were converted from UTM WGS84 datum to UTM Nigerian Local Datum (Minna Datum) using GeoCalc (Geographic Calculator) software.

4. Data Analysis and Research Findings

Table 1 shows the results of the processed coordinates using Leica geo Office software along with the standard deviations in Easting and Northing.

Table 1: 3D Coordinates of Points and Standard Deviation

Station ID	Easting (m)	Northing (m)	Ellipsoid Height, h(m)	Orthometric Height, H(m)	Std. Dev. Easting	Std. Dev. Northing
GME02	543971.8901	720208.5936	30.0777	7.2462	0.0023	0.0023
GME03	543938.7781	720408.3233	30.2855	7.4474	0.0017	0.0016
GME04	543885.2924	720582.2999	31.0157	8.1648	0.0021	0.0019
GME05	544022.5950	720626.0305	30.8074	7.9651	0.0028	0.0026
GME06	544110.0961	720551.5312	29.7357	6.9018	0.0023	0.0024
XST347 (Reference)	543235.4300	719894.2200	27.5045	4.7010	0.0008	0.0007

Note, however that the orthometric heights in Table 1 were obtained using the Lagos Geoid model(Olaleye et. al 2013). The orthometric heights obtained from actual leveling operations after adjustment with least squares(Ayeni, 2001) are presented in Table 2 with differences compared to height from geoid;

Table 2: Orthometric Heights of Points from Field Observations

Station ID	Orthometric Height, H(m)	Difference from Geoid Model (m)
GME02	7.2553	0.0090
GME03	7.4564	0.0090
GME04	8.1738	0.0090
GME05	7.9741	0.0090
GME06	6.9109	0.0090
XST347 (Reference)	4.7010	0.0000

5. Discussion of Findings

The discussions on the baseline established are divided into two. Although the data presented in this study constitute the preliminary results over a short duration of two months, trends in trend in deformation displacements can be observed as consistent observations takes place using the baseline monuments established in this research. The significance of these initial results is enhanced when considering the reliability of the established baselines judging from their accuracies and precisions acquired with the research.

5.1. Reliability of Vertical Controls

Reliability refers to the controllability of observations i.e. the ability to detect blunders in the observations (Kurotamuno, 2016). According to Ayeni (2001), the amount of redundancy (r_{ij}) that each observation adds to the solution is given by;

$$r_{ij} = q_{ij}p_{ij}(1)$$

Wherer_{ij} is the observational redundancy number.

q_{ij} is the *i*th diagonal element of the observational weight matrix P

$p_{ij}$is the *i*th diagonal element of the covariance matrix of the residuals

Computing the amount of redundancy from the observation using Equation (1), the result obtained is $r_{ij} =$

$$\begin{pmatrix} 0.5000 & 0 & 0 & 3.9448e-16 & 4.9464e-16 & -3.0748e-16 & 0 & 0.5000 \\ 0 & 0.5000 & 0 & 0 & 0 & 0 & 0.5000 & 0 \\ 0 & 0 & 0.2245 & 0.2245 & 0.2245 & 0.2245 & 0 & 0 \\ -7.0988e-17 & 0 & 0.1777 & 0.1777 & 0.1777 & 0.1777 & 0 & -7.0988e-17 \\ -7.0988e-17 & 0 & 0.1417 & 0.1417 & 0.1417 & 0.1417 & 0 & -7.0988e-17 \\ -1.4198e-16 & 0 & 0.4560 & 0.4560 & 0.4560 & 0.4560 & 0 & -1.4198e-16 \\ 0 & 0.5000 & 0 & 0 & 0 & 0 & 0.5000 & 0 \\ 0.5000 & 0 & 0 & 3.9448e-16 & 4.9464e-16 & -3.0748e-16 & 0 & 0.5000 \end{pmatrix}$$

From least square estimate the highest redundancy number was 0.5 which is the height difference between XST347 and GME02 and the lowest redundancy number is 0.147 which is

the height difference between GME05 and GME06. From the results, we can conclude that the established vertical controls are highly reliable.

5.2.Precision of Established Baselines

In computing the relative accuracy of each of the newly established baselines, the relative precision of a traverse leg formula was adopted from Ghilani and Wolf (2012) and modified to yield the formula below (Table 3);

$$Precision = \sigma_A / L_A, \quad (2)$$

Where;

$\sigma_A$is the standard deviation of the baseline between controls in consideration

$L_A$is the length of baseline between controls in consideration.

Table 3: Precision of Established Baselines

SN	Baseline	Precision in Part Per Million (PPM)
1.	XST347 to GME02	7.36E-06
2.	GME02 to GME03	1.46E-06
3.	GME03 to GME04	1.92E-05
4.	GME04 to GME05	2.22E-05
5.	GME05 to GME06	2.54E-05
6.	GME06 to GME03	1.13E-05

Part of the results of establishment of baseline for monitoring deformation in University of Lagos as detailed in Table 3 show that the best precision was acquired between GME04 to GME05 which is 2.54E-05. The results are in correlation with the standard given in the work of Malet et al (2002)and Gili et al (2000)where surficial displacements and their precision using GPS is found to be between 1-2mm for a typical baseline range of less than 20km. Furthermore, inferring from the accuracy claimed by different deformation monitoring techniques in the work of Savvaidi(2003), GPS L1/L2 static observation must give a typical accuracy of ± (5mm ± 2ppm) for a distance of less than 50 km between two stations and ± (1-3mm ± 2ppm) for a distance of less than 1 – 2 km between two points. Comparing the results in Table 3 from what is the standard from the literature, the results obtained from this research show that the baseline is standard and very reliable to carry out deformation monitoring not in the University of Lagos alone but around its environ.

6. Conclusion and Recommendation

Deformation and subsidence measurements are very vital for stability of structures and buildings. Deformation and subsidence monitoring are easily carried out with the aid of well-established baselines. This study focuses on the establishment of baseline for monitoring deformation and subsidence within university of Lagos. Geodetic method of control establishment was used, where five (5) control stations were established on stable grounds across the university's main campus with Differential GPS observation carried out on them and data obtained were processed and analysis statistically. The result of the findings shows that the baseline established is very reliable given that the vertical controls have their relative redundancy number r_{ij} ranging between $0.1 < r_{ij} < 1.0$, and the standard deviations ranges from $0.002\ to\ 0.005$. Also, the reliability of the established baselines fell within the range of

$7.36E-06ppm - 2.54E-05ppm$.From the findings of this research, deformation and subsidence monitoring studies can be carried in University of Lagos corridor in order to safeguard lives and properties in the environment – including high rise structures within the university's main campus.

With the economic and social importance of the coastal environment to the growth and well-being of the inhabitants, which includes implementation of marine and coastal structures and activities, there should be adequate and regular monitoring measurement to forestall any occurrence of deformation on the heavy structures around and within the University of Lagos.

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DESIGN AND IMPLEMENTATION OF SUSTAINABLE BUILT ENVIRONMENT: THE ROLE OF SURVEYING AND GEO-INFORMATICS TOWARDS EFFECTIVE COLLABORATION WITH OTHER PROFESSIONALS

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Abstract

Built environment sustainability has become an issue of national concern, owing to the constant threat posed by its negative impacts on the survival of man. This has made it necessary for a study on how there can be collaboration for sustainable development in the built environment, in order to reduce or completely eliminate its negative impacts (such as climate change, environmental degradation, desert encroachment, etc.). This paper proposes the identification of the role of professionals in the design and implementation of built environment, as a means of enhancing effective collaboration for sustainable development in the built environment. The roles of Surveying and Geo-informatics in design and implementation stage of the built environment were investigated through a review of literature, after which a research questionnaire was issued to professionals in the built environment to seek their assessment on how each role could serve as a collaborative support towards achieving sustainable development in the built environment. Descriptive statistics (mean score) was used to analyze and gain an overview of the data obtained. The results showed that all the roles of Surveying and Geo-informatics at the design and implementation stage of built environment would support and enhance effective collaboration for sustainable development in the built environment.

Keywords: *Built Environment, Sustainability, Surveying and Geo-informatics, Design, Implementation, Collaboration*

1.0 INTRODUCTION

Built environment refers to Man-made space in which people live, work, and recreate on a day to day basis. This includes; buildings, parks and transportation systems (Roof and Oleru, 2008). Built environment can also be referred to as everything that shows the activities of man in the natural environment, such as the design and construction of buildings and infrastructure (Huges, 2010).

The importance of having a built environment are numerous, and cannot be overemphasized. One of its greatest importance which was identified by Burton (2011), is the fact that children's well-being is been enhanced positively. That is, living in a well built up environment is important to children's good health and up-bringing.

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However, built environment also have some negative impacts, such as climate change, depletion of natural resources, global warming, Ozone layer depletion, and environmental degradation (Ilha et al, 2006; Dassah and Nimlyat, 2010; Wong, 2016; Tan et al, 2017). The effects of these impacts tend to constantly threaten the survival of Man and the Eco-system. For example, in August 2018 it was discovered that climate change was causing Indonesia's largest metropolis to sink at an average of 1 to 15cm per year. Also, in October 2018, series of Earth tremors were experienced across parts of Abuja in Nigeria, and it was found to have resulted from environmentally degrading activities of Man, such as rock blasting and indiscriminate drilling of bore holes.

Owing to the devastating nature of these impacts, and their effects on the environment, it has become necessary for a study on how to effectively collaborate for sustainable development in the built environment in order to reduce or completely eliminate its negative impacts.

Sustainable development in the Built Environment implies meeting the current needs of the present without affecting those of the future (Cesar and Ryan, 2014; Pero *et al*, 2017). This literarily means developing the environment to suit the present needs, without destroying or compromising it for the future. The challenge therefore is how to collaborate to achieve sustainable development. Research works that have been carried out on sustainable development include the works of (Sarkis et al, 2009; Kamar et al 2010; Dassah and Nimlyat, 2010, Wong, 2016; and Pero et al, 2017).

This paper seeks to investigate the roles of Surveying and Geo-informatics professionals at the design and implementation stage of built environment, that will facilitate effective collaboration with other professionals for a sustainable development in the built environment.

2.0 LITERATURE REVIEW

Sarkis et al, (2009), established a framework for the evaluation of the most effective method of integrating sustainability in the built environment, such that a win-win opportunity may be maximized, through an extension of ecological modernization theory, at the organization level. Dassah and Nimlyat (2010) tried to investigate the role and responsibilities of professionals in the built environment in contributing towards achieving sustainable development. Kamar et al (2010) tried to explore a collaborative initiative on green construction as a means of enhancing sustainable development in the Malaysian construction industry. Wong (2016) investigated the roles of quantity surveyors in sustainable building, through review of literature and case studies. Pero et al (2017) investigated the role of environmental collaboration of supply chain partners in achieving sustainable development in the construction industry.

3.0 MATERIALS AND METHODS

A review of past literatures was undertaken, to put together the major roles of the Surveying and Geoinformatics professionals in the design and implementation stage of the built environment. Thereafter, a research questionnaire was designed to seek the assessment of 6 different professionals in the built environment, on the extent to which each of the roles could serve as a collaborative support towards achieving sustainable development in the built environment. Table 1 shows a list of roles the Surveying and Geoinformatics professionals could offer as support at the design and implementation stage of built environment.

Table 1: Roles of Surveying And Geo-Informatics Profession In Design And Implementation Stage of Built Environment.

S/N	Role	Purpose	Source
1	Reconnaissance Surveys	The information provided from a reconnaissance survey could be used to select the best location for a proposed infrastructure, and to decide on the choice of material to be used.	Kavanaugh, 2009; Uren and Price, 1994
2	Carry out topographic surveys for the provision of topographic maps	Topographic maps could be used by professionals in the built environment for proper planning and design of engineering structures such as dams, bridges, roads, etc.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
3	Provision of Land Use, Land cover information	Land use Land cover data helps in proper planning and management of natural land resources, thereby preventing the environment from being degraded.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
S/N	Role	Purpose	Source
4	Design data acquisition	most built environment infrastructures require accurate information about the existing ground surface for their design. Examples include; the design of Roads, Bridges, and Dams.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
5	Setting out	Needed for the establishment of design points on the ground during construction	Ghilani and Wolf, 2012; Schofield and Breach, 2006; Uren and Price, 1994
6	As-built Surveys	used to show that construction of a project has been performed according to the approved construction drawings, specifications and contracts.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
7	Provision of Horizontal and Vertical control network	needed for preliminary surveys (surveys made to collect data) and construction surveys (setting out of propesed construction features	Kavanaugh, 2009; Uren and Price, 1994
8	Monitoring of Ground and Structural stability	Constructed structures such as dams and high-rise buildings need to be monitored due to changes in ground conditions and Earth movements.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Schofield and Breach, 2006; Uren and Price, 1994
9	Cadastral survey	Needed for land parcel delineation, property surveys and boundary definition	Kavanaugh, 2009

10	Bathymetric Surveys	needed for determining the depth of a water body, and its surface topography. It is usually required for dredging activities and constructions made on water, such as foundation of a bridge built across a water body	Ghilani and Wolf, 2012; Kavanaugh, 2009

The questionnaire which comprised the compiled roles alongside a likert scale which ranged from 1 to 5 (1 – important; 2 – fairly important; 3 – moderately important; 4 – important; 5 – very important) was issued to 6 different professionals of the built environment residing within Kwara state. The method of random sampling was used, and a sample size of 300 was extracted from the 6 professionals involved. This is tabulated in table 2.

TABLE 2: SAMPLE FRAME

Professionals	**Sample size**	**Response**	**Percentage**
rchitects	50	32	10.7
Civil Engineers	50	35	11.7
Estate Surveyors	50	41	13.7
Quantity Surveyors	50	37	12.3
Surveyors	50	39	13
Town planners	50	34	11.3
Total	300	218	73

A total of 218 valid responses were received. This represented a response rate of 73%, which was considered as satisfactory, since it conforms with the general rule of thumb pointed out by Leedy, (1997) and Chan, (2012), which states that a minimal sample size of 30% is sufficiently large to provide an effective normal approximation regardless of the shape of the population frequency distribution.

Descriptive statistics, specifically the mean score was afterwards used to analyze and gain an overview of the data obtained from the questionnaire survey.

4.0 DATA ANALYSIS AND RESEARCH FINDINGS

TABLE 3: MEAN AND STANDARD DEVIATION OF ROLES

S/N	Roles	Professionals											
		Architects		Civil Engineers		Estate Managers		Quantity Surveyors		Surveyors		Town Planners	
		Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation
1	Reconnaissance Surveys	4.151	0.626	4.091	0.619	4.091	0.699	3.747	0.827	4.483	0.621	4.139	0.723
2	Carry out topographic surveys for the provision of topographic maps	4.073	0.739	3.794	0.617	3.796	0.682	4.041	0.791	3.987	0.656	3.533	0.76
3	Provision of Land Use, Land cover information	3.927	0.839	3.429	0.698	3.52	0.724	3.977	0.745	3.543	0.714	3.632	0.682
4	Design data acquisition	4.277	0.567	4.411	0.685	4.104	0.645	4.421	0.739	4.412	0.595	3.256	1.091
5	Setting out	4.552	0.541	4.643	0.587	4.421	0.739	4.537	0.532	4.565	0.627	3.754	0.758
6	As-built Surveys	4.027	0.706	3.952	0.538	3.792	0.769	3.974	0.728	3.389	0.56	2.845	0.853
7	Provision of Horizontal and Vertical control network	4.532	0.53	4.357	0.648	3.759	0.989	3.798	0.924	4.567	0.516	3.694	0.833
8	Monitoring of Ground and Structural stability	3.893	0.754	4.373	0.63	3.445	1.037	3.238	1.124	3.916	0.592	3.009	0.741
9	Cadastral Surveys	3.469	0.692	3.574	0.587	3.739	0.651	3.439	0.654	4.152	0.517	3.643	0.699
10	Bathymetric Surveys	3.757	0.761	4.142	0.481	3.561	0.549	3.524	0.795	3.805	0.513	3.444	0.801

5.0 DISCUSSION OF FINDINGS

As shown in the results on table 3, the mean score of each role is above 1.0, which indicates that respondents were generally in agreement with the fact that these roles could facilitate effective collaboration of the Surveying and Geoinformatics professionals with other professionals in the built environment, towards achieving sustainable development in the built environment. Furthermore, all the roles are perceived as moderately important to very important (above 2.0) which also indicates that all the roles would facilitate effective collaboration of the Surveying and Geoinformatics professionals with other professionals in the built environment, towards achieving sustainable development in the built environment.

6.0 CONCLUSION

The roles of the surveying and Geo-informatics professionals in the design and implementation stage of a sustainable built environment have been investigated, and the results shows that all the identified roles would facilitate effective collaboration of the Surveying and Geoinformatics professionals (Surveyors) with other professionals in the built environment, towards achieving sustainable development in the built environment.

The paper concludes that proper identification of the roles of professionals in the design and implementation stage of built environment, and sharing of ideas is necessary for an effective collaboration for sustainable development in the built environment. Further studies may investigate more roles of the Surveying and Geo-informatics professionals, and try to find out if they would facilitate effective collaboration for a sustainable development in the built environment. Also, more professionals of the built environment may be included in further studies, as only six professionals of the built environment were considered in this research.

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GIS AS A TOOL FOR SUSTAINABLE DEVELOPMENT IN PUBLIC SECONDARY SCHOOL MAPPING

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The paper focuses on using GIS as a tool for sustainable development in public secondary school mapping of Ilorin west local government area of Kwara State, Nigeria. The purpose is to map and carry out geospatial analysis of the public secondary schools in the study area to enable effective and efficient planning and management of the public secondary schools in a sustainable manner. This has been achieved through identification of the public secondary schools in the study area, mapping of the schools through the satellite imagery and global positioning system (GPS) technology, generating the attribute data of the schools, creation of GIS database for the schools and finally carry out geospatial analysis of the school data. The base map of the study area was obtained using SAS planet software package. The school addresses were obtained from the Kwara State ministry of education while the geospatial locations were obtained by field observations using GPS receivers and the attribute data through the administration of questionnaires and interviews with major stakeholders of the schools. A GIS database was created, the spatial and attribute data encoded, and geospatial analysis carried out including production of relevant maps using QGIS software. The resulting school location, student gender ratio, staff-student ratio, year of establishment and school type maps provides stakeholders with relevant maps and working environment for data management and also allows efficient query of information needed for decision making that would aid in sustainable development of the schools and education sector.

Keywords*: Geospatial Analysis, GIS, School Mapping, GPS, Sustainable Development* [29]

1.0 INTRODUCTION

Education is a key factor to measure the development of any society. The development of a society could be measured by the quality of its education. High quality human resources could be generated by good education very well linked to the nature and management of the schools. Education affects development through various dimensions of cognitive competence: literacy (reading and writing), numeric, modernity, and problem-solving behaviors (Lockheed and Verspoor, 1990). For these reasons, sustainable development become expedient in the education sector of any society. Therefore, government needs an efficient system that can help it in analyzing the current state of education vis-a-vis the public secondary schools being managed and its progress. It also needs a system that can support in decision-making and policy framing. Geographic Information System (GIS) as a geospatial technique can serve the mentioned requirements not only for government but also for individuals and corporate bodies.

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GIS is a collection of tools and techniques that works on the geospatial data and is used in the analysis and decision-making. GIS is required for very diverse fields from government to common public, from commercial to social service, from science to defense. According to Bolstad (2012), GIS is "a computer-based system to aid in the collection, maintenance, storage, analysis, output, and distribution of spatial data and information" whereas Burrough (1986) defined GIS as "a powerful set of tools for storing and retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes". GIS is a system that works on the spatial as well as attribute data.

Because of the need to know the existing state of the public secondary schools and make sound decision while proffering solution to problems the public secondary schools are facing, it has become necessary for the government and decision makers to have a proper understanding and analyze the existing school locations and facilities. Geospatial mapping and analysis of the schools play an important role in this aspect. Geospatial analysis in this sense consists of creating geospatial database of schools that supports in the infrastructural development, policy analysis and decision-making.

The paper focuses on using GIS as a tool for sustainable development in public secondary school mapping of Ilorin west local government area of Kwara State, Nigeria. This paper indicates the status of the existing public secondary schools, available human resources and facilities. Therefore, this paper tried to demonstrate how to integrate spatial, attribute data together, and apply GIS to analyze the public secondary schools. This paper attempts to support particularly the government and other stakeholders in public school management in Ilorin west local government area, Ilorin, Kwara State, Nigeria by providing information on the spatial patterns as well as attribute character of the schools for decision support.

2.0 STUDY AREA

The study covers Ilorin West Local Government Area, Kwara State, Nigeria which is situated between latitude 40°33’29.84”E and longitude 80°27’40.18”N of the equator. It has an estimated land area of 54.25% of the whole city of Ilorin. It has a total landmass of 105km2 and population of 365,221 (NPC, 2006). The local government was created in October, 1991 and divided into 12 electoral wards (Adewole, Ajikobi, Alanamu, Badari, Baboko, Mogaji-Ngeri, Ogidi, Oko-Erin, Oloje, Ojuekun/Sarumi, Ubandawaki, and Wara/Osin/Egbejila and serves as the headquarters of Ilorin emirate council.). Of the Ilorin emirate, comprising Ilorin West, Ilorin East and Ilorin South local government area, Ilorin west is importantly known for its educational and religious significance. Public secondary schools in the local government spread across all its 12 electoral wards.

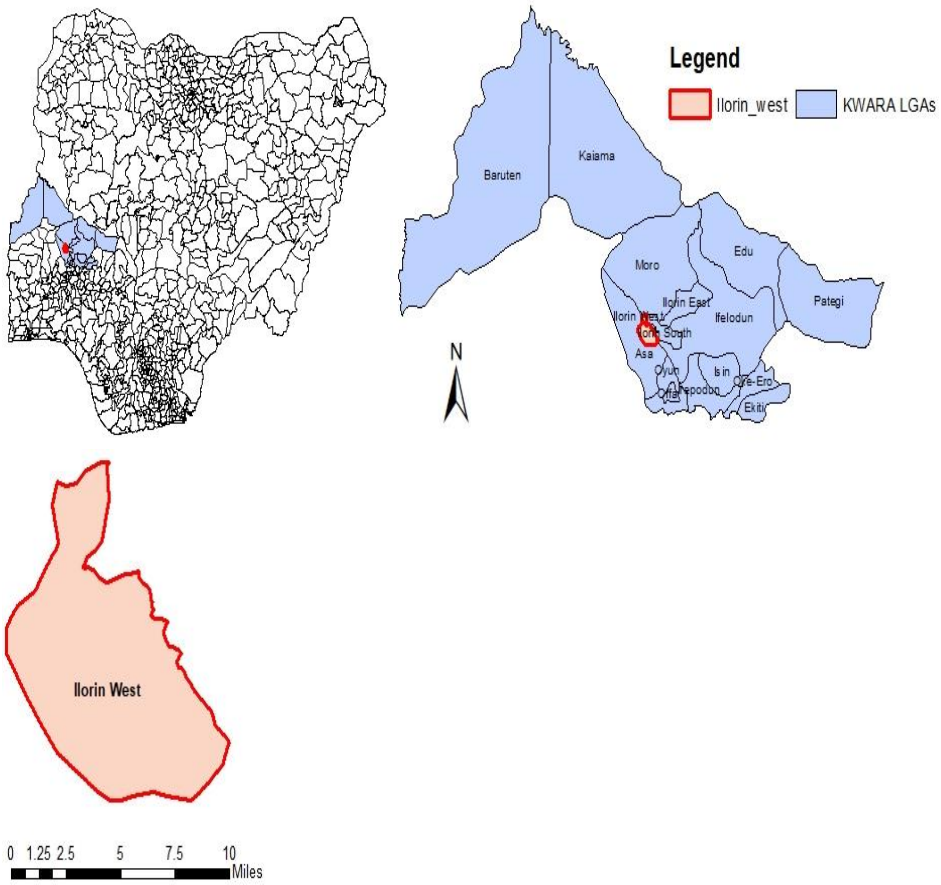


Figure 1: Map showing the study area

3.0. METHODOLOGY

The spatial extent of the study covers Adewole, Alanamu, Baboko, Mogaji-Ngeri, Oko-Erin, and Wara/Osin/Egbejila. The temporal extent of the study covers the public senior secondary schools in the study area as at 2017.

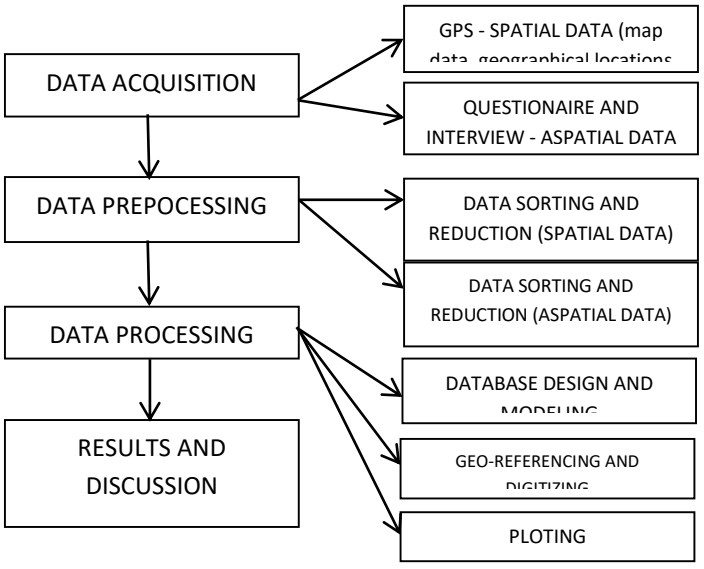


Figure 2: The Methodology Flow Chart

3.1 Data Acquisition

Two data type employed for the study include the spatial and aspatial data. Spatial data obtained include the base map acquired using SAS Planet software and spatial location data of 23 senior secondary schools in the study area using Garmin 76csx GPS Receiver. The base map data of the study area was obtained using SAS planet software. The aspatial data otherwise called attribute data gives the description of spatial data. The aspatial data were collected by combination of on-the-spot assessment, questionnaires and personal interviews with the school administrators, staff and students. An attribute table was built that consist of school name, school addresses, school year of establishment, school type, the number of male and female students, number of staff, etc.

3.2 Data Sorting and Reduction

Data sorting and reduction are integral part of data preprocessing. This include arranging the data in alphabetical order, arranging them in a way that support easy processing and queries. Data reduction carried out involved bringing the large amount of data down to the meaningful parts. Both data sorting and reduction were done for the obtained school data. This was carried out using Microsoft excel software and it was done for clarity and easy data usage.

3.3 Data Processing

The data processing stage involved the processing of the data and extraction of relevant information about the study focus and area. The database design and creation was carried out and it involved definition of related and each of the data types in a systematic manner for easy querying, analysis and efficient use of the data.. All the necessary information for each school was entered into its layer's attribute table and stored for analysis within the QGIS software environment. QGIS 3.2 software was used for the processing, plotting and map production.

4. RESULTS AND DISCUSSION

The results of the processed data are as presented in the form of tables, figures, and are discussed below.

4.1 School Location Map

Figure 3 shows the locations of the public senior secondary schools within the study area. The location map helps to shows locational spread of the schools within the study area. This could aid the government and all stakeholders in decision making for future location of public schools in a manner that supports sustained development within the study area. Table 1, table 2 show the spatial location and aspatial information of the Public Senior Secondary Schools in the study area. Figure 3 shows the school location map.

Table 1
Spatial Location of the Public Senior Secondary Schools

S/N	School Name	Address	Eastings(m)	Northings (m)
1.	Ansar-U-Deen Senior Secondary School, Ilorin	Adamu Road Off Taiwo Road, P.O. Box, 146 Ilorin	670824	937851
2.	Community Secondary School, (Senior Secondary School) Baboko, Ilorin	Abul Azeez Attah Road	669465	938717
3.	Baptist Senior Secondary School, Surulere, Ilorin	Surulere Area, Ilorin	669366	937936
4.	Barakat Community Senior Secondary School, Ilorin	Adam Al Ilory Road, Yahaya Area Ilorin	666675	939390
5.	College Of Arabic And Islamic Studies Adewole, Ilorin	Near Yebumot Hotel Adewole Ilorin	664842	937913
6.	Ecwa Senior Secondary School, Oja Iya, Ilorin	78 Oja Iya Streeet Beside Ecwa Church Oja Iya Ilorin	670227	938203
7.	Government Day Secondary School, Adeta Ilorin	P.M.B 1541 Alfa Yahaya Road Aromaradu Ilorin	666750	938878
8.	Government Day Secondary School, Adewole Ilorin	P.O. Box 13751 Adewole Estate Ilorin	667589	937734
9.	Government Day Secondary School, Airport Ilorin	Airport Area, Ilorin	665862	931790
10.	Government Girls Day Secondary School, Oko-Erin, Ilorin	P.M.B 1461 Oko-Erin	668893	936939
11.	Government Day Secondary School, Odo-Okun, Ilorin	Saw Mill Area	668391	937304
12.	Government High School, Adeta Ilorin	Adeta Round About	666870	938377
13.	Ilorin Grammar School, Ilorin	Umoru Saro Road Private Mail Bag 1368, Ilorin	667909	936105
14.	Iman Senior Secondary School, Ilorin	Irewolede Area, Ilorin	671052	936052
15.	Local Government Senior Secondary School, Osin Aremu, Ilorin	Osin Aremu	673180	932379
16.	Local Government Secondary School, Odore, Ilorin	Off Airport Rd	669035	930897
17.	Mandate Senior Secondary School, Ilorin	Apalara Area Adeta	666441	938316
18.	Queen Elizabeth Secondary School, Ilorin	Ummaru Saro Rd P.Mb 1357	668807	937299
19.	Senior Secondary School, Ita-Alamu, Ilorin	Ita-Alamu	674299	933492
20.	Senior Secondary School, Gbagba, Ilorin	Off Airport Road Near Airport Hotel Gbagba, Ilorin	666298	933247
21.	Sheikh Abdulkadir College, Ilorin	Off Former University of Ilorin Mini Campus	668386	937421
22.	St. James Cac Senior Secondary School	New Yidi Road, Ilorin	670840	936888
23.	Waziri Senior Secondary School, Babaoko Ilorin	University Mini Campus Junction, Ilorin	668431	668431

Table 2
Aspatial Information about the Schools.

S/N	School Name	Year of Establis Hment	School Type	No. of Teaching b Staff	No. of Male Students	No. of Female Students	Total No. of Students
1.	Ansar-U-Deen Senior Secondary School, Ilorin	2012	Day	40	150	169	319
2.	Community Secondary School, (Senior Secondary School) Baboko, Ilorin	1980	Day	63	390	408	798
3.	Baptist Senior Secondary School, Surulere, Ilorin	2013	Day	30	143	113	256
4.	Barakat Community Senior Secondary School, Ilorin	1980	Day	61	533	292	825
5.	College Of Arabic And Islamic Studies Adewole, Ilorin	2006	Day	53	341	286	627
6.	Ecwa Senior Secondary School, Oja Iya, Ilorin	2012	Day	30	185	161	346
7.	Government Day Secondary School, Adeta Ilorin	1997	Day	73	510	570	1080
8.	Government Day Secondary School, Adewole Ilorin	1996	Day	65	480	432	912
9.	Government Day Secondary School, Airport Ilorin	1983	Day	80	346	355	701
10.	Government Girls Day Secondary School, Oko-Erin, Ilorin	1984	Day	61	0	681	681
11.	Government Day Secondary School, Odo-Okun, Ilorin	1997	Day	87	529	453	982
12.	Government High School, Adeta Ilorin	1967	Day	62	684	432	1116
13.	Ilorin Grammar School, Ilorin	1967	Day	78	530	399	929
14.	Iman Senior Secondary School, Ilorin	2013	Day	24	101	98	199
15.	Local Government Senior Secondary School, Osin Aremu, Ilorin	2003	Day	31	297	234	531
16.	Local Government Secondary School, Odore, Ilorin	1983	Day	39	81	117	198
17.	Mandate Senior Secondary School, Ilorin	2010	Day	43	414	414	828
18.	Queen Elizabeth Secondary School, Ilorin	1956	Boarding	78	0	780	780
19.	Senior Secondary School, Ita-Alamu, Ilorin	2006	Day	41	185	195	380
20.	Senior Secondary School, Gbagba, Ilorin	2006	Day	28	132	116	248
21.	Sheikh Abdulkadir College, Ilorin	2006	Day	62	290	340	630
22.	St. James Cac Senior Secondary School	2010	Day	44	305	351	656
23.	Waziri Senior Secondary School, Babaoko Ilorin	2010	Day	40	340	325	665

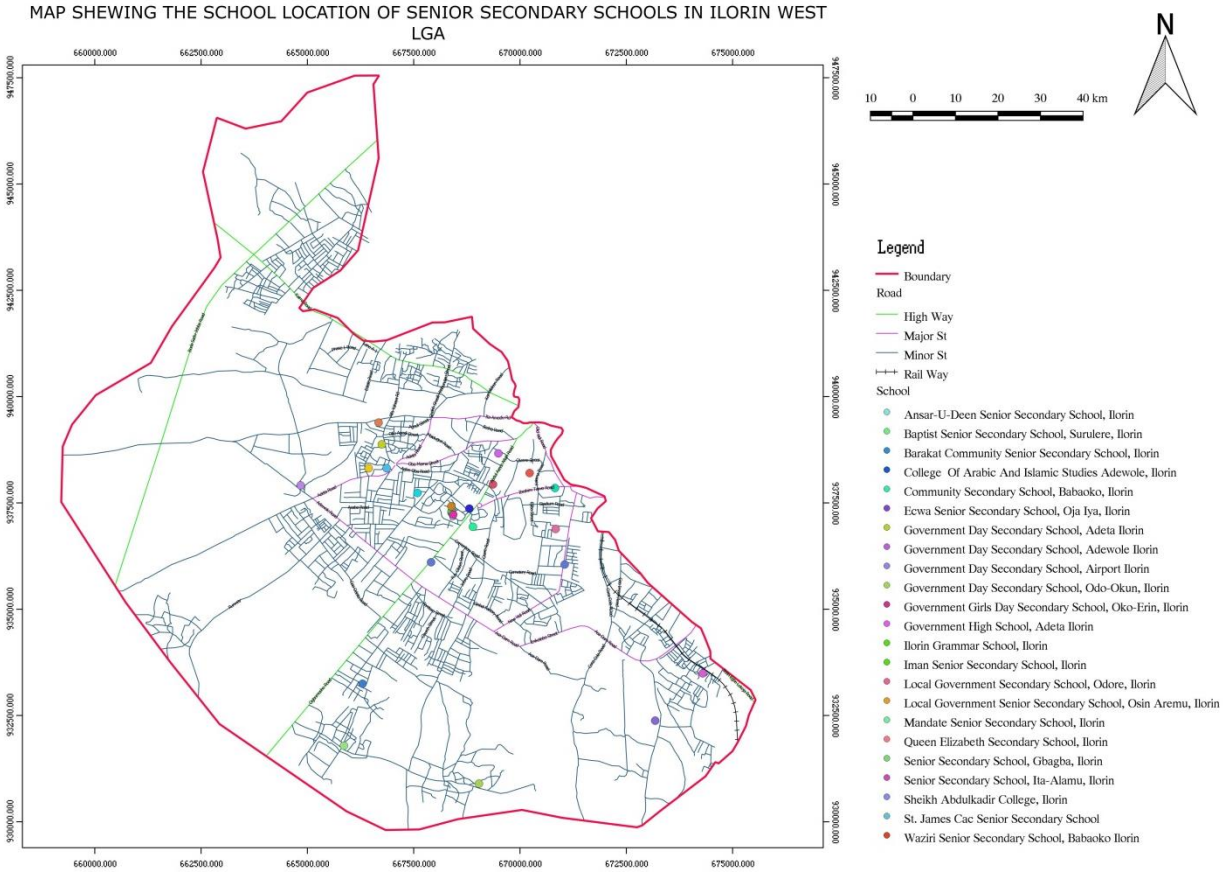


Figure 3: The School Location Map

Analysis based on the spatial distribution of the schools within the local government showed that out of the 6 of the 12 electoral wards covered, 26.09% of the schools are located in Adewole, 21.74% in Alanamu, 21.74% in Baboko, 17.39% in Oko-Erin, 8.70% in Warrah/Osin/Egbejila and 4.35% in Mogaji-Ngeri wards respectively. Adewole ward with 6 of the 23 schools contains more number of senior secondary schools than other wards. Mogaji Ngeri ward has the least number with 1 school located in the ward.

4.2 School Student Gender Ratio Map

Figure 4 shows the gender ratio of the students in each of the schools. The gender ratio is the number of males per the females' student in the schools. Generally, it was observed that the female literacy level is lower than the male literacy in the study area; this map can help in identifying the areas where there is need to promote female literacy in order to reduce this imbalance. It can also be observed that at many of the schools, the number of female students

is almost at pal with that of male, which reflects the changing mindset of the people towards the girl-child education. This is very important for sustainable development in the education sector as the role of the female folks cannot be underestimated. Figure 4 shows the student-gender ratio map and table 3 student-gender and staff-student ratios.

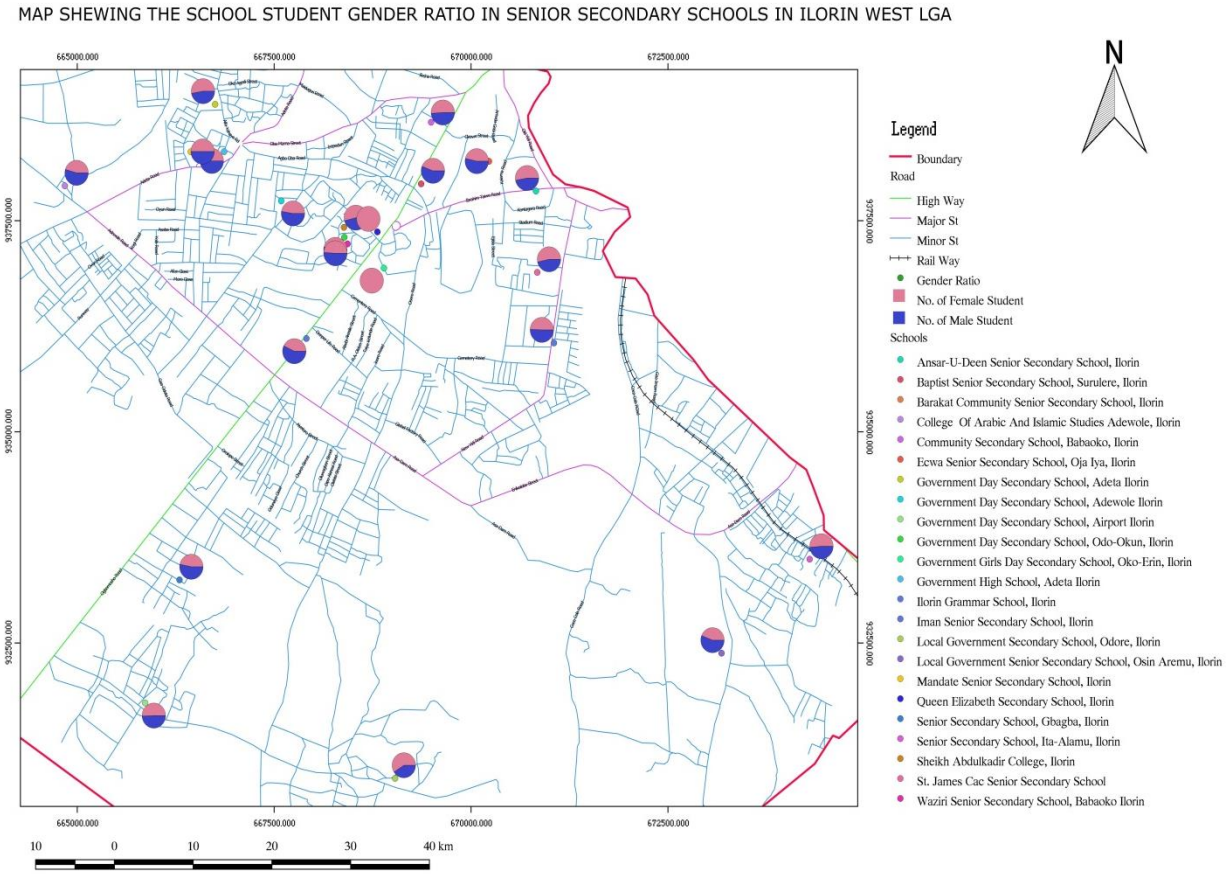


Figure 4: Student Gender Ratio Map.

Table 3
Student-gender and Staff-student ratios.

S/N	School Name	Student Gender Ratio (Male/Female)	Staff-Student Ratio
1.	Ansar-U-Deen Senior Secondary School, Ilorin	1: 1.1	1: 8
2.	Community Secondary School, (Senior Secondary School) Baboko, Ilorin	1: 1.1	1 : 13
3.	Baptist Senior Secondary School, Surulere, Ilorin	1 : 0.8	1 : 9
4.	Barakat Community Senior Secondary School, Ilorin	1 : 0.6	1 : 14
5.	College Of Arabic And Islamic Studies Adewole, Ilorin	1 : 0.8	1 : 12
6.	Ecwa Senior Secondary School, Oja Iya, Ilorin	1 : 0.9	1 : 12
7.	Government Day Secondary School, Adeta Ilorin	1: 1.1	1 : 15
8.	Government Day Secondary School, Adewole Ilorin	1 : 0.9	1 : 14
9.	Government Day Secondary School, Airport Ilorin	1 : 1.0	1 : 9
10.	Government Girls Day Secondary School, Oko-Erin, Ilorin	0	1 : 11
11.	Government Day Secondary School, Odo-Okun, Ilorin	1 : 0.9	1 : 11
12.	Government High School, Adeta Ilorin	1 : 0.6	1 : 18
13.	Ilorin Grammar School, Ilorin	1 : 0.8	1 : 12
14.	Iman Senior Secondary School, Ilorin	1 : 1.0	1: 8
15.	Local Government Senior Secondary School, Osin Aremu, Ilorin	1 : 0.8	1 : 17
16.	Local Government Secondary School, Odore, Ilorin	1 : 1.4	1 : 5
17.	Mandate Senior Secondary School, Ilorin	1 : 1.0	1 : 09
18.	Queen Elizabeth Secondary School, Ilorin	0	1 : 10
19.	Senior Secondary School, Ita-Alamu, Ilorin	1: 1.1	1 : 9
20.	Senior Secondary School, Gbagba, Ilorin	1 : 0.9	1 : 9
21.	Sheikh Abdulkadir College, Ilorin	1 : 1.2	1 : 9
22.	St. James Cac Senior Secondary School	1: 1.2	1 : 15
23.	Waziri Senior Secondary School, Babaoko Ilorin	1: 1.0	1 : 17

4.3 School Staff-Student Ratio Map

The staff considered are the teachers. Figure 5 shows the school staff-student ratio map. The map can be used to identify the schools where there is a need to employ more teachers. It can be deduced from the map that not all the schools did meet up with the standard ratio set by the Kwara state government ministry of education based on Kwara Annual Education Sector Performance Report (KAEPR), 2010. According to KAEPR, the average ratio ought to be 1:12 teacher to students' ratio in the secondary schools. Furthermore, the study shows that out of the 23 schools investigated, only 9 schools, representing 39% met and are above the standard ratio. 3 schools representing 13% are exactly within the standard ratio and 10 schools representing 44% of the school falls below the ratio and are the schools where there is an urgent need of teachers as there is only one teacher on more than 12 students.

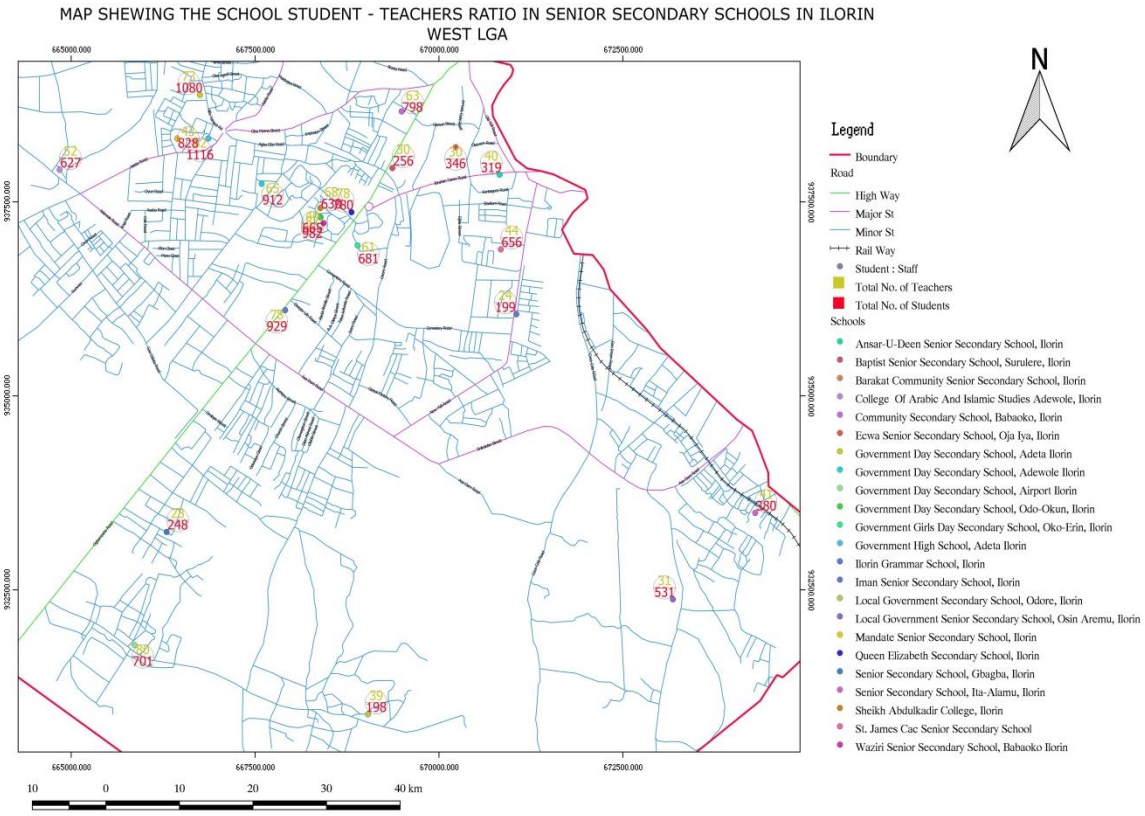


Figure 5: Staff-Student Ratio Map

4.4 School Year of Establishment Map

Table 2 shows the year of establishment of the schools under review in the study area and figure 6 shows School Year of Establishment Map in the study area.

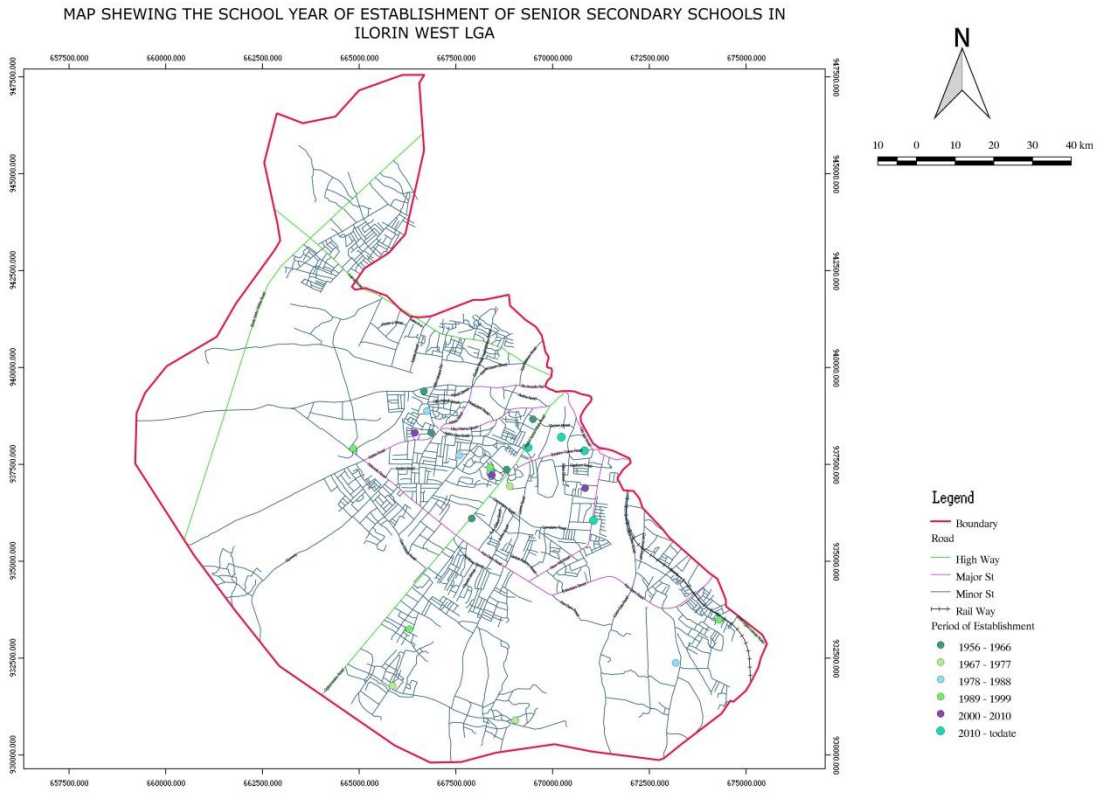


Figure 6: School Year of Establishment Map

The first and oldest Public Senior Secondary School that was established in Ilorin West Local Government is Queen Elizabeth Senior Secondary School in 1956. The last public school established being Baptist Senior Secondary School and Imam Senior Secondary, Ilorin in 2013. Analyzing the rate of establishment of public senior secondary schools since 1956 in the LGA using ten years interval, the result shows from 1956-1966 only one (1) school was established. Between 1967 and 1977, 1978-1988, 1989-1999, 2000–2010 and 2011-2017, two (2) (8.69%), five (5) (21.74%), three (3) (13.04%), five (5) (21.74%) and seven (7) (30.43%) schools were established respectively.

Table 4
Period of Establishment of Public Secondary Schools in the Study Area.

S/N	YEAR INTERVAL	NUMBER OF PUBLIC SENIOR SECONDARY SCHOOLS	PERCENTAGE (%)
1.	1956-1966	1	4.35%
2.	1967-1977	2	8.69%
3.	1978-1988	5	21.74%
4.	1989-1999	3	13.04%
5.	2000-2010	5	21.74%
6.	2010-2017	7	30.43%

4.5 School Type map

Of all the 23 public secondary schools under investigation, only one school is of boarding school type, the school is Queen Elizabeth Senior Secondary School, and it is an all-girls school. All the other schools operate Day school type. By implication, it means no school is a set-aside only boy's school and no boarding school type for the boys within the study area.

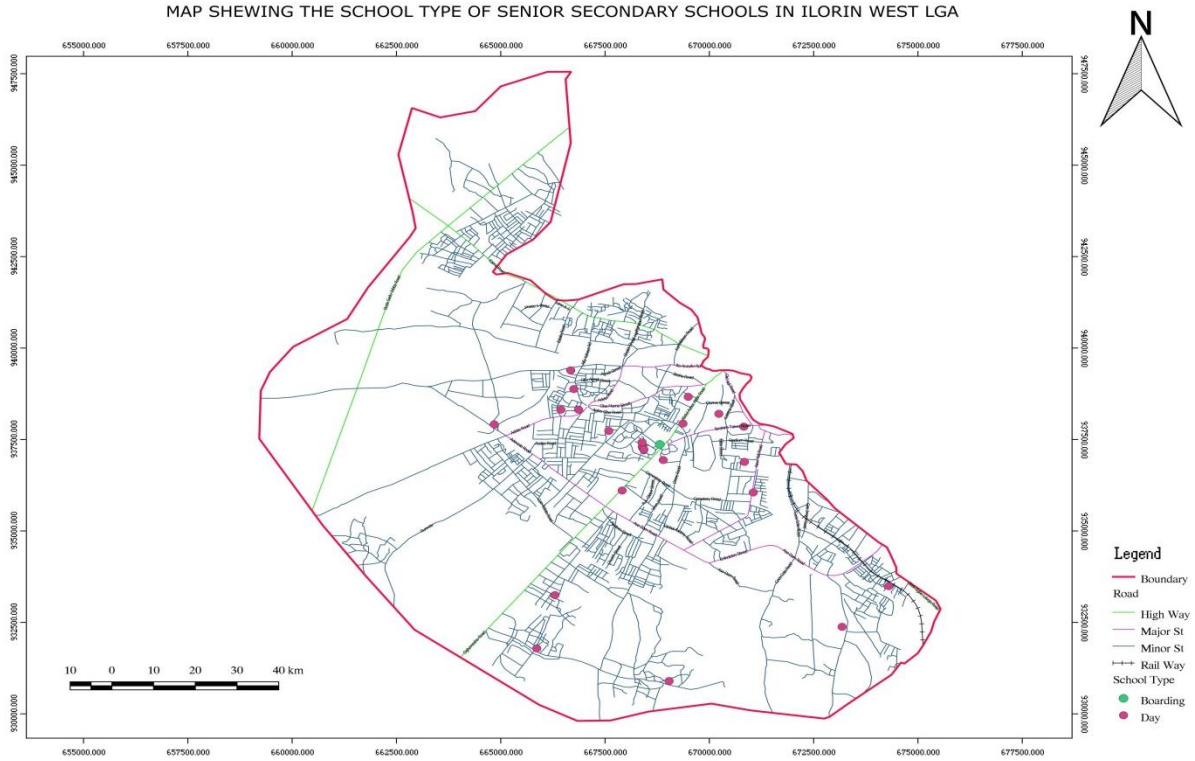


Figure 7: School Type Map

5. CONCLUSIONS AND RECOMMENDATIONS

GIS as a geospatial technique provides opportunity for analysts and decision makers to manage and plan as well as solve geospatial related problems. The study has demonstrated the capability of GIS for geospatial analysis of public secondary schools in Ilorin West Local government area for sustainable development of the education sector. Different geospatial analysis has been carried out and maps produced on the schools. It is expected that the government and relevant bodies in the education sector would find the issues highlighted in the study useful for effective and efficient decision making on the schools and public education administration in the local government and the state at large.

ACKNOWLEDGEMENTS

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A REVIEW OF INTELLIGENT TRANSPORTATION SYSTEM: ADAPTIVE MANAGEMENT

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Abstract

In the last decade, traffic congestion has become a disturbing concern due to increasing vehicle possessions in urban areas. Intersections are one of the foremost logjams that results into urban traffic congestion. Traffic light signals are used with the sole purpose of efficiently managing vehicular traffic at intersections. The traditional traffic signal control systems which follows a deterministic order, cannot adjust the timing pattern depending on road traffic demand. This results into excessive delays for road users. The vehicles on one side have to wait even though there are little or no cars on other sides of the road. Hence, they inherently fail to successfully manage traffic flow when it is anomalous situations. Adaptive traffic signal control in a connected vehicle environment has demonstrated a prevailing measure to effectively lessen urban traffic congestions to achieve anticipated objectives (e.g., reducing waiting time). The purpose of this paper is to review the existing approaches of adaptive traffic signal control in a connected vehicle environment using a systematic approach and to compare the benefits or shortcomings of those approaches. Future research is needed to develop more efficient and adaptive dynamic traffic signal control systems in a connected vehicle environment.

Keywords: *Traffic congestion, Adaptive control, intelligent transport system, Average waiting time, Queue length*

1. INTRODUCTION

Traffic congestion is a fundamental problem in large cities. To solve these congestion problems, there is need to erect new facilities and infrastructure, and at the same time make it smart to meet the present and future challenges. Traffic lights are used with the intension of effectively managing vehicular traffic at junctions. The conventional traffic lights follow a predetermined sequence usually based on historic traffic pattern. As a result of this assumption, they inherently fail to successful manage traffic flow when it is anomalous Liphoto & Masinde, (2016). However, the drawback to create new road infrastructure apart from costs is that it still makes the surroundings more congested Adebiyi *et. al*, (2017). This has demanded the introduction of an intelligent control method which works adaptively irrespective of traffic

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Adebiyi B., Adebiyi R.F., Salawudeen A.T. and Umar A., (2019). A REVIEW OF INTELLIGENT TRANSPORTATION SYSTEM: ADAPTIVE MANAGEMENT. Collaboration for Sustainable Development in the Built Environment. International Conference of Environmental Sciences, ICES 2019. 1st International Conference of the Faculty of Environmental Sciences, University of Ilorin, Nigeria, 29th - 30th April 2019.

situation, which has proven to be more superior to the conventional signal control methods. To alleviate traffic congestion in urban areas, the concept of Intelligent Transportation Systems (ITS) has been widely accepted in developed countries. The ITS is a system in which knowledge of Information and Communication Technologies (ICT) are applied in road transportation, which entails vehicles and users, traffic and mobility management, as well as interfaces with other modes of transportation Kotwal *et. al*, (2013). This ITS make use of technologies in electronics, communications, computers, control, sensing and detecting in all kinds of transportation system. The primary goals of ITS systems are to "increase transportation system efficiency and capacity such as: enhance mobility, improve safety, reduce energy and environmental costs" Kotwal *et. al*, (2013). The ITS is a highly promising system for providing key solutions to current road congestion problem. Therefore, many countries have been able to manage their existing transportation systems by introducing ITS to improve mobility, safety and traffic flow in order to reduce the demand for vehicle use.

Adaptive traffic control system is the modern generation of traffic control systems that maneuvers, accomplishes and control the signalized intersections with or without coordination Gündoğan *et. al*, (2014). They form primarily on traffic flow and traffic effect model as real-time based on traffic demand. Adaptive traffic control in a vehicular intersection environment has shown a prevailing ability to effectively lessen urban traffic congestions to achieve required objectives (e.g., delay minimization) Jing *et. al*, (2017). Although several reviews about traffic signal control or connected vehicles have been written, a quality evaluation needs to be established based on previous research instruments and applied to the current review. Hence, the purpose of this article is to review the existing approaches of adaptive traffic signal control in an intersectional vehicular environment. In this paper, we present a thorough and systematic review on adaptive traffic signal control in a connected vehicle environment to offer an outline of the research in progress of adaptive traffic control systems in a vehicular environment. The merits and demerits of those methods are also briefly described. Future research is needed to develop more efficient and generic adaptive traffic signal control methods in an intersection vehicular environment.

2. LITERATURE REVIEW

Tubaishat *et al*, (2007) examined a wireless sensor based traffic light control. They defined cycles by ordering three set of pre-defined phases (4-phase, 6- phase, 8- phase) to mimic conventional traffic controllers. The researchers analysed the performance of other controllers in comparison to fixed cycle. These selection were based on queue sizes. Several experiments were conducted to determine the suitable distance between two sensors in calculating queue length. Results showed that the distance between two sensors on the same road had no great effect on traffic volume. However, only queue length was considered. Other parameters such as average waiting time and other combination of possible movements on each lane were not taken into consideration.

Zhou *et al*, (2010) developed an adaptive traffic light control algorithm that adjusts both the sequence and length of traffic light in accordance with the real-time traffic detected. The algorithm selected the sequence of phases among a set of conflict -free situations according to multiple criteria: traffic volume, priority vehicles, waiting time, starvation degree and queue lengths. Results obtained showed the algorithm maximized traffic throughput and minimized the average waiting time at an intersection in comparison with a fixed-time control algorithm and the actuated algorithm. However, the algorithm was based on the assumption that all vehicles were of the same type and run at the same speed.

Chinyere *et al*, (2011) presented a hybrid methodology obtained by the crossing of the Structured System Analysis Design Methodology (SSADM) and the Fuzzy Logic based Design methodology. An analysis of current traffic systems in Nigeria was carried out which necessitated the design of an intelligent traffic control system. Java software was used for simulation of the system using popular cross junction in Eastern Nigeria infamous for traffic congestions. The system assumed that traffic movement is only from North to South as that from one side while East to West as traffic from another side. The fuzzy logic provided better performance in terms of total waiting time and total moving time. However, the fuzzy logic approach failed to adapt into complex intersection based on the 68% success rate for average vehicular traffic dissipated.

Faye *et al*, (2012) developed a distributed algorithm for adaptive traffic light control. The algorithm decides in a dynamic fashion, the green light sequences by selecting movements comprising each phase and its duration. The system model made use of sensors organized into four hierarchical layers with several communication paths. Simulation results obtained showed proper tuning of the algorithm could reduce the average waiting time at an intersection. However, in the adaptive approach developed, choosing the appropriate value of the green light limit, Tmax influenced performance of the average waiting time when conflicts were allowed and forbidden.

Odeh, (2013) proposed a system that aided in the management of an intelligent traffic light using genetic algorithm. The system detected the level of congestion and the abnormal situations in two main highways and four intersections. Collection of data was achieved using a video imaging system, which captured and interpreted images detected and count of the vehicles. The system made real-time decision that determined the interval of green light time for each traffic light at each intersection. The average accuracy of the counted vehicles was 96%. This was due to noise caused from detecting objects size too large or too small for consideration as a vehicle. However, even though the algorithm was suited for obtaining global optimum solution, it required a longer simulation time to effectively implement the system.

Mittal & Singh, (2013) developed a novel approach for automatic control of road traffic congestion using imaging mosaicking technique. The paper discussed a new method named Structured System Analysis (SSA) to analyse the existing traffic congestion problem and

designing a new model using image mosaicking technique by assembling multiple overlapping images of the same scene into a larger image. The algorithm proposed adopted the use of inter-arrival and inter- departure times to simulate the leaving of vehicles. The model provided good and satisfactory results. However, the model was not also suitable for real-time traffic situations during left and right turns for two–way road ways. Issues of False Rejection Rate in the image tracking system may occur thereby not allowing or authorizing vehicular flow at some instance.

Alam, (2014) presented an advanced traffic light system based on congestion estimation using fuzzy logic. The number of cars sensed at the input of the fuzzy controller were converted to fuzzy values. The advance traffic light control system outperformed the fixed traffic light control or even the actuated traffic controllers. This was observed from results obtained in terms of total waiting time as well as total moving time at the intersections. However, the use of fuzzy logic may not be suitable in adapting to dynamic changes in traffic demands.
Pau & Scata, (2014) developed a self- powered wireless sensor network for dynamic management of queues at traffic lights. The proposed architecture provides a technique to power the sensors based on piezoelectric materials generated through vibration of moving vehicles. A decision making algorithm was used to dynamically evaluate the cycles based on queue length. Results obtained were promising in terms of queue management and energy harvesting. However, the approach used considered only queue length on lanes with higher priority. The simultaneous movements which does not results in conflict or overlap were not considered.
Gündoğan *et al*, (2014) presented an evaluation of an adaptive traffic light control system in Istanbul, Turkey. The algorithm developed made use of fuzzy and genetic algorithm as optimization tool. The system determined optimum signal timings according to measured real-time traffic and occupancy. The adaptive system automatically calculated the signal timings and sends these new signal timing plans to control devices at the end of each cycle. The performance had a 10% improvement in terms of cycle time and 15% for travel time. The result showed that the adaptive system outperformed the dynamic intervention to vehicular traffic. However, decisions were taken at the end of each cycle leading to longer period in time for a lane to achieve green light signal timing.

Collotta *et al*, (2015) proposed a novel system that combines numerous technologies (WSN, fuzzy logic control) in an innovative in other to obtain a frothy but effective solution, implementable on Commercial off-the-self (COTS) devices. Simulation results obtained in the paper clearly demonstrate that the multi-controller approach here proposed outperforms related work Pau and Scata, (2014) in terms of reduction of the vehicle waiting times in the queues, especially under heavy traffic.
Punetha *et. al*, (2014) proposed an intelligent traffic light system architecture for safe passage in adaptive traffic light. The system that helped save fuel consumption and time using active adaptation to speed on urban roads. The algorithm proposed featured prediction of speed, by

incorporating Raspberry Pi model B interfaced with global positioning system (GPS) and global system mobile (GSM). A method of intelligent traffic light control was presented, with automatic interaction of traffic light with the vehicles using GPS. Based on simulation results were obtained, for interaction with and without traffic light adaptation algorithm. However, even though an adaptive traffic light was presented by the researchers. It was not evident that the system gave priority to lanes in order to reduce the average waiting time.

Saleh *et al*, (2014) developed a hierarchical scheduling algorithm for congestion traffic control using multi-agent systems. The proposed control system was modelled based on Packet switched networking model, where different classes of real-time traffics (audio and video) requesting the best quality of service were guaranteed. The algorithm made use of Weighted Fair Queue (WFQ) First Come First Serve (FCFS) approach. According to multi-agent the system design was based on three main layers namely: decomposition, modeling and communication protocol. The aim was to minimize the vehicle delay time at a single intersection. Simulation results showed that the agent based algorithm outperformed baseline algorithm as the variance of arrival time increases. However, the system mostly considered queue length which may result in omitting lanes with shorter queues.

Salehi *et al*, (2014) presented an application of fuzzy logic for multi- agent based autonomous traffic lights control system using wireless sensor networks. The real-time parameters such as traffic density and queue length were obtained by using image-processing techniques for the two junctions. Sensors were installed 500m away from the junctions. The system was designed to consider emergency vehicles (ambulance, police unit, and fire brigade) coming from three different directions at the same time with different speed ratio. Based on their speed detected by the sensors, two actions were performed. One, traffic flow is minimized on their routes so that they can pass by with maximum possible speed. The second approach was for collisions to be avoided. The proposed fuzzy logic system and fixed time controller produced little difference in results; in terms of constant traffic flow. While, in the case of time varying traffics, the proposed FLSC was superior to the fixed time controller. One of the limitation of the work was that the performance of the fuzzy logic approach was affected by the configuration of the membership functions. The input and output variables as well as rule base were difficult to configure.

Wang *et al*, (2014) proposed an algorithm for vehicle queuing system using the Monte Carlo simulation technique. The developed algorithm was intended to reduce vehicle waiting time and vehicle queues at intersections in urban region. A queuing theory combined with the knowledge of static simulation (M/M/1 queuing model) was employed with a view to reducing the effect of traffic congestion. The Monte Carlo algorithm generated random numbers using the queuing model to realize improvement at the intersections of vehicles queuing system. However, the use of Monte – Carlo algorithm requires large amount of simulation leading to high computational time.

Erwan *et al*, (2015) presented the design of an adaptive traffic light controller using fuzzy logic Sugeno method. The Fuzzy Logic was used to determine the green time at an intersection. The

system made use of three inputs namely the number of queues, waiting time and traffic flow of vehicles. The design was applied in a simulation to observe the number of queues, waiting time, and the number of vehicles passing an intersection. The simulation results showed that the traffic light using fuzzy logic control performed than using fixed time control. The number of queues and waiting time were lower, and the number of departures was higher than using the fixed time controller for traffic light. However, using the Fuzzy Logic system can be improved upon by using simultaneous movements.

Garg & Kaushal, (2017), proposed a traffic lights dynamic control system that combines an IEEE 802.15.4 Wireless Sensor Network (WSN) for real-time traffic monitoring with multiple fuzzy logic controllers, one for each traffic light phase, for dynamically determining the green time duration of each phase. The work addresses the dynamic control of traffic lights in an isolated intersection, i.e., an intersection whose incoming vehicle flows are not affected by the effects of upstream traffic lights.

Barzilai *et al*, (2018), developed an algorithm for a smart intersection, where several cars approach the intersection from various directions, and a smart traffic light must decide about the time intervals of RED and GREEN in each direction, based not only on the number of vehicles in each lane, but also on other factors such as the type of vehicles (e.g. emergency vehicles), and the social characteristics of the passengers (e.g. a handicapped person, a student who is late for an exam).

Yousef *et al*, (2019), a novel, reconfigurable and adaptive history-based traffic management algorithm that relies on previous all-year traffic information to predict the traffic flow on congested road intersections. The main idea is to use the recorded traffic history information to compute the green/red times for each direction on a congested intersection with a traffic light controller.

Cai *et. al*, (2013) presented a method consisting of travel-time estimation and adaptive traffic signal control under V2I environment. The proposed method is based on approximate dynamic programming (ADP), which allows the traffic controller to learn from its own performance progressively. In the method, the remaining travel time will be predicted when a vehicle approaches the stop line at an intersection. The approximation techniques can mitigate the difficulties of solving the dynamic programming to optimize the control performance. Based on function approximation which is one of the common methods for ADP, they method, the numerical experiment shows that the reduction in the total travel time and vehicle stops is notable under various simulation scenarios.

Younes & Boukerche, (2018) designed a dynamic and efficient traffic light scheduling algorithm that adjusts the best green phase time of each traffic flow, based on the real-time traffic distribution around the signalized road intersection. This proposed algorithm has also considered the presence of emergency vehicles, allowing them to pass through the signalized intersection as soon as possible. However, the developed algorithm could not efficiently and

safely tackled those scenarios in which more than one emergency vehicle appeared at the signalized intersection.

Kabir & Salam, (2016) proposed a system for reducing the delay times while also making provision of quicker paths for emergency vehicles. A combination of field programming gate array System on Chip (SoC) and infrared radio frequency identification sensor were used to implement the system. The system, during the simulation stage was observed to respond almost immediately when emergency vehicles were added to lane for which it paved a least delay time of exit.

Sadiq *et al*, (2018) a new and different method based on modified round robin scheduling algorithm through genetic algorithm technique to optimize the performance (in terms of timing) of a signalized intersection in one of the busiest and most crowded roads in Minna, Niger State – Nigeria. The technique uses an initial timing pattern to generate newer offspring (in terms of delay duration) to analyze cost function and to check if a global optimum is reached. This technique outweighs current techniques because the data upon which the nature of the system is built is relatively more phenomenal, as it puts into consideration the exact nature of the lane in many possible occurrences.

An Adaptive Dynamic Scheduling Algorithm (ADSA) based on Artificial Bee Colony (ABC) was developed by Adebiyi *et al*, (2017) for vehicular traffic control. The developed model optimally scheduled green light timing in accordance with traffic condition in order to minimize the Average Waiting Time (AWT) at the cross intersection. A MATLAB based Graphic User Interface (GUI) traffic control simulator was developed. In order to demonstrate the effectiveness of the developed ADSA, it was validated with the work of Erwan *et al*, (2015). The result obtained for the AWT of the developed ADSA had a performance of 76.67%. While for vehicular queues cleared at the intersection the developed ADSA had a performance of 53.33%.

Yousef *et al*, (2019), proposed a novel reconfigurable and adaptive history-based traffic management algorithm that relies on previous all-year traffic information to predict the traffic flow on congested road intersections. The proposed algorithm is implemented and tested using MATLAB and the well-known traffic simulator, SUMO. Simulation results show that the proposed algorithm optimizes the traffic flow up to 18% more than a standard traffic system.

Adebiyi *et al*, (2018) developed an adaptive traffic control system that dynamically manages traffic phases and durations at cross-intersection. The developed model optimally schedules green light timing in accordance with traffic condition on each lane in order to minimize the Average Waiting Time (AWT) at the cross intersection. Three scenarios of vehicular traffic control were simulated and the results presented. The results show that scenario one and two demonstrated the variation of the AWT and Performance of the developed algorithm with changes in the maximum allowable green light timing over the simulation interval. In the third scenario, an AWT of 38sec was recorded against a maximum allowable green light duration of 120sec, during which 1382 vehicles were evacuated from the intersection, leaving 22 vehicles

behind. The algorithm also had a performance of 98.43% over a simulation duration of 1800sec.

Nagarajan *et al*, (2019) proposed an improved score function for interval neutrosophic numbers (INNs) to control traffic flow that has been analyzed by identifying the junction that has more vehicles. This improved score function uses score values of triangular interval type-2 fuzzy numbers (TIT2FNs) and interval neutrosophic numbers.

Islam *et al*, (2017), presented a Distributed-Coordinated methodology for signal timing optimization in connected urban street networks. The fundamental postulation is that all vehicles and intersections are connected and intersections can share information with each other. The novelty of the work arises from reformulating the signal timing optimization problem from a central architecture, where all signal timing parameters are optimized in one mathematical program, to a decentralized approach, where a mathematical program controls the timing of only a single intersection. As a result of this distribution, the complexity of the problem is significantly reduced thus, the proposed approach is real-time and scalable.

3. RESULTS AND DISCUSSIONS

Adaptive traffic signal control based ITS on an interconnected vehicular environment is a relatively growing research field. Unlike the deterministic traffic signal control methods, this method has many advantages on reducing the delay and improving the road traffic flow efficiency. In view from the above cited review, the crux of optimizing the traffic signal is to minimize the vehicle delay at the intersection by adjusting the traffic signals or optimizing vehicle queue. Minimizing the delay can reduce the waiting time for vehicles, smooth the traffic flow at intersections, and reduce the exhaust emissions. In brief, this method not only improves the efficiency of the road transport system, but also reduces the fuel consumption and gas emissions that pollute the environments. Table 1 provides the summary of the overall literatures in this paper.

Table 1. Summary of methods of Adaptive traffic signal control utilized in selected papers

Lead Authour (Year)	Method/Algorithm	Consideration	Objective Functions
Tubaishat et al. 2007	Decentralized traffic control	2, 4 and 8 intersections	Minimizing the queue length
Zhou et al. 2010	Traffic information detection	12 intersections	Queue length and average waiting time
Chinyere et al. 2011	SSADM and Fuzzy Logic based design	2 intersections	Total waiting time and total moving time
Faye et al. 2012	Sensor network architecture	4 intersections	Reduction of average waiting time
Odey 2013	VANET and Video Image Technique	2 highways and 4 intersections	Reducing average travel time, the average delay and the queue length
Mittal & Singh 2013	Image mosaicking technique	Isolated intersection	Minimizing the total delay
Alam & Pandey 2014	Fuzzy logic based controller	Isolated intersection	Total waiting time and total moving time
Collate et al. 2015	IEEE 802.15.4, WSN and Multiple FLC	Isolated intersection	Vehicle waiting time and queue length
Pau & Scata 2014	Architectural technique	Isolated intersection	Queue management
Punetha et al. 2014	GPS-VC	7 intersection	Average waiting time
Saleh et al. 2014	Hierarchical scheduling algorithm	Isolated intersection	Vehicle delay
Salehi et al. 2014	FLSC multi-agent based a	3 intersections	Average waiting time and queue length
Gündoğan et al. 2014	ATAK based algorithm	Isolated intersection	Cycle timing and travel timing
Wang et al. 2014	Monte Carlo algorithm	5 intersections	Reducing queuing length

Erwan et al. 2015	FLC Sugeno method	4 intersections	Average waiting time, queue length and traffic flow of vehicles
Garg & Kaushal	IEEE 802.15.4 WSN based	4 intersections	Average waiting time and queue length
Barzilai et al. 2018	Social priorities based	3 and 4 intersections	Queue length
Cai et al. 2013	A vehicle to infrastructure communication-based adaptive control (VICAC) method	1 and 2 intersections	Travel time and average waiting time
Younes & Boukerch 2018	An emergency dynamic traffic light scheduling algorithm	4 intersections	Traffic flow
Kabir & Salam	RFID based traffic control	4 intersections	Average waiting time and queue length
Sadiq et al. 2018	Modified round robin scheduling	4 intersection	Delay time
Adebiyi et al. 2017	ADS-VTCS	Isolated intersection	Average waiting time and queue length
Adebiyi et al. 2018	ADSA-VTCS	Isolated intersections	Average waiting time
Nagarajan et al. 2019	Triangular interval type-2-fuzzy	8 intersections	Traffic flow
Islam et al. 2017	Distributed-Coordinated methodology	2 an 9 intersections	Minimizing queue length and maximizing throughput and reducing travel time
Yousef et al. 2019	Calendar based traffic congestion management system.	Isolated	Average waiting time and average queuing length

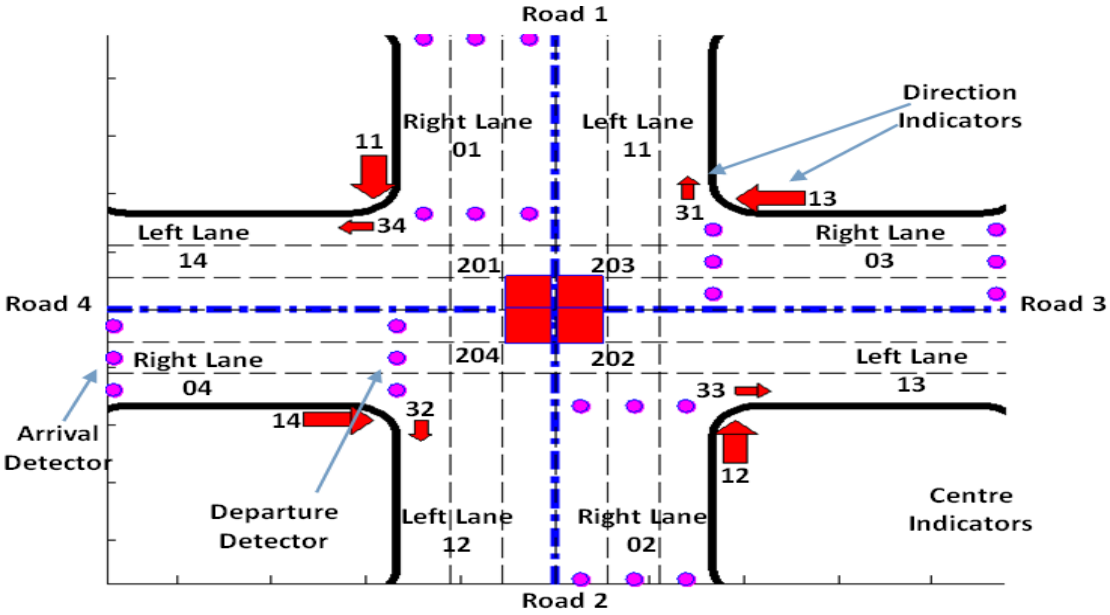


Fig 1: Cross – Road Intersection as Generated by the Developed Simulator (Adebiyi et al, 2018)

In the developed model, each lane is represented by a double digit array/number as further described in the following:

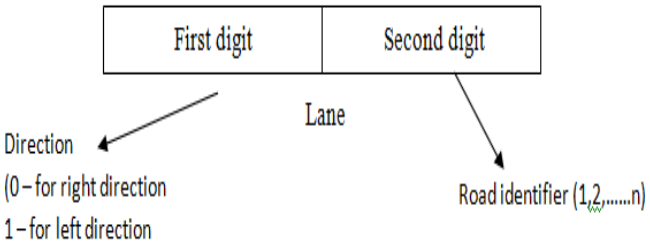


Fig 2: Coding a Lane at the Intersection

For example, 01 is used to represent the right lane of road 1, while 14 denotes the left lane of road 4. There is no particular manner in which the roads must be numbered, but what matters is that once the roads are numbered, the order remains the same throughout the simulation.

4. LIMITATIONS AND FUTHER WORKS

The following limitations should be taken into consideration when deducing the existing results. Our search papers were limited to papers published in English, consequently, related literature published in other languages were barred. The second limitation is that, all included studies were adaptive traffic signal control, while other traffic signal control approaches applied in a connected vehicular environment were not be deliberated. The state of research have shown that there are significant progress of models and solution techniques in adaptive traffic light control in a connected vehicular environment. However, most of the existing researches were mainly focused on the optimization-based method. Hence there are still prospects for improvement on this optimization problems.

5. CONCLUSION

In this paper, we present a review on adaptive traffic signal control in a connected vehicle environment. In order to have a stern evaluation process, this review has delivered an exhaustive discussion and thorough analysis of adaptive traffic control systems, such as the method implemented in the selected papers, the estimation of unequipped vehicle status, and the simulation platform employed in those papers. The review has also carefully discussed the successes and shortcomings of the different methods or strategies used in the selected papers. The artificial intelligence technology such as (Artificial Bee Colony (ABC) algorithm, Smell Agent Optimization (SOA), reinforcement learning, etc,) provide more options for the optimization algorithm and signal control approach. The intelligent control techniques has a better advantages when compared with the conventional methods because of its strong approximation nonlinear function without bank on on the detailed mathematical model. This

may be an effective method for a traffic signal control system that is hard to build a better mathematical model, especially in a connected vehicle environment.

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SECTION 5:

URBAN/ENVIRONMENTAL MANAGEMENT AND PLANNING

MULTIDIMENSIONAL APPROACH TO FLOOD VULNERABILITY ASSESSMENT IN COASTAL COMMUNITIES OF SULEJA AND TAFA LGA, NIGER STATE

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Abstract

Flooding is no doubt one of the world's most prominent and most damaging natural disaster; destroying millions of lives and properties. The continuous increase in developments and land-use changes due to population growth is increasing the vulnerability in flood-prone areas. This study therefore, examines flood vulnerability of households in coastal communities of Suleja and Tafa LGA, Niger State, using multiple flood vulnerability assessment indicators. The study adopts the descriptive and exploratory approach to research design and quantitative method. The data used for the study were gathered from both primary and secondary sources. The sample frame for the study is 26,205 households in the communities, while a sample size of 383 households is estimated at 95% confidence level and confidence interval of 5. The respondents were selected using cluster and simple random sampling technique, from which a total of 310 questionnaires were returned completed. The data were standardised and analysed using multiple vulnerability indicator methods (MVIM) and descriptive statistics. The study established that the household's in the study area are vulnerable from multiple dimensions (physical, economic, and social); Chechnya, community recorded a vulnerability index of (0.55), and Sabon-wuse (0.56). The vulnerability recorded in the communities is occasioned by the vulnerability experienced from the three dimensions of assessment. The study concludes that the vulnerability of households to flooding is multidimensional and requires prompt intervention. Therefore, effective development control strategies must be put in place to discourage floodplain development, while attention must also be paid to the improvement of household economic and social welfare.

Keywords: *Assessment, Coastal, Flooding, Indicators, Vulnerability*[31]

1.0 INTRODUCTION

The quantum of properties and number of lives lost to flood is only second to tornadoes as the lead natural disaster. The statistic regarding flooding in the world is quite alarming. In the last three decades, about 2.8 billion people have been affected by flood across the world, out of which about 4.5 million people were rendered homeless, 540,000 lives were lost, and about 360,000 had secure various degree of injuries. United Nations International Strategies for Disaster Reduction (UNISDR, 2016) reported that in the year 2015 alone, over 152 flood events were reported globally, leading to 3,310 deaths and affecting about 27.5 million persons. Lehmann (2015) has suggested that by the year 2030, about 54 million people worldwide will

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be affected by flood as more intense precipitation and increase in city growth is expected to double the rate of exposure to inundation. Van Western and Hosfstee, (2000), suggested that mitigation of flood disaster can only be successful when requisite information is obtained about the expected frequency, character, and magnitude of hazardous events in an area as well as the vulnerability of the people, buildings, infrastructures and economic activities in a potentially dangerous area. Unfortunately, this detailed knowledge is always lacking in most urban centres of the developing world especially in Nigeria.

Increased developments, investments, and land-use a change is increasing the vulnerability in flood-prone areas, which is, in turn, increasing the trends in flood frequencies and damage. The term vulnerability does not lend itself to an easy definition, and it is evident in the multiplicity of vulnerability definition that exists across various fields of study. Khan (2017) describes vulnerability as a condition that predisposes a community to the impact of hazards. The International Strategy Disaster Reduction (UN/ISDR), formulated one of the best-known definitions, which defines vulnerability as the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards (UNISDR 2004). Yadzi and Neyshbouri (2012) argued that the measurement of vulnerability is gaining attention as it is seen to be a key factor towards effective risk reduction and the promotion of a culture of disaster resilience. In the light of the increasing frequency of disasters and continuing environmental degradation, the measurement of vulnerability is of eminent importance towards the transition to a sustainable world (Kasperson *et al.,* 2005).

According to the National Emergency Management Agency (NEMA, 2013), in Nigeria about of 7.7 million people were affected by flooding in the year 2012. It was also estimated that about 2.1million people were officially registered across the country as internally displaced persons and over 300 people were killed during that period (NEMA, 2013). Similarly, the Niger State Emergency Agency (NSEMA, 2012) also reported that about 1000 households were displaced, and 47 persons were killed by the flood. Over 500 communities in the state including Suleja and environs was also reported to have been affected by the flood. Many communities in Niger State particularly Suleja has since consistently experienced flooding on a yearly basis till date with loss of lives and properties.

Extant literature review shows that flood vulnerability assessment has been carried out primarily through the narrow framework of physical vulnerability and in some cases socio-economic vulnerability. There is a need for a multi-dimensional approach to vulnerability assessment to provide a holistic view of residents' level of vulnerability to flooding. The current studies about the vulnerability indicate the necessity of considering all factors and effective parameters of vulnerability including physical, economic, social, environmental and institutional characteristics (O'Brien *et al.,* 2009; Rayhan 2009).In the light of the identified research gap, this study seeks to assess the flood vulnerability level of some selected flood-

prone communities using a multi-vulnerability indicator approach. In a view to achieving the broad aim and specific objectives of the study, the following research questions were drawn.

2.0 LITERATURE REVIEW

2.1 A holistic approach to risk and vulnerability assessment

The conceptual framework for a holistic approach to evaluating disaster risk goes back to the work of Cardona (1999, 2001) and his developments with Hurtado and Barbat in 2000. In their first concept, vulnerability consisted of exposed elements that took into account several dimensions or aspects of vulnerability (Wilches-Chaux, 1989), which are characterized by three categories or vulnerability factors: physical exposure and susceptibility. This is designated as hard risk and viewed as being hazard dependent fragility of the socio-economic system, which is viewed as soft risk and being non hazard dependent lack of resilience to cope and recover, which is also defined as soft risk and being non hazard dependent (Cardona and Barbat, 2000).

According to "Holistic Approach" framework vulnerability conditions depend on the exposure and susceptibility of physical elements in hazard-prone areas on the one hand, and the other, on socio-economic fragility as well as on a lack of social resilience and ability to cope. These factors provide a measure of the direct as well as indirect and intangible impacts of hazard events. The approach emphasises the fact that indicators or indices should measure vulnerability from a comprehensive and multidisciplinary perspective. They intend to capture conditions for the direct physical impacts (exposure and susceptibility), as well as for indirect and at times intangible impacts (socio-economic fragility and lack of resilience), of potential hazard events. Therefore, the approach defines exposure and susceptibility as necessary conditions for the existence of physical (hard) risk. On the other hand, the likelihood of experiencing negative impacts, as a result of the socio-economic fragilities, and inability to cope adequately and also vulnerability conditions, which are understood as ''soft'' risk.
Although the classification of vulnerability conditions into ''hard'' and ''soft'' risk is controversial, the conceptual framework suggests a broader understanding of vulnerability, encompassing exposure, susceptibility and lack of resilience. The consequences of the interaction of the hazardous events and vulnerabilities are defined as risks from which a feedback loop starts: it encompasses a control and an actuation system that represent risk management organisation and corrective and prospective interventions. The feedback loop starts after the risk has become evident (Cardona and Barbat, 2000).

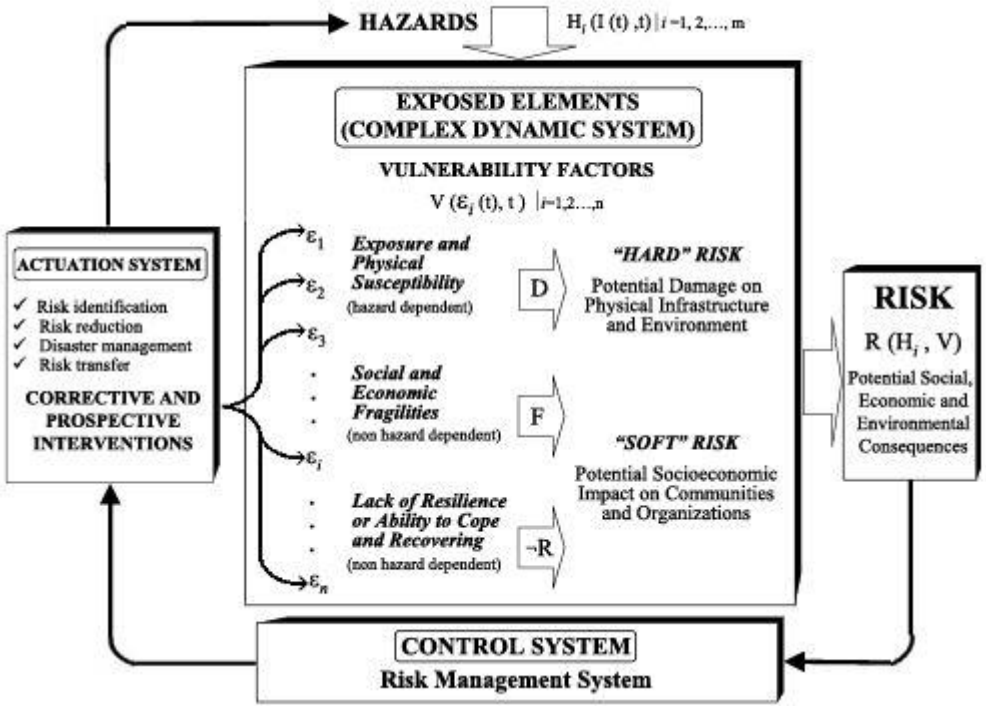


Figure 2.1: Theoretical Framework and Model of Holistic Approach to Disaster Risk Assessment

Source: Cardona and Barbat, 2000

Carreno *et al.* (2004, 2005a, 2005b) have developed a revised version of the holistic model to evaluate risk that redefines the meanings of hard and soft risk in terms of ‘‘physical damage’’, obtained from exposure and physical susceptibility, and an ‘‘impact factor’’, obtained from the socioeconomic fragilities and lack of resilience of the system to cope with disasters and recovery.

The revised version of the holistic model of disaster risk developed by Carreno *et al.* (2004, 2005a, 2005b) views risk as a function of the potential physical damage and the impact factor (social and economic fragilities and lack of resilience). While the potential ‘‘physical damage’’ is determined by the susceptibility of the exposed elements (e.g. a house) to a hazard and its potential intensity and occurrence, the ‘‘impact factors’’ depend on the socio-economic context particularly social fragilities and lack of resilience. Based on the theory of control and complex system dynamics, Carreno *et al*. (2004, 2005a, 2005b) also introduce a feedback loop encompassing corrective and prospective interventions, to underline the need to reduce both the vulnerabilities and the hazards.

Thus risk management requires a system of control (institutional structure) and an actuation system (public policies and actions) to implement the changes needed. The holistic approach to estimating vulnerability was also presented by Cardona (2004) in Geneva. However, because

his presentation outlined only some elements of the approach, the original model was examined. At present, this model has been used to evaluate disaster risk at the national level in the Program of Indicators for Disaster Risk and Risk Management for the Americas as well as at the sub-national level and for cities, including Barcelona and Bogota ´ (Carreno *et al.*, 2004).

2.2 Concept of Vulnerability

Vulnerability is a concept that evolved out of the social sciences and was introduced as a response to the purely hazard-oriented perception of disaster risk in the 1970s (Schneiderbauer and Ehrlich, 2004). Since the 1980s, the dominance of hazard-oriented prediction strategies based on technical interventions has been increasingly challenged by the alternative paradigm of using vulnerability as the starting point for risk reduction. This approach combines the susceptibility of people and communities exposed with their social, economic and cultural abilities to cope with the damage that could occur (Hilhorst and Bankoff, 2004).

The term vulnerability has already been used multiple times in this study. Its commonplace meaning is of being prone to or susceptible to damage or injury. Different scholars have had their definitions of the term. Vulnerability may refer to the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Blaikie, 1994). Although there is still much uncertainty about what the term vulnerability covers, Cardona (2004b) underlines the fact that the concept of vulnerability helped to clarify the concepts of risk and disaster. He views vulnerability as an intrinsic predisposition to be affected by or to be susceptible to damage; that means vulnerability represents the system or the community's physical, economic, social or political susceptibility to damage as the result of a hazardous event of natural or anthropogenic origin (Cardona, 2004).

The vulnerability of society is related both to the physical susceptibility of the exposed elements (physical vulnerability) and the socioeconomic frailties or lack of resilience of the flood-prone communities (socioeconomic vulnerability) (Cardona, 2003). For this study, the operational definition of vulnerability is the one that the United Nations/International Strategy for Disaster Reduction (UN/ISDR) has devised. It defines vulnerability as the "conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of a community to the impact of hazards" (UN/ISDR, 2004).

3.0 Methodology

3.1 Research Design

The research design for this study was anchored on descriptive research design. This research design helps to provide answers to questions of who, what, when, where, and how associated with a specific research problem. This research design aid the gathering of information concerning the present status of the phenomena (flooding) and to describe "what exists" with respect to variables or conditions in the situation.

3.2 Types and Sources of Data

To achieve the broad aim of the study, data were sourced from both primary and secondary sources of data. The primary data were sourced directly from the households and stakeholders (Mai angwa) in the selected communities, while secondary data were sourced from the following areas: United State Geological Survey (USGS), Niger State Ministry of Lands, Niger. The primary data collected include data on the socio-economic attribute of households (household size, composition of household, income, education status, gender, among others), building condition as well as preparedness measures and coping strategy. The secondary data collected include the Digital elevation model (DEM) of the study area and the population data.

3.3 Data Analysis

The data was analysed using descriptive statistics and slope analysis. The DEM collected was analysed and classified into four categories using slope analysis under spatial analyst tool in ArcGis 10.2. The quantitative data collected was analysed using descriptive statistics such as mean, frequency, and percentage. The data collected was standardised using linear scaling technique developed by the United Nation Development Programme (UNDP, 2006). The choice of the method was predicated on the fact the method normalizes variables with consideration for functional relationship between the variables and the indicators. The linear scaling technique is expressed mathematically as:

Vij=(X_ij-〖Min〗_ij)/(M〖ax〗_ij-〖Min〗_ij)……..Equation (1)

Where: Vij: stands for the standardized vulnerability score with regard to vulnerability component (i), for municipality (j);Xij: stands for the observed value of the same component for the same municipality;
MaxXi stand for the maximum value of the observed range of values of the same component, for all settlement of the index.
MinXi stand for the minimum value of the observed range of values of the same component, for all settlement of the index.

After normalization, the average index (AI) for each source of vulnerability is constructed by using equal weights methods. Each index is obtained by averaging the variable within each component of vulnerability following the formula:

AI=1/N ∑_(i=1)^n▒X_i ……Equation (2)

AI= being the average index of each source of vulnerability, N= the sum of the index and
Xi = the value of the index.

4.0 RESULTS AND DISCUSSION

4.1 Physical Vulnerability

The physical vulnerability was computed from three variables, elevation, proximity to the water channel, and housing condition. The three variables were standardised to derive the mean physical vulnerability of the households in the study area. The physical vulnerability index of the households is presented in Table 1. The result shows that Chechenia had a physical vulnerability index of 0.57 while Sabon wuse 0.62. Although Sabon Wuse area recorded a higher physical vulnerability index than Chechenia, they are both physically vulnerable to

flooding. Housing condition is the major contributor to physical vulnerability, followed by households' proximity to the river. It indicates that reducing household physical vulnerability will involve improvement in housing quality and condition as well as discouraging development of housing close to the river as against what was observed.

Table 1: Physical Vulnerability Index

Variables	Chechenia	Remark	Kaduna Road	Remark
Elevation	0.50	V	0.47	MV
Housing Condition	0.69	V	0.76	HV
Proximity	0.51	V	0.62	V
Index	**0.57**	**V**	**0.62**	**V**

0.0-0.30= Not Vulnerable (NV); 0.31-0.50= Marginally Vulnerable (MV); 0.51-0.75= Vulnerable (V); 0.76-1.00= Highly Vulnerable (HV)

4.2 Social Vulnerability Index

The social vulnerability of the households in the study area was examined using the following factors, the proportion of female household member, the proportion of dependent household member, the proportion of household member with a disability, household size, and the proportion of household member without secondary education. Table 2 shows the social vulnerability index of the households in the study area.

Table 2: Social Vulnerability Index

Variables	Chechenia	Remark	Sabon Wuse	Remark
Household Size	0.54	V	0.60	V
% of Female	0.64	V	0.59	V
Dependant	0.68	V	0.63	V
Disabled	0.17	NV	0.10	NV
Secondary Education	0.41	MV	0.47	MV
Info/Communication	0.61	V	0.57	V
Index	**0.51**	**V**	**0.47**	**MV**

0.0-0.30= Not Vulnerable (NV); 0.31-0.50= Marginally Vulnerable (MV); 0.51-0.75= Vulnerable (V); 0.76-1.00= Highly Vulnerable (HV)

The result shows that Chechenia is socially vulnerable to flooding with an index of 0.51. The social vulnerability of Chechenia is occasioned by the proportion of dependent household members (children and the aged) (0.68), the proportion of females household member (0.64), large household size (0.54) and poor access to information and communication gadget (0.61). However, Sabon Wuse had a social vulnerability index of 0.47, which implies that the households are marginally vulnerable from the social dimension. Dependency (0.63), household size (0.60), a high proportion of female to male (0.59), and poor access to information and communication gadget (0.57) were also responsible for the level of social vulnerability of the households.

4.3 Economic Vulnerability Index

The economic vulnerability is expressed by the per capital income of the household member, livelihood diversification, households whose primary occupation is farming/fishing and the proportion of household member without job. The result that the per capital income index in Chenchenia is 0.69 and 0.73 in Sabon Wuse, which shows that a significant proportion of the households earn less than N540.00 (1.2 dollars). Table 3 shows that a livelihood diversification among the resident is low with an index of 0.71 and 0.65 in Chenchenia and Sabon Wuse respectively. The unemployment index of an adult household member stands at 0.66 in Chenchenia and 0.61in Sabon Wuse.

Table 3: Economic Vulnerability Index

Variables	Chechenia	Remark	Sabon Wuse	Remark
Per Capital Income	0.69	V	0.73	V
Livelihood Diversification	0.71	V	0.65	V
% Farmers or fishermen	0.23	NV	0.36	MV
% of unemployed members	0.66	V	0.61	V
Index	**0.57**	**V**	**0.59**	**V**

0.0-0.30= Not Vulnerable (NV); 0.31-0.50= Vulnerable (V); 0.51-0.75= Acute Vulnerable (AV); 0.76-1.00= Ultra Vulnerable (UV)

Table 3 also shows that the proportion of households that rely on farming or fishing as the only occupation in Chenchenia is low with an index of 0.23, and 0.36 in Sabon Wuse. The result shows that Chenchenia and Sabon wuse are vulnerable to flooding from the economic dimension with an index of 0.57 and 0.59 respectively.

4.4 Multidimensional Flood Vulnerability Index

Table 4 shows the multidimensional flood vulnerability index of Chenchenia and Sabon wuse. The result shows that Chenchenia (0.55) and Sabon wuse (0.56) are multidimensionally vulnerable to flooding. Households in Chenchenia are vulnerable in all the dimension of assessment, physical (0.57), social (0.51), and economic (0.57). However, households in Sabon Wuse are only vulnerable from the physical (0.62) and Economic (0.59) dimensions and marginally vulnerable (0.47) from the social dimension. The result shows that flood vulnerability in the study area is multidimensional; that is, it is a function of the interaction of physical, social and economic factor. Hence addressing the problem will involve a multidimensional approach.

Table 4: Multidimensional Flood Vulnerability Index

Variables	Chechenia	Remark	Sabon Wuse	Remark
Physical	0.57	V	0.62	V
Social	0.51	V	0.47	MV
Economic	0.57	V	0.59	V
Index	**0.55**	**V**	**0.56**	**V**

5.0 Conclusion and Recommendation

This study concentrates on three major dimensions of vulnerability assessment which is physical, social, and economic vulnerability. This study demonstrates how multidimensional flood indicator method can be used to integrate interdisciplinary knowledge to not only guarantee a useful model according to the needs of the end users but also to increase the acceptance of the vulnerability assessment. From the result of the study, it can be shown that Chechenia and Sabon wuse are vulnerable to flooding. The vulnerability of the study area is multidimensional, which implies that physical, social and economic factors occasion the household exposure to flooding. The study shows that flood vulnerability is not a function of proximity to river or floodplain only, but may also be influenced by the social and economic attributes of the households.

Therefore, to effectively reduce the menace of flooding, aside from discouraging development along floodplains, it is also important to improve the social and economic attributes the people. The study, therefore, recommends effective development control and monitoring to discourage people from developing the floodplain areas. Setback should be observed from all water channel to avoid encroachment on the floodplain areas, while strict disciplinary action should be enforced on defaulters. The study also recommends the improvement of the social and economic status of the people to enhance the capacity of the people and reduce their vulnerability to flooding.

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AN ASSESSMENT OF STREETSCAPE INFRASTRUCTURE IN ILORIN METROPOLIS, NIGERIA

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Abstract

High tempo urbanization, non-compliance with planning standards and increasing pressure on vehicular transport has precipitated problems that threaten functionality of streetscape infrastructure in Nigeria. Streetscape infrastructure includes street lights, sidewalks, bus shelters, sign posts, drainages, speed limiter, street-trees & landscape strips amongst others. This study assessed their availability, functionality, condition and desirability in Ilorin metropolis, Nigeria. Data were collected using structured questionnaire and Twenty-six streets were sample across the three local government areas. 310 respondents were sampled and data analysed using SPSS version 16 software package. Frequency tables and percentages were used to present the statistics generated. Results revealed that 54% of streetscape infrastructure in Ilorin Metropolis is not adequate in supply. Nevertheless, most respondents are satisfied with the level of availability of some streetscape infrastructure, specifically street lights, drainages, speed bumps and speed limit signs. 52% of the respondents confirmed that infrastructure such as sidewalks, sit-outs, bus-shelters, waste-cans, street-trees & landscape strips are not functional. Study concludes that deficiency and poor condition of the streetscape infrastructure predispose pedestrians to dangers of road accidents while creating transport, economic, health and urban management problems. Recommendation is made for adequate provision and efficient management of streetscape infrastructure to achieve satisfactory, functional, safe and aesthetically pleasing vehicular and pedestrian routes. These are basic necessities for sustainability and efficiency in cities of the 21st century.

Keywords: *Infrastructure, Landscape, Pedestrian, Streetscape, Sustainability, Vehicular*

32.

1.0 Introduction

Streets in cities can symbolically be likened to blood vessels in humans (Abdulraheem M.O. 2018). In traditional planning, street function was limited to the movement of people, cars and freights. However, the inception of modern planning revealed streets to hold more potentials than serving just transportation and accessibility purposes alone. They actually play a vital role in the improvement of health and well-being of citizens and sustainability of urban centers.

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2.0 Literature review

Wang, Wang & Hong (2014) opined that roads/streets play a vital role in shaping the landscape of the city and the function of roads is no longer limited to transportation, but also includes safety, convenience, comfort and aesthetics among others. Montgomery, J. (1998) said "Streets are undoubtedly the most important elements in a city's public realm; the network of spaces and corners where the public is free to go, to meet, to gather or simply to watch one another. Thus successful urban places are based predominately on streets and the connected street life and this might not be actualized without considering the condition of the streetscape. Many authors provided various perspectives on streets. Glaser (2012) insisted that streets were the frontage of cities and that it was from the streets that people first experienced and felt cities.

Streetscape as a term is relatively new in the Nigerian context, as the term has been of little usage among Nigerian scholars, planners' civil engineers and other allied professionals. The term 'streetscape' is used to describe the aspect of urbanism that considers the totality of the physical street environment. It also includes semi-private spaces such as residential front yards and commercial terraces, street trees, flower boxes, and planters which enhance these spaces (Montgomery, J. 1998)

According to Charlwood (2004), Streetscape is a term used to describe the natural and built fabric of the street, and defined as the design quality of the street and its visual effect, particularly how the paved area is laid out and treated. It includes buildings, the street surface, and also the fixtures and fittings that facilitate its use from bus shelters and signage to planting schemes. From the context of this definition streetscape isn't new in the Nigerian context it's only the term that sounds new, the constituent of streetscape aligned perfectly with street furniture/infrastructure which we are very much used to.

Nevertheless the birth or origin of the term isn't the main object of focus in this review but its functions, objectives and what it stands to achieve in our environment. Streets are integral part of our environment, thus factors and components that ensures it continuous functionality and survival becomes important too.

The elements of a sustainable streetscape are the main components of the streets, they include all that is expected to be on a street to serve beyond the purpose of pedestrian and vehicular mobility, and these elements are summarized as follows: Sidewalks, Planters, Street furnishing, Benches, Trees and Landscape Strips, Rain Garden, Lighting, Trash Receptacles, Signage, Bus Shelter, Medians, Curbs, Bicycle Facilities, Crossing, Public Art and Cafe Spaces

The term 'streetscape' is used to describe the aspect of urbanism that considers the totality of the physical street environment. It is the visual identity of a neighbourhood and plays an important role in facilitating interaction and cohesion between residents and creating a livable community.

With the spate of urbanization, series of problems have cropped up which are affecting the peaceful nature and beautiful arrangement of the streets in our urban centers. This includes encroachment of the road and its rights of way for display of wares, on-street trading, carrying out informal activities e.g. vulcanizers' stand, refuse dumps, building of shops or citing of illegal roadside structures. This hampers pedestrian movement on the sidewalks, distorts the aesthetic view of the street and reduces its functionality Shonibare (1996). Shonibare (1996) concluded that the encroachment of open spaces and road sides by markets and service industries is one of the major environmental management problems plaguing many Nigerian urban centers. In a similar study, Alabi (2009) also reported that most of the open spaces and roads in the city had been encroach upon by the people for commercial activities or other uses. In addition, Olorunfemi, Oladele and Koffi (2016) emphasized that one aspects of streetscape that cannot be undermined is the arrangement of buildings on the street, but which has been altered due to the desire of property owners to maximize the use of their land in many urban center, non observation of building codes and setbacks which is not only disrupting the aesthetics of the street but also endangering the lives of the residents and other road users. The authors concluded this to be the result of negligence on the part of the planning authorities.

Pedestrian friendly streets have been advocated by urban designers and transport planners, that is the creation of an environment that is lively enough to discourage the dependency on cars while embracing cycling, walking, bicycling etc an approach that will reduce carbon emission, improve security of the environment and also improve the health of the residents. This study will assess streetscape infrastructure in Ilorin metropolis, verify its suitability to cars, friendliness to pedestrians and its effect on the sustainability of the general environment and wellbeing of the citizens.

The research is aimed at assessing the streetscapes infrastructures in Ilorin metropolis Kwara state and the specific objectives are to;

1. appraise the availability of streetscape facilities in the study area;
2. assess the existing conditions of streetscape infrastructures in Ilorin metropolis;
3. examine the functionality of street infrastructures to the car users and the pedestrians in the study area;
4. appraise the desirability level for these facilities by the residents; and
5. make recommendations.

The streetscape is an important element in the city which cannot be undermined, owing to its functions and importance to the city and the city dwellers. Streets as a subset of urban public space, is an element that is able to promote continuity, cohesion and order in the territory. This is in addition to its natural ability to create and maintain strong local centrality, environmental quality, economic competitiveness and sense of citizenship. The use of streetscape for community cohesion, pedestrian friendly / street walk ability, heat Island eradication, community policing and traffic calming among its

other advantages have not been fully harnessed in Ilorin, Kwara state and Nigeria as a whole.

The findings of this study will thus be of immense benefits in the aspect of insightful provision to policy makers in the study area through the revelation of the conditions of streetscape and its components and the proactive measures to be taken to ensure sustainability of the available streetscape infrastructures. Furthermore, it will contribute to knowledge, by offering useful data to students and researchers of transportation studies, urban management and other related concerns.

3.0 Materials and Methods

This study was conducted in Ilorin, a city in Kwara State Nigeria, considered to be one of the fastest growing cities in Nigeria since 1967 when it became a state capital (Oyegun 1992). It occupies an area of 100km^2 with a height of 129 meters above sea level and located on latitude $8^0$30'N and longitude $4^0$35'E. Ilorin metropolis comprises Ilorin west, Ilorin East and Ilorin South Local Government Areas with over twenty political wards (Aboderin 2006). Ilorin shares common boundaries with Moro, Asa and Ifelodun Local Government Areas of Kwara State. The city is strategically located at the geographical and cultural confluence between the North and Southern parts of Nigeria.

The survey method was primarily used for this study. The secondary source of data was also used included the population figures from the National Population Commission, maps and published journals from the internet and other relevant literatures on the subject of study.

Research instruments that the aided data gathering process for this study, are majorly three. They are questionnaire, use of photograph materials and interviews. Structured questionnaire was designed to elicit relevant facts from the respondents on the availability, condition, functionality and desirability of streetscape and street infrastructures in various neighbourhoods in the study area. The first section of the questionnaire dealt with the socio-economic characteristics of the respondents, the second section consisted of checklists that were used to appraise the streetscape infrastructure.

Interviews were scheduled with some stakeholders e.g. staff of the Ministry of Works, Ilorin and Town Planning and Development Authority. Photographs and images were obtained to support the findings of the study, mostly on the existing situation of various street infrastructures in Ilorin metropolis.

Cluster Sampling was used to sub divide the study area into clusters with the aid of the established Kwara state political ward division, from which sub-clusters were randomly selected. In order to give all the clusters equal representation, proportional allocation was then used to ascertain the total numbers of respondents to be sampled in each sub-cluster. Systematic Random Sampling was adopted in administration of questionnaire on respondents within the sub-clusters. This was achieved by administering 10

questionnaires on every street in each sub-cluster or 5 questionnaires after every ten houses in every sub-cluster.

In order to determine the sample frame, the population of Ilorin was projected using the population projection model based on the 2006 population figure of Ilorin which was put at 777,667 (NPC 2006). The population projection formula: $P_t = P_n (1+^r/_{100})^n$ was adopted, and 1,145,482 figure was arrived at, as the projected population figure for the year 2018. A sample size of three hundred and ten (310) was used for this study. This choice was supported by Krejcie and Morgan (1970) who opined that, for a population size of one million and above, a sample size of 310 is relevant for effective generalization of finding.

Structured questionnaires were prepared, which had two (2) major sections. A total number of 310 questionnaires were administered, using systematic random sampling technique. However, of 310 respondents sampled, not all responses provided useful data for this study. Data analysis was done using SPSS version 16 software package. Frequency tables and percentages were used to present the results and descriptive statistics generated.



Plate 1: The use that a typical bus shelter is put to Odo. Tanke road, Ilorin.
Source: Author's Field Work, (2018).



Plate 2: Street lights along Tanke Oke-

Source: Author's Field Work, (2018).

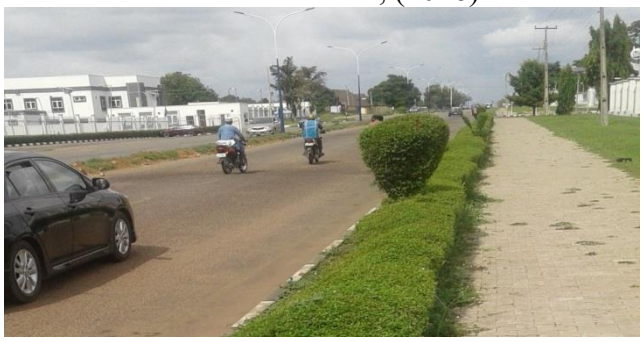


Plate 3: Sidewalk in good condition along



Plate 4: Sidewalks/ drainage overridden

Ahmadu Bello way, Ilorin.
Source: Author's Field Work, (2018).



Plate 5: Streetlights along Challenge road Ilorin
Source: Author's Field Work, (2018)



Plate 6: Street lights along Taiwo road
Source: Author's Field Work, (2018).

By Shops, F-Division, Ilorin.
Source: Author's Field Work, (2018).

Table 1: Availability, Functionality and Desirability of streetscape Infrastrusture

STREETSCAPE FACILITIES	*Available n=192*	*Not Available*	*Highly Functional n=133*	*Functional*	*Not functional*	*Highly desirable n=148*	*desirable*	*Not desired*	*Indifferent*
Sidewalks	46.4	53.6	51.8	25.9	22.3	73.5	15.9	7.3	3.3
Sit-outs	32.8	67.2	24.3	27.1	48.6	43.6	35.0	6.4	15.0

STREETSCAPE FACILITIES	*Available n=192*	*Not Available*	*Highly Functional n=133*	*Functional*	*Not functional*	*Highly desirable n=148*	*desirable*	*Not desired*	*Indifferent*
Road Median	48.9	51.1	35.5	33.9	30.6	51.6	29.5	9.8	9.0
Trees/ Landscape Strips	29.7	70.3	25.5	15.3	59.2	40.3	18.7	27.3	13.7
Streetlights	90.6	9.4	53.6	27.1	19.3	81.5	7.7	6.2	4.6
Bus shelters	38.5	61.5	17.9	30.8	51.3	42.8	27.5	11.6	18.1
Parking Spaces	32.9	67.0	17.6	41.7	40.7	58.1	29.1	6.8	6.1
Drainages	89.0	11.1	34.3	36.6	29.1	67.2	23.0	9.8	NIL
Speed Bumps	50.0	50.0	23.3	39.1	37.6	53.2	22.7	14.2	9.9
Waste Can	35.6	64.4	18.3	38.5	43.1	62.1	21.4	9.0	7.6
Sign Posts	65.6	34.4	18.9	40.9	40.2	52.4	27.0	5.6	15.1

Source: Authors' field work (2018)

Table 2: Condition of Streetscape Infrastructure

STREETSCAPE FACILITIES	*Very good n=117*	*Good*	*Fair*	*Bad*
Sidewalks	62	27	12	16
Sit-outs	17	23	22	58

Road Median	40.3	20.9	22.5	16.3
Trees/ Landscape Strip	31.3	10.1	11.1	47.5
Streetlights	56.6	19.3	10.2	13.9
Bus shelters	16.5	26.0	28.3	29.1
Parking Spaces	30.30	22.22	22.22	25.25
Drainages	45.8	13.1	20.8	20.2
Speed Bumps	30.6	27.4	17.7	24.2
Waste Can	28.0	15.0	25.2	31.8
Sign Posts	28.9	31.4	11.3	28.3

Source: Authors' field work (2018)

4.0 Results

Among the Respondents the male gender constituted the highest percentage (54%) while the female gender which accounted for the remaining percent (46%). When considering the occupation of respondents, it was revealed that 45% are students, 27.5% are traders, 16.5% are civil servants, 9.0% are artisans' and only a minute percentage (2%) are unemployed.

Assessing the monthly income of respondents in the study area, it was revealed that 36.02% earn less than N20, 000 monthly, 28.49% earn between N21,000-N41,000, while 22.51% earn between N41,000-N60,000. Only 12.1% earn above N100, 000 in a month.

Data on duration of stay of respondents in the area showed that 11.79% of the respondents have stayed in the area for less than 1 year, 38.98% have stayed in the town for up to 5years. Those that have stayed between 6-10 years accounted for 25.64% while 8.72% have actually stayed in the town for up to 10years. 8.72% of the respondents have stayed in the area for 21 years and lastly 6.15% stayed in the study area between 11-15years.

Car ownership was another variable assessed in the study area, 74.49% of the respondents do not own a car, only 24.51% of the people sampled have cars. Since highest percentage of the people living in the area have no personal cars, provision of adequate streetscape infrastructure facilities would be of immense benefit to the area, considering the fact that facilities such as sidewalks, trees, bus shelters, streetlights, speed bumps, road medians to mention a few, are of great benefits in safeguarding lives and health of pedestrians generally and specifically those who use public transport.

About 54% of respondents attested to the availability of side-walks, while 46% claimed that sidewalks are not available. In addition 74% consider sidewalks as highly desirable though about 7% find them not a desirable streetscape facility (see table 1). Field observation also show that the roads in the study area are not pedestrians friendly e.g. roads in Sango, Agbo-Oba, Pakata, Oloje, Tanke, Sabo-Line, Opo-Malu, Oke-Ose among others.
Further analysis revealed that 49% of respondents believe that the available sit-outs are not functional at all though they are highly desired (44%) when compared to 6% that say they are not facilities that are desired. Furthermore, about 48% of respondents reported that the available sit outs are in a bad state while only 18 % belief the condition is fair. (See table 2).
Forty percent (40%) of respondents believe the available road medians are in very good condition while 16% said they are in a bad state. Furthermore 51% attest to the fact that road medians are not available while 40% confirm they are available in their own areas (See table 2). Moreover 52% find road medians as a very highly desirable streetscape facility. Only 10% consider them undesirable.

As high as 70% of respondents attest to the fact that trees/landscape strips are not available at all in the metropolis, though 27% do not consider this facility as desirable, 40% consider it highly desirable (See table 1). When considering the condition of tree/ landscape strips that are even available in Ilorin metropolis, 48% of respondents indicated that they are in very bad state (See table 2). When analyzing the availability and condition of streetlights in Ilorin, the largest percentage (91%) of respondents confirmed the availability of streetlights(See table 1). 57% belief the streetlights are in good working condition, when compared to 10% that belief the condition is just fair (See table 2). 82% find streetlights as highly desirable streetscape facility but about 5% do not really bother whether they are available or not. 81% of the respondents consider the streetlights as highly functional. Only 19% reported that they are not functional, though available (See table 1).
Bus shelters are not commonly found in the metropolis as confirmed by 62% of respondents. 51% also said they are not functional at all as most of the available bus shelters are not used for purposes meant for but for display of wares by hawkers of vegetables, dried fish, fruits etc. Parking spaces are highly desired but generally not available as confirmed by 67% of respondents (See table 1). It was also discovered that where available, only 17% of respondents find them highly functional while the remaining percentage of respondent find them either fairly functional or not functional at all. The condition of speed bumps is believed to be very good according to 31% of the respondents, though, to 24% of the sampled respondents the condition of speed bumps is bad 27% said they're in good condition while about 18% believe the condition is just fair. 53% of the respondents find speed bumps highly desirable though about 14% said they do not desire to have speed bumps in their areas. The number of people that desire to have waste bins in their neighbourhood is large (62%) but an equally large percentage (64%) confirmed that they are not available at all (See table 1).

Indeed 89% of the sampled respondents confirm availability of drainages while 49% belief the drainages are in very good condition though only 34% confirm that they are very functional while another 29% said they're not functional at all despite the fact that a large percentage (67% and 23%) find the presence of drainages in Ilorin highly desirable or desirable respectively. Furthermore, the study revealed that some streetscape facilities are available and highly functional e.g. streetlight (80.7%), drainages (70.97%) and road median (69.4%)

5.0 Discussion

The survey considered eleven (11) streetscape infrastructural facilities in Ilorin Metropolis. They include Sidewalks, Sit-outs, Road-Medians, Trees/Landscape-Strips, Streetlights, Bus-shelters, Parking Spaces, Drainages, Speed-Bumps, Waste Cans and Sign Posts. They were all assessed on the basis of Availability, functionality and desirability.

Assessment of the availability of streetscape infrastructure in Ilorin metropolis revealed that the largest percentage (90.62%) of respondents confirmed streetlights to be the most available and generally well spread amongst all the streetscape infrastructures. This is followed closely in terms of availability by drainages (88.95%), then sign posts (65.6%). The least available streetscape infrastructure is trees / landscape strips, which scored about thirty percent (29.7%). This is closely followed by parking spaces (32.9%) and sit outs (32.8%) which equally scored low in terms of availability though they ranked low only after trees / landscape strips.

Evaluating the functionality of the streetscape infrastructure, streetlights still scored the highest percentage (54%) and considered highly functional. In fact renaissance survey carried out by the researcher at night time in the study area also confirmed this (see plate 2 & 6). The street lights were on in most of the areas visited at night during the study period. Most of the respondents confirmed that this was a result of the "OPERATION LIGHT-UP KWARA" project of the Governor Abdulfatai Ahmed administration of. They reiterated that the project had considerably reduced incidence of criminal activities at night generally in the state. Sidewalks scored 52% while drainages ranked third (36.6%) on the highly functional scale. Meaning that drainages and sidewalks were available and highly functional in the area under study. Trees and bus shelters are infrastructures that are considered as not functional at all scoring 59% and 51% respectively. This may be attributed to the fact that they also ranked low on the availability scale.

Measurement of the desirability of the streetscape infrastructure was among the objectives of this study. They were ranked as highly desirable, desirable, not desired and indifferent. Streetlights had the highest score (81.5%) on the scale of highly desirable. Sidewalks, drainages, and waste cans scored highly after streetlights with 74%, 67% and 62% respectively The landscape features not desired by the populace are speed bumps (14.2%), and bus shelters (11.6%). In fact it was observed that most speed bumps are evident in areas where sidewalks are lacking. This also could translate indicate high rate of motorcycle/car accidents in such areas since pedestrians have to share the road with moving vehicles and motorcycles. Furthermore most of the bus shelters have been converted to uses other than what they were meant for (See plate 1).

Indeed many respondents said they are indifferent to the availability of trees (13.7%), sign posts (15.1%) and bus shelters. This points to the fact that a lot of enlightenment and awareness campaigns is required for the citizenry, by government and other stakeholders on the importance of these landscape infrastructure for safe, healthy, efficient and sustainable cities. Sustainable environment is dependent on streetscapes as it is one of the ways to achieve sustainable cities. The streetscape facilities in Ilorin are highly desirable though some are not in a good condition which invariably influences their functionality.

6.0 Conclusion and Recommendations

Urban environment is so dependent on adequacy, functionality and condition of streetscape infrastructure as it is one of the ways to achieve sustainable metropolitan cities However, the provision and management of streetscape infrastructures must be enhanced so as to achieve a well-coordinated, aesthetically pleasing and sustainable street and road networks in Kwara State.

The study reveals a general dearth of streetscape infrastructures in the metropolis. Only street lights, drainages and speed bumps are available to some extent in the state even though some of the areas sampled still do not have them. Infrastructures such as sidewalks, sit outs, trees and landscape strips, bus shelters, waste cans are generally absent. Absence of sidewalks expose pedestrians to dangers on the road and contribute to transportation problems in the study area. Furthermore, trees and landscape strips that ought to moderate atmospheric temperature in the urban areas are almost lacking in the study area, the resultant effect is the heat island we are presently experiencing. In fact the midday temperature in the study area fluctuated between 38-40^{0}C in the months of Feb to April 2019. (NTA weather Forecast Report).

The study also revealed streetlights to be highly functional in the study area. This is a result of the just concluded 'Light Up Kwara' project by the state governments. In addition infrastructures such as road median, drainages, speed bumps and sign posts are found to be available and fairly functional. Surprisingly the function of the recently launched 'soludero' bus shelter has been totally changed by the residents as some of this shelter are now used for display of wares by hawkers of pepper ,vegetables, fish etc (See plate 1) while beggars and the mentally imbalanced sit and sleep under some of the bus shelters too.

The condition of streetscape infrastructures, sidewalks, road median, street lights, parking space, drainages, is confirmed by respondent to be good, however some of these facilities are affected by the weather/climate conditions and human activities. For instance, the drainages are filled with sands and debris during raining season and subsequently get blocked. Human actions such as the disposal of waste into the drainages due to the unavailability of the waste cans result is littering of the streets with refuse. Most residents also build shops on top of the drainages or very close to it (See plate 4) thereby obstructing free flow of storm water and movement of debris in the drainages.

In addition, lack of parking spaces lead motorists to park indiscriminately on the streets this always lead to traffic clog especially during the peak hours. The study reveals the level of desirability of all the streetscape facilities in the study area is very high as they are what make

the environment a safe and convenient abode. In conclusion, maintenance and proper management techniques are the life wire of infrastructures, the state of our streetscape and its components is deplorable today due to poor environmental management this which has led to problems such as blockage of drainages, dilapidation of street furniture, pollution, road deterioration, accidents among others.

The following recommendations are made;

1. Quality of materials used in the construction/manufacture of streetscape infrastructure should be regulated by government. Only durable materials with distinct texture that enhance the life span of infrastructures and their functions should be allowed.
2. To safeguard the life and health of pedestrians, government must ensure roads are separated with bollards while walkways must be wide enough to allow free movement of people.
3. Policies, rules and regulations should be made to restrict on-street parking, trading on sidewalks and inside the bus shelters. Stringent fines should be imposed on defaulters.
4. Planting of appropriate trees, shrubs and flowers along the street and road networks should be promoted to reduce the issue of heat island in the urban centre, while cleaning and maintenance of streets should be awarded to the private contractors to ensure regular and sustained maintenance of the streetscape infrastructure.

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THE PRACTICE AND CHALLENGES OF BIOMEDICAL WASTE MANAGEMENT: A STUDY OF SELECTED MEDICAL FACILITIES IN ILE-IFE, OSUN STATE

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Abstract

In pursuing their aims of providing treatment and safeguarding the health of the people against illnesses, health-care services inevitably create waste that is hazardous to health and whose management has remained a great challenge due to its highly toxic contents. This paper examines the practice of biomedical waste management in some medical facilities in Ile-Ife with a view to determining the risks associated with the practice. Four medical facilities with some level of sophistication in waste management were purposively selected for study. The type of waste generated was determined by sorting of waste while hand-held scale was used to determine the volume of waste generated. Questionnaire was used to obtain information from the waste management and medical staff of the selected medical facilities. Descriptive (frequencies and percentages) and inferential statistics (Multinomial logistic regression) were used in analysing the data. The study established that the daily per capita waste generation in the medical facilities was 0.51kg. Scrap (Syringes and absorbent paper) (96.7%), infectious (Excreta and dressing swabs) (72.9%) and pathological wastes (Human tissue and body fluid) (57.0%)were the most generated waste while open dumping and pit burial of waste were widely practiced among the medical facilities. Exposure to harmful chemical and radioactive waste (68.8%)and injuries from sharps (52.3%)pose serious health risks not only to the waste managers but health care workers. The paper holds that solutions to the challenges of biomedical waste management practices lie in strict adherence to the global best practices as recommended by the World Health Organisation.

Keywords: Biomedical Waste; Medical Facilities; Incineration; Radioactive Waste; Infections[33]

1.0 INTRODUCTION

The term biomedical waste includes any waste which consists wholly or partly of human or animal tissue, blood or other body fluids, excretions, drugs, or other pharmaceutical products, swabs or dressings or syringes, needles or other sharp instruments being waste which unless rendered safe may prove to be hazardous to any persons coming into contact with it (WHO, 2015). Also, any other waste arising from medical, nursing, dental and veterinary, pharmaceutical or similar practice, investigation, treatment, care, teaching or research, or blood from transfusion, being waste which may cause infection to any persons coming into contact with it may be seen as biomedical waste (Anjali et. al., 2014). In recent times, serious concerns

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have been expressed on proper handling of biomedical waste globally but most especially in developing countries. The concerns are unconnected with the quantity of the biomedical waste being generated but rather its hazardous nature which calls for extra care in handling. WHO (2005) estimates that each year there are about 8 to 16 million new cases of Hepatitis B virus (HBV), 2.3–4.7 million cases of Hepatitis C virus (HCV) and 80,000–160,000 cases of Human Immunodeficiency Virus (HIV) due to unsafe injections disposal and mostly due to very poor waste management systems. It has been reported that in UK in the period of 1996 to 2004, 2,140 people got occupational exposures to blood borne viruses with 21% of the injuries occurred during the disposal process (Banu and Shetty, 2010). A study in Mexico City revealed that out of 69 interviewed waste handlers 34% reported 22 needle stick injuries during the first 12 months and 96% had seen needles and syringes in waste (Johnson, Gonzalez, Duenas, Gamero, Relyea and Luque, 2013). In Pakistan Waste Pickers who were going through medical waste, for collection and resale, experienced on average, three to five needle stick injuries a day (Ramesh,Babar, Shaikh, and Robert, 2015). In India more than 30% of the injections administered each year were carried out using re-used or inadequately sterilized medical equipment and that nationally, 10% of health care facilities sold used syringes to waste pickers (Manasi, 2017). Research suggests that population living within 3 km of old incinerators saw an increase of 3.5% in the risk of contracting cancer (Kumar, Khan, Ahmed, Khan, Magan and Nousheen, 2010).

Biomedical waste management in Nigeria have been observed to fall short of international best practices or even meeting a minimum standard required for it to pose less threats to public health and the environment (Ibijoke, Babajide and Rafid, 2013). As observed by Sawyerr, Adeolu, Salami, and Adejoh, (2016), medical waste in Nigerian urban centres was generally managed as any other waste which exposes the scavengers, children and the local people to hazards. For instance, contaminated injection equipment was found to be scavenged from waste areas and dump sites in Kano either to be reused or sold to be used again (Oke, I. A. (2008). Anozie, Lawani, Eze, Mamah, Onoh, Ogah, Umezurike and Anozie, (2017) also reported that some members of local communities in Ebonyi salvaged and used some of the waste receptacles such as sharps, containers to store food commodities while healthcare workers used red waste bags for other purposes other than storage of infectious waste. Despite the deadly nature of biomedical waste, WHO (2005) has revealed in a study that two thirds of hospitals in 22 countries, mostly developing countries including Nigeria were not following the proper infectious waste management practices. The inference from this study is that about one third of the health facilities were properly managing their biomedical waste. Unfortunately, research efforts aimed at explaining the biomedical waste management practices in Nigeria are few and limited in scope (Abah, and Ohimain, 2011; Ogbonna, Chindah and Ubani, 2012; Ibijoke, Babajide, and Rafid, 2013). Few researchers have also been preoccupied with empirical studies undertaken to identify the public health implications of poor handling of biomedical waste (Coker and Sridhar, 2010) while the effects of the poor handling on the healthcare workers

themselves have received less research attention. This study seeks to fill this gap in knowledge by examining the effects of biomedical waste management practices on the healthcare workers using Ile-Ife, Osun State as example. Another merit of this study is that both public and private hospitals of different hierarchy of healthcare facilities were included in the study. This is not the case in most of the previous studies which focused more on teaching hospitals (Sawyerr, Adeolu, Salami and Adejoh, 2016; Toyobo, Baba, and Oyeniyi, 2012).

ISSUES IN BIOMEDICAL WASTE MANAGEMENT

WHO (2012) has categorised biomedical waste as follows: Infectious waste (Anything that may be infectious or that is infectious goes into this category. This may include excreta, swabs, equipment, tissues and lab cultures); Sharps (This type of medical waste includes scalpels, needles, broken glass, lancets, staples, razors, trocars, wires or anything else that can pierce the skin); Pathological (Any human tissue, fluids, body parts, blood, bodily fluids and contaminated animal carcasses); Radioactive (Unused radiotherapy liquid, lab research liquid, glassware and other supplies and equipment that may be contaminated with lab research liquid or radiotherapy liquid); Pharmaceuticals (This includes any expired, unused and contaminated drugs and vaccines. Injectables, antibiotics and pills also fall into this category); Chemical (Solvents, disinfectants, batteries and any heavy metals that are found in medical equipment such as mercury from thermometers); Genotoxic waste (This medical waste is highly hazardous and is mutagenic, carcinogenic or teratogenic. Cytotoxic drugs that are used in cancer treatment also fall into this category).It has been roughly estimated that about 1 to 1.5 kg/day/bed of biomedical waste is produced by hospitals in developing countries while waste produced in developed countries' hospitals has been quoted up to 5.24 kg (WHO, 2015).

It has been established that, the hazards of exposure to biomedical waste can range from gastro-enteric, respiratory, and skin infections to more deadly diseases such as HIV/AIDS, and Hepatitis (Rao, 2008). For instance, WHO (2012) reported that globally; injections with contaminated syringes caused 21 million hepatitis B infections (32% of all new infections), 2 million hepatitis C infections (40% of all new infections) and 260,000 HIV infections (5% of all new infections). As documented by (Rao, 2008), 2 million new Hepatitis B, 400,000 Hepatitis C and 30,000 HIV positive cases occur in a year due to needle prick injuries in India. Van Schalkwyk (2013) further asserts that the risk of being infected by HBV, HCV and HIV for a person who experiences one needle stick injury from an infected needle is 30%, 1.8% and 0.3% respectively.

According to WHO (2013), biomedical waste management involves waste generation, sorting (separation), collection, treatment, storage, transportation and disposal. The management of biomedical waste varies between the developed and less developed countries owing to their level of economic prosperity, technological advancement and availability of adequate regulations (Diaz and Savage, 2003; Abah, and Ohimain, 2011; Babanyara, 2012). Considering

the global impact of poor biomedical waste management and the need to ensure safety in these practices, standard measures for managing biomedical waste have been established by international organizations, countries' agencies and known scholars in the field of health care waste management. These standard practices are reviewed and used to assess the level of compliance by the sampled health care facilities in Ile-Ife in this paper.

WHO (2014) has outlined several safe methods of biomedical waste treatment which include: incineration (controlled combustion process where waste is completely oxidized and harmful microorganisms present in it are destroyed under high temperature); Autoclaving (low-heat thermal process where steam is brought into direct contact with waste in a controlled manner and for sufficient duration to disinfect the wastes);Microwaving (Microbial inactivation through inter-molecular heating process which occurs inside the waste material in the presence of steam); Hydroclaving (indirect heating of waste by applying steam in the outer jacket. The waste is continuously tumbled in the chamber during the process); Shredding (a process by which waste are cut into smaller pieces so as to make the wastes unrecognizable. It helps in prevention of reuse of bio-medical waste and also acts as identifier that the wastes have been disinfected and are safe to dispose of).

Waste sorting should be carried out immediately the wastes are generated to separate all hazardous biomedical waste from the non-hazardous general waste. For safety of staff and patients, the hazardous waste portion should be separated into two parts: used sharps and potentially infectious items such as bandages, disposable medical items, swabs and tissues (Hotel Services Manager,2005). Consequently, the segregation of non-hazardous waste, potentially infectious waste and used sharps into separate containers is often referred to as the "three-bin system" (WHO, 2013). To make it easier for medical staff and hospital workers to put waste items into the correct container, and to maintain segregation of the wastes during transport, storage, treatment and disposal as well as providing a visual indication of the potential risk posed by the waste in that container, colour coding should be introduced. WHO (2014) has recommended the following colour coding: Yellow, marked "HIGHLY INFECTIOUS" with biohazard symbol for highly infectious waste, Yellow, marked "SHARPS", with biohazard symbol for sharps and black for non-hazardous waste. Infectious wastes are to be stored in strong, leak-proof plastic bag, or container capable of being autoclaved, sharps are to be stored in puncture-proof container while non-infectious waste are to be stored in plastic bag. The waste central storage area(s) within a medical facility should be fenced, lockable and isolated from patients and the public (Kharat, 2016). The maximum storage times before treatment or disposal of infectious waste are not longer than 72 hours in winter and 48 hours in summer in temperate climate while in tropical climate, the storage times should not be more than 48 hours during the wet season and 24 hours during the dry season.

Transportation of biomedical waste has two phases. The first phase is waste movement from the points of generation to storage site within a medical facility otherwise known as on-site transportation while the second phase is the waste movement from the medical facility to disposal sites outside the facility otherwise known as off-site transportation (Palanisamy, Sivaraman, Babu and Athimoolam, 2011). For on-site transportation, hazardous and non-hazardous waste should always be transported separately in order to prevent possible spread of infectious agents. Waste trolleys painted in black and labeled "Non-hazardous waste" should be used in transporting non-hazardous waste while infectious waste should be transported with trolleys coloured in the appropriate colour code for infectious waste (yellow) and labelled with an "Infectious waste" sign (WHO, 2014). For off-site transportation, the most important requirement is for the vehicle transporting hazardous waste to be roadworthy and labelled to indicate its load, and its payload to be secured to minimize the risk of accidents and spillages (WHO, 2015). Any vehicle used to transport health-care waste should fulfill several design criteria: Vehicles or containers used for transporting health-care waste should not be used for transporting any other material. Vehicles should be kept locked at all times, except when loading and unloading, and kept properly maintained.

There are several ways of disposing biomedical waste but the most hygienic option is sanitary landfill. A sanitary landfill is designed to minimize contamination of soil, surface water and groundwater; limit atmospheric releases and odours; block access to waste by pests and vectors; and prevent contact with the public. Where sanitary landfills are not available, as in many Nigerian small and medium sized cities, safe burial of biomedical waste on hospital premises have been advocated (Visvanathan, (2006). (Oli, Ekejindu, Adje, Ezeobi, Ejiofor, Ibeh and Ubajaka, 2016) have however, maintained that to adopt this option the following safety measures must be established: access to the disposal site should be restricted to authorized personnel only; the burial site should be lined with a material of low permeability, such as clay, dung and river silt, if available, to prevent pollution of shallow groundwater and nearby wells; new water wells should not be dug near the disposal pit; only infectious health-care waste should be buried because if non-infectious waste were also buried on the premises, available space would be quickly filled.

An important aspect of biomedical waste management is the use of personal protective equipment (PPE) and other safety practices in handling the waste. Before handling biomedical waste, waste workers must be fully kitted with necessary PPE such as boots, gloves, safety glasses, hard hats, dust masks and impervious clothing (Ozder, Teker, Eker, Altındis, Kocaakman and Karabay, 2013). Boots should have steel toes and puncture-resistant soles and 6 inch lace-up cover to provide added protection for the ankles. Gloves should be worn whenever the hands may come in contact with the waste. Safety glasses and hard hats may also provide protection to the head and face from splashes. Other skin surfaces should be covered with impervious clothing whenever the skin might be exposed to infectious agents. Special

equipment, such as respirators, face shields and boot covers may be necessary if splashing or splattering is expected, or if another unusual hazard arises (Manyele, 2014).

3.0 STUDY AREA AND METHODOLOGY

3.1 Study Area

Ile-Ife is an ancient Yoruba city in south-western Nigeria. It is located in present day Osun State. The city is about 218 kilometers northeast of Lagos and 75 kilometers east of the city of Ibadan and connected to it through the Ife-Ibadan highway; Ife is also 40 km from Osogbo and has road networks to other cities such as Ede, Ondo and Ilesha.The main city of Ife is divided into two local government areas: Ife East, headquartered at Oke-ogbo and Ife central at Ajebandele area of the city. Both local governments are composed of a total of 21 political wards. The city has an estimated population of 355,813 people (Yoade, 2015). It is located between latitudes 7°28′N and 7°45′N and longitudes 4°30′E and 4°34′E. Ile-Ife has an undulating terrain underlain by metamorphic rocks and characterized by two types of soils, deep clay soils on the upper slopes and sandy soils on the lower parts (Yoade, 2015). It has average rainfall of 1,000–1,250 mm usually from March to October and a mean relative humidity of 75% to 100% (Ajala and Olayiwola, 2013). Ile-Ife has about 35 health facilities with a teaching hospital, one general hospital, one specialist hospital, one comprehensive health centre and thirty-one primary health centres. Wastes generated from these facilities are often mixed with municipal waste and are deposited in the two dumpsites provided by the municipal authorities in the city (Nwosu and Pepple, 2016).

3.2 Methodology

This study used the data that were collected from selected health care facilities in Ile-Ife, Osun State in Nigeria. The data were collected between April and June, 2016 with well structured questionnaire comprising of four distinct modules. The first module contained information on selected healthcare facilities, the second contained information on the facilities waste management practices, the third was on staff involvement in waste management, and the fourth contained information on the occupation health risks associated with the facilities' waste management practices. Out of the 35 health care facilities in Ile-Ife, one is a teaching hospital, one is a general hospital, one is a specialist hospital, one is a comprehensive health centre while the remaining 31 are primary health centres. From preliminary investigations, it was observed that the four higher order health care facilities had some level of sophistication in their biomedical waste management practices while there were no organised waste management practices in any of the primary health centres. Consequently, the 31 primary health centres were excluded from the study. Two waste workers in each sampled facility were selected for survey. In order to determine the level of staff involvement in waste management and the health risks associated with the waste management practices of the sampled health care facilities, two staff (one Doctor and one Nurse) in each department and unit of the facilities were randomly selected

for survey. Thus, the Teaching Hospital with 15 departments had 30 respondents, General Hospital with 8 departments had 16 respondents, the Comprehensive Health Centres with 3 departments had 6 respondents, the specialist hospital with 4 departments had 8 respondents. Hence, 60 questionnaires were administered in the sampled health facilities. To determine the volume of the waste collected, hand-held scale was used to measure the biomedical waste after they had been segregated from the general waste. Descriptive statistics (frequency and percentages) and inferentialstatistics (multinomial logistic regression) were used in analyzing the data collected.

4.0 RESEARCH RESULTS

The findings of the study are presented under the various sub-headings below. Unless otherwise stated, all the tables in this section emanated from the survey carried out by the authors in 2016.

4.1 Types and Volume of Waste Generated

Sharps, infectious and pathological waste constituted the major waste being generated in the sampled establishments.There was a preponderant of sharps (used cannulas, needles, surgical blades, vial injections, syringes) constituting the major component of the waste generated in the sampled healthcare facilities (96.7%). Others are dressing swarbs (39.1%), human tissue (32.3%), excreta (33.8%), blood or other body fluids (24.7%). A total of 642.3 kg of these wastes were generated daily in these facilities. The bulk of the waste was generated by the teaching hospital (395.4 kg), while the general hospital, comprehensive health centre and specialist hospital generated about 154.3 kg, 62.5 kg and 48.4 kg respectively. The per capita waste for the teaching hospital was computed to be 0.75 kg while the per capita waste for the general hospital, comprehensive health centre and the specialist hospital were 0.47 kg, 0.34 kg and 0.29 kg respectively. Thus, the average per capita waste was 0.51 kg.

4.2 Waste Sorting

Waste sorting is an important and recommended practice in biomedical waste management. It ensures appropriate handling, treatment and disposal of waste by types thereby reducing the costs of biomedical waste management and protecting the public health. Findings from the sampled facilities indicated that none of the sampled healthcare facilities sorted its wastes before other subsequent phases of waste management are carried out. The non-sorting of waste was due to less time dedicated to waste management because of the need to carry out other engagements in the establishment (Comprehensive health centre and general hospital) as well as inadequacy of personal protective equipment to carry out the sorting (Teaching hospital, specialist hospital and comprehensive health centre).

4.3 Waste Collection and Storage

With the exception of the teaching hospital, other healthcare facilities did not collect waste on daily basis. The frequency of waste collection from the waste bins at the general hospital and comprehensive health centre was two days while waste collection at the specialist hospital took three days. None of the sampled healthcare facilities used labeled bags with appropriate colour codes indicating the waste content of the bags and points of production (wards, laboratories etc) to collect the biomedical waste as recommended by WHO (2014). Instead, polythene bags and metal bins were used in the teaching and general hospital while plastic waste bin was used in the comprehensive health centre and the specialist hospital. Furthermore, contrary to the WHO (2014) recommendations for ideal storage facilities for biomedical waste, the storage area of all the sampled facilities were not shielded from the sun, accessible for animals, insects and birds and did not have hard-standing floor with good drainage. However, the storage areas offered easy access for staff in charge of waste handling and waste collection vehicles as recommended by WHO (2014). Moreover, the waste storage time (i.e. the delay between production and treatment) in all the sampled healthcare facilities did not follow the global best practice. While WHO (2014) recommended maximum of 48 hours (2 days) during wet season and 24 hours (One day) during dry season for waste storage in the tropical region such as Nigeria, the earliest period for waste storage in all the sampled facilities was three days. It took about three days for waste to be stored in the teaching hospital, five days in the general hospital and comprehensive health centre and 6 days in the specialist hospital.

4.4 Waste Treatment

The key motive for biomedical waste treatment is to reduce the potential hazard posed by the waste to humans, animals and the environment to the barest minimum. Basically, there are about seven different techniques of waste treatment (WHO, 2014). These include: incineration, sterilization, disinfection, shredding of wastes, autoclaving, microwaving and encapsulation. Findings from the sampled health facilities indicated that only the teaching and general hospitals used incineration and disinfection as waste treatment techniques regularly, the comprehensive health centre employed sterilization and disinfection periodically but regularly employed open burning while the specialist hospital relied on disinfection and open burning.

4.5 Waste Transportation

On-site transportation of waste was done through push carts in the teaching hospital and general hospital while in the comprehensive health centre and the specialist hospital, the practice was to carry the waste containers to the on-site storage facilities. For off-site transportation of the waste, only the teaching hospital and the general hospital used waste trucks to transport their waste directly to the public disposal site while the comprehensive health centre and specialist hospital relied on public waste trucks to transport their waste to the disposal sites.

4.6 Waste Disposal

Ile-Ife had no sanitary landfill site, therefore, all the sampled healthcare facilities disposed their biomedical wastes in the two dumpsites provided by the municipal authorities in the city. It should be noted that these dumpsites were opened and serious control of dumping was not ensured. With the exception of the teaching hospital and general hospital that transport their waste directly to these dumpsites, other sampled facilities disposed their waste in the municipal stationary waste containers for transportation to the dumpsites by the municipal authorities. In addition, three of these establishments engaged in pit burial of the waste.

4.7 Use of personal Protective Equipment

Personal protective equipments being used in all the sampled healthcare facilities were boots, gloves, and dust masks. While waste management workers in the teaching hospital and general hospital used all the three equipments, the workers in the comprehensive health centre used only gloves and dust masks.

5.0 STAFF INVOLVEMENT IN BIOMEDICAL WASTE MANAGEMENT

5.1 Year of Service

Analysis of the data revealed that 64.5% of the sampled staff had worked in their respective establishments for between 7 and 9 years. Some 14.2% had worked for 4 to 6 years, 8.4% had worked for between 1 and 3 years, 7.8% had worked for more than 10 years while 5.1% had worked for less than a year. The result implies that majority of the respondents were sufficiently knowledgeable to assess the waste management practice of their respective establishments.

5.2 Method of Waste Collection

Plastic and metal bins were mostly used in all the sampled establishments for waste collection as stated by 78.2% of the respondents. A further disaggregation of the data revealed that metal bin was mostly used in the teaching hospital and the general hospital as indicated by 82.4% and 71.6% of the respondents working in the establishments respectively. Plastic bin was mostly used in the comprehensive health centre as stated by 88.2% of the respondents working in the establishment while 74.3% of the specialist hospital staff indicated polythene as the main means of collecting waste in their establishment.

5.3 Waste Sorting

Majority of the staff of the teaching hospital (76.2%) stated that the wastes from their units were normally sorted before collection. However, fewer percentages of the respondents from the general hospital (37.6%), comprehensive health centre (31.0%) and specialist hospital (14.5%) stated that they did sort their wastes before disposal. This result corroborates the finding from the waste management staff (See section 4.2).

5.4 Rating of Waste Management Practices

The respondents were asked to rate the biomedical waste management practices of their establishments. This expectedly generated diverse responses. Some 40.2% stated that the waste management practice in their establishment was good, 38.6% indicated fairly okay while 21.2% considered the waste management practice in their establishments poor. A further disaggregation of the data revealed that 50.1%, 32.5%, 14.4% and 8.2% of the respondents in teaching hospital, general hospital, comprehensive health centre and specialist hospital respectively stated that their the waste management practice of their establishment was good. Also, 31.2%, 20.4%, 10.5% and 10.2% of the respondents in teaching hospital, general hospital, comprehensive health centre and specialist hospital respectively stated that the waste management practice of their establishment was fairly okay while those that considered the waste management practices of their establishments poor accounted for 11.1% in the teaching hospital, 18.6% in the general hospital, 28.8% in the comprehensive health centre and 41.5% in the specialist hospital.

6.0 CHALLENGES OF BIOMEDICAL WASTE MANAGEMENT

A number of challenges associated with biomedical waste management were identified by the respondents. This includes physical injuries and infections.

6.1 Injuries from Contact with Sharps

About 52.3% of the respondents had incurred injuries from waste handling or accidental contact with waste (21.8%) especially sharps. Larger percentage (31.6%) was from the comprehensive health centre, followed by the general hospital (20.4%), teaching hospital (12.8%) and specialist hospital (8.5%).

6.2 Infections from Contact with Waste

A number of respondents have had infections as a result of either exposure to harmful chemical and radioactive waste (42.3%) or deliberate contact with biomedical wastes (such as in the process of waste sorting or disposal) (26.5%). The general hospital recorded the highest rate of infection (62.3%), followed by comprehensive health centre (51.5%), specialist hospital (42.2%) and teaching hospital (21.8%).

6.3 Types and Frequency of Infection

Tetanus (40.1%) and hepatitis B (37.2%) were the most frequent infections resulting from contact with biomedical waste. Other infections as indicated by the respondents were dysentery (13.4%), pneumonia (6.2%) and malaria (3.6%). The general hospital recorded more tetanus (42.6%) than the teaching hospital (30.5%), comprehensive health centre (26.2%) and specialist hospital (21.4%). More staff of the teaching hospital (61.2%) has had tetanus than the general hospital (50.6%), specialist hospital (43.4%) and comprehensive health centre

(39.1%). Moreover, 16.5%, 11.3% and 9.4% of the respondents in the comprehensive health centre, teaching hospital and general hospital respectively have had hepatitis B while none of the respondents in specialist hospital reported this.Majority (60.8%) of the respondents did experience waste-related infections twice in a year, 20.5% experienced it once in a year, 8.4% experienced it four times in a year while 11.2% experienced waste-related infections occasionally.

6.4 Cost Bearer of Injuries and Infections Treatment

As stated by all (100%) the respondents from teaching hospital and general hospital, the cost of treatment of injuries and infections associated with biomedical waste management was bored by the management of the two establishments while all (100%) respondents from the comprehensive health centre and specialist hospital reported that treatment cost is shared by the management and the affected staff. Cost sharing takes place when medical services (consultation) are provided free to affected staff while the staff bears the cost of drugs.

A question deserves an answer in this analysis. Can it be said that the biomedical waste management of the sampled medical establishments influenced the rate and type of infections afflicting their staff. This question prompted the formulation of a hypothesis as follows: infections are not a function of biomedical waste management practices. The hypothesis was analysed using multinomial logistic regression. Infection of staff was regressed against biomedical waste management variables. They are: waste collection, waste sorting, waste treatment, waste storage, waste transport and disposal. The result of the analysis is presented in Table. The multinomial regression model derived from the analysis is given as: $Y = 53.064 + 36.325x_1 + 74.613x_2 + 41.251x_3 + 20.592x_4 + 21.642x_5 + 16.764x_6$.

The 2-log likelihood of the model which is 53.064 indicates a direct positive relationship between the independent and predictor variables. The Nagelkerke pseudo r2 of 0.791 shows that, the six independent variables accounted for 79% of the variation in the rate and types of infections. All the predictors in the model exert positive influence on the frequency and types of infections. Waste sorting with 74.613 influences infections most. This is followed by waste treatment with 41.251, while waste collection, waste treatment, waste storage and waste disposal with 36.325, 21.642, 20.592 and 16.764 respectively exert moderate positive influence on the rate and types of infections suffered by the staff of the sampled healthcare establishments. Thus, given the present biomedical waste management practices among the healthcare facilities, a unit increase in any of the independent variables will lead to increase in infections and vice versa.

7.0 DISCUSSION

There is a preponderance of sharps (or radioactive waste) in the biomedical waste stream of the sampled healthcare facilities. This finding conforms with WHO's (2014) assertion that sharps usually constitute the larger component of biomedical waste in developing countries. It should, however, be noted that the high sharps component of the biomedical waste constitutes a potential danger to the healthcare facilities waste handlers especially where there is inadequate personal protective equipment such as hand gloves, boots, safety glasses and hard hats to effectively shield the handlers from injuries from the sharps which might open the door for other deadly infections. Studies have shown the likely consequences of human contact with sharps (Rao, 2008; WHO, 2012). The per capita waste generation from the sampled health facilities (0.51kg) is a slight departure from the WHO's (2014) report that 0.54 to 1.39 kg/bed-day of biomedical waste is generated in health care facilities in developing countries. There was partial compliance with the World Health Organisation's recommended biomedical waste management practice including collection, sorting, treatment, storage, transportation and disposal. For instance, metal and plastic collection bins were used by the sampled healthcare facilities for biomedical waste collection. This to some extent is hygienic and close to the recommended bins by WHO (2014). However, none of the sampled healthcare facilities used labeled bags with appropriate colour code indicating the waste content of the bags and points of production as recommended by WHO (2014) to pack their wastes. Contrary to the recommended global best practice of biomedical waste storage time not exceeding between one and two days in the tropical region (Nigeria is in tropical region), biomedical waste storage in the sampled facilities took an average of five days before they are transported to disposal sites. Three-quarter of the sampled healthcare facilities did not sort waste before disposal. Three-quarter of the sampled facilities did not treat the biomedical waste before storage, despite WHO (2014) recommendation that biomedical waste should be treated either by incineration, autoclaving, microwaving, hydroclaving or shredding before storage. Considering the harmful nature of biomedical waste, non-treatment of the waste before storage, makes the waste management staff in particular and other staff and even patients highly susceptible to deadly infections if contact is made with the waste. Biomedical wastes have been found to contain highly communicable pathogens such as staphylococcus (Sridhar and Ayeni, 2003). This explains why majority of the sampled staff of the healthcare facilities have had infections as a result of contact with biomedical wastes in their respective establishments.

Half of the sampled facilities disposed their biomedical waste in public stationary waste containers while all the sampled healthcare facilities disposed their biomedical waste in the public uncontrolled dumpsites in the city. Similar findings were made in an earlier study by Agbola et al. (2009) in Ibadan where biomedical waste were dumped either in public stationary containers, designated communal dumpsites or open dumpsites. Thus, not only the staff and patients of the healthcare facilities are exposed to dangers through the biomedical waste management practices of these facilities, but the public especially the waste scavengers and

young ones are rendered vulnerable to deadly infections. This results from the usual search for the disposed wastes for recyclable/reusable items and materials to play with respectively.
Injuries and infections were the major health challenges experienced by the employees of the healthcare establishments as a result of improper biomedical waste management. Thus, tetanus, hepatitis B, dysentery, pneumonia and malaria were frequently reported by the sampled employees. This agrees with similar study conducted in UK by Banu and Shetty (2010) where it was reported that in the period of 1996 to 2004, 2,140 people got occupational exposures to blood borne viruses with 21% of the injuries occurred during the disposal process. A similar study in Mexico City by Johnson, Gonzalez, Duenas, Gamero, Relyea and Luque (2013) revealed that out of 69 interviewed waste handlers 34% reported 22 needle stick injuries during the first 12 months of operation. This finding is reinforced by the result of the hypothesis which indicates that waste collection, waste sorting, waste treatment, waste storage, waste transport and disposal exert positive influence on the rate and types of infections suffered by the staff of the sampled healthcare facilities.

CONCLUSION

As noted earlier, researchers have been preoccupied with investigating the public health implications of poor handling of biomedical waste while the effects of the poor handling on the healthcare workers themselves have received less research attention. Thus, this study has filled an important gap in knowledge by establishing that poor management of biomedical waste by healthcare facilities makes the healthcare workers themselves more susceptible to deadly diseases or infections. Understanding the effect of poor biomedical waste management on the healthcare workers is required for evolving or adoption of a better management practices for safe, healthy and effective biomedical waste management in the healthcare centres. It is however, pertinent to note that this study relied essentially on questionnaire administration to determine the type and frequency of infections the healthcare workers had experienced, efforts are needed to clinically determine the magnitude of susceptibility to infections and the linkage of the identified infections to poor biomedical waste management in the sampled healthcare facilities. Furthermore, the findings of this study indicate that healthcare workers in Nigeria and other developing countries are faced with the challenges of accidental contraction of infections due to improper management of biomedical waste in their respective healthcare facilities. This also applies to waste management sector generally, where non application of appropriate technology for managing wastes by waste management agencies is capable of exposing the waste handlers to serious diseases.

The above observations suggest that a better approach to biomedical waste management practice is imperative. The paper therefore, holds that solutions to the challenges of biomedical waste management practices lie in strict adherence to the global best practices as recommended by the World Health Organisation. In addition, the State and Local Governments should ensure the establishment of a sanitary landfill in the city for general and biomedical waste disposal.

Dumpsite is being phased out globally due to its numerous threats to public health such as: pollution of groundwater, highly toxic smoke from continuously smoldering fires, foul odour from decomposing refuse, health hazards to waste pickers and spread of infectious diseases (*Powell, Townsend, Zimmerman, 2015)*. In order to avert possible threat to public health, there is also the need to raise awareness among residents especially those living close to dumpsites and the waste pickers on the dangers of carelessly searching through disposed waste without using protective equipment such as boot, gloves, nose cover and eye glasses. The awareness can be accomplished through close collaboration among the waste management agency, state ministry of environment, local government's departments of environmental health services and community development as well as the community development associations in each neighbourhood.

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UNDERSTANDING VULNERABILITY AND RESILIENCE OF ILORIN CENTRAL AREA, ILORIN, KWARA STATE

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Abstract
Urban vulnerability to disasters is indubitably a function of human behaviour and lifestyles. Globally, countries have shown vulnerabilities to disasters, both natural and man-made in the time past and present. However, poverty represents a distinct contributing factor to vulnerabilities both in time and space. it is against this problem proceedings that this research was borne out with the aim of investigating the vulnerabilities vis-à-vis the resilient nature of Ilorin central area. The specific objectives of this study focus on assessing the socio-economic characteristics of the study area, identifying the actual and potential disasters of the study area. Etc. The methodology employed involved the collection of spatial (satellite imagery, topographical map. Etc.) and non-spatial data (socio-demographic data, risk factors etc.), both primary and secondary data. The key findings from multiple regression analysis using dummy variables reveals that there exists a functional dependency at a significant p level of 0.00 on Unregulated land use, socio-economic characteristics. Furthermore, flooding and traces of heat wave were labelled to be the most prevalent form of vulnerability in Ilorin central area of study. To this end, few policy responses like public awareness, adaptive urban planning techniques, community engagement were recommended as a way forward in coping and forestalling vulnerabilities.
Keyword: *Vulnerability, Resilience, Urban Risk*[34]

Introduction

Issues of risk and resilience have been extensively and abundantly researched by many academic disciplines. Globally, countries have shown vulnerabilities to disasters, both natural and man-made in the time past and present. The multitude of people affected by dramatic natural shocks is evidence of our inadequacy at dealing with such events (Pelham, Clay, & Braunholz, 2011). Rasmussen (2004) report, contains information on 14,535 natural disasters since 1900, including estimates of the number of people affected and the value of damage. According to these data, since 1970 natural disasters have affected more than 5 billion people and have caused more than $1 trillion in damage. In the economic vein, between the 1950s and the 1990s, Benson and Clay (2004) report that the global cost of natural disasters increased 15-fold. The report further maintains that major natural catastrophes in the 1990s caused economic

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losses estimated at an average US$66 billion per year (in 2002 prices). In 1995, the year of the Kobe earthquake in Japan, record losses of about US$178 billion were recorded, the equivalent of 0.7 percent of global gross domestic product (Munich Re, 2002). The most familiar and publicized hazards are those that take place without warning, often of catastrophic dimensions.

The combined effects of sea-level rise, floods and storms have damaged the homes and livelihoods of millions of urban dwellers (Brown , 2015). Despite debate among the scientific community about the frequency and predictability of natural disasters and extreme weather events, there is consensus that the concentration of urban populations and economic activity in hazardous locations is increasing, with impacts being felt more by the urban poor. Rasmussen (2004) postulates that there are two fundamental reasons for development of hazards. First, an increased concentration of population in high-risk areas (Freeman, Keen, & Mani, 2003). Second, an increase in the frequency and intensity of extreme weather events. This second development is generally thought to be associated with the rise in mean global surface temperatures and is expected to become more pronounced during the twenty-first century (IPCC, 2001).

Urban areas are not disaster prone by nature; rather the socio-economic structural processes that accelerate rapid urbanisation, population movement and population concentrations substantially increase disaster vulnerability, particularly of low-income urban dwellers (UNEP, 2009). Empirically, poor areas are more prone to natural disasters than wealthy areas. Hence there is a link between disaster risk and poverty, one that Pelham, Clay and Braunholz (2011) posit can lead the poor to become trapped in a cycle of poverty and exposure to natural shocks. A factor used in characterizing hazards is their predictability (Natural Hazards, 2009; Corbett, 2009). An important concept of predictability is the *return period*, which represents the average period of time for an event of a given magnitude to recur. Public perception of the seriousness of a hazard is influenced by many factors, but in general a hazard is more acceptable if a relatively small amount of damage takes place frequently, compared with a large degree of damage occurring infrequently. Comparatively, with all these historical evidences, little is known about the extent to which fragile cities are able to cope, adapt and rebound from massive shocks (Muggah, 2012)**.**

A flood or a typhoon does not distinguish between residents, affecting everyone in its path (UNEP, 2009). However, the UNEP (2009) report further maintains that urban vulnerabilities are created directly by global change such as sea level raise and flooding (more than 80% of cities are on river basins or close to a coast, or both). No gainsaying that vulnerability to natural disasters is found to have important policy implications. By definition, VUSSC (2006) defines it to be the extent to which a community's structure, services or environment is likely to be damaged or disrupted by the impact of a hazard. In other words, it can be labelled as the degree of possibility that loss will occur with negative consequences. With resilience taking the other extreme as regards how these shocks can be absorbed and quickly recover. However, the results show that developing countries tend to suffer most from natural disasters, especially in terms

of the number of persons affected and the value of the damage (Benson & Clay, 2004). Many African countries including Nigeria have showed resistance to many natural disasters like earthquakes, tsunami, cyclones. Etc. but vehemently have no answer to issues of flooding, landslides, mudslides, drought, desertification, terrorism. Etc.

Understanding vulnerabilities in the context of Ilorin metropolis have been perceived under natural and human caused events. Ilorin is a typical traditional African city whose urban history predates colonialism in Nigeria (Olorunfemi, 2011). This presupposes the fact that Ilorin is characterised by ever-increasing population, whose larger percentage are impoverished, and are on a daily basis exposed to risks of disaster (Bako, Aduloju, & Abubakar-Kamar, 2017). Conceptually, Raheem (2011) argues that the collective forms of hazards in Ilorin ranges from tropical storms, land erosion, windstorms, floods, drought, desertification and human diseases. According to the *National Bureau of Statistics report 2016;* the percentage of urban poor in Ilorin stands at 61.8%. Poverty represents a distinct contributing factor to vulnerabilities both in time and space. This assertion has given rise to demands for precarious locations to rest their heads. From many literatures like World Bank (2015); World Bank (2016), it has been ascertained exhaustively that poverty, population growth, unregulated land use and urbanisation all represent an important indices in predicting the potential of a disaster and its return period in any locality (World Bank, 2015). However, it is against this problem proceedings that this study tends to investigate the vulnerabilities vis-à-vis the resilient nature of Ilorin central area.

Literature Review

Concepts and Definitions of Vulnerability Amidst Resilience

The tentacles of natural caused events cut across all aspects of human endeavours measured on the degree of tangibility and intangibility (Table 1). Tangible vulnerability can be defined has vulnerability that can be quantified. In other words, attaching numerical values to empirical properties according to specified units. While in tangible takes the other extreme as regards what and what that cannot be quantified. Vulnerabilities associated with disasters are not prerogative of economic factors alone, as it cut across physical, social, economic, cultural institutional, political and psychological factors. These factors in which Twigg (2004) believes shape people's lives and the environment that they live in. Concentration of population and infrastructure in cities contribute to increased exposure to natural hazards. Pelham, Clay, & Braunholz (2011) argue that vulnerability is the human dimension of disasters and is changing quickly, especially in countries that are experiencing economic transformation— rapid growth, urbanisation, and related technical and social change. Given this assertion, natural shocks can affect people differently, the premise is that a major hazard may not lead to disaster, if a community or vulnerable groups are well-prepared. The risk of a disaster is therefore defined by both the probability of the hazard and the vulnerability of the household and community.

Table1: Classification of Vulnerabilities

Types of Vulnerability Characteristics	Types of Vulnerability Characteristics
Tangible/Material (easy to see; value easily determined)	People – lives, health, security, living conditions Property – services, physical property loss, loss of use Economy – loss of products and production, income Environment – water, soil, air, vegetation, wildlife
Intangible/Abstract (difficult to see; value difficult to determine)	Social structures – family and community relationships Cultural practices – religious and agricultural Cohesion – disruption of normal life Motivation – will to recover; government response

Sources: Authors Computation, 2018

On average, natural disasters affect about 2 percent of a country's population each year and cause damage amounting to well over one-half of 1 percent of GDP and99 percent of the people affected were in developing countries (Rasmussen, 2004). Disaster risk is an intrinsic characteristic of human society, arising from the combination of natural and human factors and subject to exacerbation or reduction by human agency (Olorunfemi, 2011). While the adverse impacts of climate change on society may increase disaster risk, disasters themselves erode environmental and social resilience, and thus increase vulnerability to climate change (O'Brien, et al., 2008).*Ip so facto*, one can clearly adduce that resilience of community depends on the frequency reoccurrence of disaster.

Vulnerability is the potential to suffer harm or loss, expressed in terms of sensitivity and resilience or of the magnitude of the consequences of the potential event (ALNAP, 2002). Conceptually, sustainability and resilience both follow the conservative standard concerning resource use and the associated risks and disasters, along with anticipation of various dimensions of vulnerability (Perrings, 2006). Given this statement, this study however, submits that there exists a tripartite relationship between Hazard, risk and vulnerability, with all the three sitting on resilience – this Agbola & Falola (2017) believe is the magnitude of disturbance that can be absorbed before the ecosystem changes its structure by changing the variables and processes that control behaviour. In the same vein, (Walker, et al., 2006) aver resilience to be the capacity of a system (Environmental System) to experience shocks while still retaining essentially the same function, structure, feedbacks and identity.

The unified approach of hazard and vulnerability can be unified in the risk formula, R=f (H, V), where the risk of disaster (R) is measured by the risk of hazard (H) and vulnerability (V) (Pelham, Clay, & Braunholz, 2011). This acknowledges that a hazard can be an exogenous trigger for disaster, but vulnerability is an endogenous and therefore controllable factor of disaster (Pelham, Clay, & Braunholz, 2011). Instead, by differentiating events by frequency, as we have sought to do here, the risk of occurrence then becomes the basis for determining the need and type of response, which in this case, focuses on social protection. Categorizing

hazards in terms of risk is seemingly tautological. As this is based of degrees of uncertainty. It is a difficult exercise but can be useful for deciding the appropriate response to invest in, to cope with a potential natural hazard. In reality, a country's financial capacity as well as political support will determine the options.

Vulnerability does not occur fortuitously. Urban vulnerability to disasters is indubitably a function of human behaviour/lifestyles. Urban areas provide a number of socio-economic opportunities for jobs and income generation, but are also simultaneously becoming increasingly risky places to live, especially for low-income residents of cities in developing countries (UNEP, 2009). Exposure to environmental risk and hazard is a result of physical processes creating these hazards (for example building construction, urban planning, infrastructure provision or transportation), and human processes along with its multiplier effect lead to vulnerabilities (for example, lifestyle choices and consumption (Table 2).

Table 2: Contributing Factors to Vulnerability

Vulnerability Contributing Factors	**Vulnerability Contributing Factors**
Poverty	People who are already in a depressed state are less able to recover. Some people are even more vulnerable – pregnant women, children and the disabled.
Population Growth	Population has grown dramatically over the past decade.
Rapid Urbanisation	Growing concentration around the capital. For example, two-thirds of the Samoan population lives in Apia.
Transition in Cultural Practices	Increase in sub-standard housing in more heavily populated urban areas. Changes in traditional coping mechanisms – declines in self-reliance, food conservation and preservation, warning systems etc.
Environmental Degradation	As resources are consumed, vegetation cover removed, water polluted and air fouled, a country is more vulnerable to a disaster.
Lack of Awareness and Information	When people and government officials are unaware or lack information about disaster management, they fail to take appropriate actions.
Civil Strife and Unrest	Resources are consumed, people are in a stressed situation, and transportation is restricted.
Geographical Isolation (Socio-Spatial Exclusion)	Island countries are disadvantaged by their relative remoteness, particular their limited access to schools, health and cash.
High Disaster Impact	Limited economies (tourism, agriculture). Disaster impact can affect an entire economy.

Vulnerability Contributing Factors	Vulnerability Contributing Factors
Political Uncertainties/Instability	Changing government policies, changing personnel in the national focal point, economic weakness all can contribute to an effective national disaster management programme.

Sources: (VUSSC, 2006)

Study Area

The study takes a case study approach of Ipata area located between latitude 8°26′48.83″ and 8°31′20.36″N and longitude 4°32′17.67″ and 4°35′38.91″E. However, the central area cut across the three (3) Local Government Areas in Ilorin metropolis. The weather is tropical wet and dry climate of average maximum temperature, average minimum temperature and average relative humidity in a year standing at 32.50C (90.50F) of 21.20C (70.20F) and 51.1% respectively (National Ocean and Atmospheric Administration, 2016).

The relief of the study area is gently undulating and the height of the land ranges between 266m to 344m above sea level. Ilorin central area is drained majorly by the Asa River and some seasonal rivers such as Agba, Oyun, Osere, Aluko, Odota, Bude and Are. The drainage pattern in Ilorin is dendritic in nature (Kwara State Diary, 1997). The growth of Ilorin has been greatly influenced by its status as the state capital, the physical development and the socio-economic activities of the people.

The occupation characteristics of the people in study area comprises of: farm practices in the form of food crops production, local craft such as; cloth weaving, leather works, pottery, mat making etc; trading industrial and administrative activities. Hence, the study area has a major impact on the socio-economic lives of the surrounding communities. However, and more specifically to the study area, the residential housing conditions and densities are characterised by various types of houses present all over the city (Akogun & Ojo, 2013). The communities covered by the studyhave significantly some levels of slums, pigeon-holed with tenement and contiguous buildings. The residential conditions of the study area bread violence, social exclusion, and vis a vis shows clear evidences of risks. The central area of study as labelled above, best described as socially disadvantaged neighbourhoods, are dominated by the locals (Abdullahi, Seedat-Khan, & Abdulrahman, 2016).

Research Methodology

This study assesses the resilient and vulnerable nature of inhabitant residing alongside river Asa, Ilorin central area of study. This study employed a mixed methods approach, which allows an integration of quantitative and qualitative approaches that facilitate the investigation of socio-economic characteristics of the respondents. Relevant data for this study were obtained through primary, semi-secondary and secondary sources. Questionnaire was one of the veritable tools used to survey the socio-demographic characteristics of the respondents.

Observations, interviews, photographs as well as GIS mappings supplemented this research. Semi-secondary and secondary data which includes delineated map of the study area, slope analysis, hill shade analysis, satellite imagery, records of population distribution and extant planning standards in the state were gotten from Town Planning Offices, Government Secretariat and monographs, reports, journals. etc., as these helped in no small measure in the map analysis.

However, the 'beck and call' of this research focuses on inhabitants residing alongside river Asa, Ilorin central area. To this end a buffer analysis of 100m was done on river amounting to 2,800 buildings captured within the 60m buffer. This evidently forms the sampling frame for this research. Due to the homogeneity of the respondents, this research assumes a 5% sampling size amounting to one hundred and forty (140) buildings being considered, since the majority of buildings in the communities were multiple-occupancy, one household per building was selected for the survey. Using systematic random sampling approach to select respondents in the area, every 5th house was sampled and 137 of those questionnaires were validly completed. Data collected were analysed using multiple regression analysis model, the relationship between vulnerability and risk factors was determined as well as their contributory significance. Satellite imagery acquired was analysed in GIS environment to determine the ring buffer of river Asa. Frequencies and Percentages were also employed to analysed the socio-demographic characteristics of the respondents in study area.

Findings and Discussion

The main thrust of this study is to measure the dimensions of vulnerabilities and resilient nature of Ilorin metropolis. However, by way of contrast, macro-level research was preoccupied with interpreting many dimensions of urban vulnerability in the central area of Ilorin vis-à-vis the Asa river traversing the study area. The research was carried out to review historical and cultural trajectories of urban risks and vulnerabilities, and further interrogate the experiences, perceptions, attitudes and inter-generational, spatial and underlying structural conditions shaping susceptibility of Ilorin Central Business District to disasters.

Socio-Demographic Characteristics:

The questionnaire administration focuses more on the adults of age bracket more than 25 years old, constituting 95.6% of the entire respondents sampled. However, there was a sharp difference between the gender distribution in the study area as 38.0% of respondents recorded were male and the remaining 62.0% to be female. This is in line with extant assumptions that the central area is always dominated by the females (Bako, Aduloju, & Abubakar-Kamar, 2017). Nevertheless, it was observed that 24.8% of the respondent were single, 60.6% were married, while 6.6%, 4.4% and 3.6% were divorced, windowed and separated respectively. From the data collected it was keenly observed that sustainable development goal three (3) still

has a long way to go, and essentially have a serious implication on the vulnerability of the Central Business Area. However, a considerable number of respondents representing 5.8%, 9.5% and 8.8% were Illiterates, primary school graduates and JSS/Model School graduates respectively. Furthermore, 33.6%, 19.7% and 21.9% were SSS/Sec/TTC, ND/NCE and University/HND graduates respectively, while 0.7% chose others like Masters and Doctorate degrees (Table2). The implication of the low level of education of the people in the area contributed to why many choose to live in a vulnerable area, as education level represents an important factor in maintaining a stable mental health. (Table 2) aptly shows the occupational distribution of respondents in the study area as literature and extant models of urban land use planning had earlier confirmed Ilorin Central Business Area of study to be business oriented. However, 40.9% of respondents owned up to be engaged in trading and commerce, 17.5% were civil servants, 0.7%, were into farming, 2.2% were industrial workers and while 22.6%, 1.5% and 14.6% were artisans, retirees and others respectively. Table 1 further shows the income levels of the respondents and how these undermines the level of liveability and vis-à-vis its vulnerability of people living in the central area of study as 8.0% number of respondents earned below minimum wage of #18,000 and 37.2% of respondents earn between #18,000 – #30,000, not even up to the amount of #30,000 Nigeria Labour Congress (NLC) is proposing as the new minimum wage while 18.2%, 10.2% 19.0% and 7.3% of the respondents claimed to be earning between #30,001 - #60,000, #60,001 - #80,000, #80,001 - #100,000 and above #100,000 respectively. This clearly shows that level of income of individuals has a direct correlation to vulnerability. Evidently one can infer that the income situation in the study area is terrible, a condition UNDP (2004) labels as "income poverty" – a status whereby a lack of financial resources limits the ability of an individual or household to meet basic needs.

Table 2: Socio-Demographic Characteristics:

Character	Percentage (%)
Gender Distribution	
Male	38.0
Female	62.0
AgeDistribution	
18-25 Years	4.4
26-40 Years	57.7
41-60 Years	34.3
Above 60 Years	3.6
Marital Status	
Single	24.8
Married	60.6
Divorced	6.6
Separated	3.6
Widowed	4.4

Type of Employment	
Trading and commerce	40.9
Civil Service	17.5
Farming	.7
Artisan	22.6
Retired	1.5
Industrial Worker	2.2
Other	14.6
Income Level Per Monthly	
Less than #18,000	8.0
#18,000 - #30,000	37.2
#30,001 - #60,000	18.2
#60,001 - #80,000	10.2
#80,001 - #100,000	19.0
Above #100,000	7.3
Total	**100**

Source: Authors' Field Work, 2018

Analysis of Environmental Factors Causing Vulnerability

Land acquisition in the study area indicated that outright purchase accounted for 8.8%, while 11.7% confided that the land belongs to their husbands,12.4%, represents land acquired through inheritancewhile those who rented the property2.9%. Most of the respondents owned their apartments as this represents 64.2%. Title of land is crucial to this study, this is to ascertain the legality of land ownership in the area, as tenure has been defined as the manner in which a person held or owned real property. To this end, 2.9% respondents agreed that their land title was through "deed of transfer"while the bulk of the respondents representing 65.7% agreed that their land has "no title document" whatsoever, this Omole (2010) classified as squatter settlement – development in which legal right cannot be claimed. Furthermore, 11.7% and 19.7% of respondents lived in houses without "C of O and R of O" respectively.Clearly, there are cyclical links between urban areas, lifestyles and consumption patterns onone hand, and global environmental problems on the other. UNEP (2009) further ascertains that the outlook is even grimmer ifwe consider the accumulated effects and synergy between environmental deterioration andpoverty which however, is striking a balance in the study area. Engelking (2008) clearly defines pollution as the contamination of Earth's environment with materials that interfere with human health, the quality of life, or the natural functioning of ecosystems.It was on this premise that the survey carried out, reveals noise pollution was the most notable form of pollution in the study area as it accounted for 40.1%, while 11.7%, 16.7% and 31.4% of respondents adduce clearly that soil/land, water and air pollution were the most prevalent form of pollution in the study area respectively. However, this study believes there are three (3) dimensions of poverty in the study area. From survey, it was revealed that the study area had 73.8% respondents who were *food poor* while the remaining 17.5% and 2.9% were *shelter* and *clothing poor* respectively. It therefore, safe to say, there exists a tinge of poverty in the

land and the population in this central area is gradually moving towards extreme poverty, a condition Corbett (2009) believes threatens people's health or lives, and also known as *destitution* or *absolute poverty*. The actual and potential risk and disasters of the study area was sampled and a considerable 38.0% respondents believe it to be traces of heat wave, 26.3% voted for flooding while 17.5%, 11.7%, 5.1% and 1.5% suggested rainstorm, fire disaster, epidemics and 'others' respectively to be the actual risks and disasters in the study area. In support of this findings, UNEP (2009) adduces clearly that urban areas are not disaster prone by nature; rather the socio-economic structural processes that accelerate rapid urbanisation, population movement and population concentrations substantially increase disaster vulnerability, particularly of low-income urban dwellers. Migrants, for example, settle in areas either originally unsafe (susceptible to floods, landslides, etc), or create the potential of man-made disaster (environmental degradation, slum fires, health hazards). More acceptingly, one can say the study area has been the harbour for poor migrants in Ilorin metropolis.

Regression Analysis of Principle Factors

Alabi & Falola (2003) believes regression is better suited for studying functional dependencies between factors. Better put, how predictors influence the outcome of dependent variables. To this end, the study identifies the relationship between vulnerability (dependent variable Y) and risk factors (predictors X_1-X_n) was determined using simple multiple linear regression model involving dummy variables. In the analysis, the variables were measured as dummy variables using the binary scale (i.e. 0, 1). The regression results show that the overall level of explanation of the explanatory variable, which is significant at 0.05 confidence level, is 46 percent ($r^2 = 0.456$). The results, therefore, reveal that 46% variance in vulnerability of the study area was indeed explained by the predictors in the model, and subsequently, Adjusted R^2 value of (0.304) still upholds the fact that 30% variance in vulnerability that can still be explained by the predictors of the model. However, it's safe to imperatively emphasize that R^2 values value is reliable and considered reasonably above an acceptable range of 15% as postulated by Mitchell and Carson (1989) and further ascertained by Akinyode (2017) that this is acceptable in social sciences when cross-sectional data are taken into consideration. Furthermore, the result, further reveals that three (3) predictors (unregulated land use, level of education and crime & civil unrest) were solely the factors influencing the vulnerability of the study area and significant at ($p< 0.05$). However, a Durbin Watson test using "a rule of thumb" was also conducted to determine the autocorrelation in the residuals. This gives a value of (1.600) considered to be appropriate according to "a rule of thumb" – test statistics values in the range of 1.5 to 2.5 are relatively normal and to further consolidate this, Field (2009) suggests that values under 1 or more than 3 are a definite cause for concerns. This regression analysis further concludes its findings by rejecting the null hypothesis as it was observed that the calculated *F* value of 3.013 is greater than the table *F* value of (2.11) at degrees of freedom (10,36). As ascertained by Panneerselvam (2014), this simply implies that the regression is significant. However, unregulated land use, level of education and crime& civil unrest are

clearly the cause of vulnerability in the Ilorin central area of study. Furthermore, the result of ANOVA shows the *P* value is 0.00 which is less than 0.05, which also proves the earlier stated findings.

Analysis of River Asa as A Major Risk Factor

Rivers are important to humans because they supply fresh drinking water, serve as home for important fisheries, provide transportation routes, and are the source for irrigation water and hydroelectric power. However, it would be of interest to know that River Asa traversing the study area has instinctively lost the aforementioned potentials, as it harbours many district vectors and according to this study recording 31.4% and 63.5% primary cause of "Typhoid and Malaria". To this end, a slope analysis of the area was done in other to ascertain the area of study at risk of flooding. The analysis of the gradient showed that greater proportion of the study area is of the lowest slope of 0.00-1.027341031 at 20 metres. This clearly indicates that over 5.00 hectares will be wet all round (Figure 1.0). This result is in consonance with the findings of Basorun (2018) who carried out similar analysis and ascertained the fact that it will be completely onerous to recover these areas from inundation and ultimately flooding. From analysis, a considerable 26.3% respondents believe flooding to be a friendly disaster in this area due to the fact that human interference has increased the severity of flooding in the study area, as a result of changes in land use such as urbanisation and deforestation. Albeit 38.0% respondents agreed that there exist some traces of "heat wave"- a period of unusually hot weather. Furthermore, a ring buffer analysis was conducted on river Asa at 20m and 30m respectively to actually account for the total number of buildings that have clearly compromised a 30m set back to this natural course considering the fact that a rail line is parallel to the natural course (Figure 2.0). In response to this, a total number of 28 buildings were seen to have clearly compromised the standards at 20m setback and total of 42 buildings at 30m. if the result of the regression analysis is to be recon with, one will can say clearly that, there exist the presence of unregulated land use and squatter settlements. Even from interviews with respondents, a respondent was quoted saying "*the central area provides only food for me, which is not even enough for my family, reason I have to do everything necessary to create shelter close to it."* From all indications and many urban literatures likeBenson & Clay (2004), believe that poverty and risk of staying in vulnerable areas share lineage.

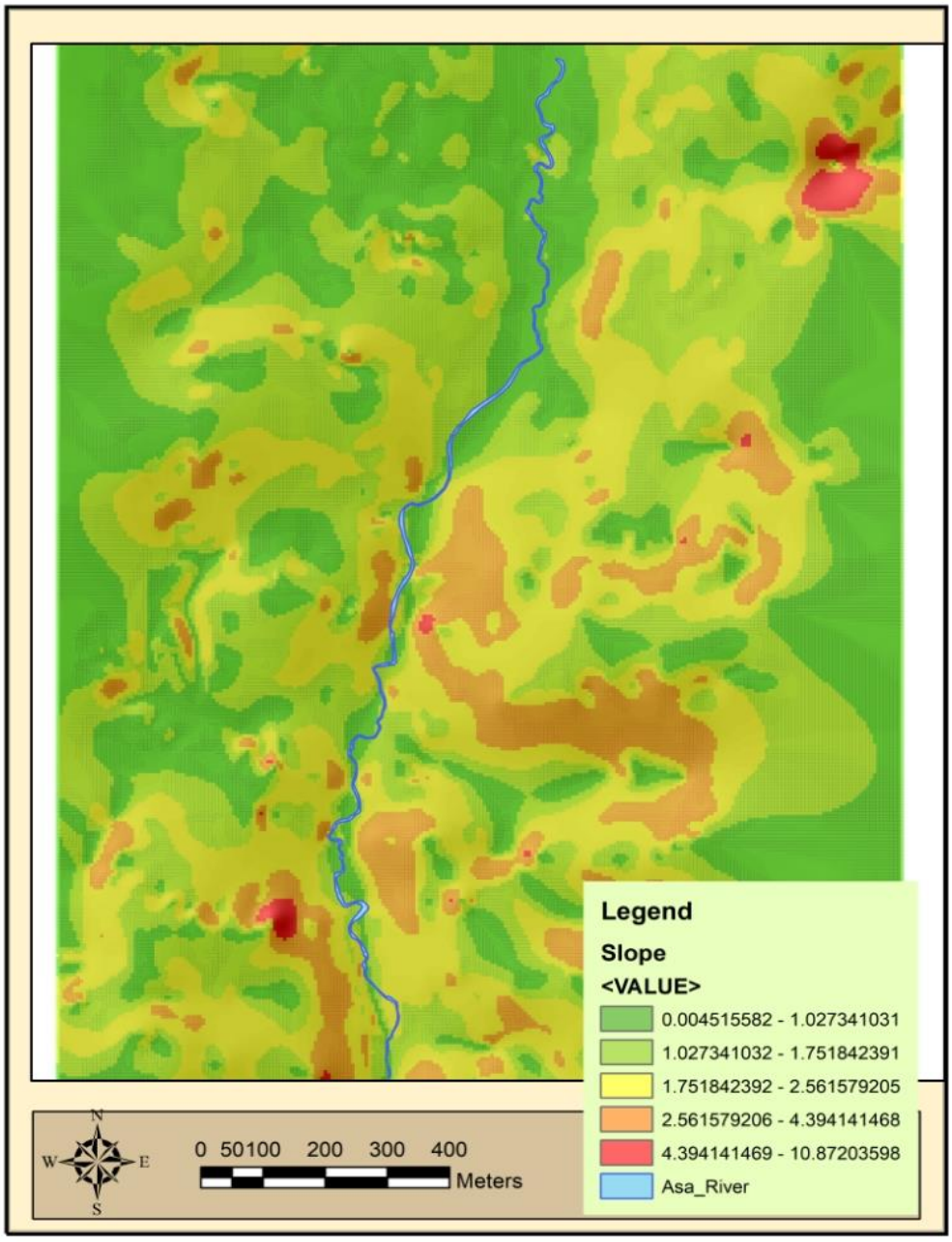


Figure 1.0: Slope Analysis of Ilorin Central Area
Source: Authors' Digitization and Computation, 2019

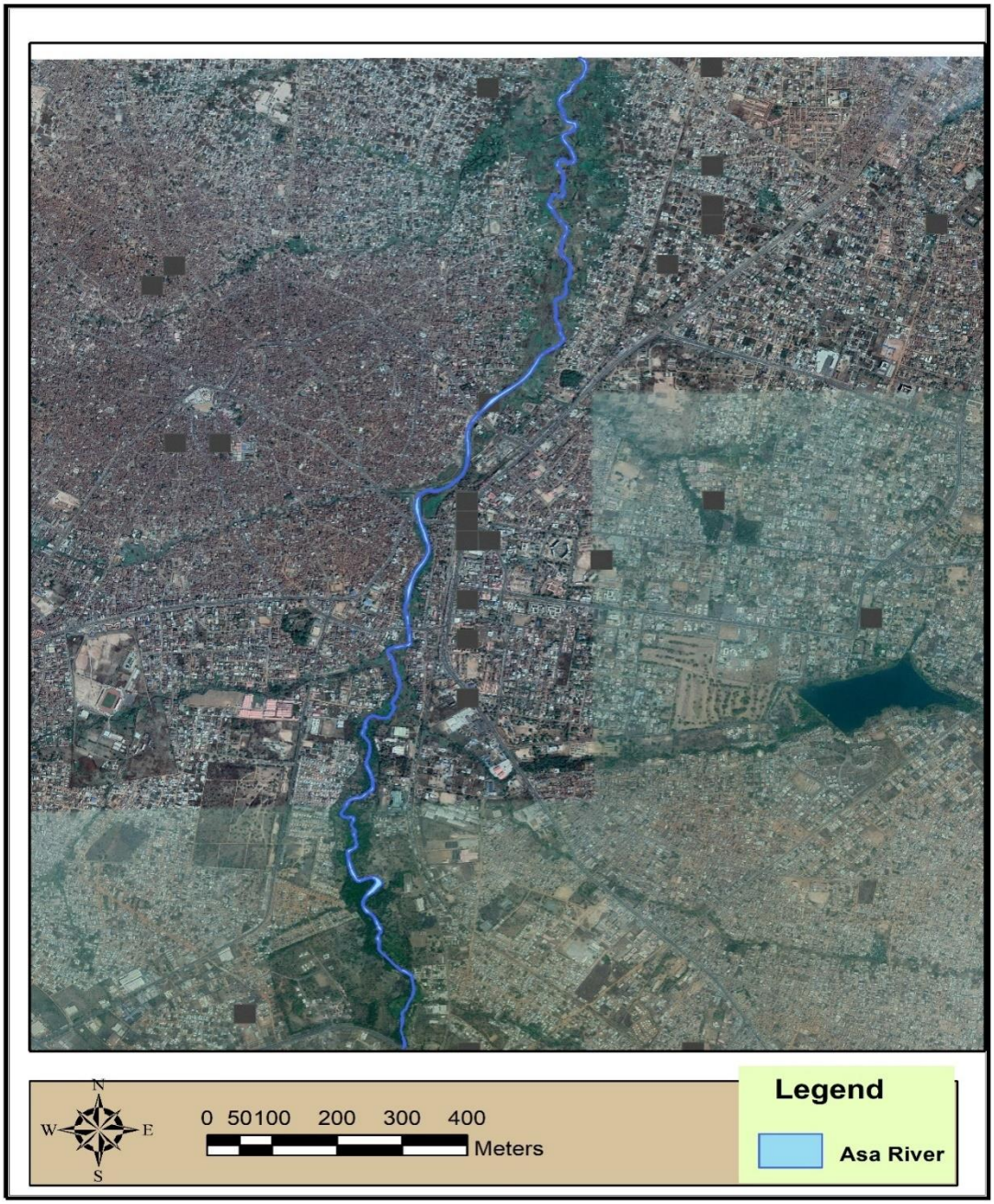


Figure 2.0: Ring Buffer Analysis of Ilorin Central Area
Source: Authors' Digitization and Computation, 2019

Recommendations

Periodic Risk Assessment:

This is the first step in managing disaster risks, Ilorin central area need to better understand the risks to social, economic, environmental and cultural heritage. This includes understanding the probability of a disaster event as well as it's likely severity. To help stakeholders make time-sensitive decisions, risk mapping can be combined with modern databases of cultural assets that include information on assets' value and location.

Building Codes and Guidelines:

Building codes should ensure resilience as well as compatibility with vernacular building practice and characteristics. The process of developing appropriate building codes and technical guidelines may include harmonizing designs and building materials of new structures with local cultural and natural tradition. However, this will go a long way in regulating the land use in the study area.

Community Engagement:

Ensuring that coordination within local communities in the study area like Ipata, Sango, Thaiwo etc. is extremely important. In some cases, the goal is to raise awareness of the tangible and intangible important assets that can be vulnerable to disaster, and in other cases it is to let communities lead preservation efforts, including in the aftermath of disasters.

Conclusion

Vulnerability is changing quickly, and its growing trend has implications on the national sustainability. While urban vulnerabilities are created directly by global change such as sea level rise and flooding, a number of indirect causes, such as household and hazardous/toxic wastes, pollution etc. are responsible as well, resulting in potentially higher impacts owing to concentrations of infrastructure, government, population and economic activity. In the context of climate change, for example, risks from natural events result from a combination of the nature of the hazard itself, and the intrinsic vulnerability of the affected society and territory. Climate change and its variability are likely to worsen the prospects for poverty eradication unless drastic action is taken to become response-capable. This however, requires a focus on reducing vulnerability, achieving equitable growth and improving the governance and institutional context in which poor people live. Strategies to reduce vulnerability should be rooted in vulnerability analysis like buffer analysis, and greater understanding of household-level and macro response options that are available to decrease the poor's exposure to climate risk. The largest concentration of high-risk urban centres, which are increasingly vulnerable to hazards in sub-Saharan Africa. Risks emanating from combination of vulnerability and hazards need to be better recognized in highly exposed urban areas like Ilorin metropolis, as the potential costs are rising exponentially with economic development**.** Conclusively**,** reliable scientific information is a necessary condition for effective disaster risk management. The international community should support global and regional research and information systems

on risk. It should also ensure that there are adequate complementary monitoring and dissemination programs not only at the national level but also at state level.

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EFFECT OF INFORMAL ACTIVITIES ON URBAN ROAD NETWORK INFRASTRUCTURE IN MINNA, NIGER STATE

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Urbanization is largely a product of change in land use characteristics. The high level of urban growth in the developing countries is associated with increasing levels of informal activity, which in most time changes the configuration of urban landscape. The increase in the informal activities is due to the availability of urban space. Allocating space for an informal activity, however has remains a major concern to urban decision makers, because of its effect on infrastructure. In Minna, the uncoordinated spread of informal activity has continued unabated, due to high population of people trooping to Minna from Federal Capital Territory (FCT). Therefore, this paper is assessing the effect of the informal activities on neighbourhood road network in Minna township of Niger State. Both primary and secondary data were employed. Primary data were generated from resident of the area and operators of informal activities within the neighbourhood through questionnaire administration, while the secondary data were sourced using the report from the Niger State Ministry of Lands and Housing and Google-Earth map of the area. Systematic random sampling technique was used in the selection of 180 respondents and descriptive statistical method of analysis was employed. The Google-Earth map of the area was digitised using GIS method to determine the extent of encroachment on road setbacks and right of way. The result shows that most of the residential buildings have been converted to commercial use and the open spaces and vacant plots converted also for various uses. Among these uses, viewing centres occupy 9% of the total areas; car wash centres 5%; automobile mechanic workshop 9%; motor-bicycle and tricycle mechanic workshop 7%; game houses 6%. This study concluded the present pattern of development, especially along the major road in selected neighbourhoods have negated the basic principles of smart city on the integration and communication route network within the city without optimising the efficiency of city operation and infrastructure and other services. It therefore recommended the monitoring of informal activities so as to reduce the rate of nuisance and decay caused by informal activities.

Keywords: Informal Activities, Infrastructure, Neighborhood, Smart City.[35]

INTRODUCTION

The capacity of the informal sector economy to absolve a teeming population of the unemployed into the labour force has posed a considerable challenge to urban land use planning and management not only in Nigeria but also in some developing countries of the world. According to Okeke (2000), the challenge is borne out of the capacity of the sector to generate land use problems such as sprawl problems, incongruous land uses, building alterations, the menace of temporary structures, alteration of land use functions, open space conversions and land degradation. These informal economic activities encompass a wide range of small-scale

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largely self-employment activities which could either be rendering services or be engaged in the production of a particular commodity, including economic endeavours of subsistence nature as retail trade, restaurants, repair services and household or other personal services. While traditional town planning tends to see the informal sector as being an environmental nuisance, its importance cannot be overemphasized as many urban households will be unable to meet their survival need without participating in this sector. Tipple G. (2005), supported the notion that "the informal economy is the highest employer of urban poor and is believed to be very important particularly in developing countries where population and demand for jobs, goods and services are growing at a rate which the formal sector cannot cope with. It also contributes to economic growth as the United Nation Development Programme (2003), in its report outlined that "informal activities constitute 70% of the Gross Domestic Product (GDP) of Nigeria and Egypt, and 30% of the GDP of Costa Rica, Chile, Brazil, Colombia, Venezuela and Paraguay. From the above assertions, it can be deduced that the activities of the informal sector contributes quite significantly to the growth of the Nigerian economy in terms of output and employment.

Despite the advantages associated with these informal activities, the sector is not devoid of negative impact to the environment. According to Harth (1973), "the presence of unregulated activities is a major feature associated with developing countries particularly in the urban centres". Beside the violation of the use of land by informal sector workers, their activities often constitute nuisance generating noise and other forms of pollution, unsanitary environment as a result of indiscriminate waste disposal and the obstruction of movement. It is also characterized by traffic congestion and unsightly appearance.

This project is aimed at assessing the impact of informal activities on highway corridor of Minna with a view to establishing its spatial attributes. To achieve this aim, the following objectives have been earmarked and they include: to identify the nature and categories of informal activities on highway corridor in Minna, to examine the spatial attributes of these informal activities identified along the corridor, to examine the pattern of the regulatory measures in coordinating the activities of the informal sector in the study area and to assess the impact of these informal activities on the highway corridor.

The study intends to focus on the nature and categories of informal activities on Minna highway corridor with respect to the land use of the area. The study will also examine its spatial attributes, the area coverage of these informal activities and its environmental impacts as a basis for developing strategies for its regulation. The study area stretches for about 11km in length from City Gate at Shango on the South to City Gate at Tudun-Fulani in the North. For the purpose of this study, the corridor is divided into two segments. Segment 1 extending from City Gate (Shango) to Mobil. Most of the land immediately adjacent to the corridor is in the State or Federal ownership, with some private property holdings. In the western part of this segment, there is the State Secretariat, Hydro electric power producing areas development commission, Central Bank of Nigeria among others. The eastern part of this segment comprises of The State House of Assembly, National Youth Council of Nigeria, Federal Road Safety Corp

office among others. The majority of the commercial services are located along this portion of the corridor and include: petrol stations, restaurants, eateries, banks and other offices alongside retail shops. The area is also interspersed with residential houses.

Segment 2 travels from Mobil down to Tudun-Fulani, traversing F-layout where there are more residential buildings and schools such as Ahmadu Bahago secondary school, Marafa primary school, Government secondary school and Waziri Nursery and primary school. This segment is also characterized by formal commercial activities such as banking and government owned institutions. Furthermore, the Federal University of Technology Minna Bosso campus is located on this segment of the corridor.

Furthermore, the increasing rate of unemployment has also contributed to the upsurge of activities in the informal sector. According to the World Bank (2010), unemployment rate in Nigeria as at 2011 was 23.9%. More particularly, the effect is felt in the urban areas, of which its highway corridors are not left unaffected, a situation which is attributed apparently to the over response to the attraction of cities. More so, there has been no considerable provision for land space for these activities commensurate to the number of people involved in them. Hence, land uses have been tempered with and developments have become haphazard. In Minna highway corridor, this gloomy picture has been painted of its physical environment with activities such as commercial, light industrial and service activities competing for land spaces and altering the scenery to the detriment of the planned use of land earmarked for Minna highway corridor. Against this background, it is pertinent to check its proliferation particularly on highway corridors. Hence, a research work of this nature to evaluate the impact of the informal sector activities on the highway corridor in Minna is considered inevitable at this time.

LITERATURE REVIEW

Urbanisation, increases in population and vehicle travel are putting additional strain on transportation system globally. This has invariably increased the rate of informal activities that take place on highway corridors of cities. According to Harth (1973), informal sector is defined as employment beyond government services, factories and large scale commercial ventures. The International Labour Organization (ILO) (1972) document, further clarifies the forms of such enterprises as comprising of some or all of the following: easy entry into and out of the business, reliance on indigenous resources, family ownership, small scale of operation, labour intensive and adopted technology, skills required outside the formal school system, unregulated and competitive market and lack of legal or government recognition. The International Labour Organization further estimates that the proportion of the urban workforce engage in informal sector activities is highest in Sub-Sahara Africa and account for more than 50% of urban employment in two thirds of countries surveyed in 1999. In Nigeria, the informal sector unfolded conspicuously after the Structural Adjustment Programme (SAP) was introduced which eventually led to mass retrenchment of formal sector workers. According to Oshinowo (2007), as cited by Farinmade and Anyankor (2012), a large percentage of the victims found solace in informal sector employment which appeared as the immediate solution to the economic crisis that was prevalent at that time. The drive for profit maximization of people in

informal sector inform their strategic location at road junctions, various bus stops and points of high pedestrian traffic. The urban informal sector covers all aspect of production, distribution and services. Its size allows adaptation to any space so desired. The informal sector plays an important and controversial role. It helps alleviate poverty as it provides jobs and reduces unemployment, but in many cases the jobs are low–paid and the job security is poor. It improves entrepreneurial activity but at the detriment of state regulations compliance, particularly regarding tax and labour regulations.

The size of the informal labour market varies from the estimated 4-6% in developed countries to over 50% in developing countries. It's size and role in the economy increases during economic downturns and period of economic adjustment and transition.

The International Labour Organization 'international symposium on informal sector' in 1999 proposed that the informal labour workforce can be categorized into three broad groups: Owner – employers of micro enterprises; which employ a few paid workers, with or without apprentices. Own – account workers; who own and operate one person business, who work alone or with the help of unpaid workers that are generally family members and apprentices. Dependent workers; paid or unpaid including wage workers in micro enterprises, unpaid family workers, apprentices, contract labour, home workers and paid domestic workers.

Operationalizing the concept of the informality for the purpose of measurement is not easy both because the two categories of the informal sector overlap and because the border between the informal sector and formal sector is blurry. First, if unofficial earning strategies are exercised by a low – profit small enterprise with low quality working conditions, then workers of this enterprise and the enterprise itself can be classified as belonging to both informal market categories. An example is an unregistered one – person low – profit street trade enterprise - these characteristics combine unofficial and survival activities. Second, some formal market jobs or enterprise can be classified as informal if it is found that they have poor work protection or if the life style and opportunities they entail are considered undesirable. If the street trader from the previous example registers her enterprise, the enterprise and the trader herself could be categorized as belonging to the formal sector if the profit is considered above survival level.

The upsurge in the number of participants in the informal economy has been attributed to various reasons. According to Okeke (2000), poverty has been highlighted as the major stimulator of these informal activities while others such rural – urban migration, increase in population growth rate, urbanization and unemployment are also crucial contributing factors. In addition, Urban Age (1993), outlined that economic crises such as underemployment, lack of governmental resources for basic services, and ineffective and cumbersome government regulation have further increased the situation. Consequently, those that are often employed full time in the informal sector are still forced to find additional means of income to survive while the unemployed take to miniature jobs just to make ends meet. Manning (1993), commented that the progressive weakening of the formal economy as in the case of South Africa has exhibited an alarming decrease in its capacity to absorb new entrants to the labour market. This resulted to entrepreneurs functioning in the informal sector 'out of necessity rather

than choice'. Manning concluded that low labour absorption in the formal economy and the dire crises of survival are the primary factors responsible for the massive expansion of the informal economy that has taken place over the last decade.

Furthermore, some formal activities are also associated with the sprawling of the informal sector. For example, the inadequacy of parking space provided for at the Olusegun Obasanjo Complex and by financial institutions and other offices located along Mobil Minna, Nigeria has resulted to informal on-street parking bringing about congestion along the road.

Recognising the activities of these informal sectors as one of the important underlying causes of environmental degradation calls for legal and institutional frameworks that are effective for the sound urban landscape management if cities and towns are to remain both economically and environmentally sustainable. Transportation has a strong influence on the spatial structure at the local, regional and global levels. A historical perspective on the evolution of transport systems underlines the impact of technological innovations and how improvements in transportation were interdependent with economic, social and spatial changes. The physical and visual relationship of the roadway to its surrounding is a key factor to the roadway.

A Highway Corridor is a general path that a highway follows. It encompasses all the surrounding land uses. Basically, it connects two major towns. According to the Texas Department of Transportation, District 12, third quarter annual report (1992), urban highway corridors tend to be linear and are visually defined by the surrounding architecture and alignment of the roadway. Highway corridors are usually dominated by commercial activities when they cut through cities. However, this is not peculiar to all highway corridors as they could also be characterized by a variety of land uses and significant land holdings. An example is the Trafalgar road corridor in Oakville which is characterized by a number of mix uses such as commercial, offices, civic uses, public spaces and a mix of residential forms and densities. Highway corridors could also serve dual purpose. For instance the Richmond highway corridor which stretches about 8 miles of the United State serves as a multi – functional, north–south oriented transportation route which carries through commuter traffic between the Southern part of Fairfax county and counties. It also functions as the 'Main Street' of the Richmond corridor which serves the many commercial and residential uses located on or adjacent to it. Corridors generally contain a mix of uses, many in transition and many unrelated or connected in form or function. Corridors are recognized for their potential for intensification due to their location along major transit routes and as in many cases, because they contain numerous vacant or underutilized lands. It is these vacant lands that informal activities often take advantage of. The activities of the informal sector on highway corridor is not peculiar to developing countries alone, some developed countries are also faced with such challenge. For instance in 1990, residents and tourists of Route 16 which is New Hampshire's major highway corridor connecting Portsmouth and the Seacoast to the White mountains and Northwestern Maine expressed concern over the proliferation of new commercial establishments along Route 16 which led to the overall deterioration of the scenic integrity of the highway thereby increasing insecurity and congestion along the roadway.

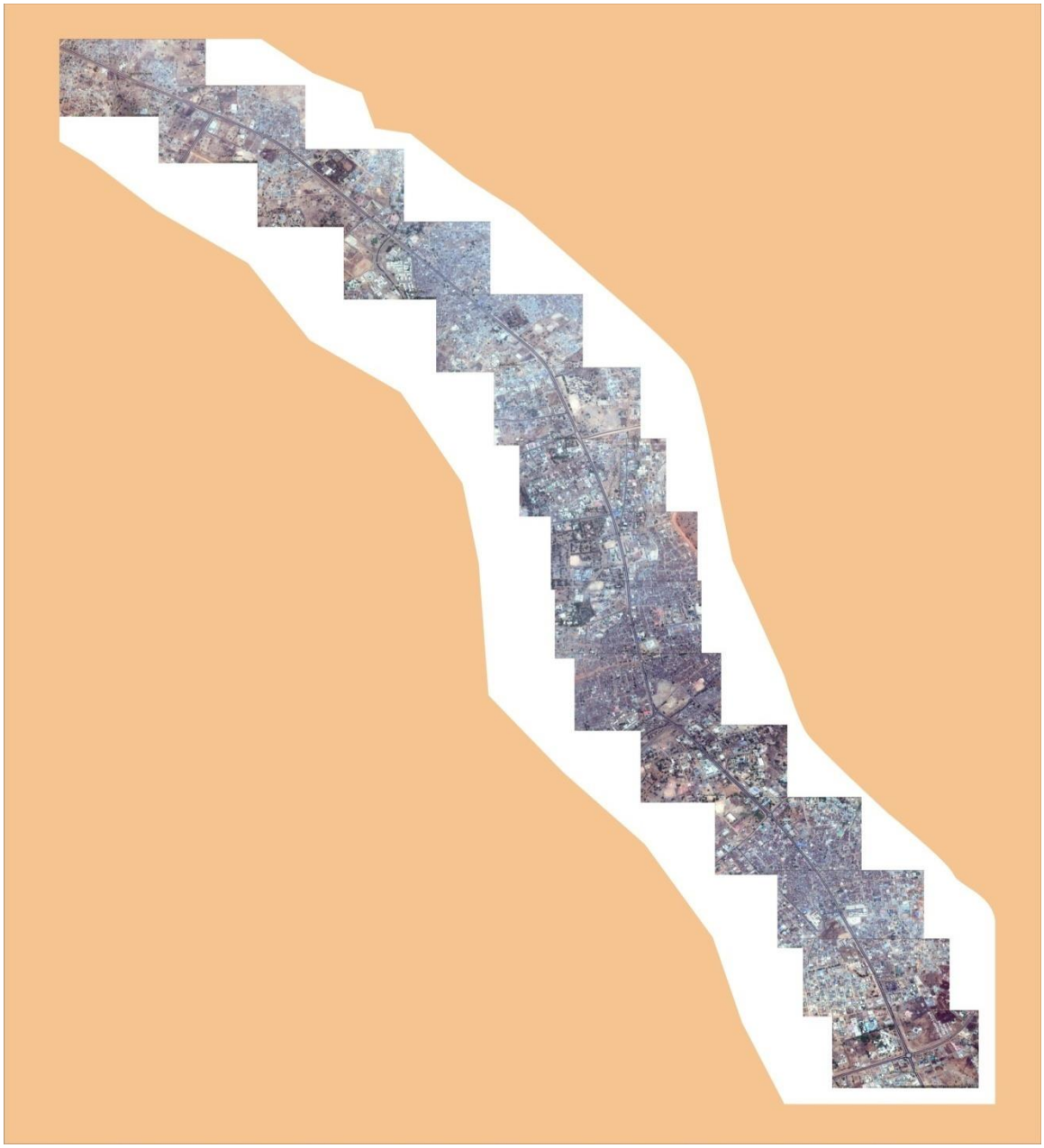


Figure 1: Showing Image of the Study Area

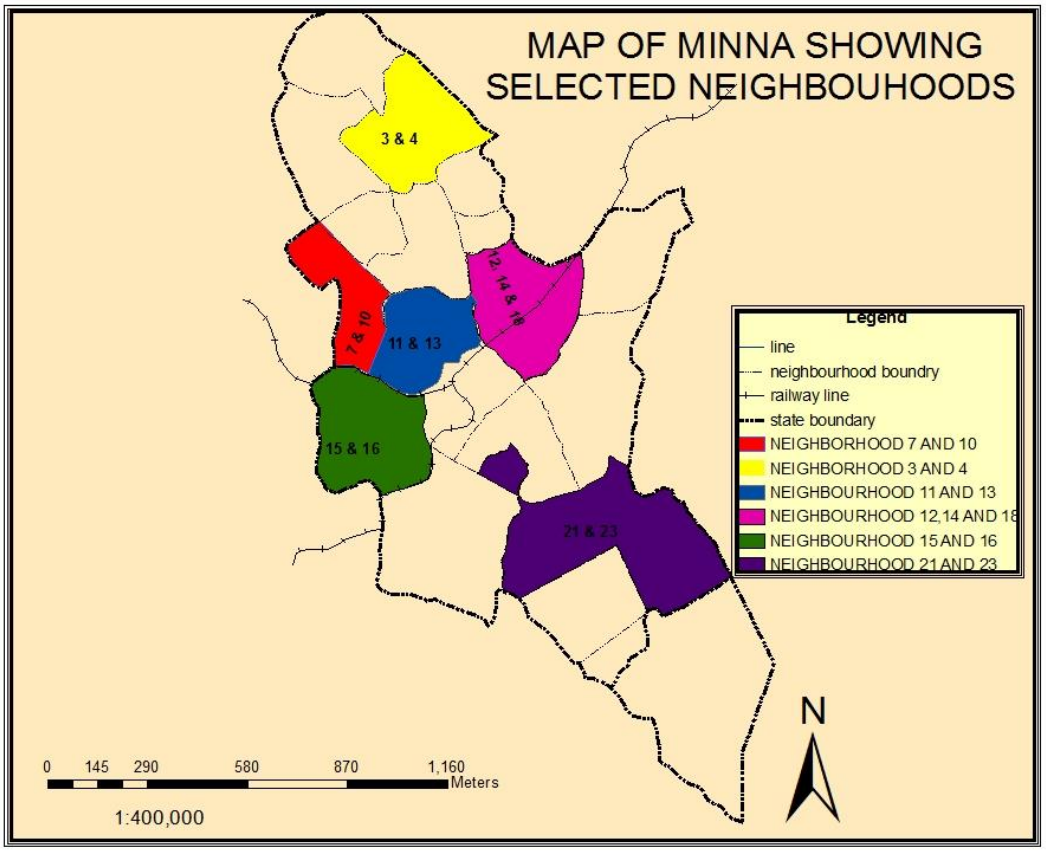


Figure 2: Map Showing Selected Neighbourhood with Informal Activities with colour

RESEARCH METHODOLOGY

The methodology for this research explains the processes involve in the collection of data, the type of data required, and the source where the data are acquired, technique to be used to analyze and present data in order to obtain relevant information that is essential to the impact of informal activities on highway corridor in Minna. A total of 175 structured questionnaires were administered on operators of informal activities in the area under study to indicate among other things, their gender, age educational qualification, type of activity engaged in and monthly income. In addition, a questionnaire was also administered to the development control department of the Niger State Urban Development Board to examine the efficiency of the measures for the regulation of informal activities on arterial roads.

The simple and systematic random sampling method was used in the administration of questionnaire to collect data so as to establish the impact of informal activities on the study

area. The research identified 1758 informal activities along the corridor under study. However, 175 questionnaires were administered which represents 10% of the informal activities in the area. The procedure adopted for data collection for this research work is the primary and secondary sources. Inventory of informal activities was also taken and the Global Positioning System (GPS) was used in taking coordinates of major features and informal activities in the study area.

- Primary data - The study utilizes three data collection methods which include: field survey, direct interview and the use of questionnaire. Primary data was collected directly from the field in their original state by the researcher.
- Secondary data – These are information collected from past research work done by different authors on 'informal activities' and 'highway corridor'. It also includes information from journals, papers and from the internet that are relevant to the research work.

Data collected from the field was thoroughly scrutinized. The data collected was coded and decoded with the use of SPSS. The data were then analyzed using descriptive and inferential statistics. The use of ArcGIS for mapping the informal activities was also employed in the process of analysis. The analyzed data are then presented using pictorial representation of frequency table, percentage, pie chart, and bar chart. There was also the use of maps and plates in the research. There is also the use of statistical analysis to show the relationship between differences.

DISCUSSION OF RESULTS

This chapter examines the nature of informal activities in the area under study, the socio-economic characteristics of the informal sector workers, its impact as well as the efficiency of the regulatory measures put in place for the location of commercial activities along arterial roads.

Data analysis revealed that 63.4% of the participants are females, while the males constitute 36.6%. This shows that females are more involved in the informal sector employment, this also conforms to an earlier findings in the south eastern part of Nigeria by Okeke (2000) as cited by Samson, Emanuel, Peter, Albert (2006) that women tend to maintain employment more, both in the formal and informal sector so as to make ends meet. The study also revealed that the age distribution of majority of the respondents is between 25-44years (60%). This indicates that majority of the operators are young men and women (youths), 10.9% of the respondents are between ages 16-24, while 26.9% are over 45years of age. Further analysis revealed that the education level of the respondents varies. Majority of the respondents which constitute 61.1% acquire education up to secondary school level, while 28% and 10.9% had Primary and Tertiary education respectively. This implies that educational qualification influence the level of involvement of individuals in the informal sector. Hence, it can be said that the informal sector attracts most people with lower education.

The profit obtained per week (income level) of the respondents also varies significantly as majority of the them which constitute 37.1% earn between N10,000-20,000 monthly, 29.1%

earn between N5001-9900, 10.9% earn below N5000 per month, while only 22.9% earn above N20,000 monthly. However, the level of income is dependent on the type of activity involved. Furthermore, 5.7% of the respondents are employed in formal sector and also currently participate in the informal sector; this is in order to supplement income earned in the formal sector, while 94.3% depend on their informal business as sole source of income. The category of informal activities in the area is divided into three (3) which are manufacturing, services and marketing. Of the three, marketing clearly dominates the area with 64.6%, next is the service sector while manufacturing is the least with 15.4%. The spatial attributes comprises of the quality and features of these informal activities on space. The analysis revealed that most of the activities are located on building setback as the operators utilize it to display their products. Also, shops and structures used are located on road setbacks and on walkways leaving the pedestrian with no safe place to use. There is also the problem of on-road parking that reduces the width of the road and results to traffic congestion and causes environmental nuisance. The type of structures used by informal sector workers ranges from kiosks, shops, temporary structures and open spaces. Most of the shops are front attachment to the main building after construction has been completed.

The reasons for engaging in the informal sector is needed to enable Planners know how to provide facilities for the sector and manage their activities better. This is because the research results show that majority of informal sector workers lack the necessary specialized education and skill to enable them obtain employment within the public and private sectors. The survey further revealed that 54.3% of the respondents are in the informal sector activity because they were unable to gain employment into the formal sector and 31.4% are engaged in the informal sector because they do not have sufficient educational qualification to enable them gain employment into the formal sector. 4% are in the sector because they inherited it from family members (mostly parents), 5.1% are in the sector because the income from formal sector they are employed is not sufficient enough to meet basic needs, while 1.1% of the respondents took up informal sector employment because they had been retired from formal (public) sector employment and needed to supplement earnings from their pensions which are not paid regularly. Also, 4% of the respondents are in the sector for pocket money, this group consist mostly students who do not want to fully depend on their parents.

Determining the reasons why informal activities locate within the area where they occur is very important so as to develop better way of managing the activities within the context of urban environment. Analysis revealed that majority of the informal sector workers (which make up 84%) chose their location because of the positive influence it has on sales, 14.3% chose theirs because of the economics of scale they enjoyed, that is, the advantages that a business or group of businesses enjoy by being located in close proximity to each other. The regulatory measure put in place to control the activities of the informal sector workers are not efficient. Based on the interview of member of staff of Niger State Urban Development Board (NUDB), it was observed that they encountered a lot of problems in regulating and managing the activities of the informal sector in the area under study. Some of these problems include:

1. Institutional incapability: The relevant planning and development control agencies experience a number of constrains in carrying out their duties in respect to the management of informal sector activities. These agencies are unable to perform their duties adequately due to lack of funds.
2. Weak enforcement: the enforcement of planning regulations and standard is generally weak. It was noticed that these activities gradually filter into areas where they are not allowed. However, observations from the survey conducted revealed non-compliance and even unawareness by many informal sector workers of the policy that bans street trading in certain areas.

The strategies currently being used for managing and regulating informal sector activities by the Niger State Urban Development Board include information dissemination and checkmating land use conversion. The effects of the informal sector activities cut across several aspects and could be either positive or negative. It ranges from employment generation or creation, to reduction in the width of the road bringing about traffic jam. It also leads to noise generation and environmental pollution among others. The information obtained through oral interview conducted shows that informal workers in most cases face the problem of double taxation by government agencies. The source of water used by majority of the workers in the sector which constitute 49.7% is from well, 14.3% make use of borehole. More so, majority of the informal sector workers within the study area embark on environmental sanitation only once a week, precisely Saturdays, while only 1.7% clean their environment three times a week. This means that the environment generally remains dirty until the following week. The provision of other facilities such as electricity and toilets were also examined, 57.1% of the respondents acknowledge the availability of toilet facility but that the facilities in most cases are inadequate or non-functional, while the remaining 42.9% do not have toilet facility.

The general characteristics and nature of the informal sector activities over the years has tempered with its image and given it a bad reputation. The sector has been noted for its non conformity to planning regulations and standards and general environmental degradation. It is characterized by haphazard location of structures which affects the aesthetic or scenic nature of the neighborhood of which the corridors are not left unaffected. It was also observed during the course of this research that certain practices impacted negatively on the urban environment and inhibits proper functioning of the urban system, they include: waste disposal practices, on-street parking and trading. Furthermore, these activities impair flow of traffic by reducing the width of the road, generate pollution and are nuisance to the environment as a whole.

Locational Status of Informal Activities

Table Showing Locational Status of Informal Activities in the Selected Neighbourhood of the Study Area

	Bosso		Jikpa		Dutse kura gwari		Fadikpe		Kpakungu		Barki – Sale		Tunga		Shango		Minna Central		Limawa		Sabon - Gari		Nassarawa		Angwan daji	
	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	p
Individual	12	80.0	5	83.3	3	75.0	2	100.0	8	80.0	9	90.0	8	88.9	3	100	9	90.0	1	100.0	2	66.7	7	70.0	2	100.0
Group	3	20.0	1	16.7	1	25.0	-	-	2	20.0	1	10.0	1	11.1	-	-	1	10.0	-	-	1	33.3	3	30.0	-	-
Total	15	100.0	6	100.0	4	100.0	2	100.0	10	100.0	10	100.0	9	100.0	3	100	10	100.0	1	100.0	3	100.0	10	300.0	2	100.0

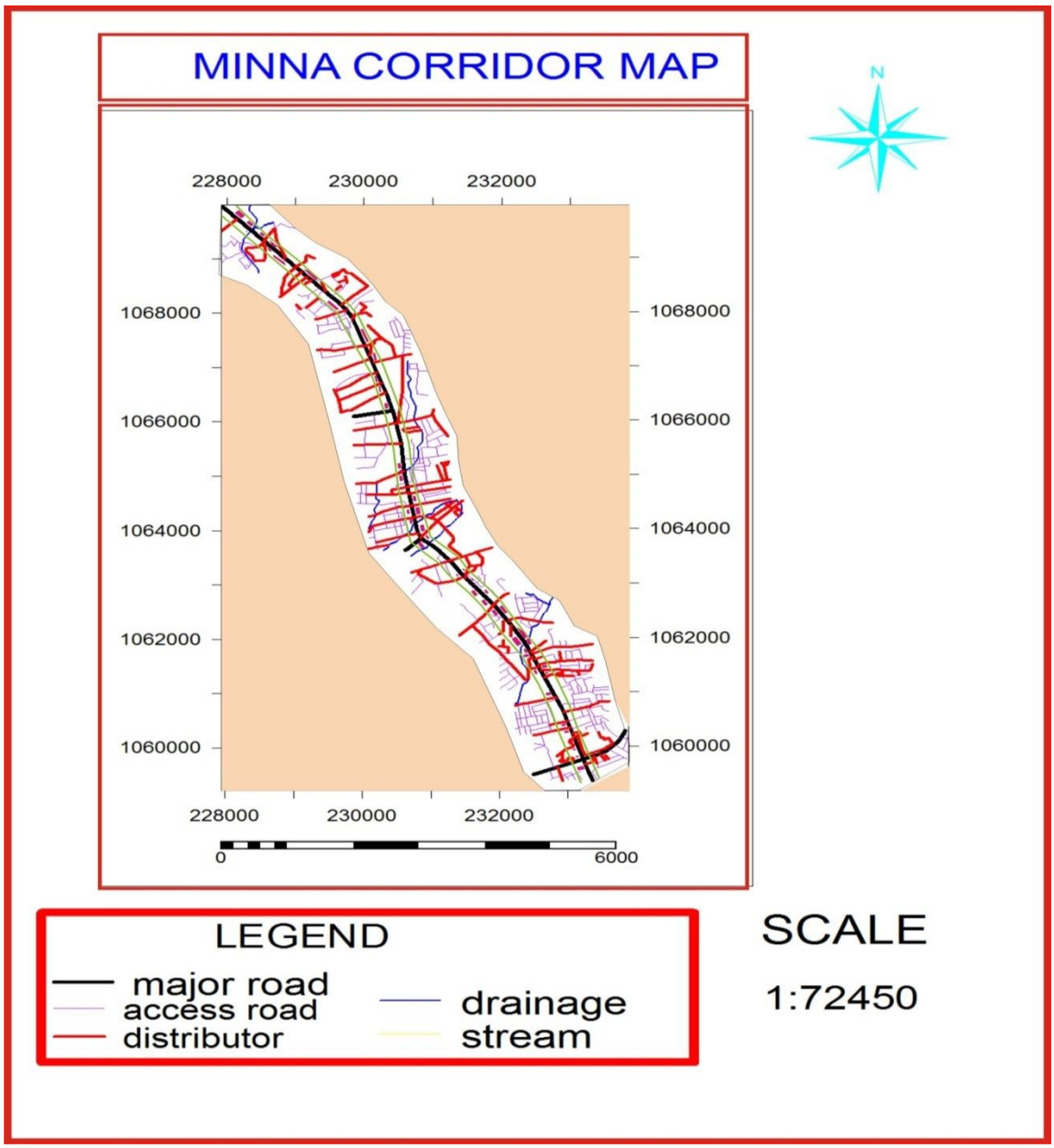


Figure 2 showing informal activities along the road network infrastructure in Minna.

SUMMARY OF FINDINGS

The proliferation of informal sector activities along road corridors and the neighborhood at large needs to be checkmated so as to reduce its potential implications and improve functionality of the environment. The data analyzed revealed the following:

1. The study area is predominantly characterized with informal sector activities with the prevalent category being the informal marketing category that comprises mainly the sale of various goods.
2. Also, a larger part of the corridor has been taken over by informal activities that are not coordinated.
3. Involvement in the sector activities is characterized by a number of factors which include; unemployment, low level of education, to supplement income earn from the formal sector. Others are involved in the sector because the inherited it from family members.
4. Environmental degradation and violation of planning rules and regulations are factors commonly associated with informal sector activities that if unchecked would lead to gradual deterioration of the environment of area where they are present.
5. The study area possesses quite a number of location factors that attract informal sector activities which informs its high intensity. Factors such as positive influence on sale, economies of scale, and the present of informal sector job opportunities influence the presence and intensity of informal sector activities along the corridor.
6. There are operational problems being faced by the Urban Management Boards in charge of the study area such as inadequate man power and inadequate funding.
7. The planning regulatory and management agencies have been developing new strategies to better regulate the informal sector activities in the study area. These include information dissemination, checkmating land use conversion, among others.

CONCLUSION

The study examined the infiltration of urban informal sector activities in Minna highway corridor. As a result, there is a need to checkmate the socio-economic, transportation and environmental implication of these activities on urban landscape, as it is expected that our urban centres will continue to attract the surplus, poor and underemployed labour force from the rural area which will lead to increase in the activities of the informal sector.

RECOMMENDATIONS

To regulate the menace pose by informal sector activities, the following are recommended as means of improving the existing situation of informal sector activities along Minna highway corridor.

1. Hawking and non-hawking areas along the corridor should be earmarked.
2. The provision of simple basic facilities like toilets, water and refuse dump.
3. The activities of the informal sector should be integrated into land use planning.
4. The development control department of the agency responsible for the control of development should step up in its duties without fear or favour.

5. Provision should be made for those businesses that do require location on highway and that cannot be forced into the type of compact development typical of shopping centres. For example automobile workshop.
6. Educating the public/community on the dangers of environmental degradation, the violation of setback standards and other planning regulations and the benefits of an organized environment and the need to preserve or conserve the corridor.
7. Organizing informal sector workers into cooperative societies so as to provide forum to educate them and enable them enjoy government assistance.
8. All regulatory agencies in the country relating to the use of land should be more empowered and adequately funded to meet the challenges of informal sector activities.
9. The provision of micro finance facilities such as loan scheme and other incentives to support identified informal sector activities that have potential of becoming large to the extent of aiding employment generation and boosting national economy.

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GULLY EROSION: VULNERABILITY AND IMPACT-THE WAY FORWARD

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Abstract

Soil erosion is no doubt one of the most predominant and notable environmental hazard in the southeastern Nigeria, especial in Anambra State. Other than the natural processes, several non-responsive human activities carried-out by both the inhabitant and government have culminated in the devastating nature of gully erosion in the area. This study, therefore, examined the vulnerability of gully erosion and its impact on residents of Agulu-Nanka, Anambra State. The quantitative approach to research was adopted; while adapting descriptive and quasi-experimental research design to provide answers to the research questions. The study population is 17,835 households from which 269 were sampled. The data used for the study was gathered from the primary (field survey) and secondary (www.USGS.com) sources. The respondents were selected using a multistage sampling technique (cluster and simple random). The data collected was analysed and integrated using ArcGIS 10.3 and descriptive statistics. The study established that 26% of the land area is fairly vulnerable to gully erosion, 24% is vulnerable, 7% highly vulnerable, while 43% is not vulnerable. The topography, rainfall erosivity and soil erosidibility contribute marginally to the gully erosion vulnerability in Agulu-Nanka. The study also shows that gully erosion has impacted negatively on the social (65%) and economic (76%) wellbeing of the households. Therefore, the study concludes that relief, soil texture properties and heavy rainfall are the drivers of gully erosion in Agulu-Nanka. The study recommends protection of gully erosion prone areas through legislation, development control and good agricultural practices among others.

Keyword: *Erosion, Gully, Impact, livelihood, Soil, Vulnerability*[36]

1.0 INTRODUCTION

Over time, one of the major causes of land degradation in the world has been identified as soil erosion. In the past decades, priority of research has been given to address agricultural issues at the plot scale and thus to rill and inter-rill erosion. More recently, gully erosion has attracted a growing interest from scholars from diverse fields of study as reflected in the submissions of international conferences: one in Leuven, Belgium (Poesen and Valentin, 2003) and one in Chengdu, China (Li *et al.*, 2004). Gully erosion is a form of soil erosion induced predominantly by water; it affects soil productivity, threatens roads, building, human lives and restricts land use development (Le Roux and Summer, 2012). The process of gully erosion encourages deprivation which affects soils in many parts of the world (Frank, *et al.*, 2014). It is a serious form of soil degradation often involving an initial incision into the subsurface, by concentrated runoff along lines or zones of weakness such as tension and desiccation fractures (Rajbhandari,

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et al., 2002). Multiple onsite and off-site effects of gully erosion threaten sustainable development, which is especially evident in dryland environments (Keesstra *et al.,* 2012).

Most parts of Nigeria is facing the threat of gully erosion, especially the southeastern zone of the country. Both humanmade and anthropogenic factors occasion the developments of gullies in the southeastern region. However, the geological characteristics of the gully erosion site and the severity of the multiplier effect of the surface processes are the primary known causes of gully erosion (Singh and Sarkar, 2009). The causes of gully erosion abound in the various academic literature of both developed and developing countries (Adekalu *et al.,* 2007; Ajaero and Mozie, 2011; Ehiorobo and Izyyon, 2012; Akpokodje and Akaha, 2010). For example, Akpokodje and Akaha (2010) asserted that natural processes usually facilitate the development of gullies such as; slope, rainfall, soil texture and properties. Ogboi and Odeh (2012) also suggested that the exposure of bare surface, cultivation of farmland, road construction sites and areas with high building density are prone to gully erosion due to the removal of vegetal cover as a result of road construction, cultivation, and bush burning.

In Nigeria, the menace of gully erosion is more pronounced in the southern part than the northern part of the country. Albert, *et al.* (2006) asserted that the most threatening environmental hazard in the southern part of the country is gully erosion, he further suggested that Anambra state is the most affected state in the country, while Agulu, nanka and Oko communities of the state had been identified as the worst hit (Ezeigwe, 2015; Abdulfatai, *et al.*, 2014). The problem of gully erosion in Agulu-Nanka has remained a local problem for quite some time and is currently gaining attention on an isolated and ad-hoc basis from communities and relevant government agencies at various levels.

1.1 Statement of Problem

Anambra is one of the State in Nigeria that is exposed to different forms of water induce erosion such as sheet, rill and gully erosion. However, gully erosion is the most pronounced form of water erosion in many parts of the state (Okpiliya *et al.*, 2017). Other than the natural processes, several non-responsive human activities carried-out by both the inhabitant and government have culminated in the devastating nature of gully erosion in the area (Abdulfatai, *et al.*, 2014). The beginning of each rainy season is always a nightmare to the inhabitant of Agulu-Nanka, especially for residents living within proximity to the erosion site (Okpiliya *et al.,* 2017). During this period, the incidence of gully erosion is usually accompanied by landslides and mudflow, a situation which results to the loss of ancestral land, agricultural lands, economic trees, homes and in some cases loss of lives.

The threat to human lives, properties, farmlands, settlement, and infrastructure are enormous. Most communities in Anambra State are faced with soil erosion of different dimension, while in some areas the problem has transformed into gully erosion. Gully erosion has attracted the attention of scholars locally and globally. The studies of Okpiliya *et al.*, 2017; Dalil *et al.*, 2016; Ezeigwe, 2015; Abdulfatai, *et al.*, 2014; Ehirim and Ekeocha, 2009; Abegunde *et al.*,

2006 are among the recent effort towards addressing the constant menace of gully erosion in Nigeria. These studies often focus on the causes, control factors and evaluation of the impact of gully erosion, while little or no attention is paid to understanding the vulnerability of gully erosion and identification of factors driving gully erosion in the area.

Having known that gullies like flood cannot be totally prevented from developing, it is important to understand the vulnerability of residents to gully erosion by identifying the factors driving gully erosion in the area. This can be achieved by integrating geographic information system (GIS)/remote sensing with physiographic information for gully erosion simulation. Determining the vulnerability of an area to gully erosion is the first step towards effective mitigation of soil erosion. Hence, this study is an attempt to examine residents vulnerability to gully erosion in

2.0 LITERATURE REVIEW

Concept of Soil Erosion

The word erosion initially came from Latin word to erodere‖ which means to eat away, and to excavate. The process of erosion occurs when the force exerted by the agents of erosion exceeds the resistance provided by the surface on which they act. Soil erosion may be simply defined as the detachment and transportation of soil (Tideman, 1996). According to Brady (1984) no other soil phenomenon is more destructive worldwide than is soil erosion as it involves losing water and plant nutrients at rates far higher than leaching. Indeed it can result in the loss of the entire soil. Soil erosion depends on both, the amount, intensity and duration of forces; as well as the nature and characteristics of the surface. Thus, climate, soil properties, topography along with biotic and anthropogenic factors control and determine the degree of soil erosion (Morgan, 2005).

Empirical Studies on Gully Erosion

Savindra and Prakash (1987) estimated an alarming rate of gully extension, with an average loss of 2.35 million m3 of agricultural soil per year at Jawa Block, Rewa District in Madhya Pradesh, India. It is estimated that the affected area will increase by 50% in the next 50 years. Fan, *et al.,* (2008) stated that the factors leading to the strong gully erosion in the Yuanmou Basin of the Jinshajiang Valley area include the unique geomorphologic configuration, the strong and time concentrated rainfall, the arid–humid alternating climate characteristics, arid and hot climate, and human activities.

Warowna and Schmitt (2010) revealed a substantial impact of human activity on the character and intensity of gully erosion today and in the past. The development of gullies poses a threat to agriculture as well as settlement and transport infrastructure. It causes the reduction of arable land and a fall in yields and leads to the silting of roads and properties. Fan, *et al.,* (2008) showed that the factors leading to the strong gully erosion at Yuanmou Basin of Jinshajiang Valley, China, include the widely distributed Yuanmou group stratum, which promotes the development of gully erosion; the unique geomorphologic configuration that is prone to rockfall and gully erosion; the strong and time-concentrated rainfall; the arid–humid alternating climate characteristics that prepare the ground for the development of fissures in soils; the arid

and hot climate that inhibits the growth and recovery of vegetation; and unreasonable and abusive human activities.

Galang *et al.* (2007) reported that land-use change played an important role in the formation of gullies present today in the Piedmont of the southeastern United States. Lesschen *et al.* (2007) reported that the potentially vulnerable lands in southeast Spain for gully erosion increased for the different scenarios, ranging from 18 ha to 176 ha. Patton and Schumm (1975) showed that a change in land use from forest to agriculture could cause accelerated erosion. This is especially true if other factors, such as slope and rainfall, are conducive to soil erosion. Hu *et al.* (2009) stated that there are significant seasonal differences in gully erosion parameters. The extension of gully area and width dominates in winter and spring without marked net erosion, while changes mainly occur in the gully head and net erosion in the rainy season.

Nyssen et al. (2006) reported that rapid gully development in northern Ethiopia is mainly caused by human-induced environmental degradation. Under the present-day conditions of normal rain and catchment-wide soil and water conservation, gully erosion rates are decreasing. Grab and Deschamps (2004) found that dryland plant invasions around grazing posts and heavily grazed areas on the slopes subsequently spread along alpine hydrological systems, particularly where gully erosion had created a suitable habitat. Cheng *et al.* (2006) measured an average gully length of about 19.6 m ha−1and an average soil loss of 8.8 m3ha−1due to ephemeral gully erosion on the Inner-Mongolia Plateau in northern China. Dirk *et al.* (2000) showed that land use has a significant impact on bank gully head activity in a Mediterranean environment. Wu *et al.* (2007) reported that gully erosion rates were quite high in the black soil region of northeastern China. They estimated that the mean soil losses due to ephemeral gully erosion were between 4.0 and 4.3ton ha–1year–1, and this loss is greater than the tolerable erosion rates of 2.0-ton ha–1year–1. Gully and ephemeral gully erosions are important processes in Dashtyary of southeastern Iran and cause severe damage to agricultural lands. To mitigate runoff and erosion from abandoned land, it is necessary to identify locations that are vulnerable to erosion as based on the primary drivers of gully erosion such as rainfall, slope, length of slope, and soil texture.

Factors controlling water erosion

The main factors, which control the erosion process by water are precipitation, topography of the hillslope, soil properties and vegetation cover (Blanco-Canqui and Lal 2008). The Revised Universal Soil Loss Equation (RUSLE) defines a fifth factor, the support practice factor, which determines the soil erosion process (Wischmeier and Smith 1965). Precipitation is the main driving force for erosion. More intense storms lead to higher surface runoff and soil loss, thus intensity, amount and duration of the rainfall event regulate the magnitude of soil loss. The topography of a hillslope affects soil erosion, as steeper and longer slopes are more prone to surface runoff with high velocity. Additionally, the transport capacity of the runoff increases with slope steepness.

Vegetation intercepts rainfall water and thus protects the soil surface and minimizes the erosive force of the rainfall. Residues on the ground enhance the protective effect as they reduce the

bouncing of the raindrops and increase surface roughness. In general, an increase in vegetation cover leads to a decrease in soil detachment. Hereby, dense and short growing vegetation is more effective than scattered, taller vegetation. Perennial plants protect the soil better than annual crops, which leave the soil bare between to cropping seasons (Blanco-Canqui and Lal 2008). Texture, macroporosity, infiltration capacity and organic matter content are soil properties affecting the soil erosion process. Clay particles are easily transported by the runoff but build strong aggregates, which hinders the detachment of the particles. The interaction of these factors defines the erodibility of the soil (Blanco-Canqui and Lal 2008).

Socio-economic Impact of Soil Erosion

In Anambra state Olife *et al.* (2008) carried out a study on the effect of trace elements in Oba and Nanka towns. Soil samples were collected and analysed through the use of atomic absorption spectrophotometer. The study reveals that the reduction in trace elements in the two communities is as a result of soil erosion. In another study conducted by Ashuma (2005) in Igueben town in Benue state on soil erosion problem. The experimental research design method was adopted for the study; the study reveals that a reduction in soil fertility occasioned by the reduction in the number of microelements in the soil is caused by soil erosion. Wang *et. al.* (2014) observed that soil erosion is currently an important environmental problem with frequent worry facing the entire world. Soil loss and water ensuing has become one of the central cause limiting local economic growth. However, being a familiar form of soil erosion, though not as of broad series of surface erosion, and because of its great quantity of high speed, gully erosion due to its nature, cuts and reduce the gradient into an area of minute sloping, diminishing farmland area causing very severe damage to agricultural production which has become source of river sediment.

3.0 METHODOLOGY

3.1 Nature/Sources of Data Required

The data for this study was gathered from both primary and secondary sources. The primary data collected was basically on the impact of gully erosion and digital elevation model (DEM), while secondary data collected include soil map and rainfall erosivity. The detail description of the data is presented thus

Impact of Gully Erosion: The impact of gully erosion on the resident of the study area was determined from the data collected from the field survey. A well-structured closed-ended questionnaire was administered on the resident to elicit information on the impact of gully erosion on their social and economic lives. A sample size of 269 was derived from a sample population of 17835 households in Agulu-Nanka using Sallant and Dillman sample size formula at 95% confidence level and confidence interval of $\pm$5. Multi-stage sampling technique (cluster and simple random) was adopted for the selection of household for sampling.

Digital Elevation Model (DEM): The digital elevation model of Agulu-Nanka was computed from 90 x 90-meter resolution SRTM downloaded from United State Geographical Science,

from which the DEM of the study area was masked and extracted on ArcGIS 10.3 platform.
Soil texture property/Map: The Harmonized World Soil Database (HWSD) was download from the Food and Agricultural Organization (FAO) website. *The soil map of Agulu-Nanka was then masked and extracted using the mask tool on ArcGIS 10.3 platform. The attribute data of the map was also added to the soil map.*

Rainfall Erosivity: The rainfall erosivity data was sourced from the works of Vrieling, *et al.* (2014). However, for clarity purpose, the process of rainfall erosivity determination will be discussed briefly in the section below.

3.2 Method of Data Analysis

To determine the gully erosion vulnerability in Agulu-Nanka, the RUSLE erosion model was adapted. The gully erosion vulnerability was estimated using the three primary erosion factors, namely: Slope/length of slope (LS), rainfall erosivity (R), and the soil erodibility (K) factor. These three factors according to Lawal *et al.* (2007) are the inherent part of the RUSLE model, while the modifying part includes land cover factor and crop management factor. The equation of the model is expressed mathematically as: $A = R * K * LS$ (1)

Where: R is the erosivity factor derived from annual rainfall data, K is the soil erodibility factor derived from equation 3, and LS is the topographic factor derived from equation (5). The output raster from equation 4 was be reclassified into five classes which range from very high to very low. The data analysis was carried out in ARCGIS 10.3 environment using the following tools: hydrology, map algebra, slope and classification tool.
Furthermore, the impact of gully erosion on the resident was analysed by using simple descriptive statistics (mean weighted value). The impact of gully erosion collected through the use of a likert scale was weighted from 1-5, where 1 represents very low impact, and 5 represent very high impact. The sum of the weighted value was computed and divided by the total response to arrive at the mean weighted value. The closer the index to 1 the less the impact and the closer the index to 5 the higher the impact.

4.0 RESULTS AND DISCUSSION

4.1 Length/Slope (LS) Factor of Agulu-Nanka

The LS factor of Angulu-Nanka varies from 0.000 – 0.0352 (Figure 1). The spatial distribution of the LS factor values is closely associated with slope categories and high elevation exceeding 12.0% rise. The lowest values of the LS factor were mainly concentrated: in the southern part of the study area and along the natural drainage lines. The LS factor depicted in Figure 1 shows that erosion areas are distributed across the study area. Although the majority of the high erosion-prone areas lies within the north and north-eastern part of Agulu-Nanka. The distribution of land area according to the risk of erosion from slope and length of slope is presented in Table 1. The Table shows that 6.09ha of land is at a very high risk of erosion,

while areas of high erosion risk cover 9.74ha. Areas that are fairly prone to erosion risk covers an area of 52.33ha, while areas with low erosion risk from topography cover an area of 236.1ha.

Table 1: Area coverage of Length/Slope

LS_Factor	Area (hectares)	Remark
0.0 – 0.00069	1285.01	Very low
0.00070 – 0.00317	236.1	Low
0.00318 – 0.00815	52.33	Fair
0.00816 – 0.01863	9.74	High
0.01864 – 0.03521	6.09	Very high
	1589.26	

4.2 Soil Erodibility of Agulu-Nanka Soil

The soil erodibility of Agulu-Nanka ranges from 0.0325- .0384 (Table 2). The result as depicted in Table 2 shows that land area with soil erodibility value of 0.0325 covers 42.68ha land area, these areas had very low risk to soil erosion but recorded the lowest land area among other classes of erosion risk. The result also shows that areas with very high soil erosion risk due to K-factor value covers an area of 430.52ha of land. This area recorded the 2nd largest land area among the five classes of erosion risk from K-factor, and this land area is located within the central part of the study area and is depicted in red colour in Figure 2. The result also shows that 472.01ha of the land area has low erodibility value, while 400.59ha has a fair erodibility value. The spatial distribution of soil erodibility in Agulu-Nanka is depicted in Figure 2.

Table 4.6: Soil Erodibility Level in Agulu-Nanka

Erodibility Value	Area (Sq/km)	Remark
0.0325	42.68	Very low
0.0326-0.0360	472.01	Low
0.0361-0.0368	400.59	Fair
0.0369-0.0373	243.46	High
0.0374-0.0384	430.52	Very high
	1589.26	

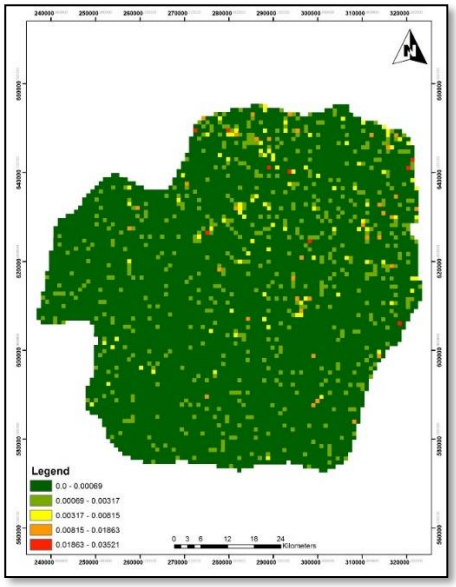


Figure 1: Topographic Factor (LS)

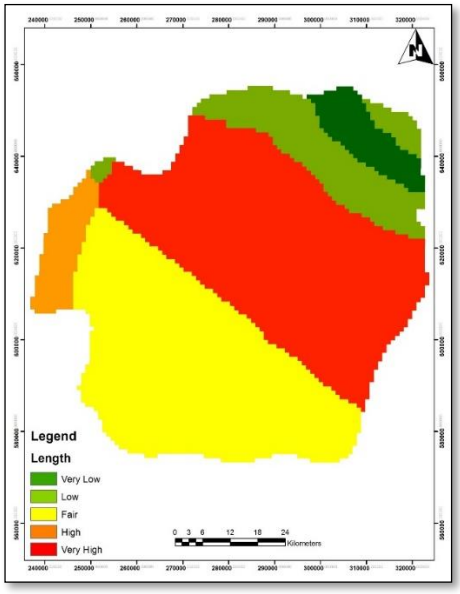


Figure 2: Spatial Soil erodibility Pattern

4.3 Rainfall Erosivity Factor and Erosion-Prone Areas in Agulu-Nanka

The rainfall erosivity index (R) of Agulu-Nanka was extracted from the work of Vrieling *et al.* (2014). The rainfall erosivity raster was reclassified into five classes, and the result is presented in Figure 3. The USLE equation was adapted to identify the area that is prone to gully soil erosion in Agulu-Nanka. The soil erosion risk zones were classified into five categories: very low erosion; low erosion; erosion risk; high erosion, and very high erosion risk areas. Table 4 shows that 111.75ha (7%) of Agulu-Nanka is highly vulnerable to gully erosion risk, while 380ha (24%) of the area is vulnerable to soil erosion. The result shows that 689.51ha (43%) of the area is not vulnerable, while 408ha (26%) of the area is fairly vulnerable. Figure 4 shows the spatial distribution of erosion-prone areas. The result shows that areas that have very high erosion risk are sparsely distributed across the study area. Although, most of the high erosion-prone areas are located in the northern part of the state. These areas are depicted in red. It is important to know that areas that are highly vulnerable to erosion have more tendency of transforming from sheet erosion to rill erosion and finally gully erosion; which can lead to the destruction of arable farmland.

Table 4: Erosion Prone Areas

RUSLE Value	Area Sqkm	Percentage	Remark
0.0 - 0.657	689.51	43	Not Vulnerable
0.658 - 2.518	408	26	Fairly vulnerable
2.519 - 6.023	380	24	Vulnerable

6.024 - 12.594	111.75	7	Highly Vulnerable
Total	**1589.26**		Very high

4.4 Impact of Gully Erosion in Agulu Nanka

The impact of gully erosion in Agulu-Nanka was assessed, and the result is presented in Table 5. The result shows that 76% of the respondents suggested that gully erosion impact negatively on the wellbeing of the people. This manifest in the loss of farmland and economic crops due to gully erosion, which invariably leads to loss of livelihood. The result further shows that 65% of the respondents allude to the fact that the gully erosion affect some social aspect of their lives which
Includes destruction of roads, and heritage site among others.

Table 4: Impact of Gully Erosion

Impact	Frequency	Percentage
Social	175	65
Economic	204	76

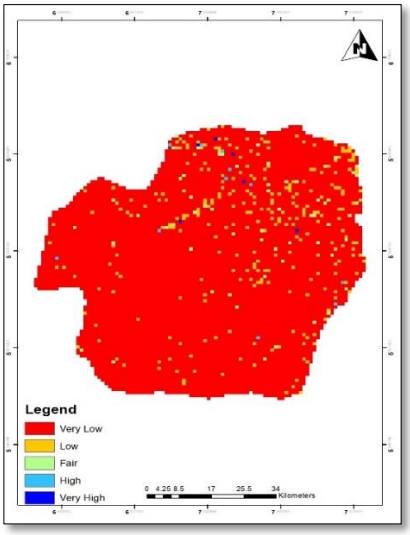


Figure 3: Rainfall Erosivity Factor (R)

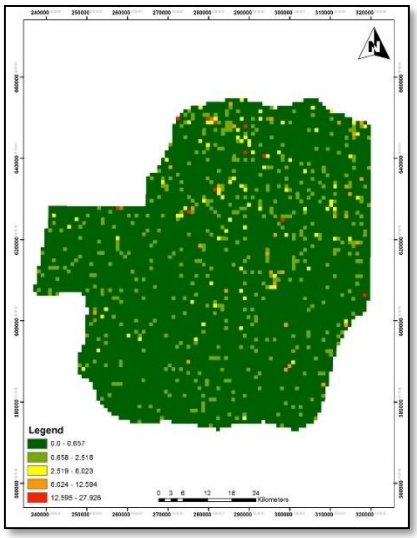


Figure 4: Erosion Prone Areas

5.0 Conclusion and Recommendations

This study is an attempt to understand the level of gully erosion vulnerability in Agulu-Nanka and the impact of gully erosion on the resident. The vulnerability of the residents to gully

erosion was achieved through the use of remote sensing and GIS data. Gully erosion vulnerability was estimated using three factors of erosion namely: Slope/slope length, soil texture and rainfall erosivity. The pattern and distribution of gully erosion vulnerabilittty was derived from the integration of the three components of erosion, while the impact of gully erosion was also evaluated. The results obtained from the study can assist in developing management scenarios and provide options to policymakers for managing soil erosion hazards most efficiently for prioritisation of different areas of the state for treatment. The study also shows that GIS and remote sensing can be integrated to enhance to work of land management personnel in the effective management of land. Therefore the following recommendations were made:

The government and land management agencies should discourage the development of gully erosion-prone areas. This can be achieved through extensive studies on gully erosion vulnerability and impact.

Factors or drivers of gully erosion should also be managed effectively in order to reduce the rate of gully development in Agulu-Nanka. Adequate sensitization should be provided for the residents on the drivers and impact of gully erosion in the study area. The resident should be properly sensitised on the best use for their land in other to avoid land degradation through gully erosion as a result of wrong use of land in the study area.

Town planners, land managers, and other agencies of government and private organisation saddled with the responsibility of land management and development should be trained and introduced to GIS and remote sensing to enhance the efficiency and effectiveness of their job. Adequate awareness should also be provided for personnel of various land management and town planning agencies on the capability of RUSLE, GIS, and remote sensing in land management and planning.

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ASSESSMENT OF SPATIAL CHANGES IN COASTAL ECOSYSTEM AT AMUWO-ODOFIN, LAGOS NIGERIA

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Abstract

The presence of coastal environment - especially wetlands, within any country or state is very valuable because of the numerous socio-economic benefits that can be derived from it. However, different studies conducted shows a gradual disappearance of wetlands and rapid dynamic changes within the lagoon coastal environment. This study investigates into the spatial changes in coastal environment in Amuwo-Odofin area of Lagos State using remote sensing technique. The Landsat image scenes covering the study area of four different epochs (2006, 2013, 2016 and 2018) were used in carrying-out the research, Land Cover Maps, Land Surface Temperature (LST) maps and Normalized Differential Vegetation Index (NDVI) maps of the study area were produced and statistical analysis was carried out on results. The findings of this research show that there has been a considerable decrease in wetlands and increase in land surface temperature and the vegetation quality in Amuwo-Odofin between 2006 and 2013 and followed by a decrease between 2013 and 2018. Relevant Government agencies and other stakeholders are thereby advised to embark on conservation policy for the maintenance of existing zoning pattern.

Keywords: *Urbanisation, LST, NDVI, Remote Sensing, Ecosystem, Coastal Environment*

1. [37]Introduction

Tropical coastal ecosystems include number of wetlands such as mangroves, coral reefs and seagrass beds. The lagoon ecosystems are, however, very valuable because they support a range of significant natural services and biological diversity that are highly valuable to the society (Dahdouh-Guebas, 2002; Anthony, *et al.*, 2009; Alatorre, *et al*, 2011; Costanza, *et al.*, 2014; Liu *et al.*, 2010; Klemas, 2011; Morris, *et al.*, 2002). However, there is alarming global disintegration in the lagoon ecosystems due to increasing population, urban and industrial growth, this has made its wetlands exposed to stress inducing modifications, including dredging and fill activities, fragmentation by impervious structures, hydrologic alterations and pollutant runoff (Klemas, 2010, 2011). Recently, impacts of global climate change on coastal

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wetlands, due to relative sea level rise and increase temperatures has given a considerable concern to coastal researchers (Klemas, 2011; Morris *et al.*, 2002; Dahl, 2005). Human effects on the lagoon ecosystem environment are the product of population, resource consumption, and technology (Ravera, 2000; Gibbs, 2000; McDonnell & Pickett, 1990). In line with the aforementioned factors responsible for changes in coastal ecosystem, there is need to investigate the spatial changes in the coastal ecosystem due to changes in climatic factors and urbanisation in order to minimise the adverse effect on the broad populace. This paper investigates the spatial changes in the ecosystem at Amuwo-Odofin – a suburb of Lagos metropolis for the purpose of establishing the relationship among climatic and socio-economic factors over a period of twelve (12) years.

2. Literature Review

According to Obiefuna, *et al.* (2013), Lagos city has grown from a settlement of about 3.85km^2 in 1881 to a huge metropolis of over 1,183km^2 in 2004 (Obiefuna, *et al.*, 2013). The nature of population growth in some of the local councils around the two lagoons between 1991 and 2006 is reflection of the urbanisation pressure thus consequently straining natural resource and coastal environment especially in areas of highly vulnerable systems such as wetlands (Obiefuna, *et al.*, 2013; Odunuga & Oyebande, 2007).

Besides, Procházka, *et al.* (2011) measured extreme values of temperatures on surfaces lacking vegetation cover or covered with sparse vegetation, in particular. On the basis of satellite data analysis, they also determined the differences between the amounts of vegetation, temperatures and humidity values depending on the type of landscape cover and the stage of reclamation. The study results proved the significant impact of vegetation on the transformation of falling solar energy and the formation of microclimate (Procházka, *et al.*, 2011). Weng, *et al*., (2004) in their research have also discovered that vegetation abundance is one of the most influential factors in controlling land surface temperature (LST) measures through partitioning solar radiation into fluxes of sensible and latent heat and by limiting the proportions of vegetation and ground within a sensor's Instantaneous Field-of-View (IFOV)

The average global temperature has increased by about 1.4^o F (0.8^o C) since 1880, according to the National Oceanic and Atmospheric Administration (NOAA). One of the most immediate and obvious effects of global warming is the increase in temperatures around the world. Since record keeping began in 1895, the hottest year on record worldwide was 2016, according to NOAA and NASA data (NASA, 2017).

2.1 Wetland and Land Cover Mapping

Ecosystems in the tropical coastal region include mangrove forests, swamps, sea-grass beds and coral reefs (Dahdouh-Guebas, 2002). Mangrove forests are one of the common vegetation of the tropical or subtropical intertidal coastal forests that are composed of halotolerant plant species. Coastal vegetation can play a significant role in reducing the severity of natural coastal disaster waves and dissipating the disastrous amount of energy associated with them (Tanaka, *et al.*,

2007; Shuto, 1987). The diminishing in the mangrove vegetation results in adverse effect on the immediate coastal habitant; this effect leads to unprecedented change in the coastal morphology.
The coastal zones. as a result of their incessant increase in population, are currently undergoing rapid, wide-ranging dynamic changes in land cover mostly in tropical countries like Nigeria (FAO 1995; Mas, 1999). These changes in land cover, in particular tropical forest clearing, have attracted attention because of the potential effects on erosion, increased run-off and flooding, increasing CO_2 concentration, climatological changes and biodiversity loss (Myers, 1988). In the recent years, Lagos State as the most populated coastal state in Nigeria and Africa has suffered adversely from the effects of coastal erosion, flooding, inundation and biodiversity loss because of her geometric increase in human population.

2.2 Monitoring Wetland Changes

Mangroves and coastal vegetation cover averagely between 300,000 and 600,000sqkm, respectively and found in the waters of over 100 countries (Dahdouh-Guebas, 2002; Spalding, *et al.,* 1997; Bryant, *et al.*, 1998). Coastal areas and their various wetlands are vulnerable to impacts due to anthropogenic activities, global warming and sea-level rise (SLR) and these factors have serious long-term consequences on the coastal ecosystems – extreme variation in area extent, spatial complexity and temporal variability (Church & White, 2006; Morris, *et al.*, 2002; Klemas, 2011). To study chiefly human induced changes around the coastal ecosystem, most coastal scientists have frequently used a combination of models including watershed models, hydrodynamic models, water quality models and living resource models and these need supplementary datasets like slope and precipitation (Li, *et al.*,2007; Liu, *et al.*,2008; Unger Holtz, 2007). Satellite remote sensing is one of the common and easiest methods that majority of the coastal scientists have employed in studying the changes in the coastal ecosystem because of the several advantages it has for monitoring wetland resources, especially for large geographic areas (Erwin, 2009).

2.3 Study Area

The study area is Amuwo-Odofin one of the local government areas (LGA) in Lagos State, Nigeria (Figure 1). It falls within the metropolitan Lagos which is the largest metropolitan in Nigeria and the area is richly blessed with mangrove and varieties of coastal wetlands (Ayeni, 1981; Ayeni, 2017; Ajibola, *et al.*, 2016). The study conducted by Adegun, *et al*., (2015) shows that the extent of wetlands (inland and coastal) in Lagos metropolis was decreasing from 1965 to 2014. The increase in the extent of urbanisation is an indicative of the conversion of wetlands in the study area to other uses.

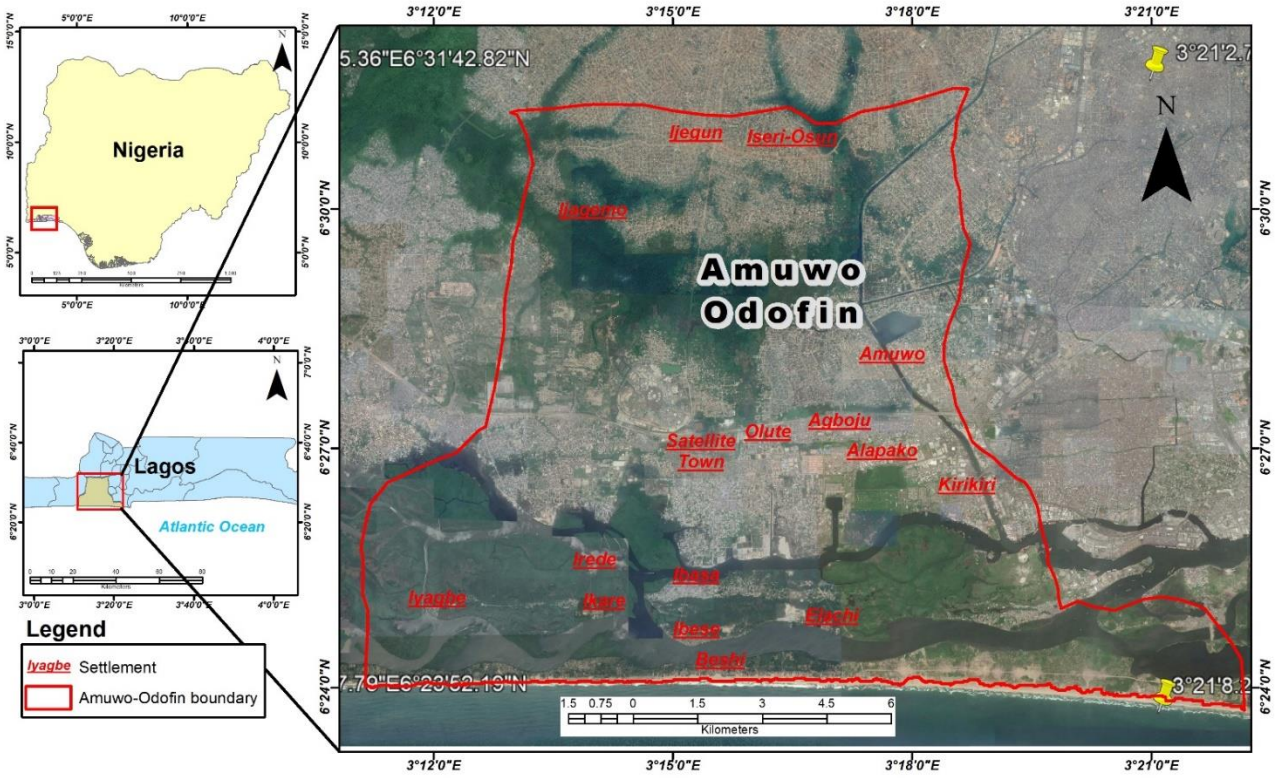


Figure 1: Study Area Map

3. Materials and Methods

In investigating spatial changes in lagoon ecosystem within Amuwo-Odofin Local Government Area, methodology employed comprises two different phases;

- Data Acquisition and Pre-Processing
- Data Processing and Analysis

3.1. Data Acquisition and Pre-Processing.

Table 1 shows the different datasets used in this research for the investigation of the coastal ecosystem changes.

Table 1: Datasets used for the research

S/N	Data Type	Source	Date of Production
1	Digitized Administrative map of Lagos state	DIVA-GIS	
2	Landsat 7 ETM satellite imagery of January 2006 with 30.0m resolution	USGS	2006

3	Landsat 8 OLI satellite imagery of January 2013 with 30.0m resolution	USGS	2013
3	Landsat 8 OLI satellite imagery of January 2016 with 30.0m resolution	USGS	2016
4	Landsat 8 OLI satellite imagery of January 2018 with 30.0m resolution	USGS	2018

In preparing the datasets for robust and analytic process, the detail administrative map of the study area was extracted from Lagos State Administrative map using Gorr procedure (Gorr & Kurland, 2008). The Landsat Imageries acquired are geometrical corrected (USGS, 2018) also radiometric and spatial resolution correction were not necessary (Hall, *et al.*,1991; Jensen & Lulla, 1987; Parece, *et al.,* 2014; Pohl & Van Genderen, 1998). The Satellite imagery was however layer stacked and pan sharpened within a GIS Software environment (ENVI 5.3 Image Processing Software environment).

3.2. Data Processing and Analysis

Using Supervised Classification with Maximum Likelihood algorithm, the satellite imageries were classified into four (5) classes – Vegetation, Bare land, Built, Water Bodies and Wet Lands based on the level of feature detection. The land use and land cover map were produced from the image classifications. Accuracy of image classification was carried out using Accuracy Assessment to ascertain the degree of accuracy.

In order to generate the relative biomass image of the study, Normalized Differential Vegetation Index (NDVI) was used. The NDVI is calculated from these individual measurements as follows (Jeevalakshmi, Reddy, & Manikiam, 2017)

$$NDVI = \frac{(NIR - Red)}{(NIR + Red)} \quad (1)$$

Land Surface Temperature (LST), which is the relative radiative skin temperature of the land surface, as measured in the direction of the remote sensor, was estimated using Top -of Atmosphere brightness temperatures from the infrared spectral channels of a constellation of geostationary satellites (Meteosat Second Generation, GOES, MTSAT/Himawari). The band 10 (Landsat 8 imagery) was used to estimate the LST using the models below Jeevalakshmi *et. al* (2017);

$$L_\lambda = \frac{(L_{max} - L_{min}) * Q_{cal}}{(Q_{calmax} - Q_{calmin})} + L_{min} - O_i \quad (2)$$

$$L_\lambda = M_L * Q_{CAL} + A_L \quad (3)$$

$$BT = \frac{K2}{In\left[\left(\frac{K2}{L\lambda}\right) + 1\right]} - 273.15 \quad (4)$$

Where, all variables are defined as in Jeevalakshmi *et al.* (2017)

The LST raster data for 2006, 2013, 2016 and 2018 were generated as well as the NDVI raster data for the respective epochs. Sixty-Two (62) random points were generated covering the study area, Amuwo-Odofin. The LST and NDVI values for the epochs were extracted to the points respectively.

3.3. Data Analysis and Research Findings

From the research, the Land cover thematic maps for the epochs 2006, 2013, 2016 and 2018 were derived from the multispectral composite of the Landsat 7 and 8 missions. The Land surface temperature maps were generated from the band 10 of the Landsat 8 TIRS for epochs, 2013, 2016 and 2018 while the Normalized difference vegetation index maps were generated from the bands 5 and 4 of the Landsat 8 OLI for same epochs. The Land surface temperature map for 2006 was generated from the band 6 which is the thermal band of the Landsat 7 ETM+ while the normalized difference vegetation index map was derived from bands 4 and 3 of the Landsat 7 ETM+ for same epoch (See Figures 2, 3, 4, 5, 6).

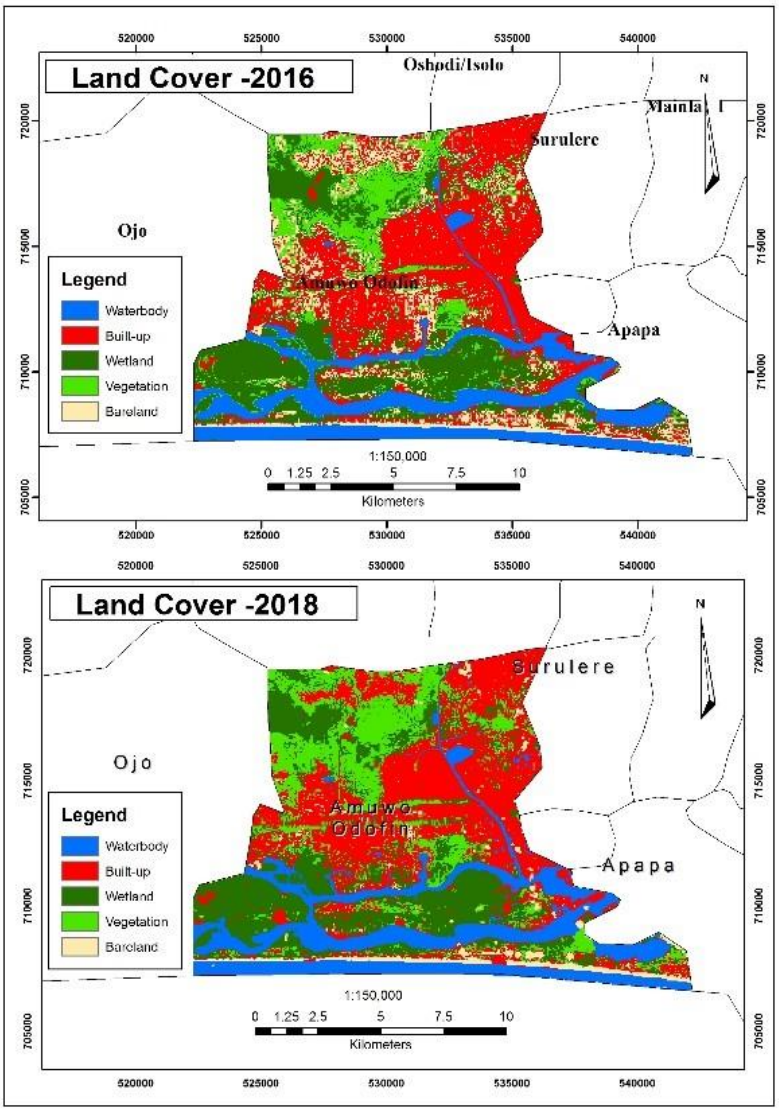


Figure 2: Land Cover for 2006 and 2013 Figure 3: Land Cover for 2016 and 2018

4. Discussion of Findings

As a result of the post-classification of land cover carried out in the study area, all the land cover classes experienced changes within the epochs considered.

Table 2: Land Cover Distribution

	2006		2013		2016		2018	
Land Cover Type	Area (Sq km)	%	Area (Sq km)	%	Area (Sq km)	%	Area (Sq km)	%

Water	26.17	16.7	33.90	21.9	29.42	18.4	30.70	19.3
Built Up	41.62	26.5	46.51	29.2	52.89	33.1	54.13	34.2
Wetland	62.16	39.6	41.60	14.3	40.61	25.4	40.44	25.3
Vegetation	13.51	8.6	13.11	18.2	16.83	10.5	28.55	17.9
Bare Land	13.52	8.6	24.54	16.4	20.10	12.6	6.05	3.4

Table 2 shows the distribution of the land cover classes in 2006, 2013, 2016 and 2018. The variation in the area of waterbody can be ascribed to incessant flooding in the study area. The coverage of built-up class increased throughout the years from 41.62 km^2 to 54.13 km^2 which is indisputably due to the rate of development in the lagoon ecosystem which has attracted a lot of land developers thereby resulting in increased population size.
In the space of 3 years, the wetland has decreased in size to about 40.61km^2 and eventually to 40.44 km^2 after 2 years. The vegetation cover increased over the years is due to the tree planting scheme embarked upon by the Lagos government and this has helped in the reduction of the Land surface temperature, this inference was buttressed by Sun, *et. al.* (2017).

The findings of this research also show that there has been a considerable increase in land surface temperature and the vegetation quality in Amuwo-Odofin as determined between 2006 and 2013 and followed by a decrease between 2013 and 2018 (Table 3). This was carried out by sampling and statistically analysis the LST and NDVI of about 61 different locations within the study area over the periods of study (Figures 8 and 9).

Table 3: Land Surface Temperature and Normalized Difference Vegetation Index

LST	Min. (°C)	Max (°C)	NDVI	Min. Value	Max. Value
LST 2006	21	31	NDVI 2006	-0.09	0.38
LST 2013	24	36	NDVI 2013	-0.06	0.43
LST 2016	24	34	NDVI 2016	-0.04	0.37
LST 2018	17	30	NDVI 2018	-0.05	0.36

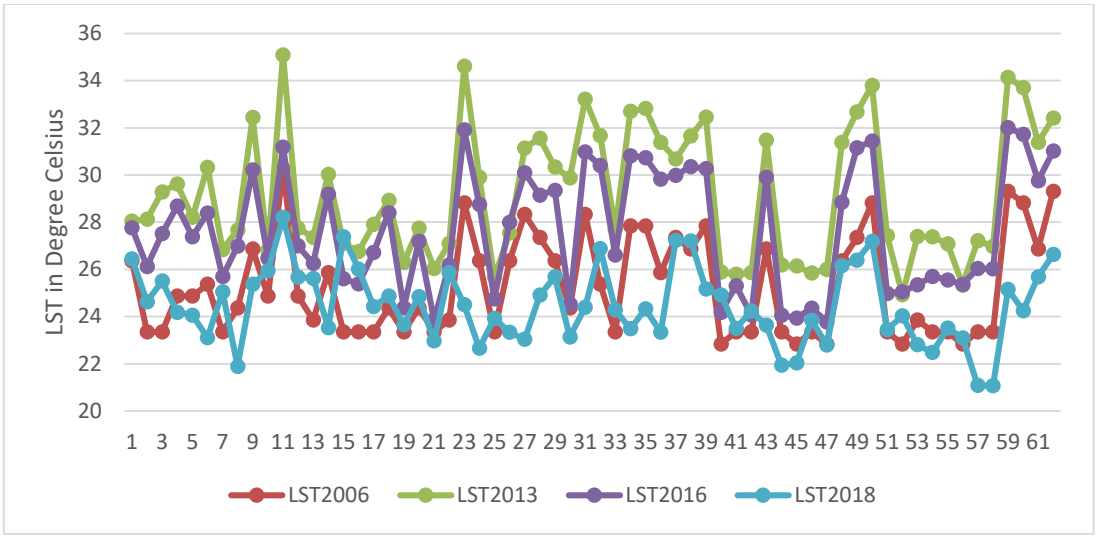


Figure 8: Changes in LST between 2006 and 2018

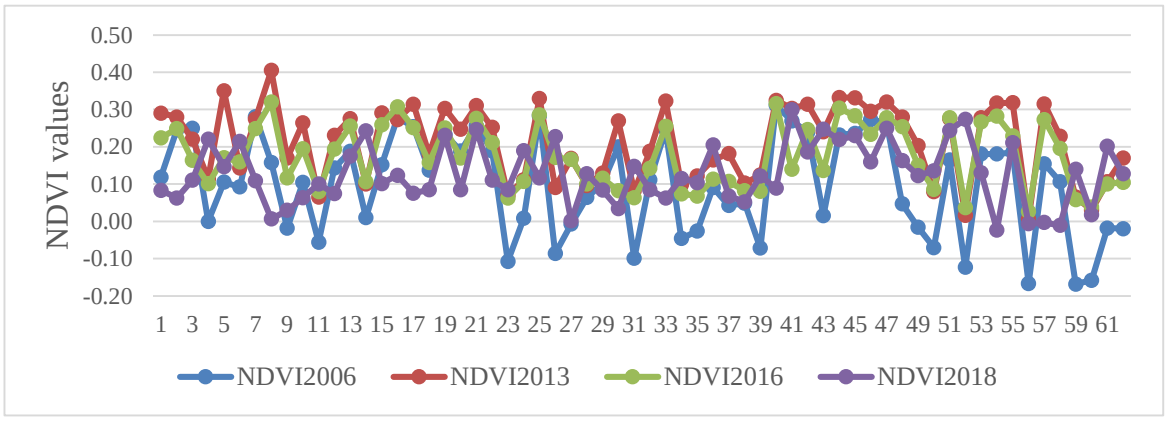


Figure 9: Changes in NDVI between 2006 and 2018

5. Conclusion and Recommendation

This study has investigated spatial changes in the lagoon ecosystem sustainability using remote sensing techniques. Land cover, normalized difference vegetation index and surface temperature studies in this research have provided information on the status of natural and social environment in the lagoon ecosystem, Amuwo-Odofin. From the study, it is obvious that urbanisation processes majorly contributed to land use/cover change and land surface temperature in the ecosystem. It is therefore, necessary that the natural environments be conserved by urban planners and policy makers through policies that support maintenance of

urban land use layout and zoning patterns owing to the tremendous social and economic benefits they offer to man.

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EVALUATION OF THE CONTRIBUTION OF REAL ESTATE-BASED REVENUE TO IGR OF KWARA STATE

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Abstract
Land and landed properties as essential sources of revenue generation have been given less attention by most states and local governments in Nigeria. This is because of the over-reliance of state and local governments on the revenue from the federation account. This research examined the potentials of land and landed properties (real estate) as sources of internally generated revenue (IGR) in Kwara state. The study adopted survey and archival research types. Primary data were collect using structured questionnaires. The major secondary data required for the study were the IGR figures in the state for a period of 8 years and those that are real estate-based. These figures were retrieved from the archive of the Kwara State Internally Revenue Services (KWIRS) and the data were further analysed using descriptive statistics (tables and graphs) and inferential statistics (correlation). The study revealed that there is moderately high correlation (0.71) between IGR and real estate-based revenue (RER. The contribution of real estate-based revenue on the annual IGR of Kwara state for the period under review was found to be 0.72%. This was low considering the abundant land and landed properties in the state and the potentials in real estate-based revenue generation of the state. The study therefore concluded that real estate as sources of IGR have not been properly harnessed in the study area and that the contribution of RER could be increased significantly if effectively tapped into. Based on the findings the members of the public should be enlightened more on the benefits of property tax payment, while the government should ensure transparency and accountability in spending public funds. Adequate infrastructures capable of enhancing real estate values should be provided.

Keywords: *IGR, Land, Land taxes, Landed Property and Real Estate[38].*

1.0Introduction

Nigeria, as a sovereign state, operates a federal system of government with three tiers/levels; the federal, state and local governments. Each tier has defined responsibilities assigned to it by the Constitution of the Federal Republic of Nigeria. This means that each tier of government has roles to play in making life worthwhile for the citizens. The extent to which they can go in accomplishing these constitutional responsibilities depends on their financial capabilities. Due to Nigeria's mono-economy (Solely depends on Oil), most states rely majorly on the revenue

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allocation from the federal government to fulfil their financial obligations. Before the discovery of oil in Nigeria, the provision and maintenance of basic infrastructures and amenities in Nigeria by all tiers of government were mainly through revenue raised from agriculture produce and tax proceeds but the reverse is the case today. Fiscal policies suffers great setback at the mercy of oil proceeds and the subsequent revenue sharing from the federation account which has eaten deeply into the fabrics of the Federal Inland Revenue Services (FIRS), States Boards of Internal Revenue (BIR) and the Local Governments Revenue Committee (Adedotun, 2018). However, the crash of the price of crude oil in the international market since early 2015 has drastically reduced the federal government revenue generation capacity and in-turn the allocation to the states and local government. In 2015, the federal government of Nigeria provides bailout funds to most states including Kwara State as most of these states could no longer meet their financial obligations such as the payment of the wages of the civil servants in these states. These scenarios prompted the government to see the need to diversify the economy hence alternative sources of revenue are required.

Internally Generated Revenue is the revenue that is independently generated by each tier of government within their area of jurisdictions. Roland *et al.* (2016) argued that decentralised units need to be financially sound by having adequate resources either raised internally or obtained from the central government. They further stressed that these decentralised units in developing countries depend mostly on external sources of revenue whereas, internal revenue sources like property rates hold great potentials for reducing the dependence. Kiabel & Nwokan (2009) earlier affirmed that the need for state governments to generate adequate revenue from internal sources has become a matter of extreme urgency and importance.

There are various sources of internally Generated Revenue (IGR) available to each state as stipulated by Decree No. 21 of 1998 now Act Cap 12 LFN. 2004, wherein, taxing landed properties is found to be one of the most reliable alternatives for raising funds internally. The term “real estate” is used to described land and everything above and below the soil (The Complete Real Estate Encyclopedia, 2007). It is often used interchangeably with property. Therefore, the attraction of real estate as a tax-base lies both in its value and its various uses that are capable of generating taxable opportunities. According to Onyike (2017) land is probably the most important resource for human development. He refers to land as being tangible, immobile, heterogeneous, durable and inelastic in supply and that the characteristics of land predispose it to providing opportunities for wealth creation and exploitation and render it suitable for taxation. Ezeudu (2017) observed that real estate taxation has been neglected in Nigeria despite its stable and immense revenue yielding potentials to all tiers of government. Real estate taxation provides dependable source of government finance in European countries especially the United Kingdom and other advanced countries of the world.

The need for the state government to look for alternative sources of generating revenue necessitated the Kwara state government to establish a virile revenue collection body, Kwara State Internal Generated Revenue Service (KWIRS) in 2015 through the Revenue Administrative Law. That was signed into law on 22nd June, 2015, to be the sole agency and to replace the then Board of Internally Revenue, saddled with the responsibility of collecting revenue on behalf of the Kwara State Government as a way of cushioning the effect of a drastic fall in its monthly allocations from the Federation Account. This paper examines the performance of and trend in real estate-based revenue (RER), compared with the internally generated revenue (IGR) of Kwara State for the period under assessment. The objective of the study would be to identify the various approved sources of revenue in Kwara State and those that are real estate based, examine the trends in real estate taxes collected from 2010-2017, measure the level of significance of these tax proceeds against the revenue generated and examine the factors militating against efficient real estate based tax mobilisation in the study area.

1.2 Study Hypothesis

The Null and Alternative hypotheses (H_0 and H_1 respectively) that would be verified are: There is no statistically significant contribution of real estate-based revenue (RER) to IGR of Kwara State (Null hypothesis) and that there is statistically significant contribution of real estate-based revenue (RER) to IGR of Kwara State (Alternative hypothesis).

The findings of this study will inform the government at various levels on the performance and the potential benefits of real estate-based revenue sources vis-à-vis their roles in boosting the internally generated revenue of the state if efficiently administered.

2.0The Study Area

Kwara state (Fig. 1) is known as the state of harmony. It is located in the north-central geopolitical zone of Nigeria covering a total land mass of around 32,500km and has a total of 16 Local Government Areas including Asa, Baruteen, Edu, Ekiti, Ifelodun, Ilorin East, Ilorin

South, Ilorin West, Irepodun, Isin, Kaiama, Moro, Offa, Oke-Ero, Oyun, and Patigi (see Fig. 1). The state shares a boundary to its West with the Republic of Benin and has as its Northern boundary, the Niger River. As of 2006, the population of Kwara state was 2.37 million based on 2006 Census. This population constitutes about 1.69% of the Nation's total population growth and socio-economic development. The state has a projected total population of 3,003,625 in 2014 based on 2006 National Census figure using annual growth rate of 3.0%. Using the same growth rate, the 2018 population projection of the State is estimated at 5,706,887 (Adedotun, 2018). The state is hugely involved in agriculture and the principal crops are cotton, cocoa, coffee, Kolanut, Tobacco, Benseed, and Palm produce. However, the production of these is not maximized in the state. Mineral resources found in Kara State are Limestone, Marble, Feldspar, Clay, Kaolin, Guartz and Granite Rocks. Important tourist attractions in Kwara State include Esie Museum, Owu Falls, Imoleboja, Rock, shelter among others. A number of companies have also set up operations in Kwara State. Some are primary industries such as a major national producer of flour, others are in soap, detergents and pharmaceuticals, and there is a furniture factory that has been restored so well that it is now regarded as one of Nigeria's top companies. A significant investment came to fruition in June 2009 when Jebba Paper Mills started rolling again. This facility is the only producer of Kraft paper in the whole of the ECOWAS region. Cashew processing and motorcycle assembly are other companies that are rapidly expanding the variety – and scope – of Kwara State's manufacturing capacity. Sectors in which Kwara hopes to attract investment include; Agriculture, Agro-processing, Minerals, Manufacturing, Industry, Education, Infrastructure, Property, Tourism.

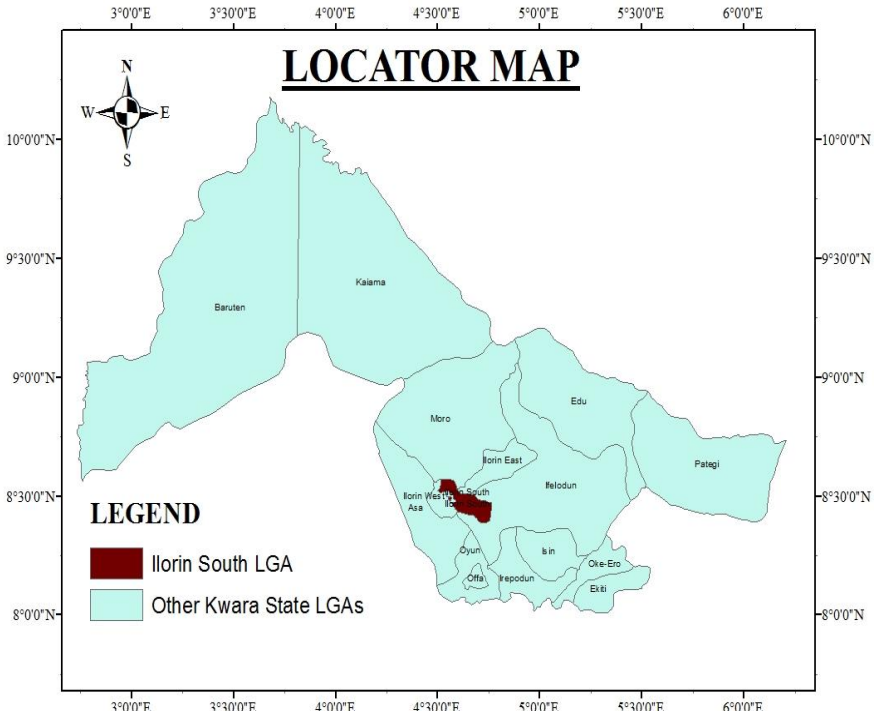


Fig. 1: Kwara State showing the study

3.0 Literature Review

Often many people think of land as only the surface of the earth. But land is substantially more than that. According to Charles (2006), land starts at the centre of the earth, passes through the earth's surface, and continues on into space. He then defines real estate or real property as land and the improvements made to land, and the rights to use them. Land is conceivably the most essential resource for human development. The unique attributes of land such as immobility, tangibility, heterogeneity, inelastic in supply and durability makes it susceptible to providing opportunities for wealth creation and exploitation and also cause it to be fit for the purpose of taxation. This is because land is tangible and unmovable and cannot be hidden from the tax authorities. Returns from real estate activities can also be taxed by the government to generate revenue since the revenue generating opportunities of land exist in, on and above the land as proven by various land uses which yield taxable returns. Land based taxes as sources of revenue to the government are often overlooked. This is due to the fact that over the years, most local and state government in Nigeria have been relying heavily on federal government revenue

allocation hence; real estate or property taxes are often neglected as important sources of revenue generation. The various forms of property taxes according to Oyegbile (1996) and Fatimilehin (2003), include the followings: Capital Transfer tax, Capital Gains Tax, Tenement Rate, Withholding Tax, Neighborhood Improvement Charge, Value Added Tax, severance tax, site value rating, Estate fee/ Probate tax, Betterment taxes, Value Added Tax, and Property rating. Capital Transfer Tax (CTT), Stamp duty Consent Fees, Title Registration Fees, Capital Gain Tax/Profit Tax, betterment levy, Planning Rates, Tenement Rates, Land Use Charge (a charge payable annually on the value of all real properties The Land Use Charge Law, No. 11 of 2001 (now Lagos Land Use Charge, 2018)

In literature, real estate taxation has not worked very well in most developing countries. However, there are varied explanations presented on the poor performance of real estate taxes in developing countries. Many have attributed the low contribution of real estate taxes to the limited capacity of the local authorities to mobilise these taxes while some blamed it on the behaviour of local politicians. However, not all these explanations are fully convincing as they are based on different and often conflicting assumptions. Adekunle (n.d.) reported that real estate tax is an essential source of raising revenue for local government services in both developed and developing countries. Real estate taxation gives local governments the power to manage the distribution of the tax burden across various property classes within their jurisdiction in addition to determining the size of the overall tax burden on taxpayers (Bird and Slack, 2002). It has therefore been accepted as an administrative tool that provides financial autonomy to local governments for decentralisation. Property taxes are the oldest and the most prevailing form of taxation which are usually referred to as local taxes because the accrued revenues are often used to fund local government activities. A country's constitution will normally establish basic taxation power. In most developing countries, the power to tax rests with the central government. However, all or a portion of the real estate tax revenues are allotted to the local governments. The local governments may be authorised to set tax rates, to decide which properties are to be taxed and to grant tax exemptions and relief beyond that provided for in the National legislation. This is often because the local governments are closer to the tax payers and will be able to determine this more efficiently. Almy (2001) reported that real estate or property taxes are considered particularly appropriate for local government. In many countries, according to Almy (2001), local governments receive all or most of the property tax revenue even when the central governments alone possesses the power to tax property. He however noted that there are argument for allocating a portion of the property tax revenue to the central governments for reasons that having a direct fiscal stake in the property tax gives the central government a stronger reason to ensure that the law is administered properly and uniformly, and it would likely provide adequate funding for property tax administration and have stronger reasons to compel local governments to perform their responsibilities properly. He further cited countries like Albania, Armenia, Bulgaria, and Lithuania that grant little or no discretion to local governments over property tax rates. Onyike

(2017) opined that In Nigeria, the revenue needs of the government can be met through the various land based generating opportunities in the country which exist in various land uses ranging from built up land to Agricultural land, Range land and wildlife, Forest land, and Wetland. Most of the various land uses are capable of generating taxable revenue. The emphasis today is on diversifying the sources of Government revenue to be able to curb the various crises created by over-reliance on crude oil and on the federation account by various states and local governments.

3.1 Challenges of Real Estate Taxation

Nuhu (2008) stated that no perfect policy exists due to challenges in human endeavours. He observed that Nigeria tax system is generally overwhelmed with numerous challenges, such as Non availability of tax statistics, Multiplicity of tax, poor tax administration, regulatory Challenges, structural problems in the economy, and corruption among others. Muhammed and Bala (2013) outlined the challenges facing Property taxation to include but not limited to the following:

i. **Assessment and valuation inconsistencies:** Determining the appropriate rate of tax most times requires expert opinion and usually this is not available. Very skilled personnel are needed to carry out this activity. This greatly affects the accuracy of collected data. Lack of skilled manpower leads to under-valuation thus reducing government's revenue, while over-assessment results into disputes which may delay payment of property taxes.

ii. **Illiteracy and Ignorance:** This has over time been seen as a major hindrance to the collection of property taxes. To a great extent, affected individuals either do not see a need/importance of it or they do not know anything about it.

iii. **Legal documents:** The statutory nature of property taxation makes it necessary to be provided with appropriate legal documents or aiding laws to back up its activities. Most times these documents either are not in existence in the region or they fall short of some provisions. To ensure successful property taxation in the state tax laws need to be either created or modified to fit present day activities.

iv. **Attitude of the Tax Payer and Taxing Authority:** No one wants to pay tax to the government on the protest that they do not know what the tax is used for. However they

still need public facilities to be supplied to them. Tax needs to be taken more seriously in terms of accountability and transparency at both collection point and how it is used.

v. **Defective Policies:** Most times especially in developing countries, governments operate on policies inherited from the western world which to a great extent are not workable in these environments. All proposed policies should go through a thorough scanning to detect loopholes. Most importantly the stakeholders should be carried along from the formation stage up to the implementation level.

vi. The absence of appropriate appeal machinery which hinders the performance of any tax policy. This often denies the tax payers of their right to seek redress. Where the tribunal is set-up, they have been found to be ineffective.

vii. **Lack of Political Will:** Despite the potential of property tax as the most lucrative local tax for urban local government, it is extremely prone to political interference and corruption. The reason is that, the tax would tend to fall most heavily on wealthier property owners (given progressive rates) who normally are more politically active. Therefore, strong political commitment and capacity building for key political functionary are essential if the property tax is going to have public credibility (Tomori, 2003).

4.0 Methodology

This section discusses the population of study, data types and sources, method(s) of data collection, data analysis and techniques. The research is a combination of survey and archival types of research, therefore, the information and data required were retrieved from the archive of the Kwara State Internal Revenue Service (KWIRS) and the primary data obtained from the staff of KWIRS in the property section. The study population is the agency responsible for mobilizing and collecting all forms of taxes in Kwara State; the Kwara State Internal Revenue Service (KWIRS). The sample size 72 made up of the land officers of the Kwara State Bureau of Lands and selected staff in the property section of the KWIRS. The two types of data adopted in this research are Primary and secondary data. The data (primary and secondary) and information required to achieve the stated objectives are collected from the archive of the KWIRS. Also personal interview with the tax administrative officers of the institution was employed. Secondary data were also collected from relevant E-copies and hard copies materials such as textbooks, Journal reports, conference papers and lecture notes related to the project. Data collected are presented and analysed using both descriptive and inferential statistics. The descriptive statistics includes the use of tables, graphs, as well as charts. Inferential statistics (correlation and simple linear regression analysis) are used to determine the contribution of real estate-based revenue (RER) on the Internally Generated Revenue (IGR) of the state.

5.0 Results and Discussions

5.1 Approved taxes/levies in Kwara state and those that are real estate-related

Kwara state government generates revenue internally to supplement the allocation from the federation account. These sources are basically in the form of taxes, levies, fees or charges of various kinds. Real estate-based revenue is often derived from tenement rate, land related charges, fees or levies collected by the state government.

Table 1: List of approved taxes/levies for collection by the Kwara State Government

S/No.	Approved Taxes
1.	Personal Income Tax: (i) Pay-As-You-Earn (PAYE) (ii) Direct (Self and Government) Assessment (iii) Withholding Tax (Individuals only)
2.	Capital Gains Tax
3.	Stamp Duties (Instruments Executed by Individuals)
4.	Pools Betting, Lotteries, Gaming and Casino
5.	Road Taxes
6.	Business Premises Registration and Renewal Levy
7.	Development Levy
8.	Naming of Street Registration fees in state capitals
9.	Right of Occupancy fees in State Capitals

Source: Kwara State Inland Revenue Services (KWIRS) website (www.irs.kw.gov.ng)

The approved form of taxes which serve as veritable sources of revenue for the state are presented in table 1 above. According to the KWIRS, the revenue sources of the state are further grouped into four headings viz: Corporate, Informal sector, MDAs and Property. The focus of this research is on real property or real estate as a source of revenue in the state. The real estate and land-related taxes or charges approved and collected in the state are shown in table 2.

Table 2: Approved real estate-based levies/charges for Kwara State Government

S/No.	Levy/Charge/Fee
1.	Land Charge
2.	Tenement Rate
3.	Premium on Land Allocation
4.	Application fee
5.	Registration of Documents
6.	Valuation Vetting Fees
7.	Subsequent Transaction Approval
8.	C of O Processing Fee
9.	C of O Certified through Copy
10.	Regularisation Fee
11.	Caveat Emptor Fee
12.	Compensation/ Development Fee
13.	Acquisition Logistic Fee
14.	Land Infrastructure Charges
15.	Change of purpose fee
16.	Re-certification of certificate fee
17.	Sales of application Forms
18.	Earnings from Allocation new layouts
19.	Earnings from Mass Titling
20.	Infrastructure Charges
21.	Capital Gains Tax
22.	Tax Clearance on Land Processes

Source: Bureau of Lands, Kwara State, 2018

Table 2 shows the various forms of levies, charges and fees connected to land and landed properties in the state. The study revealed that tenement rate, which by the provisions of the Constitution of the Federal Republic of Nigeria, is to be administered and collected by the local governments in the state has been taken over by the Kwara State government. Further enquiry was made to find out whether there is a sharing formula in place to share the proceeds of the tenement rates between the state and local governments. The finding revealed that there is no sharing formula presently. One major reason for the takeover was that, major and capital intensive infrastructural projects in the state's local governments are been executed by the state government.

5.2 Trends in tax revenue collected and the proportion or contribution of real estate-base taxes/levies from 2010 to 2017

This section summarises the revenue from real estate taxes, charges, fees and levies as retrieved from the archive of the Kwara State Inland Revenue Services (KWIRS). This is to enable the researchers measure the trend in the total internally generated revenue (IGR) of the state and the contribution of real estate-based taxes or levies. The research intended to collect data for 10 year period but the figures for the first two years were not available to the researchers during retrieval. Hence, the 8 year data was considered good enough to make inferences.

Table 3: IGR and the corresponding real estate-based revenue (RER) for the period of 2010 to 2017

Year	Total IGR for the period (₦)	Total contribution from Land-Based Taxes/Levies (₦)
2010	7,295,348,963.22	48,164,658.69
2011	8,816,657,944.50	68,926,327.53
2012	11,317,269,384.36	50,491,541.01
2013	13,838,085,972.51	96,306,236.40
2014	12,460,517,954.55	79,799,166.46
2015	7,178,922,182.76	96,675,041.75
2016	17,779,686,990.86	105,566,874.00
2017	19,988,283,964.45	118,575,017.74

Source: KWIRS, 2018

Table 4: Changes in IGR and real estate-based revenue (RER) and contribution of RER on IGR for the period under consideration (2010-2017)

Year	IGR	RER	Change in IGR	Change in RER	% change in IGR	% change in RER	% contribution of RER to IGR
2010	7,295,348,963.22	48,164,658.69	-	-	-	-	0.66
2011	8,816,657,944.50	68,926,327.53	1,521,308,981.28	20,761,668.84	20.9	43.1	0.78
2012	11,317,269,384.36	50,491,541.01	2,500,611,439.86	-18,434,786.52	28.4	-26.7	0.45
2013	13,838,085,972.51	96,306,236.40	2,520,816,588.15	45,814,695.39	22.3	90.7	0.70
2014	12,460,517,954.55	79,799,166.46	-1,377,568,017.96	-16,507,069.94	-10.0	-17.1	0.64
2015	7,178,922,182.76	96,675,041.75	-5,281,595,771.79	16,875,875.29	-42.4	21.1	1.35

2016	17,779,686,990.86	105,566,874.00	10,600,764,808.10	8,891,832.25	147.7	9.2	0.59
2017	19,988,283,964.45	118,575,017.74	2,208,596,973.59	13,008,143.74	12.4	12.3	0.59

Source: Author's field work, 2018

Table 3 shows the Internally Generated Revenues (IGR) and real estate-based revenue (RER) of Kwara State from 2010 to 2017 as retrieved from the Kwara State Internal Revenue Service (KWIRS). Table 4 further analysed these figures to establish the changes in both revenues and the annual contributions of LBT to IGR. The analysis shows that the IGR of the state for the period under consideration increased steadily for the first three years (2010 to 2013) but dropped by about ₦1.4 billion from 2013 to 2014 (see the 4th column of table 4). More significantly, the IGR of the state fell by ₦5.3 billion from 2014 to 2015 and this can be attributed to the disruption in the activities of the organisation when it was reformed in 2015. Thereafter, IGR rose appreciably by over ₦10 billion in the subsequent year and afterwards. Changes in RER did not follow entirely the same trend as IGR. The values of RER fell drastically in 2012 and in 2014 compare to the preceding years respectively. The reason alluded to the fall in 2014 was the transition witnessed in the agency.

Furthermore, the proportion or percentage contribution of RER to the IGR of Kwara state is less than 1% annually (see the 8th column of table 4). Although RER contributed about 1.35% to the IGR of the state in 2015, the annual contribution is found to average 0.72% for the period under assessment.

5.3 The contribution of real estate-based revenue to the internally generated revenue of the state for the period under assessment.

The preceding section discussed the proportion of IGR that accounted for by land based taxes from 2010 to 2017. The analysis revealed that RER contributed about 0.72% to the IGR of Kwara state annually. In this section, further analysis is carried out to find out if this contribution is statistically significant. Regression analysis was used to analyse the relationship between RER and IGR and the impact of RER (independent variable) on IGR (dependent variable). The dependent variable is internally generated revenue while the independent variable is real estate-based revenue. The result of the regression analysis as analysed with SPSS version 16 is presented in table 5 below.

Table 5: Regression analysis result

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
	.710[a]	.504	.421	3.58945E9	.504	6.099	1	6	.048

a. Predictors: (Constant), Real Estate-based Revenue

Source: Computed from table 3

Table 5 shows the regression analysis result. From the table, the Coefficient of Correlation (R) is 0.710. This shows a fairly strong positive correlation between IGR and RER for the period under consideration. The R-Square, also known as the coefficient of determination, is 0.504. This shows that about 50.4% of the variations in IGR are explained or accounted for by the relationship between RER and IGR while 49.6% are due to other factors.

5.3.1 Verification of Hypotheses

The following hypotheses have been formulated and are tested:
Null hypothesis (H_0); there is no statistically significant contribution of real estate-based revenue to the IGR of Kwara State and the Alternative hypothesis (H_1); there is statistically significant contribution of real estate-based revenue to the IGR of Kwara State"
The null hypothesis is verified to take a decision and reach a conclusion.
The null hypothesis (H_0) is interpreted as meaning that the contribution of the RER to IGR is not statistically significant while the alternative hypothesis (H_1) states that it is statistically significant. This is a two-tailed test since the alternative hypothesis is non-directional.

The sample is a small one hence t-test statistic is used.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Using the values in table 5.0 above

$t = 0.71 \times \sqrt{8-2} / \sqrt{1-0.71^2} = 2.47$

At a 0.05 (two-tailed) level of significance (i.e. 95% confidence level), the calculated value is greater than the table value of 2.36. That is, 2.47 > 2.36.

Decision: Since the calculated *t-value* falls in the critical region of a normal distribution curve, we reject the null hypothesis in favour of the alternative hypothesis.

Conclusion: There is statistically significant contribution of real estate-based revenue to the internally generated revenue of Kwara State.

5.4 Factors militating against efficient real estate-based revenue mobilisation in Kwara State

The preceding analyses revealed that the coefficient of correlation between RER and IGR is 0.71, indicating that a moderately high positive relationship existed between the two variables. In terms of the contribution of RER to the IGR, the analysis revealed that RER contributed only about 0.72% to the annual IGR of Kwara State. This means that, Kwara state has not tapped the potential of RER to raise it IGR through revenue from land and landed properties within the state. The revenue from land and landed properties has not been on consistent increase. It was in 2011 and 2013 that the state recorded a significant rise in RER (see table 4). The study therefore further enquired to identify the challenges confronting RER mobilisation in Kwara State and the findings presented in table 6. The study examined the perceptions of the tax officials in the Kwara State Internal Revenue Service (KWIRS) regarding the identified factors. A likert scale was used to measure their responses and the results summarised in the table. The following likert scale was adopted: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree and 5 = strongly agree. The mean
responses are present on the fourth role of the table 6.

Table 6: Factors militating against efficient real estate-based revenue mobilisation in Kwara State

Statistic	Inadequate trained/staff personnel	Corrupt practice among Tax Administrators	Excess Tax Exemptions which is capable of reducing Tax Proceeds	High Rate of Tax Exemption Avoidance in Kwara State	Inconsistency in Tax Rate	Illiteracy and Ignorance of the Tax payers on the relevance of Property Taxes	Delay Payment of Tax Due by Tax Payers	Defective/Improper Implementation of the Existing	Logistic Problem	Tax Payers believe that tax collected are not being utilised judiciously by the government
N Valid	69	72	71	70	71	72	71	72	72	72
Missing	3	0	1	2	1	0	1	0	0	0
Mean	2.14	2.06	2.34	3.93	2.76	4.04	3.86	3.06	3.40	4.49
Std. Deviation	1.309	1.232	1.041	1.081	1.127	1.106	1.234	1.086	1.391	1.035
Variance	1.714	1.518	1.084	1.169	1.270	1.224	1.523	1.180	1.934	1.070
Skewness	.655	.868	.759	-.847	.368	-1.433	-1.367	.226	-.181	-2.199
Std. Error of Skewness	.289	.283	.285	.287	.285	.283	.285	.283	.283	.283
Minimum	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5

Source: Authors' field survey, 2018

Table 6 shows the identified challenges likely to impede efficient RER generation in the state. These range from inadequate trained personnel, corrupt practices among tax administrators, to tax payers' lack of trust in the political leaders. A careful view of the table reveals that the tax officials agreed that the following are the major factors militating against efficient land-based tax mobilisation in Kwara State:

i. Tax Payers believe that tax collected are not being utilised judiciously by the government,
ii. Delay Payment of Tax Due by Tax Payers,
iii. Illiteracy and Ignorance of the Tax payers on the relevance of Property Taxes, and
iv. High Rate of Tax Exemption Avoidance in Kwara State

The average mean score of the responses for these factors is 4 (that is 'agree').The researchers however observed that the coefficients of skewness of these factors are negative and standard deviation moderately high. This shows that respondents' responses concentrated on the high side; agree or strongly agree. Tax officials do not see factors such as inadequate trained/staff personnel, corrupt practice among tax administrators, and excess tax exemptions as important constraint to revenue generation through land and landed properties.

6.0 Conclusion and Recommendations

Real estate-based taxes have been reported and proven to be the most stable source of revenue to all tiers of government. This has been attributed to the permanent and fixity nature of land and landed properties. This study revealed that revenue from real estate-based taxes account for 0.72% of the annual internally generated revenue of Kwara state. Responsible for the low real estate-based revenue are the major challenges facing the state's revenue mobilisation authority, KWIRS. This study identified these challenges to include delays in the payment of taxes/rates, lack of awareness on the benefits of property taxes, and high rate of tax exemption and avoidance in the state.
The study further revealed that the agency responsible for administration and collection of taxes in the state (Kwara State internal Revenue service) lacks professional Estate surveyors and valuers among the staff. High rate of tax exemption was also found to be a factor responsible for low RER generation in the state. Whole lot of land based revenue generated opportunities are not being exploited by the state government.

6.1 Recommendations

This study revealed RER contributes less than 1% to the annual Internally Generated Revenue of Kwara State. This is low considering the abundance land and landed properties in the state. It follows that real estate taxes are not properly harnessed. Based on the research findings, the following recommendations are made:
Members of the public should be enlightened on the benefits of real property taxation. Various forms of public awareness like radio and television advertisements, placing stickers on private and commercial vehicles, bill boards, and holding press briefings should be employed to complement the existing public awareness programmes.
This study noted that basic infrastructures are grossly lacking in the state. This has often led to the questions as to what is the revenue from taxes are been used for? Thus taxpayers are reluctant to pay property taxes and invariably lead to delays in paying taxes and in most cases evading taxes. The government should therefore ensure transparency and accountability in spending public funds by providing adequate infrastructures such as good roads, drainages, security, and water.

Kwara State Inland Revenue Service lacks adequate trained Estate Surveyors and Valuers. In most cases property values are determined arbitrarily that often discourage taxpayers willingness to fulfil this vital constitutional obligation. More professional Estate surveyors and valuers should be employed to bring in people with professional knowledge and skills with regards to real estate taxation.

The study also noted the problem of double/multiple taxation. Various charges, fees and levies are being imposed on same property. These charges should therefore be harmonised to eradicate double or multiple taxations.

Furthermore, religious properties by virtue of the enabling property tax law are exempted from property taxation. As obtained in the advanced world, these types of properties are also exempted but "Pay in Lieu of Taxes" (PILOT) principle usually applies. PILOT is a kind of arrangement whereby users of these properties voluntarily pay certain amount of money, say annually to support the government in providing and maintaining public infrastructure and services such as road, water, security, and electricity.

Finally, there is need reform the relevant laws and regulations to strengthen real estate tax administration in the state.

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CHILD POVERTY MAPPING: TOWARDS EFFECTIVE CHILD POVERTY REDUCTION

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Abstract

Poverty is not a respecter of gender nor age; it is a problem that affects male and female, and people of various age group alike. However, women and children are more susceptible to poverty compared adult. Poverty manifest in children in many forms; through lack of access to sanitation, education, health, water, food, and shelter among others. This study, therefore, seeks to analyse child poverty in Minna, using a multi-dimensional approach; with a view suggest possible ways of ameliorating child poverty menace in the study area. The study adopts the exploratory and descriptive research design which involves survey and observation. The study population is 54, 141 households within the 24 neighbourhoods of Minna, while the sample size is 386 households. The study area was delineated based on neighbourhood boundary, while households were randomly selected for sampling within each of the 24 neighbourhoods. A total of 321 questionnaires were returned completed, while the data was analysed using descriptive statistics and multi-dimensional poverty measurement approach developed by Alkire and Forster (2007). The study established that multidimensional child poverty headcount in Minna is 50.9%, while 28.7% only experience child poverty from a uni-dimension. The intensity of child poverty in Minna is moderate (0.52), while Minna does not experience child poverty (0.29). However, neighbourhoods level result shows that thirteen neighbourhoods experience medial child poverty while two neighbourhoods experience acute child poverty. The study concludes that child poverty dynamics varies across spatial units as can be seen at neighbourhood level. Hence, attention must be paid to the spatial disparities that exist within the city if child poverty must be drastically reduced. Therefore, the study concludes that a concerted effort must be put in place to enhance the adequate provision of necessities for sustainable development.

Keywords: *Access, Child Poverty, Indicators, Multi-dimensional Poverty Index, Sustainable development*[39]

1.0 INTRODUCTION

Evolving a universal definition of poverty is a difficult task; the question of how best to define poverty has been at the centre stage of economic development debate since world war II. The traditional concept of poverty has been described based on resource deprivation and analysed using monetary indicators. In recent time, the concept of poverty has shifted towards a broad definition of multidimensional deprivation where poverty is seen from the broader lens of non-economic deprivations (Sumner 2004; Baschieri & Falkingham 2007). The shift from the traditional concept of poverty to the multidimensional approach translates to the emergence of

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new empirical measurement approach as well as policies and programmes. A typical example is the multidimensional poverty measure by Forster and Alkire (2007), while the Sustainable Development Goals (SDGs) by the United Nations General Assembly and Nigeria's National Poverty Eradication Programme (NAPEP) are among the poverty reduction policies and programmes developed at International and local level.

Despite the unprecedented progress achieved in poverty reduction within the last three decades, children account for a significant proportion of the world's poorest people (United Nations Children's Fund (UNICEF) and Global Coalition to End Child Poverty (GCECP), 2017). Children make up one-third of the population of developing countries, of which 50% (385 million) are income poor (UNICEF/GCECP, 2017). This is an indication that children are the most affected by poverty in developing countries of which Nigeria is not an exception. According to UNICEF (2015) one out of every eight children in the OECD countries is growing in poverty accounting for about 30 million children. One of every three children in the developing world lacks access to basic sanitation, and one of every five has no access to safe drinking water (UNICEF, 2009).

Although child poverty is more prevalent in low-income countries, it is a global challenge that affects both developed and developing countries. UNICEF (2013) stated that 54% of Nigerians live on less than 1 dollar per day, going by this statistics, it is evident that significant proportion of children from poor households may experience child poverty due to their reliance on parents for essential goods and needs (Ashworth *et al.*, 2003). Child poverty in Nigeria manifests in many ways such as poor access to education, quality water, healthcare facility, food and security. Child poverty is not a problem that is peculiar to the rural areas; the urban areas also enjoy a fair share of the problem (Umukoro, 2013). Child poverty in urban areas can be seen through the lens of street hawking, Almajiri system, and child abuse, among others. While in rural areas, child poverty manifests in the form of the absence of basic goods and services such as water, healthcare and low school enrolment, to name a few.

1.1 The Statement of Research Problem

In the last three decades, quite some studies have been conducted on child poverty using different methodologies and measurement approach (Forster et al., 1984; Summer, 2004; Adetola and Olufemi, 2012; Rufai, et al., 2016). The earlier studies conducted by (Forster et al., 1984; Summer, 2004) measured child poverty through the narrow lens of income. Despite the importance of income in child poverty assessment; it has been criticised on numerous grounds. The monetary approach to child poverty does not account for the social, physical and emotional effect of poverty on the children. For example, the nutrition of a child can affect both the education and health of the child, which can, in turn, affect the long-term development of the child.

The criticism of the monetary approach led to the development of the multidimensional poverty methodology. More recently, the multidimensional approach has been adopted among other methods by scholars and international organisations in poverty assessment. The multidimensional poverty index (MPI) is the most widely adopted approach to

multidimensional poverty assessment; this method accounts for the breadth, depth and severity of poverty. In Nigeria, only a few studies have adopted the use of MPI to child poverty estimation (Adetola and Olufemi, 2012; Rufai, et al., 2016). However, these studies do not account for the spatial disparities in child poverty; thereby providing aggregated information on child poverty. Accounting for the spatial disparities in child poverty regarding the breadth, depth and severity of child poverty is essential for effective child poverty policy and programmes development and implementation. Therefore, there is a need for child poverty data disaggregation to account for the spatial disparity for effective child poverty reduction through the use of Geographic Information System (GIS) tools.

Investing in children and reducing child poverty is a prerequisite for sustainable economic and social development (Sanfilippo *et al.* 2012). Hence, the importance of child poverty reduction can never be overemphasised. Reducing poverty and insecurity which are the hallmark of the challenges bedevilling many parts of the country requires proper child poverty estimation that will lead to the development of child poverty reduction policies and programmes. Eradicating child poverty is not only about child poverty measurement; it is also about identifying the location of the poor child. This study provides information on the dimensions of poverty experienced by children in Minna, which will aid the implementation of child poverty reduction in this direction. The breadth, depth and severity of child poverty were also accounted across the spatial unit of Minna. The spatial disparity in child poverty among the neighbourhoods by dimension, breadth, depth, and severity was also accounted for to understand the peculiarity of child poverty across the spatial units. The findings of this study provide the necessary tool for the development of policies and programmes as well as the implementation of child poverty reduction strategies in Minna.

2.0 LITERATURE REVIEW

Ngeutse, Tegoum and Hevi (2009) conducted a study on the extent of household and child poverty using multi-criterion analysis (MCA) in Cameroun. Five (5) non-monetary indicators derived from the third multiple surveys were used which included nutrition, access to potable water, health, education and lodging while multidimensional household poverty was accessed using accessibility to water, hygiene, patrimony, lodging and level of education of household head. The hierarchical classification models constructed from the MCA was used to identify non-poor and poor households. The study established that child poverty is occasioned by child health as against the household which is dependent on the comfort of the household to which the child belongs. The trend analysis of multidimensional child poverty was carried out by Plavgo *et al.* (2013) using DHS data of 2000, 2005, and 2011 in Ethiopia. The MODA method was adopted to define the thresholds, while the extent of deprivation among children was determined using nutrition, health, water, sanitation, housing and information. THE MPI developed by Alkire and Foster (2007) was employed as an analytical tool for child poverty estimation. Comparative analysis of child deprivation headcount ratio and household poverty index revealed that household poverty level is not a determinant of child poverty in the rural areas.

Landiyanto (2013) employed the use of multiple cluster survey (MICS) data for assessing the multidimensional poverty in Papua. Similarly, MPI was used as an analytical tool, while the indicators of child poverty were defined using the Bristol approach. The study established that the children suffer almost all dimensions of deprivation. However, some children fall within the middle, fourth and richest quintile that were not recognised as poor based on the asset index that was deprived in some of the child poverty indicators. Adetola and Olufemi (2014) assessed the determinant of child poverty in rural Nigeria using the multidimensional approach. The data used were sourced from the Demographic and Health Survey, 2008 data. Children under five years were the focus of the study. In all, a total of 4,543 children were sampled. A single step Multiple Correspondence Analysis (MCA) was carried out to generate weights for five dimensions of safe drinking water, sanitation, housing, health and nutrition adopted in the study. Like the previous studies, MPI was used to determine multidimensional poverty profiles of the children. When the poverty cut off K=1, 52% of the children were multidimensional poor as against 27.9% poor when k=3. These imply that when children are deprived in at least one dimension, 52% are multidimensional poor. The health and sanitation dimensions had the highest relative contribution of 38.54% and 22.58% respectively to the overall multidimensional poverty index.

Furthermore, Rufai, *et al.* (2016) also assessed child poverty in rural Nigeria. This study investigates the extent of poverty among under-five children in rural Nigeria and its distribution across household wealth status. The study used the 2013 DHS data. The Alkire and Foster counting approach was used to generate poverty profiles among the children while descriptive statistics were used to assess their distribution. The results revealed a significant level of poverty among the children and poor children were found in all classes of household poverty. The study recommended that specific policies targeting deprivations suffered by children should be used to address child poverty.

2.3 Summary

The existing studies on child poverty show that multidimensional child poverty is gradually gaining more attention within Nigeria and the world at large. However, majority of these studies relies on secondary data collected Demographic Household Survey data which are usually streamlined to the mission of the survey. Extant review of literature also shows that a significant proportion of the studies focus on children between the age of 0-5, which is against the United Nations definition of 0-18 years. This implies that a large proportion of the children are mostly not accounted for in the child poverty assessment. The study also shows that information on child poverty is mostly aggregated and conducted in rural areas, therefore making it difficult to identify the location of the poor child. Disaggregating child poverty data to a smaller spatial unit of neighbourhood or district will enhance the quality of the data and as well aid effective implementation of child poverty eradication measures/strategies. Therefore, this study attempt to map child poverty dynamics regarding dimension, breadth, depth and severity in Minna, Niger State.

3.0 METHODOLOGY

A) The scope of the study

The study was conducted within the geographic boundary of Minna. Minna according to Owoyele (2014) has a total of 24 neighbourhoods which forms the basis of analysis for the study. Five indicators were used to determine multidimensional child poverty in Minna which include education, water, housing, communication, and sanitation as adapted from Alkire and Forster (2007). The study focused on establishing the dimensions of child poverty, breadth, depth, and severity of child poverty experienced in Minna.

B) Type and Source of Data

The data used were sourced primarily from the field using the open data toolkit (ODK). The data collected include household information on education of children (years spent in school, number of school-age children out of school), water access (availability, location, distance, and time spent), housing quality, household sanitation (availability of toilet, location of toilet, shared toilet facility), as well as availability of communication and information gadget e.g. television, radio, phone, internet service.

C) Sampling Procedure

The unit of measurement for the study is the household. Therefore, the projected number of households in Minna was derived from the National Census of 2006 at 3.6% growth rate and a base population of 201429. The project projected population of Minna in 2018 is estimated at 324846, while the average number of households is 54141 using the national average household size of 6 persons per household. The sample size is 321 using Sallant and Dillman sample size formula at 95% confidence level and confidence interval of 5. Multistage sampling technique was adopted; the study area was divided into twenty-four cluster using neighbourhoods, while households were randomly selected from each cluster for questionnaire administration. The number of questionnaires administered within each cluster is determined by the ratio of the cluster population to the total population of the study area.

D) Analytical Technique

The data collected were analysed using descriptive statistic, Multidimensional approach by Alkire and Foster (2007) and Mapping using symbology for gradient mapping in ArcGIS 10.3

I) Descriptive Statistics

The descriptive statistics was used to provide a general background for the study using frequency, percentage, mean, minimum and maximum.

II) Multidimensional Poverty Index

The multidimensional poverty index was developed by Alkire and Forster (2007) to measure poverty from multidimensions. The method has been widely adopted because of the advantage it posses over other multidimensional poverty measures by accounting for the depth and severity of poverty. The formula for determining the poverty headcount is

$$H = \frac{q}{n} \text{.....equation (1)}$$

Where H is the poverty headcount; q is the number of persons deprived and n is the total number of people in the cluster. The poverty headcount is otherwise known as the breadth of poverty.

The intensity of poverty which is otherwise known as the depth of poverty is expressed mathematically as: $A = \frac{\sum k}{N}$…….equation (2)

Where A is the intensity/depth of poverty; $\sum k$ is the sum of deprived persons, while N is the total population. The multidimensional poverty is expressed mathematically as the product of poverty headcount and the intensity of poverty:

M = H x A……Equation (3)

The dimensions and cutoffs is presented in Table 1.

The three broad dimensions of the assessment was weighted equally. Hence education, health, and living standard is weighted 1/3 respectively. The sub-dimensions were weighted based on a number of subdimensions of the broad dimension. Health has two subdimensions and each subdimension carries a weight of 1/6, education has no subdimension and therefore maintains the weight of 1/3, while living standard has 4 subdimensions weighted 1/12 respectively.

Table 1: Child Poverty Indicator and Dimensions

Dimensions		**Indicators – a child is deprived,**	**Weight**
Health	Immunisation	If the child hasn't been immunised before the age of 2 or does not have access to a health facility.	1/6
	Sanitation	If a child uses unimproved sanitation facilities (pit latrine without slab, open pit latrine, bucket latrine and hanging toilet) or shares toilet with other families.	1/6
Living standard	Housing	If a child lives in a household with inadequate flooring (dung. Sand or dirt floor) or inadequate roofing or overcrowded in a room (more than 4 or more persons in a room).	1/12
	Safe Drinking Water	If it takes up to 30minutes for a child to get water or use unsafe water sources (surface water, open wells).	1/12
	Information / Communication	If a child does have no access to radio or television, Phone.	1/12
	Cooking Fuel	If a household cooks with tradition fuel (firewood, sawdust, charcoal or animal dung)	1/12
Education	School attendance	Within the age of 6-17 years not attending school or hasn't completed primary education.	1/3

Table 1: Dimension and Indicators

Source: Adapted from the UNICEF Global Study on Child Poverty among developing countries (2011).

4.0 RESULT AND DISCUSSION

4.1 Child Poverty Headcount

The poverty headcount in Minna by neighbourhoods is presented in Table 2. The result shows the poverty headcount of children who are deprived of a single dimension compared to those that suffer deprivation from multiple dimensions. The result shows that Bosso town (38.2%) had the highest proportion of children that suffer from a single dimension of deprivation. Limawa (37.2%), Sauka-Kahuta (36.3%), Sabon Gari (36.1%), and Makera (35.2%) were among the five neighbourhoods with the highest proportion of children suffering from a single dimension of deprivation. Table 2 also shows that the average deprivation from a single dimension in Minna is 28.7%, while GRA (3.9%), F-layout (12.7%), and Bosso estate (18.9%) had the lowest poverty headcount from a single dimension.

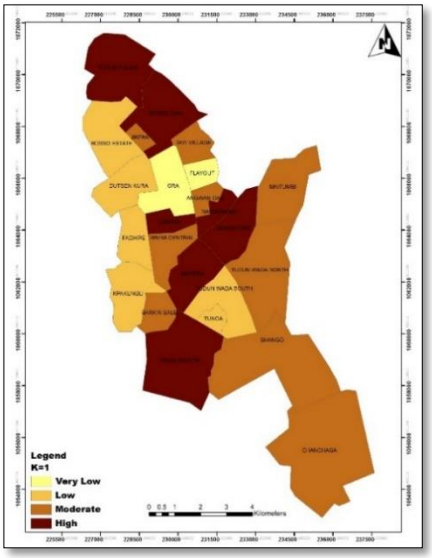
Poverty headcount from multiple dimension is also depicted in Table 2. The result shows that 50.9% of the children in Minna suffer from multiple deprivations. Multiple deprivations in Minna by neighbourhoods range from 8.9% in GRA to 72.4% in Kpakungu. Neighbourhoods with a high proportion of children that suffers multiple deprivations are: Barkin Saleh (69.3%), Tudun Fulani (64.3%), Maitumbi (63.4%), Tayi Village (61.8%), Jikpan (61.5%), Limawa (61.2%). In GRA (8.9%) and F-layout (25.1%) children that suffer multiple deprivations are less than one-third of the population. Furthermore, the child poverty headcount was classified into four classes of very low, low, moderate and high using Jenks classification method. The result of the classification for single deprivation and multiple deprivations is depicted in Figure 1 and Figure 2 respectively.

Table 2: Poverty Headcount by Dimension By Neighbourhoods in Minna

Neighbourhoods	K=1	K>2
Angwan Daji	32.2	59.7
Barkin Saleh	30.6	69.3
Bosso Estate	18.9	37.8
Bosso Town	38.2	47.5
Chanchaga	26.5	56.6
Dutsen Kura Gwari	21.3	49.5
Fadikpe	23	42.3
F-Layout	12.7	25.1
GRA	3.9	8.9
Jikpan	31.8	61.5
Kpakungu	24.5	72.4
Limawa	37.2	61.2
Maitumbi	31.4	63.4
Makeera	35.2	57.4
Minna Central	30.2	53.9

Nasarawa	33.6	54.1
Sabongari	36.1	57.8
Sahuke Kahuta	36.3	56.2
Shango	30.9	54.2
Tayi Village	27.5	61.8
Tudun Fulani	33.4	64.3
Tudunwada North	27.3	38.1
Tudunwada South	22.2	33.2
Tunga Low-cost	21.8	36.7
Minna	**28.7**	**50.9**

Figure 1 shows that Tudun Fulani, Bosso town, Barkin Saleh, Limawa, Makeera, Sabon Gari, and Nassarawa had a high proportion of children who suffer Uni-deprivation while only GRA and F-layout had a very low proportion of children that suffer from a Uni-deprivation. Nine neighbourhoods recorded a moderate proportion of children that suffer from a single deprivation; these neighbourhoods are: Maitumbi, Chanchaga, Shango, Tayi village, Jikpan, Minna central, Angwan daji, Kpakungu, and Tudunwada north, while other neighbourhoods had low poverty headcount of unidimensional deprivation. However, Figure 2 shows that four neighbourhoods had high multiple child poverty headcounts, these neighbourhoods are Tudun Fulani, Kpakungu, Barkin Saleh, and Maitumbi. GRA and F-layout had very low proportion of children who suffer from multiple child deprivation, while multiple child poverty headcounts in Fadikpe, Bosso town, Bosso estate, Tunga, Tudun wada north and south is low. The intensity of child poverty and the multidimensional child poverty index is presented in Table 3.



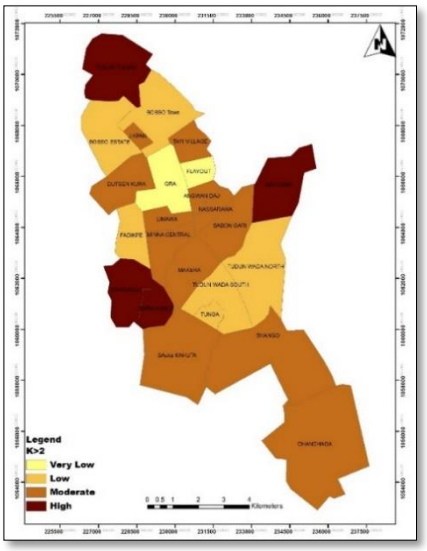


Figure 1: Uni-Dimensional Deprivation **Figure 2:** Multiple Dimension of Deprivation

The result shows that the intensity of child poverty in GRA (0.03), F-layout (0.15) and Bosso estate (0.20) is low, while the intensity of child poverty in Tunga (0.32), T/wada north (0.31), T/wada south (0.34), and Fadikpe (0.47) is moderate. The result also shows that a high intensity of child poverty is experienced in other neighbourhoods of Minna.

The multidimensional child poverty index is computed using the 30% (0.30) benchmark. The result shows that nine neighbourhoods do not experience child poverty (non-poor) with multidimensional poverty index (MPI) of less than 0.30. These neighbourhoods are Bosso estate (0.08), Bosso town (0.27), Dutsen Kura (0.28), Fadikpe (0.20), F-layout (0.04), GRA (0.00), T/wada north (0.12), T/wada south (0.11), and Tunga lowcost (0.12).

Table 3: Intensity and Multidimensional Poverty Index in Minna

Neighbourhoods	Intensity	Remark	MPI	Remark
Angwan Daji	0.53	High	0.32	Medial
Barkin Sale	0.76	High	0.53	Acute
Bosso Estate	0.20	Low	0.08	Non-Poor
Bosso Town	0.57	High	0.27	Non-Poor
Chanchaga	0.62	High	0.35	Medial
Dutsen Kura Gwari	0.56	High	0.28	Non-Poor
Fadikpe	0.47	Moderate	0.20	Non-Poor
F-Layout	0.15	Low	0.04	Non-Poor
GRA	0.03	Low	0.00	Non-Poor
Jikpan	0.68	High	0.42	Medial
Kpakungu	0.73	High	0.53	Acute
Limawa	0.63	High	0.39	Medial
Maitumbi	0.68	High	0.43	Medial
Makeera	0.65	High	0.37	Medial
Minna Central	0.57	High	0.31	Medial
Nasarawa	0.60	High	0.33	Medial
Sabongari	0.62	High	0.36	Medial
Sahuke Kahuta	0.57	High	0.32	Medial
Shango	0.60	High	0.32	Medial
Tayi Village	0.65	High	0.40	Medial
Tudun Fulani	0.68	High	0.44	Medial
T/wada North	0.31	Moderate	0.12	Non-Poor
T/wada South	0.34	Moderate	0.11	Non-Poor
Tunga Low-cost	0.32	Moderate	0.12	Non-Poor

Minna	**0.52**	**High**	**0.29**	**Non-poor**

Intensity: 0-0.29= Low; 0.31-0.49=Moderate; 0.50-0.79=High; and 0.80-1.0=Very high
MPI: 0-0.29= Non poor; 0.31-0.49=Medial; 0.50-0.79=Acute; and 0.80-1.0=Ultra

However, thirteen neighbourhoods experience medial child poverty with MPI value of 0.31-0.49, while Barkin Saleh and Kpakungu experience acute child poverty with MPI of 0.53 respectively. The child poverty intensity in Minna is 0.52 (moderate) while multidimensional child poverty index is 0.29 (Non-poor). This result is in contrast with the result of the individual neighbourhoods, which shows that thirteen neighbourhoods experience medial and two neighbourhoods (Barkin Saleh and Kpakungu) experience acute poverty. This is an indication that the aggregation of data hide useful information that can enhance effective policy development and implementation.

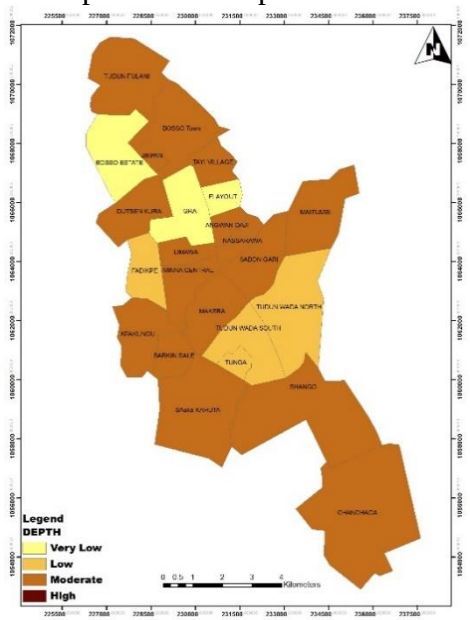


Figure 3: Child Poverty Intensity

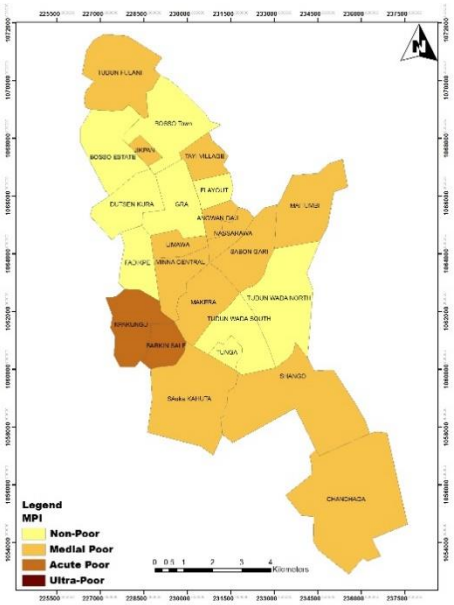


Figure 4: Multidimensional Child Poverty

The child poverty intensity and MPI is depicted in Figure 3 and 4 respectively. The result shows that child poverty is prevalent in fifteen neighbourhoods out of twenty-four, which calls for concern. Although none of the neighbourhood experience ultra-child poverty. However, child poverty manifests in most neighbourhoods and more pronounce in Barkin Saleh and Kpakungu.

Conclusion and Recommendations

This study measured child poverty in Minna by neighbourhood using Alkire and Forster (2007) approach to determine the level of multiple deprivations experience by children within Minna town with an emphasis on the spatial variations that exist within the spatial unit (neighbourhoods) of the town. The study shows that a significant majority of the children

experience deprivations from multiple dimensions compared to those who experience deprivation from a single dimension. This is an indication that the deprivations experienced by children is multidimensional and must be tackled from all angles. The multiple dimension of deprivation experienced by children is occasioned by poor access to water, sanitation, clean cooking fuel and poor housing condition. The intensity of child poverty in most of the neighbourhoods is high while only seven neighbourhoods had low or moderate intensity of child poverty. This shows that the depth of child poverty experienced by children within most of the neighbourhoods is deep, which means it will require concerted efforts from all stakeholders to tackle this problem. The spatial variation of the multidimensional child poverty in Minna is a pointer toward the aspects and areas that need proper planning and implementation of poverty reduction programmes, particularly those that are child-friendly. The study suggests approaching these problems through sustainable approaches and strategies, which are more of commitments than routine inclusion on print.

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APPRAISAL OF URBAN REGENERATION IN ISALE GANGAN COMMUNITY IN LAGOS ISLAND, LAGOS STATE NIGERIA

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Abstract

Lagos Island, Isale Igangan is a rapidly growing city largely uncontrolled, with attendant qualitative physical development problems, and slum condition, traffic congestion, unreliable service provision and "development chase" rather than "development control". This, characterized by over-population and over-utilization of facilities, reaching a consequent deterioration and degenerated condition usually known and referred to as "slum" Urban regeneration, thus becomes necessary at different degrees of deterioration and degeneration of urban environment. The measures may include total demolition of deteriorated structures, carrying out rehabilitation or renovation of the buildings to be retained, re-designing the street system, changing the pattern of land use, amongst many others. The paper goals evaluate existing physical and infrastructural conditions, examines the impacts of urban regeneration on physical condition and the resident's satisfaction of Lagos Island. In a bid to achieve these goals of this paper, primary data were collected through questionnaires distributed among the residents; both landlords and tenants of the study areas. These were drawn based on stratified method of sampling. A total number of 212 respondents were thus selected while descriptive statistical tools such as charts to interpret the findings, photographs, map and other relevant data analysis presentation formats also used where necessary to illustrate areas of interest for visual information about findings in the study area and also used to analyse the information gathered from the field survey. The findings revealed that urban regeneration effort for Isale Igangan aimed at reviving the degenerated core of the community was effective. The findings indicated that urban regeneration has brought about improved physical quality in the study area. The dwellers expressed their satisfaction in the regeneration process as most of the respondents (40.6%) said the regeneration has improved the. quality of the neighbourhood as they concur that the environment is secured and safe for everyone to live in. This has facilitated a wide range of activities and services affecting economic and physical development of Isale Igangan. Conclusively, based on the findings, urban regeneration of Isale Igangan has significant impact on the physical condition with a multiplier effect on the inhabitants, economically, socially and culturally. Urban regeneration has been observed and recommended as the highest way or means to transform or bring development to the urban area. It contributed to integrating the urban area with economic and commercial activities.

Key words: *Degeneration, deteriorated structures, structure rehabilitation and renovation urban regeneration, safe and sustainable communities.*[40]

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1.0 INTRODUCTION

Cities grow from settlement areas which serve specific functions and people's activities in these centres lead to the population concentration and constant expansion in relation to rapid urbanization. Urban Centres are perceived as centre of excellence, centres of opportunities where aspirations and desires are met. Nevertheless, the process of urbanization which means specific changes in the distribution and structure of population as well as in a size and character of a settlement, their network or system, has many sided relationship with slums formation. In most urban areas, there is a complex mix of land uses. Also certain land uses are greater generator of human activities than the other. Central Business district-typical of Lagos Island, creates high demand for human activities or human interaction to such land usage. Accordingly, a joint study by the Lagos State Government and a United Nations group in 1998 discovered that about 42 towns in Lagos alone could be classified as slums and in direct need of upgrading or regeneration (Atere 2001). The problems were particularly pronounced in the old, indigenous core areas of the cities, and in the outer spontaneous settlements that accommodate the low-income population. The urban infrastructural decay such as poor road network, lack of portable water supply, bad drainages and canals, poor housing and poor waste management systems have increased the environmental threat within the urban populace (Gbadegesin and Aluko, 2010).

The inevitable result of this has been: disorganized congestion, dilapidation, blighted areas and then slum. Blighted areas mean areas which, by reason of deterioration, faulty planning, inadequate or improper facilities, deleterious land use or the existence of unsafe structures, or any combination of these factors, are detrimental to the safety, health or welfare of the community (Atere 2001). Similarly, the ugliness and low livability index of some part of urban Lagos such as lack of or over stretched basic amenities and infrastructures, bad roads etc. can be traced in part to, the age of the city where many houses are huddled together without road access. Only vigorous programmes of Urban Regeneration can revive such old urban structure and enhance their livability.

Meanwhile, urban regeneration has been taking an important place in urban planning discussions and policies since the last two decades worldwide. The reasons for the widespread popularity of the subject are related to the emergence of rapid population growth and urban sprawl experienced in most developing countries such as Nigeria. In addition, it is noted that most urban centres in Nigeria were planned before the establishment of regional town planning and urban development authorities (Oyesiku, 2011). Similarly, urban regeneration and urban renewal means the same thing and serve the same purpose; of providing safe and sanitary environment for the people. Nonetheless, the first urban slum renewal or regeneration in Nigeria was implemented in 1951 with a slum area of about 28.34 hectares (70 acres) in central Lagos (Amidu and Aluko, 2006). This urban renewal project was initiated due to poor accessibility, inadequate parking facilities, poor drainage and sewer systems and lack of open

space. Also, the poor health condition and waste disposal systems in urban slums have increased the outbreak of communicable diseases. (Dimuna and Omatsone, 2009).

1.1 STATEMENT OF PROBLEMS

Efforts aimed at addressing the challenges associated with urban decay through urban regeneration have been underway in Lagos since 1928 when the Lagos Executive Development Board (LEDB) carried out the first slum clearance exercise to check the spread of the bubonic plague in the city (Sule, 1990; George, 2006). This was followed by a comprehensive slum redevelopment programme covering areas, including Azikiwe Street, Broad Street and Palm Church Street carried out again by the LEDB in 1951 George, 2006. Olawepo (2010) noted that the goal of that scheme was to give a facelift to the aforementioned areas in Lagos Island. Four years later, another renewal scheme involving slum clearance, resettlement and redevelopment was carried out in central Lagos also by the LEDB yet the Lagos Island environment seemingly looked deteriorating.

Recently, Lagos State government in a bid to enhancing environmental sustainability established urban regeneration project in various areas of the State to include Lagos Island through Lagos State Urban Renewal Authority (LASURA). The Lagos Island urban regeneration project consists of the redevelopment of Princess Aroloya, regeneration of burnt properties in Ojo Giwa/Okoya Street and redevelopment of Isale Gangan, Whereas, this study focuses more on the IsaleGangan project. The site is bounded with Princess Street, Binuyo Street and Onola Street. The project consists of 54 serviced residential units on a land size of 2.500sq.m. The expected benefits include:-

a. Housing provision towards decent and quality living
b. Enhanced environmental quality
c. Improvement in socio-economic lives of the Community
d. Encouraging Private Sector and citizen participation
e. Complementing of their uses etc.

The essence of urban regeneration can be viewed as a means of replacing the various degrees of obsolescent, decayed and congested buildings which are characteristics of the so called slum areas with relative convenience and greater efficiency, all with the general framework of the overall plan for city development.

By examining the goals and operations of urban regeneration effort of Lagos Island as well as the problems and achievements of urban regeneration effort in the State; it also articulates how the built environment could be improved upon or enhanced for sustainable development and living; this paper is aimed at appraising the impact of Isale-Igangan urban regeneration project on the residents.

1.2 AIM AND OBJECTIVES

This paper is aimed at appraising the impact of Isale-Igangan regeneration project on the residents; it also articulates how the built environment could be improved upon or enhanced for sustainable development and living.

1.3 SCOPE OF STUDY

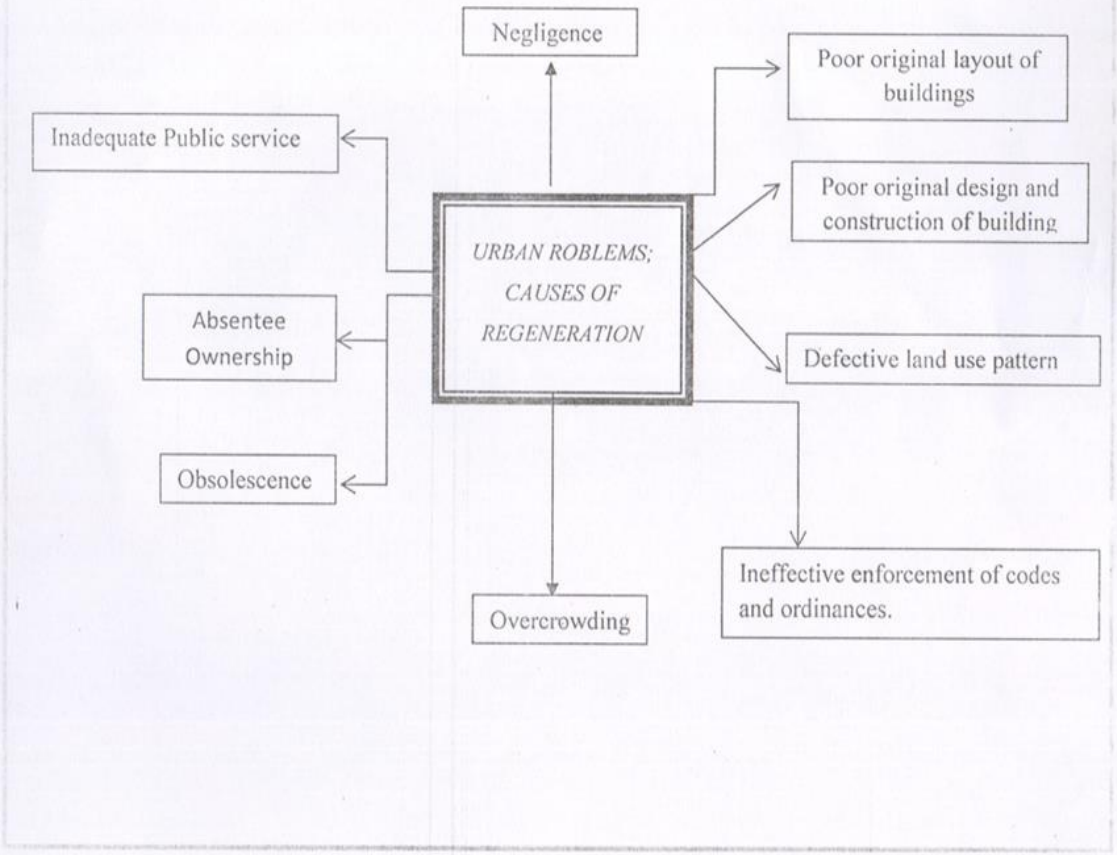
Isale-gangan, Lagos Island is chosen as a result of the renewal efforts and environment improvement projects carried out by the state government since 2008 to arrest the rapid social and environmental threat in the area. The scope deals with the urban servicing and renovation of Isale-Gangan in relation to the building and environmental condition coupled with the socio-economic capability of the people in the area. It focuses at assessing the upgrading impact of the environment on the physical, social, cultural and economic aspect of Isale-Gangan, as it enhances it functionality.

2.0 CONCEPT OF URBAN REGENERATION

The concept of urban regeneration may be interpreted in a number of ways, depending on the level of development of the country. In the most developed economies, the goal is to promote a "return to the city", revitalize the city Centre, restore activity in a fiercely competitive international context, and implement initiatives to improve the quality of the environment operating in a wide sense towards a smart growth. (UNEP, 2004)Similarly, urban regeneration is a process of reordering of the physical structures of dilapidated part of an urban settlement. It may be defined as a conscious attempt to alter the urban environment by way of deliberate and large scale adjustment of an existing city area in order to meet up with the current and future needs of urban life. It is a well-designed and coordinated intervention to re-engineer a competitive future for deprived nations and communities over a given period of time. Nonetheless, some factors responsible for Urban Regeneration are as provided by Tsenkova, (2001) as displayed in figure 2.1.

The immediate results of urban regeneration strategies can be grouped in four broader categories-economic, social, physical and environmental. Providing new employment opportunities, improved education and health care services, homes, transportation, and better quality of life in environmentally sound urban areas are the most important outputs that define the success of urban regeneration efforts. In looking for ways to define long-term success, the following appears to be the key - cities/places become economically competitive, liveable, fiscally sound and socially inclusive. This framework was developed to guide the analysis of urban regeneration in centre Lagos and to capture the dynamics of a significant urban Lagos of regeneration initiatives and approaches as provided by Tsenkova, (2001) as displayed in figure 2.2.

Figure 2.1: FACTORS THAT ARE RESPONSIBLE FOR URBAN REGENERATION



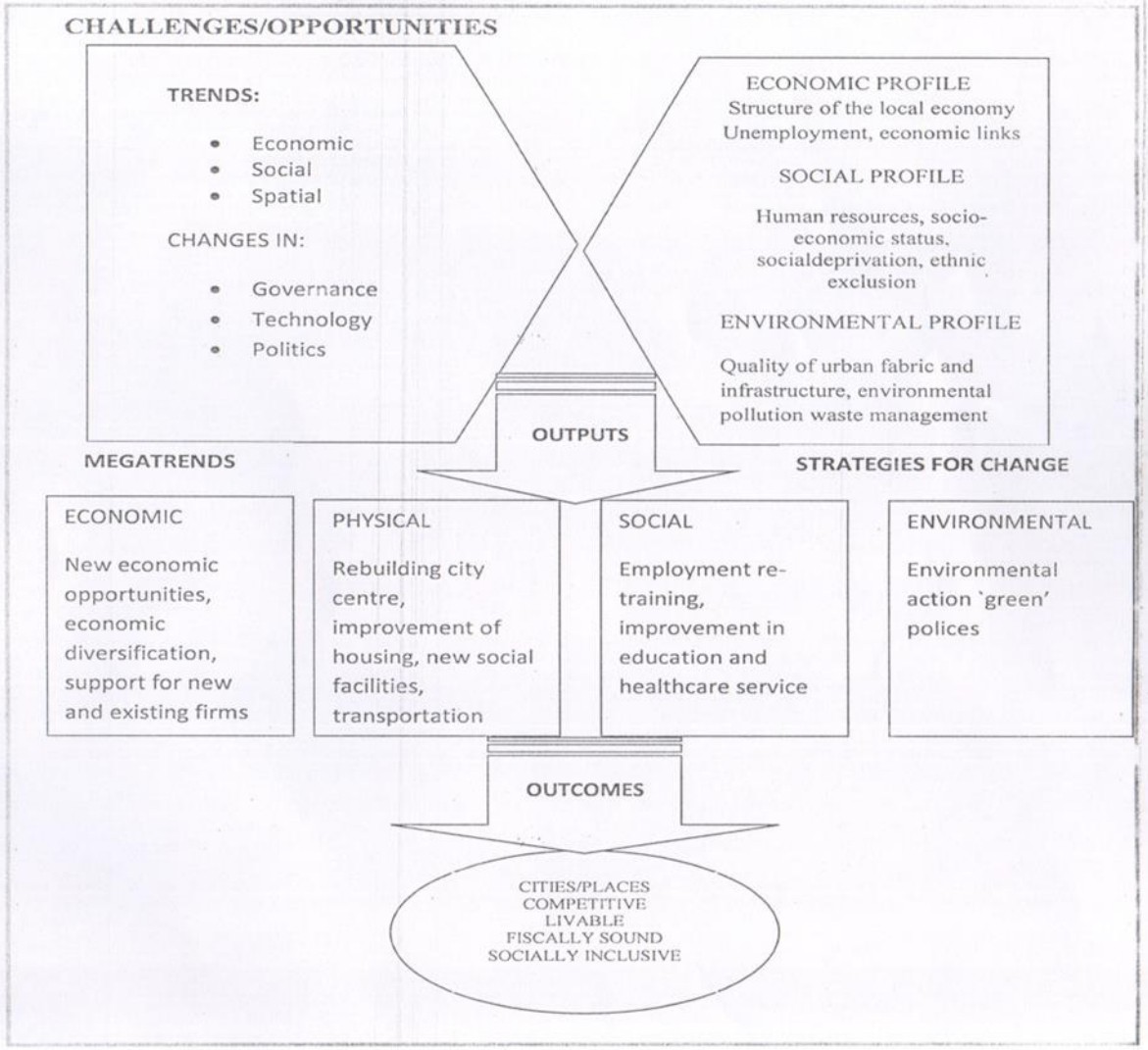
Source: Tsenkova, 2001

From the above, three characteristics can be identified that will be of particular importance in the future practice of urban regeneration: the need for a comprehensive approach that deals with economic and social issues, the provision of a long-term integrated strategic perspective and the adoption of the goals of sustainable development (Robert, 2000). A new agenda for regeneration or renewal should consider the environmental performance of the area which includes: buildings, mix of uses and travel demand either within individual sites or as part of an overall city strategy.

The outputs of the urban regeneration process can be grouped under five headings; neighbourhood strategies, training and education, physical improvements, economic development and environmental action (Roberts, 2000).

Therefore Urban regeneration can be described as, "a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change" (Roberts. 2000).Urban regeneration, in essence, intends to change the nature of a place by involving residents and other stakeholders, embracing multiple objectives and activities, with Partnership working among different stakeholders (Turok, 2004).

Figure 2.2 The Process of Urban Regeneration



Source: Tsenkova, 2001

Recent studies on urban renewal in Lagos state confirm the need for, and importance of, research into the effects of the New Living program (a joint Initiative between the state, local government and private industry sector) upon Indigenous people. (Parry-Strommen 2001; Hillier 2001; Shelter WA 2001). Research with existing and new tenants in at least three new proposed urban regeneration in Lagos (Isale - Igangan, Anikantamo, Adeniji Adele) has revealed the need for further research to assess the Urban Regeneration effort of Lagos State Government on Indigenous people in Lagos.Drawing on recent experiences in the Lagos State

New Renewal projects, Wilkins (in Randolph & Judd, 2001) outlines the very real grief experienced by communities involved in urban renewal, and the potential impacts upon their mental, spiritual and social wellbeing.

2.2. URBAN REGENERATION IN NIGERIA

Historically, urban and social segregation policy in Nigeria dates back to the colonial dispensation- Colonial Europe Reservations Policy of 1902, the Township Ordinance of 1917, the Nigerian Town and Country Planning Ordinance of 1946, and was later followed, by the National Housing of 1972, the National Housing Policy of 1991 and the Millennium Development Goals adopted by Nigeria (Ugwu 2011; Uyanga 2011). At independence, cities that served as seat of political administration across different levels of government, necessarily, had to witness some expansion and infrastructural enhancement. Ever since then in Nigeria, one form of urban replanning and renewal has been the hallmark of governance (Agbaje, 2013).According to Agbaje 2013; three factors could be identified to have contributed greatly to urban renewal in Nigeria. One, creation of new sets of states through territorial disaggregation, two, election of new party and set of elites into government, and three, the need to embark on major environmental and infrastructural development, such as road, rail construction, drainage, airport, markets. However, it was further observed in his work that these developments occur bringing along with it some consequences both positive and negative. One case in point was the displacement of people at Maroko and Lekki in Lagos in 1992.

In the Lagos Metropolis, it is easy to determine a dichotomy in the physical landscape of the city, poverty and affluence existing side by side. That is, the urban slum and the well planned and beautiful residential estates, the former occupied by the poor who are in the majority and the later by the few very rich. This contrast is very striking and is already well pronounced, as over 5 million people living below poverty line inhabit Lagos metropolis (Osatuyi, 2004).Battle against slum has been in long existence. The devastating public health crises crowning in the bubonic plague outbreaks of the 1920s in Lagos, led to the establishment of the Lagos Executive Development Board (LEDB) (1958-59) and subsequent clearance-driven urban renewal efforts in the core area of Lagos. Maroko clearance was in July 1991 and several other attempts such as the Olojowon renewal among others.

More so, example of regeneration program in Lagos is the case of Badia East, the community which was originally deified despite being part of the area ranked 3rd among the 42 identified slums in the state (Anthony, 2013). Attempts by the Lagos State Government in 1986, 1991 and 2003, at redeveloping the area were out rightly rejected by the community because of their experiences from other parts of the State, such as total clearance of Maroko in 1991. Actions by the State Government to forcefully carry out the renewal yielded negative results socially and economically as many people were displaced and rendered homeless before the actions were suspended. However, Maroko being a Federal Government acquisition and the contract for the work signed in 2003 (after the Lagos State partial demolition) to renew the place. This

followed adequate sensitization of the community and the exercise was seen to have enjoyed the cooperation of the community to a reasonable extent.

Despite various efforts at the Local, National and Global levels at solving the ravaging twin phenomena of poverty and slum through the organization of Local and International workshops and summit at the topmost level of Governance, and direct policy statements by governments, the problem rather than being ended, continued to spread. One major problem that has contributed to this is the methodology being employed in most renewal and other planning efforts. Another major contributor to the urban decay is negligent urban housekeeping, and irresponsible civic management; which has permitted its spread. Continuous neglect will mean that: physical decay of urban community will continue or be encouraged; obsolesces (obstruction to full production of housing) will continue to stretch over the built environment with its consequent degeneration to the city.

3.0 THE STUDY AREA

The study area covers Lagos Island Local Government Area of Lagos State Nigeria. The three selected area out of eleven enumeration areas are among areas delineated by National Population Commission (NPC) in 1991 as: Olowogbowo, Offin, Agarawu, Idumota, Isale-Eko, Isale-Gangan, Oke Popo, Epetedo, Popo-Aguda, Lafiaji, and Araromi-Odo. Lagos Island at its inception was divided into four geographical wards (north, south, west and east) with respective local governments but in recent times, it is being governed by a single entity following a merge of the four wards. Lagos Island can be grouped into Olowogbowo, Epetedo, Isale-Eko, Popo Aguda and Lafiaji areas. The growth of Lagos Island can be classified into three periods namely; pre-colonial, colonial and post-independence periods. Each period offered unique values and attributes that eventually made up what is today, a densely populated and complex urban environment. Over the years, Lagos Island is known as Lagos State centre of civilization. Hence, its urbanization process was rapid and there was no or less consideration given to proper planning therefore, many built houses at will in any location of their choice and the idea of family houses was also embarked on which led to the condensation of building. More so, there was a time when some of the indigenes fled to other areas of choice to build houses while the core area of Lagos Island was left unmaintained and this contributed to the deterioration of the environment. Only urban regeneration can bring back Lagos Island to what it is earlier known for.



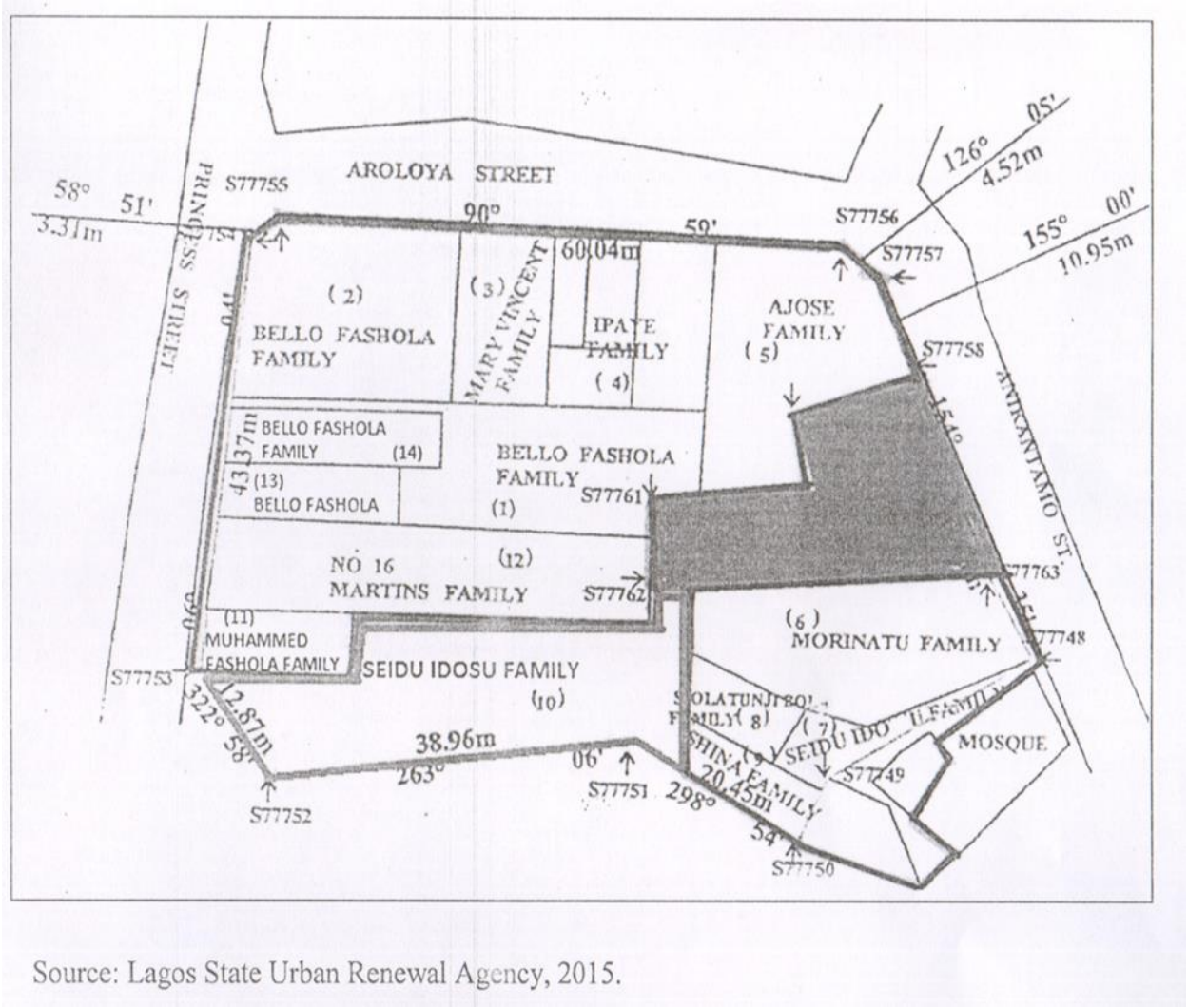
FIGURE 3.1: MAP OF STUDY AREA.

Nevertheless, urban regeneration is perceived as a welcome development in every modern society. It however should be realized that to promote genuine development, every public programme should embrace 'interclass mutual needs and appreciation approach' embedding some measures of assured benefits for all categories of people.

3.1 INFORMATION FROM LAGOS STATE URBAN RENEWAL AGENCY

(LASURA)

The information gathered from LASURA indicated that more than 30 roads has been rehabilitated in Lagos Island part of which include the Adeniji Adele road via Jankara Market and across Princess road to Isale Gangan where an eleven storey building is been built to house 48 households. These families whose lands were acquired by the Government to embark on the project include: Bello Fashola Family, Ipaye Family, and Morinatu Family among others. See figure 3.1.



Source: Lagos State Urban Renewal Agency, 2015.

Figure 3.2 showing the various rehabilitated roads and the families whose lands were acquired for the regeneration project by the Government.

The project has been in the fore-front of renewal and regeneration of the densely populated state to make it a model mega city, is the 11-storey Isale Gangan resettlement estate which will house 48 families who have earlier pooled their lands together to allow for the modern edifice within the largely unplanned community. The first two floors are for parking cars with the combined capacity to park about 60 cars while the sixth floor is essentially a big open hall for all the families to carry out their daily and other activities such as meeting, parties and other social activities. The remaining eight floors consist of a two wing six apartments on each floor with one, two and three bedrooms on each wing. The urban renewal programme also involved working simultaneously on the drainages and the inner city roads, walkways, roads, and street lightings.

The Lagos Island Area Regeneration projects provide a rich source of research findings from which to learn valuable lessons about appropriate processes and strategies to facilitate sustainable and positive social change in disadvantaged communities

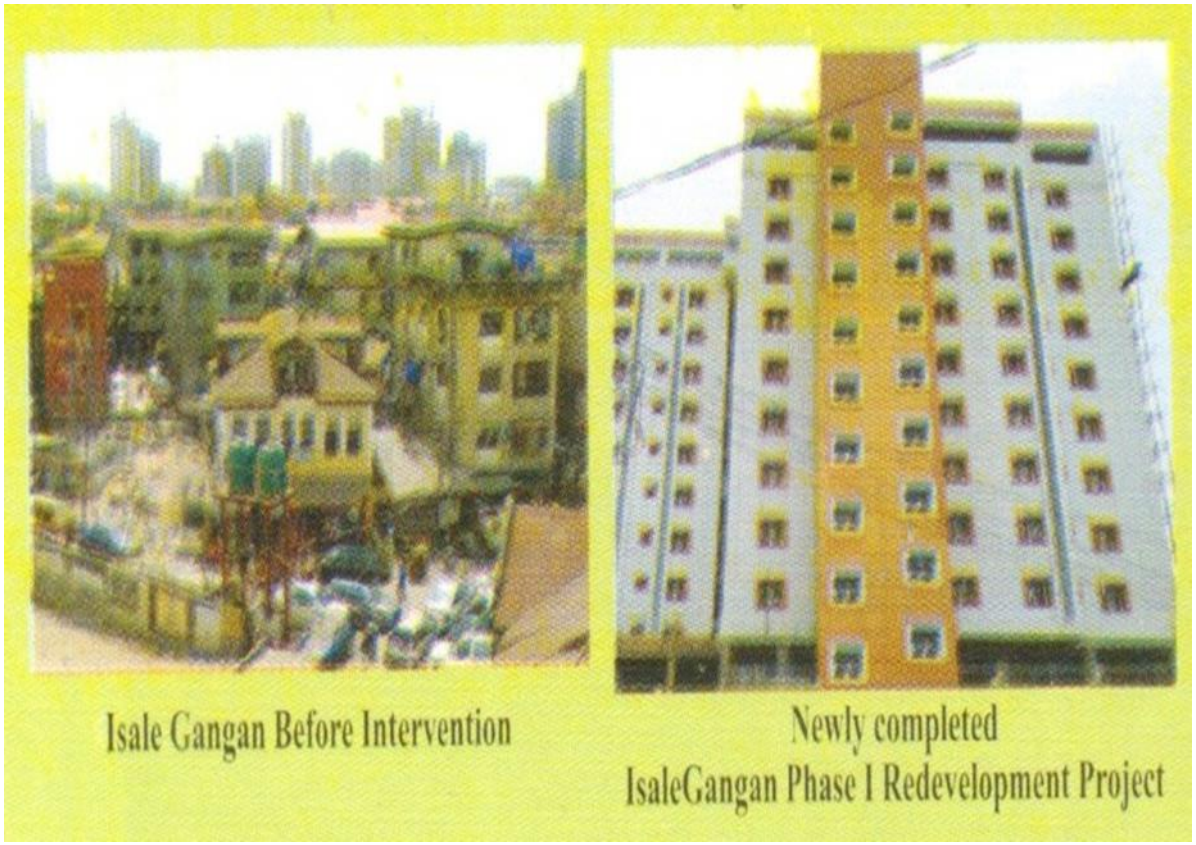


Figure 3.3 showing isale gangan before the project with the various family lands acquired for the completed regeneration project

3.0 THE RESEARCH METHODOLOGY

The study used both primary and secondary data sources. The primary data were generated through the use of structured questionnaires, observation schedule and interviews were conducted within the study area. The study is interested in conducting the assessment of the impact of urban regeneration in the area. The variables used to detect such effect include losses on physical development, human development and landscape structure, infrastructure and facilities, security, etc. Questionnaires were administered to the sampled residents to obtain information on their socio-economic characteristics and perceived level of satisfaction. While, interview was administered with the private and public sector developers (which includes Lagos State Urban Renewal Agency-LASURA) involved in the regeneration project, on various measures put in place to improve the level of services provided as well as the challenges encountered in the operation.

3.1 SAMPLING TECHNIQUES AND PORCEDURE

The sample frame is indicted as the total number of buildings in the study area which is three hundreds (300). However, the sample size was worked out taking 70% of the existing building population. To enable us have an unbiased generalised findings from the selected population to be sampled. As a result, a total of two hundred and twelve (212) questionnaires were administered in the three selected areas (old Aroloya Street - Anikantamo, Isale Gangan and Ojogiwa) where regeneration is currently taken place on the island.

The study employed stratified sampling method, and random sampling technique. This was used within the context of already stratified or demarcated areas in Lagos Island. The technique involves the subdivision of the building population of "N" (Isale Gangan - Lagos Island) into sub-population of nl, n2 and n3 units respectively. These subpopulation are referred to as "strata"; they are non-overlapping and they together constitute sample for the whole population so that: l + n2 + n3 = N Individual residents are selected from each stratum in a random systematic fashion. This involves selecting "n" units out of "N" such that every one of the "n" which is subset of the N distinct samples has an equal chance of being drawn. Thus, questionnaires were distributed among the residents in the stratified areas and each possible sample of residents in the population had equal chance of being selected.

3.2 METHOD OF DATA ANALYSIS

The data collected was analysed and Inferences made by careful observation of the data and situation of the study area. The statistical instrument used in presenting the data collected includes:

4.1 FINDINGS AND DISCUSSIONS

4.1.1 Economic Activities Brought By Regeneration

Regeneration is a term that means different things to different people, ranging from large scale activities that promote economic growth to neighbourhood interventions that improve quality

of life, 'Thus, it improve places and make them more attractive to residents and investors, enabling new and existing businesses to proposer as well foster ambition and unlock potential in the most deprived areas by breaking cycles of poverty; enabling everyone in society to gain more power in decisions made which affect them, and to take advantage of the economic opportunities that regeneration brings thereby opening up opportunities to create more equal communities and also to secure long-term change by tackling barriers to growth and reducing joblessness - moving communities and individuals from dependence to independence level.

However, redistribution of the economic activities brought to Lagos Island as a result of the urban regeneration, these activities determines the livelihood of residents, especially the upgraded market. In this regard, about 31.1% of the respondents said the market upgrading was a major changing factor to the economic activity brought by the urban regeneration project the showed a significant increase in patronage and sales. On the other hand, 9.4 said the "financial institution revitalisation" is another relevant improvement of all economic activities improvements brought by the urban regeneration project. However, 24% of respondents within the study area are of the opinion that the adequate provision of low cost "lock-up shops" within the study area is another economic activities improvement brought about by the urban regeneration project.

Urban transportation was in total disorder for there were neither road regulations nor road furniture required to optimize free flow travel along the road in-place. This problem has been compounded by on-roadside parking and trading, in other to avoid the congestion on the roads, tri-wheelers have taken over the road transport sector. This is the likely reason why a larger part (24.5%) of the respondent is of the opinion that improved transportation is a major economic activity booster while 19.6% differ from this view saying it is restaurant operation. The respondents who are of the view that other economic activities aside lock-up shops, upgraded market, restaurants, motorcycling, financial institutions and banking accounted for 1.3%o of the sampled population.

4.1.2 Social Amenities Brought as a results of regeneration

Based on the respondents' observation, the major social activity brought about by urban regeneration is the expansion and renovation of the police station along the study area this was ascertained in the response of 68 respondents which is synonymous to 32.1%. The number of respondents who differ from this view but are of the view that other social amenities have been brought about as a result of the regeneration effort include recreation Centre and open spaces are 89, 46 and 9 respondents respectively.

The relationship between flooding and standard gutter produced interesting analyses. The respondents with standard gutters within their vicinity and have experienced flooding before the regeneration accounted for 31.6% while those with standard gutters and have not

experienced flooding accounted for 68.4%. It is interesting to know that all area within the study area without standard gutter before the regeneration have experienced flooding.

The distribution of types of toilet uses at the study area, 14.2% of respondents said they make use of public toilet and 42.9% use pit latrine, 32.1% use water system toilet in the study area. The most interesting thing about the toilets in this area is that; their soak away are being channelled into the drainage (gutter).

The analysis of waste disposal indicated that 19.8% of respondents said, they disposed their waste at the neighbourhood bin, while 58.0% which is the majority of the respondents who dispose waste through private refuse collector (truck pushers). 22.2% respondents dispose their wastes through other means. The analysis of waste disposal before urban regeneration indicated that 19.8% of respondents .said, they disposed their waste at the neighbourhood bin, while 58.0% which is the majority of the respondents who dispose waste through private refuse collector (truck pushes) and 22.2% of the respondents dispose their wastes through other unspecified method. However, waste disposal after urban regeneration indicated that 25.5% of respondents said, they disposed their waste at the neighbourhood dumpsites, while 68.4% which is the majority of the respondents who dispose waste through public refuse collector (LAWMA). 4.7% and 1.4% of the respondents dispose their wastes through neighbourhood bin and other unspecified methods respectively. The implication of this is that there has been positive change in the waste disposal method of the area thereby making the environment to be free from environmental pollution.

4.2.1 Respondents' perception on the Regeneration Efforts in the Study Area

The perception of urban dweller on the urban regeneration efforts within the study area and its effect on the economic activities of the state; 40.6%) of the respondents believed that urban regeneration has improved every activities within the study area, 29.2%observed that there is fast improvement of the study area from it formal outlook in term of infrastructure, while the other 19.4% said regeneration is a positive redevelopment to the study area because of the state of dilapidation of some houses within the study area that called for redevelopment.

- ***Perception of respondents on road condition before regeneration***
  The perception of respondents on road condition before regeneration shows that the road was bad since majority of the respondents 38.7% professed the road was bad. 31.6% responded that the road was fair, 19.3% responded that the road was fairly good while 10.4% believed the road was good before regeneration.

- ***Perception of respondents on road condition after regeneration***
  Unlike the responses of respondent on the road condition before regeneration, the regeneration project of Isale Gangan has improved the road condition of the area. This was shown in the table below where majority of the respondents (37.7%) agreed that

this is fairly good. Others responses were that the road condition is good after regeneration was 32.1%, 25.5%of the respondents sees the road condition as fair while others (4.7%) responded to the road condition as being bad. The significant of this is that, urban regeneration project of Lagos Island has improved the road condition in the area.

- ***Time Spent in Traffic Delay before Road Rehabilitation***
  The time spent in traffic delay by respondents before regeneration of the study area. Majority of the respondents (43.4%) spent 15 minutes in traffic delay within the study area, while 22.6%) said they spent 10 minutes within the study area before rehabilitation of the road. Those with minority of time spent were the category of people that spent 25minutes and above have the lower percentage of 9.4%, follow by those that spent below 10 minutes also have the lowest percentage (6.1%)

- ***Time Spent in Traffic after Road Rehabilitation in the Study Area***
  Time spent after the road redevelopment, the distribution of perception of urban dweller within the study area. 34.4 % stated they now spend less than l0 minutes while 41.0% said they spend less than I5 minutes, also 16.5% state that they now spend less than 20 minutes above.

4.3.1 Evaluation Matrix for the urban regeneration effect on the environment and resident of the study area.

The table is an illustration of the evaluation matrix comprising ten sustainability criteria, their respective indicators and scores of regeneration contribution scale. Although, it is very difficult to have every indicator to conform to all of the identified criteria;

Table 4.22 Evaluation Matrix for the urban regeneration effect on the environment and resident of the study area

No	Variables	Action areas	Scores
1	Road Construction/ Rehabilitation	Adeniji Adele Road, Ojo Giwa street, okoya street	3
2	Environmental sanitation	Regular collection of waste by LAWMA and weekly sanitation exercise has reduce pollution	3
3	Housing provision towards decent and quality living	Provision of 54 serviced residential units on a land size of 2.500m2 at Isale –Gangan	2
4	Enhanced environmental quality	Rehabilitation of road infrastructure and provision of road furniture along the regeneration area	2
5	Improvement in socio-economic lives of the Community	Resident satisfaction in the economic improvement of the study area	3

6	Encouraging Private Sector participation and citizen	Several stakeholders meeting between the government agency and the residents before and during the commencement of the regeneration project	2
7	Security of lives and properties	The infrastructure provided are in correlation with the environment Enhancement of security agencies with the area	3

Examination of the scores on the contributions of each of the variables to the impact of the regeneration project on residents reveals that three criteria including; improvement in socioeconomic lives of the Community, Road Construction/ Rehabilitation, Environmental sanitation and Security of lives and properties with score "3" were considered as contributing optimally to the sustainability of the project. Whereas compatibility of the project with surrounding neighbourhood, encouraging Private Sector and citizen participation, Enhanced environmental quality, Housing provision towards decent and quality living, with score "2" were rated as contributing moderately to the effectiveness of the project..

5.1 SUMMARY, RECOMMENDATIONS AND CONCLUSION

Urban regeneration involves several approaches, each becoming necessary at different degrees of serious environmental deterioration. The approaches or measures may include total demolition of deteriorated structures, carrying out rehabilitation or renovation of the buildings to be retained, re-designing the street system, changing the pattern of land use, amongst many others. Investigation revealed that virtually the neighbourhoods in Lagos Island already have run-down structures and facilities. Also, some areas have developed into potential slums, even at the peri-urban interface of the community. However, respondents' responses indicated that the regeneration project of Lagos State has increase the provision of infrastructure to the study area which led to the improvement of general revenue of economic or commercial activities at the study area. 69.8% of the respondents indicated. That the road construction and rehabilitation has reduced traffic congestion thereby, making their shops more accessible and has also increased the socio-economic activities in the area.

The dwellers expressed their satisfaction in the regeneration process as most of the respondents (40.6%) said the regeneration has improved the. quality of the neighbourhood as they concur that the environment is secured and safe for everyone to live in. The residents commended the effort of the state government in relation to the rehabilitation and dualisation of Adenji-Adele to Idumagbo Avenue road as well as the new housing project at Isale - gangan as they believed more democracy dividends will come there ways. However, in a bid to sustain the urban regeneration plan of the Lagos State, the State Government has expressed commitment to the completion and expansion of the Isale Gangan Urban Renewal project as a model for the regeneration of the Lagos Island, a small community with thick population.

5.2 CONCLUSION

The sustainable dimension of urban regeneration in Nigeria, especially Lagos State requires a detailed understanding of how to promote environmental sustainability amidst the rapid urban growth to achieve a common national economic goal. This involves the collaboration of all physical planning functionaries from the town planner to the architects and other built environment practitioners, politicians, public sector workers, manufacturers, residents and public-work contractors to suitably integrate measures towards enhancing urban regeneration projects. Although, stakeholders' indifference to urban regeneration projects, has hindered the adaptive capability of urban populace, but a concise presentation of decision making process to non¬experts and residents will support sustainable environment amongst the vast majority of poor-urban populace. The Nigerian government will require a sustainable approach to support urban regeneration projects across the country, due to the increased rate of environmental degeneration.

Urban regeneration effort of Lagos State Government for Lagos Island sets broad parameters for reviving the core of the community with a view to facilitating the coordination of a wide range of commercial activities and public services affecting economic development, employment, transport, housing, education and social welfare by making provision for sustainable development Lagos Island through a plan that aimed at maximizing efficiency in the provision of key infrastructural facilities and utility services such as road, water, electricity and sewerage. Thus, the urban regeneration approach is designed to engender community participation and promote safe and sustainable communities that are now widespread throughout Lagos State. Indeed, the Urban Regeneration Effort in Lagos Island is based on people oriented policy and I want to suggest it continues that way in other areas of the state in order to create a sustainable environment.

5.3 RECOMMENDATIONS

Urban regeneration has been observed and recommended as the highest way or means to transform or bring development to the urban area. It contributed to integrating the urban area with economic and commercial activities. All these merit would not be possible if there is no adequate planning of urban area and accessibility of the area. For regeneration effort of Lagos State Government to bring good development in the urban Lagos the following steps must be put in to consideration.

1. Despite that regeneration has it short coming, it has been proven that it benefit is greater in improving the socio - economic activities of any environment therefore; Lagos State Government should hasten the commencement of other identified slum areas of the stale so as to ensure a wider range of healthy environment and promote economy stability.

2. Studies have shown that the infrastructures at Isale Gangan have been improved by the State Government and most of the users are satisfied with the development. Hence, Government should continue providing more infrastructures till it reaches every nook of the Island and Lagos State in general. This will embrace more revenue generation as the level of users' satisfaction increases the more they will believe in proper utilization of the taxes paid.

3. Residents should be encouraged to absorb the act of maintaining the facilities provided by the government as a means to showcase good urban culture.

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SECTION 6:

INFORMATION TECHNOLOGY ADOPTION IN CONSTRUCTION

BIM ADOPTION CHALLENGES IN MALAYSIA: EXPERT OPINION.

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Abstract

There are various challenges that creates impediment in the realization of Building Information Modeling (BIM) benefits in construction industry; though, the awareness of this technology is growing fast due to potential benefits expected to be derive therefrom. Conversely, from the literature various mitigating factors have been identified and these have call for measures that will revamp these hitches. This study majorly made use of experts' opinion in the construction industry via interviews. In sourcing for the respondents, a snowball data collection approach was adopted; this was because there are still few practices that have adopted BIM for project delivery and locating them have to be through their professional associations and at BIM events. The data received from the conducted interview was analyzed using MAXQDA-12, a qualitative data analysis software program. Therefrom the analysis of the interviews, it is apparent that the experts have good knowledge of the challenges bedeviling BIM adoption in Malaysia; therefore, proffering solutions to the identified hitches would not be far fetch. Of major challenges among others to the BIM adoption are lack of BIM knowledge and awareness; high cost of setting up BIM office and attitude of stakeholders. However, the way forward in solving these hitches is by focusing on the BIM education, training and skill to the practitioners and the upcoming ones. To achieve this, the education sector should as a matter of urgency integration BIM to their academic curriculum for the professionals under the academic tutelage. The issue of high cost of setting up BIM office can be augmented by the government through intervention, grant or tax rebate to the deserving practices. These will boost BIM adoption along with the benefits yarning for harvest.

Keywords: - *Building Information Modeling, Challenges, Experts, Opinion. Construction Industry*[41]

1. INTRODUCTION

Studies have shown that BIM possess the propensities to change and revamp the performance of construction industry globally, with the tendencies of reducing inefficiencies; enhance productivity through collaboration, communication and free flow of information (Goedert and Meadati, 2008). Moreover, it is also established that BIM has the prospects of keeping project

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cost under control with an increased productivity, quality, and reduced project delivery time (Azhar et al., 2008). In other word, BIM technology has come as a relieve to ease the pressure on the industry in order to provide value for money, creating opportunities for sustainable design and construction, and to find solution to other problems bedeviling the industry. However, BIM is transforming the paradigm of the industry from 2D lines based drawing systems to nD object based information systems (Mihindu and Arayici, 2008). Yusuf et al. (2015) also maintained, that BIM is a modern delivery tool that is widely in use in the construction industry which is becoming international benchmark for efficiency in Architectural, Engineering, and Construction (AEC) and it influences and benefits are still unfolding. Enegbuma and Ali (2011), noted that the Malaysia government through its agencies such as Jabatan Kerja Raya (JKR) and the Construction Industry Development Board (CIDB) are of the assurance that employment of BIM technology for project delivery has the ability to revolutionizing the entire construction industry in Malaysia, thus fully involve in the awareness campaigns.

Though, construction industry has been found to play a prominent role in any economic worldwide, nevertheless it still remains one of the most defied industries in this present age, with low reliable rate of profitability, little investment in research, education and development. Also, the problem of training of beginners for replacement of aging workforce and the present market needs of experts with adequate modern technological training are among the major problems that needed urgent attention (AHmad, 2013). Despite the perceived benefits of BIM and it envisage potentials, Becerik-Gerber et al. (2011) noted that the adoption of these opportunities has remain low. In addition Macdonald (2012), opines that even with the numerous BIM benefits, its benefits cannot be fully achieved due to limited knowledgeable workforce in the sector. Thus, she maintained that education remains the only option for production of competent workforce needs in the construction industry labour market. The construction industry in Malaysia is not absorbed of challenges militating against adoption of BIM by the stakeholders, and in order to overcome these impediments effort are geared towards development of training and education program that will facilitates changing management style and developing new roles and responsibility (Zahrizan et al., 2012).

A standard is a measured of quality and it guides the level of acceptance of a product, BIM is still a product yet to establish standards which allow array of BIM software products that lack the ability to produce interoperable files; lack of strict BIM implementation standards and rules for certain project participants, contract obligations and unified documentation to be adopted for BIM operations (Darius et al., 2013). This problem is in turn affect the collaborative team work of professionals as they use different non-compatible software (Gray et al., 2013). Darius et al. (2013) further noted that the fears of too low success or big failure, high initial investment costs, time to learn the use of new software and conservative approach among senior professionals are impedance to BIM adoptions. These challenges are manifestation of: Lack of

standardization of BIM practice; Interoperability among disciplines; Lack adequate knowledge; conservative approach of professionals; the fears of low success and big failures; high initial investment cost and lack of organizational and professional qualification alignment. In addition,

Hartmann and Fischer (2008) noted that, as part of the observation made by the 4th e-Construction Roundtable organized by AISC and ACLL, with sole purpose of identify and address process issues with respect to BIM implementation; noted some obstacle that stand on the way of widespread of building information modeling adoption globally.

2. RESEARCH METHOD

The appropriateness of the data collection method adopted was due to the explorative nature of the study, this is essential for ensuring the credibility of content analysis (Graneheim and Lundman, 2004); also credibility is a function of research focus and the confidence in how well the data address the intended focus (Polit and Beck, 2010). This study made use of review of literatures and data received from interviews, which was conducted among practicing consultants in the industry. In an effort to get to the intended focus, a modified snowball data collect technic was adopted in order to locate practices that are using BIM for their project delivery. This is because many stakeholders in the industry are yet to adopt the new technology for their project delivery. The obtained data was analyzed by the use of MAXQDA-12, a qualitative data analysis software program. The choice this analytical approach was based on its suitability for easy coding, data display, data mapping, importation and exportation of data and interrelation of various data for analysis purpose (Silver and Lewins, 2014). However, this paper provides an empirical assessment of experts of the challenges of BIM adoption in Malaysia, this is to stimulate necessary solutions to tackle is hitches. The interviews comprise of seventeen (17) respondents, as illustrated in Figure 1, five (5) architects, four (4) quantity surveyors, four (4) engineers and four (4) officers (professionals) from two government agencies responsible for construction industry activities. Among the engineers are project manager, contractor's engineer and civil/structural engineers.

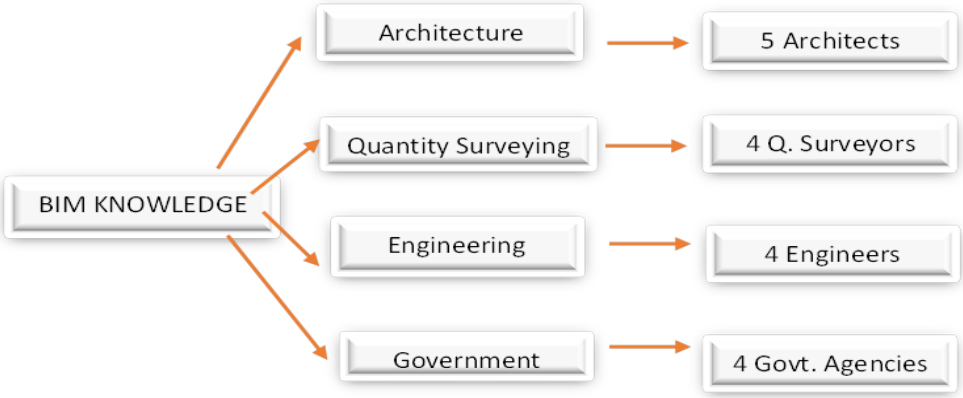
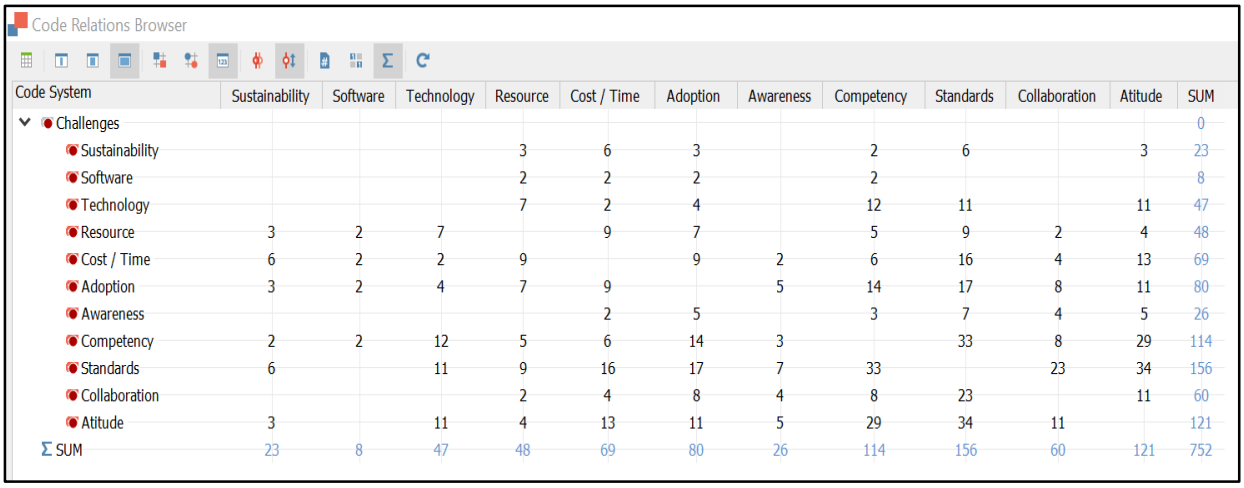


Figure 1: Modified Snowball Sampling approach

3. DATA PRESENTATION AND ANALYSIS

These are various challenges that creates impediment in the realization of BIM benefits in construction industry; though, the awareness of this technology is growing fast due to potential benefits expected to derive therefrom. Conversely, BIM adoption is not at the same level with it awareness due to some mitigating factors such as: awareness and adoption; software technology and sustainable base; resource in teams of capital and time; competency and standards; collaboration and attitude



Code System	Sustainability	Software	Technology	Resource	Cost / Time	Adoption	Awareness	Competency	Standards	Collaboration	Atitude	SUM
Challenges												0
Sustainability				3	6	3		2	6		3	23
Software				2	2	2		2				8
Technology				7	2	4		12	11		11	47
Resource	3	2	7		9	7		5	9	2	4	48
Cost / Time	6	2	2	9		9	2	6	16	4	13	69
Adoption	3	2	4	7	9		5	14	17	8	11	80
Awareness					2	5		3	7	4	5	26
Competency	2	2	12	5	6	14	3		33	8	29	114
Standards	6		11	9	16	17	7	33		23	34	156
Collaboration				2	4	8	4	8	23		11	60
Atitude	3		11	4	13	11	5	29	34	11		121
Σ SUM	23	8	47	48	69	80	26	114	156	60	121	752

Figure 2: Code Relation Browser (CRB) Challenges of BIM Adoption

Figure 2, of Code relation browser (CRB) of the challenges of BIM adoption in the construction industry in Malaysia, which indicated that factors of standards and attitude among practices have the highest co-occurrence of 34 this signifies that they both weightily affects BIM adoption. In other words, the study revealed that attitude of stakeholder toward the adoption of BIM is very poor; this is because many are still comfortable with the tradition delivery methods. Also lack of BIM standards and technological knowhow put off the willingness of many stakeholders to adopt BIM. Also, Figure 3 showed the graphical illustration of various identified factors that are challenging the BIM adoption; it shows that lack of standard having 54 code segments, attitude of practitioners account for 42 code segments, while software technology accounted for the least code segments of 2. This shows the degree to which each factor influence BIM adoption in the industry.

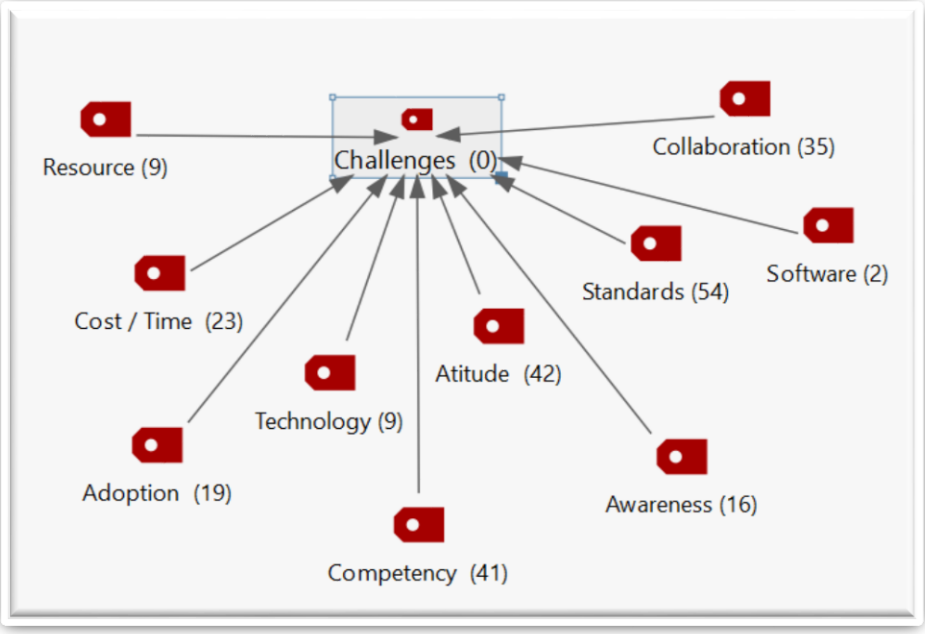


Figure 3: Factors Impeding BIM Adoption

i. Awareness and Adoption

Awareness of BIM pave way for it acceptance and adoption, though, respondents are of the opinions that the rate of adoption is proportional to the knowledge and skill which determine to large extent it adoption. In Malaysia respondents are of the notion that level of adoption is still very low, but they believed that with knowledge more stands to be benefited.

> *"Not many people are really aware of BIM existence……..When you talk about the awareness of BIM, the actual fact is that, in Malaysia only the few knows what BIM is all about and it capacity, or the advantage of how BIM can help them, and that is it; it is a small percentage, of the total of the people in the industry"*

ii. Software Technology and Sustainable Base

Software(s) are set of programs that run on a computer to perform certain functions. Nonetheless, the software technological knowhow of BIM is a very big issue that determines rate of it adoption, the higher the software technology in the industry the more stakeholders come into the fold of BIM adoption. But in reality, the software technology knowhow in Malaysia construction industry has been found to be low and with a low sustainable base for the few that have the knowledge. This pose a major problem for BIM adoption, this was acclaimed by the expression of respondents as thus:

"if I talk about technologies, people do not understand……..So it is not a small task, it is a big task; once you introduce an ideology, or even a new technology, you must follow it up with gadget that goes with it……..this is because of the traditional delivery process that we are going through now is not sustainable, is not efficient, because of this lack of efficiency, we forfeit a lot of things, so that is the main point"

iii. Capital and Time

The cost of setting up BIM office have always been of great concerned, many consultants outfits are not willing to adopt the new technology because of it affordability both in term of the cost of software and the acquisition of knowledge and skills. Added to the problem is non-availability of workforce to be employ for BIM jobs. This made many stakeholders to stick to the traditional delivery methods of project delivery because of it affordability and requires neither new training nor extra cost to setup. However, many of the respondents acknowledge that the main impediment to BIM adoption is the cost of software and the training to man the software; some of the respondents express their opinions as:

"BIM is not cheap, it affordability is still a challenge, in terms of its cost and technical knowledge required…..when the client instructed that BIM be used by the consultants, but when you start to look into BIM, and the cost of setting up BIM applications, training, and other cost needed and compared to the actual fee that they are going to be paid, this do cause discouragement and lack of the will to adopt BIM"

iv. Competency and Standards

Competency is the proficiency in the use a related knowledge, skills, and for successfully performs in a defined work setting. Competencies often serve as the basis for skill standards and it is used to identify the level of knowledge and skills, which is used to determine and assessing competency attainment (Association, 2000; Hoffmann, 1999). The competency level among practitioners is low as commented by some of the respondents as quoted:-

"This is the common challenge that is facing the construction industry world over, that is the skill sense and knowledge and the competent workforce…The problems that is prevalent among consultant such as, "I have BIM, I have Revit in my office but I'm not using it due to lack of BIM operators….So if you just engage somebody who knows drafting without construction knowledge the production will just be an illustration, so in engaging BIM operators, they should have construction skill and knowledge"

v. Collaboration

Collaboration entails information sharing and working together of professionals; this stimulates various benefits inherent in BIM adoption. In Malaysia, collaboration is still to be established due to the absence of platform for professionals working together, this confirmation was made by the respondents such as:

"In Malaysia this is not applicable as BIM have not been establish as a building industry working platform and Consultant Company are still in the individual silos…….For now the professional bodies are not working together for this common goal"

Due to the individualist working style that has been the tradition among experts in the construction industry for so long, this has made working as a team difficult as dictated by the collaborative quality of BIM. This was supported by such expressions from respondents as:

"Everybody has their organizations; whether they are architects, engineers, the QSs, project managers, facility managers, contractors; it is hard to ask them to collaborate, it is hard, unless the owner wants it that way, even with BIM"

vi. Attitude

Attitude is a predisposition or a tendency to respond or adhered to a certain idea or method, it influences an individual's choice of action. Adoption of BIM in Malaysia is challenged by the many stakeholders who deem the BIM technology will not increase their productive and this due to their limited knowledge and huge cost of setting up BIM offices in teams of software(s) procurement and time to go for the training. This tends to strengthen the seal to keep to the traditional method they are used to. These were the expressions that come from those respondents that were interviewed, such as:

"It is meant to encourage collaboration and easy communication among professionals but with limited knowledge and lack of willingness, still stands on the way of achieving this, may be the near feature……There are problems of lack of BIM acceptance, not being ready, unwillingness for adoption among practitioners"

Also, the industry is dominated by old practitioners with traditional ways of practicing, while the rate of injection of professionals with modern technological knowledge and skills are still low as commented by Interviewee 04 as quoted:

"For instance, we are old people; we are used to use pens, we are not used to slide, so it is our set-back, the same thing with these technicians. If you are talking about Malaysia, BIM is in Malaysia already, I do not think so, we are progressing only, but are not ready yet"

5. DISCUSSION

From the ongoing discussion it is apparent that the experts in the construction industry have a good knowledge of challenges that is affecting the BIM adoption in Malaysia, these mitigating factors as identified includes and not limited to: Awareness and technical knowledge; Software Technology and Sustainable Base; Resources of Time and Money; Competency and Standards; Collaboration; and Attitude. Most of these identified challenges have their root-cause linked to lack of adequate BIM knowledge and skills, this in turns fuel the lack of willingness of adoption among the professionals. Thus, identification of these challenges makes proffering solutions to them defined and an easy to tackle. The way forward out of these hitches as offer by some of the respondents and the literatures are:

- Focusing on the BIM education, training and skills to the practitioners and the upcoming ones, through urgent integration of BIM to academic curriculum for the professionals under the academic tutelage
- It is good to note that there exist BIM awareness campaign in form of seminars, conferences and awareness campaigns for the stakeholder. Championing this cause are CIDB, JKR, professionals associations and other individuals and cooperate organization.
- For software and technical knowledge, there are organized training vendors with moderate charges and software renting is available where users pay as their prints.
- The issue of high cost of setting up BIM office can be augmented by the government through intervention, grant or tax rebate to the deserving practices. These will boost BIM adoption along with the benefits yarning for harvest.

6. CONCLUSION

The construction industry in Malaysia has showed its readiness to accept it share responsibility in the realization of BIM as a sustainable delivery process. The ambitious efforts of professional associations, non-governmental groups, individuals and government agencies in the creation of awareness and knowledge are laudable and in order to complement this, the education sector needs to do more in the production of competent BIM graduate to the labour market.

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SUSTAINABLE ARCHITECTURAL PRACTICES IN NIGERIA: BENEFITS OF ADOPTING BUILDING INFORMATION MODELING

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Abstract

Building Information Modeling-BIM is a new approach to design depending on collaboration between the architects, engineers, contractors, building services, client, manufacturers and other consultants. It is vital for the advancement of architectural, construction and engineering practices in developing nations and inevitable for sustainable architectural practice in Nigeria. The objective of this paper to highlight the adoption benefits of BIM and also emphasis the need to adopt as a tool for sustainable architectural practice in Nigeria. The secondary research method was used in this study to gather secondary data from textbooks, articles and journals. The major findings of this paper are that BIM has become a common tool used for sustainable building design. It can assist in building orientation thereby reducing energy costs, building massing- analyse building form and optimize the building envelope, day-lighting analysis, water harvesting (reducing water needs in a building), energy modeling (reducing energy needs and analysing renewable energy options, leading to low energy costs), sustainable materials (reducing material needs and using recycled materials), site and logistics management (to reduce waste and carbon footprints). Design options for sustainability can be tracked and studied in a model along with spatial data to geographically locate and import building site information to place it within context and to contribute to an understanding of issues relating to climate, surrounding systems and resources. The paper concludes by recommending that empirical studies should be carried out to determine factors that are impeding the adoption of BIM in developing countries and how to curb it.

Keywords: *Building Information Modeling, Sustainable Architectural Practice, Computer Aided Design, Object-oriented Computer Aided Design, Virtual Design and Construction*[42].

Introduction

Traditional boundaries in the construction industry have been crossed as a result of emerging technologies. There is increasing need for speed, efficiency and reduced lifecycle cost among others in the construction industry. Computer aided design (CAD) technology is the most important innovation in the last 40 years. Other technologies like building information modeling (BIM) have also emerged.

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BIM is a new approach to design depending on collaboration between the Architects, Client, Engineers, Building services, Manufacturers, Contractors and other consultants. It is a team approach where inputs of all the professionals in the design are captured in the same model (Onungwa and Uduma-Olugu, 2016). As a result of the changing trends in architectural practices, the adoption of BIM is vital for the advancement of architectural and engineering practices/services (Trubiani, 2011).

BIM is regarded as the latest generation of object-oriented computer aided design (OOCAD) systems in which every component of intelligent building objects that combine to make up a building design is able coexist in a single 'project database' or 'virtual building' that captures everything known about the building. A building information model (in theory) provides a single, logical, consistent source for all information associated with the building (Howell and Batcheler, 2005 cited in Agele, 2012).

Although Building Information Modeling (BIM) has existed for over 20 years, it is only over the last few years that building owners are becoming aware that BIM promises to make the design, construction and operation of buildings much more streamlined and efficient (Coates *et al*, 2010). There is some evidence to suggest that the architectural profession is beginning to come under pressure to adopt BIM (Arayici, Coates, Koskela, Kagioglou, Usher and OReilly (2011). However, there is a low level of knowledge on building information modeling (BIM) in the Nigerian construction industry which is associated to the low level of awareness and utilization amongst stakeholders (Ruya, Chitumu and Kaduma, 2018; Ryal-Net and Kaduma, 2015).

Similarly, Usman (2015) assessed the readiness of the Nigeria public sector (Federal Ministries and Departments and Parastatals) to implement BIM in its project delivery process. Results of the study show that the federal ministries in Nigeria have achieved management, process as well as technology readiness but need to put in more efforts to improve people's readiness. Similarly, the agencies considered in the study have management and people's readiness but do not have process and technology readiness.

The role of BIM in sustainable architectural practice cannot be overemphasized as discussed below. Consequently, the adoption of BIM for sustainable architectural practice has become inevitable. Therefore, the aim of this paper is to discuss and promote the adoption of BIM as a means of advancing architectural practice in Nigeria by highlighting a brief history BIM, concepts, principles, characteristics and processes of BIM, benefits and challenges of adopting BIM.

Methodology

The paper is a review paper. The secondary research method was used in this study to gather secondary data from textbooks, master and doctoral theses, conference papers, articles and journals to extract the history of BIM, characteristics of BIM, benefits of adopting BIM, BIM global adoption, a review of BIM implementation benefits and challenges. Finally, practical

applications: BIM as a tool for sustainable architectural practices in Nigeria were discussed explore and further highlight the need BIM adoption in Nigeria for sustainable architectural practice.

Bim: Concept, Brief History, Characteristics and Process

National Building Information Modeling standards (NBIMS) committee in the United States (US) defines BIM as a digital representation of physical and functional characteristics of a facility (Azhar, Khalfan, & Maqsood, 2012, cited in Abdul, 2016). BIM emerged as a way to create a virtual depiction of a construction project prior to the start of the actual construction work in order to detect, simulate and analyze potential problems and factors of delay encountered throughout the construction phase of the project (Liu, Xie, Tivendal, & Liu, 2015). BIM covers geometry, spatial relationships, geographic information, quantities and properties of building components (Agele, 2012). BIM has been highlighted by the Architecture, Engineering, and Construction (AEC) industry as a powerful design and management tool that has significant advantages over the building life cycle, design and management (Yan & Damian, 2008 cited in Abdul, 2016).

Building Information Modeling (BIM) is an intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure(Autodesk, 2017). BIM seeks to integrate processes throughout the entire lifecycle of a construction project (Aouad and Arayici, 2010). BIM is essential about how data is shared, used and presented in forms that are meaningful to the intended recipients. Similarly, physical models were an early method of presenting data on building projects. The model has been an important method of communication in the understanding of architecture for over 500 years. This is something that is likely to continue, albeit via a BIM platform, as adoption rates increase (Harty, 2013 and Dunn, 2010 cited in Comiskey, David, Tzortzopoulos, Patricia and Winnington, Mark, 2014).

The concept of product modeling can be traced back to the late 1970s, amidst countless economic changes, with globalization of the markets and increased pressure on the companies. In the search for improving the processes it was essential to make an integrated approach of the different aspects related to the product, to reach a market whose demands on terms, quality, and costs were on the increase. In the search for improving the processes it was essential to make an integrated approach of the different aspects related to the product, to reach a market whose demands on terms, quality, and costs were on the increase (Livia, Sergio and Arnaldo, 2009).

However, early origins of BIM can be traced back to the 1960's when Englebart authored a report that included a notional example of how advancements could be made in the architectural design process by developing new working methods in conjunction with potential advancements in computing technology (Englebart, 1962). Eastman and his colleagues at Carnegie-Mellon University built upon this concept in the 1970's with the development of their

"Building Description System" (Eastman, 1975), which in essence was a computing program containing many "now-routine BIM notions" (Eastman *et al*, 2008).
According to cited in Willem (2008), the processes related to the project simulation and the virtual 3D models of the project can be separated into several major groups:

i. The processes enabling the owner to develop an accurate understanding of the nature and needs of the purpose for the project
ii. The processes enabling the design, development, and analysis of the project
iii. The processes enabling the management of the construction of the project
iv. The processes related to the management of the operations of the project during its actual use

Such processes describe what happens with the information from the building information model to achieve our stated goals. These categories are clearly related to the phases of a construction project and may require a very different type of BIM in each of these phases. There can be a lot of carryover, however, from a BIM used in one phase to the one required for the tasks of the next phase. BIM is not a single static model of a project. The nature of the components that make up a BIM (3D models and project information) will evolve throughout the developmental phases of the project and result in various major changes in the nature of the character of both the 3D models and the linked information. This observation particularly serves to reinforce the importance of the process, rather than the model itself; building information modeling is a dynamic process.
Six major definitive characteristics of BIM are identified in literature (Isikdag *et al*, 2007 cited in Underwood and Isikdag, 2010) include: object oriented, data-rich/comprehensive, three dimensional, spatially-related, rich in semantics and models support view generation

Benefits of Bim Adoption

BIM adoption comes with several benefits. It enables seamless team integration, n-D visualisation and simulation, integrated industrial processes. It enhances process efficiency and quality delivery while reducing project cost, delivery time, and project risks (Azhar, 2011); It tackles the problem of low productivity, it reduces waste, Instant 3D visualization of spaces and alternatives that could quickly be evaluated by technical and non-technical staff alike, sections, perspectives, plan views and quantity take offs could quickly (in many cases automatically) be updated to effectively ascertain potential costs (Underwood and Isikdag, 2010) and the parametric attributes allowed programming information to quickly be compiled for comparison to original authorization documents with a high degree of confidence in its accuracy (Underwood and Isikdag, 2010).
Other benefits of BIM adoption include: it allows simultaneous access, robust information, auto-quantification, quality communication, multidimensional integration, project visualization, project documentation and digital facilities management.

Practical Application of Bim in Nigeria

Buildings have become much more complex with many more interrelated and integrated systems. Data and telecom, air conditioning, security, sustainability, underground parking, and enhancements to building envelopes, to name just a few specialties. With the added complexity, architects have had to adapt to these changes. These layers have required more documentation on the part of the architect to design the project, with many more sheets and details added to the drawing sets. This has in turn demanded more time to coordinate all of these systems, coordinate and manage the additional trades and installers on site for the contractor, and demanded a more knowledgeable staff to maintain these systems on the part of the owner. These increases in specialization, scale, and complexity have added time and cost to the process and lifecycle of the building. These and other factors have led to an overall decline in building performance and an increase in energy consumption.

Eddy and Bradley (2008) outline three basic challenges in the construction industry that BIM has the potential of managing. These include: increased use of materials, increased need for energy, and increasing cost of labour. BIM an important tool in the AEC industry capable of contributing to the integration of processes, from the elimination of inefficiencies and redundancies, increasing collaboration and communication, to ensure better productivity results, and in the long run allowing greater integration of projects and of all processes involved in the construction, bringing greater quality to the building, with smaller costs and reducing design time (Campbell, 2007 and Eastman, Teicholz, Sacks & Liston, 2008).

The emergence of BIM has significantly enhanced the overall construction practices of the companies that have adopted BIM in industrialized countries while the barriers of BIM implementation are still persistently inhibiting the adoption process. Therefore, there is dire need for Nigerian architects to adopt BIM for sustainable architectural practice in Nigeria.

Sustainable architecture bears consideration not only to building performance, but also the triple bottom line- the environmental, economic and social impacts of the building industry. Because of the abundance of needed information, efficient information-technological solutions are desirable. BIM arose as a solution to support the supply, integration, and management of information throughout the building life cycle (Häkkinen and Kiviniemi, 2008 in Yupeng and Wei, 2015). For instance, Revit Architecture is particular well suited to address the kinds of problems sustainable design professions encounter every day, and may eventually open up new building characteristics such as embodied energy and complete lifecycle costing for evaluation and optimization. It carries a wealth of information necessary for many other aspect of sustainable architecture and/or LEED certification.

According to Dowsett and Harty (2013), BIM application to construction projects has the potential to enhance the quality of information provided for making critical design decisions regarding a building's environmental impact. BIM can assist in the following areas of sustainable design: Building orientation (selecting a good orientation can reduce energy costs), Building massing (to analyse building form and optimize the building envelope), Day-lighting analysis, Water harvesting (reducing water needs in a building), Energy modelling (reducing

energy needs and analysing renewable energy options can contribute to low energy costs), Sustainable materials (reducing material needs and using recycled materials), Site and logistics management (to reduce waste and carbon footprints). Design options for sustainability can be tracked and studied in a model along with spatial data to geographically locate and import building site information to place it within context and to contribute to an understanding of issues relating to climate, surrounding systems and resources. The building can then be adjusted and engineered using real coordinates to reduce the impact on and utilise sustainably the surrounding environment to reduce energy requirements, for example solar orientation (Krygiel & Nies 2008 & Hardin 2011 in Dowsett and Harty, 2013).

Through the use of BIM tools, designers can foresee and envisage the likely errors in design and subsequently adjust the designs early in order to reduce the possibility of project failure. Consequently, BIM has become a common tool used for sustainable building design. It simulates building projects in the virtually visible environment and incorporates all associated information include geometry, spatial relationships, geographic information, and quantities and properties of building elements (Hoes, Hensen, Loomana, De Vries & Bourgeous, 2009 in Oduyemi and Okoroh, 2016). It provides an ability to do the simulation for validating the performance of design projects and enables designers to improve their designs and select the optimal one.

Through the integration of LCA software and BIM software to automate use of highly energy efficient materials and building operation optimisation technologies the impacts to life cycle energy and emissions consumption from the operational phase not only allows efficiencies in LCA assessment procedures but also enable design changes to be made prior to construction and assist building management in the optimisation of a building's environmental footprint throughout its operation (Russell-Smith & Lepech 2012).

Examples of building performance and environmental analysis software include:

- *Autodesk Ecotect Analysis 2010*, a green building software designed to provide information regarding projects throughout the design and preconstruction phases of development (Autodesk 2009a).
- *Virtual Environment (VE)*, software offered by Integrated Environmental Solutions (IES) that virtualizes the entire process of designing buildings specifically for 52 environmental purposes. The software provides a full building modeler, similar to BIM, where a user may import extensible files or start from the beginning within the interface.
- *Graphisoft EcoDesigner*, a plug-in. It is a program that allows for modeling and analysis of the energy efficiency performance of a building early on during the design phase of a project (Thoo 2010).
- *eQUEST***,** an acronym for "Quick Energy Simulation Tool," is a building energy simulation tool provided by the US Department of Energy as part of the DOE-2 software packages. It is designed so that it may be used during the early schematic

phases of design, with modeling capabilities built within its software platform (Energy Design Resources 2009).

Finally, BIM has deservedly received so much attention in recent years and is very useful in performing sustainable building designs. BIM provides important data and information for design projects and also encompasses several important functions for building performance analysis in performing sustainable building designs. Consequently, studies around sustainable building design have become more methodical in nature (Liu, Meng & Tam, 2015 and Wang, Wang, Wang & Shih, 2015).

Conclusion

The objective of this paper is to review to highlight the adoption benefits of BIM and also emphasis the need to adopt as a tool for sustainable architectural practice in Nigeria. the paper highlight BIM is a new approach to design depending on collaboration between the architects, client, engineers, building services, manufacturers, contractors and other consultants. It is vital for the advancement of architectural, construction and engineering practices in developing nations. It is vital for sustainable architectural practice in Nigeria. The review reveals that BIM has become a common tool used for sustainable building design.

However, empirical studies should be carried out to determine factors that are impeding the adoption of BIM in developing countries. This will increase the understanding on challenges faced by developing countries in BIM adoption and how to overcome it.

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FACTORS AFFECTING HUMAN RESOURCE MANAGEMENT IN SMALL CONSTRUCTION FIRMS IN LAGOS METROPOLIS, NIGERIA

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Abstract

The problems facing the construction industry is typically characterized by the difficulty in managing human resources. Reasons for such poor performance in this sector are fragmentation, project-based culture, and temporary teams. It is therefore important to determine to what extent this practice can be useful in addressing the specific problems confronting the construction professional service firms. This study examines the effect of Human Resources Management (HRM) on the performance of small construction firms. A quantitative research survey was used and the population consists of construction professionals in the construction firms. They comprise of Architects, Builders, Quantity Surveyors and Engineers. Stratified sampling technique was used to identify the small indigenous construction firms. A total of 80 questionnaires were distributed and 65 questionnaires were returned and used for the analysis. Statistical Packages for Social Scientists (SPSS) was used for the analysis. The finding showed that performance appraisal is the most practice HRM adopted in small indigenous construction firms. It was also identified that performance appraisal HRM practices have more effect on organisation project quality delivery. It ensures a better working experience among the workers. In conclusion, the use of performance appraisal HRM practices will assist small contracting firms in project delivery to their clients.

Keywords: *Human Resources Management, Small Construction Firms, Indigenous Contracting Firms.*[43]

1. Introduction

The construction industry is placed under primary production in commerce (Arthur, 2016). The industry is recognize as a highly hazardous industry due to its fragmented nature. The activities involved are numerous and they comprises of repairs, demolition, alteration and construction of building. The construction industry is being identified as the highest generating economy

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for any nation (Adeagbo, 2014). Durdyev and Ismail (2012), opined that the construction industry is large and dynamic when compared with other industries. The industry has a linkage with other industries. It implies that other industries depend on it for development. Thus, it had been recognised as the social and economic development of any nation (Adeagbo, 2014; Okoye, 2016). The Nigerian construction market is among the largest construction markets in Africa (Odediran *et al.*, 2015). It has led to a tremendous growth of the industry. The tactical role of the industry in Nigeria in term of the industry contribution to Gross Domestic Product (GDP) is low when compared with other developing countries. However, the industry enhances employment generation and contributes to the Gross Domestic Product (GDP) and Gross Fixed Capital Formation (GFCF) of any country (Okoye, 2016). It is only the construction sector that occurs twice in the national account of every nation (Lopes, 1998). The GFCF entails the total value of all new construction which includes construction works (building and civil engineering works). This also includes all capital alternatives that improve the life span of the project.

The construction industry comprises of many key players for the sustainable project delivery. Thus, these key players who are the human resources needs to be monitored and managed for project performance (Aguenza & Soon, 2012 cited in Ameh & Daniel, 2017). It was realized that

Human resources had a significant relation with the project cost (Ameh & Daniel, 2017). Adequate management of the human resources is necessary to ensure the project is completed within cost. Human Resources Management (HRM) includes recruitment, training, motivation and the welfare of the workers. Human Resource Management (HRM) is the function within an organization that focuses on recruitment of, management of, and providing direction for the people who work in the organization (Agu & Ugochukwu, 2016). Human Resource Management can also be performed by line managers.

However, HRM is the organizational function that deals with issues related to people such as compensation, hiring, performance management, organization development, safety, wellness, benefits, employee motivation, communication, administration, and training (Ulasi, 2011). Human Resource Management is also a strategic and comprehensive approach to managing people and the workplace culture and environment. Effective HRM enables employees to contribute effectively and productively to the overall company direction and the accomplishment of the organization's goals and objectives. These had prone researchers especially in the manufacturing sector on studies on HRM practices adopted and its impact on organizational performance (Wekesa *et al*., 2013; Akinbode & Uweme, 2013). Such studies includes those from Iran (Tabassi & Abu Bakar, 2009) United State (Yankov & Kleiner, 2001), China (Zhai *et al.*, 2014) and in Nigeria (Oladipo & Abdulkadir, 2011; Akinbode & Uweme, 2013; Ameh & Daniel, 2017. Other studies relate Knowledge management with HRM practices (Shih & Chiang, 2005; Alshanbri *et al.*, 2012). Construction firms do not consider the managing of their Human Resources despite the critical issue faced by the industry in terms of performance of the construction projects. Therefore, this study intends to assess HRM of small construction firms with a view to ensure effective project

delivery of the firms. This is to enable utilization of the employees in pursuit of the organization goals and objectives.

2. Review on HRM practices

HRM practice is a process of attracting, motivating, and retaining employees to ensure the survival of the organization (Schuler & Jackson, 1987). HRM practices are designed and implemented in such a way that human capital plays a significant role in achieving the goals of the organization (Delery & Doty, 1996). HRM practices set the tone and condition of the employer-employee relationship which can encourage the employees to become more innovative (Tan & Nasurdin, 2011). If HRM practices properly implemented, it could play a sjignificant role in contributing to the management of organizational knowledge. Thus innovation will be realized through the ability to use the knowledge to identify and pursue the opportunity. The appropriate use of HRM practices positively influence the level of employer and employee commitment. HRM practices such as, training and development, performance appraisal encourage the employees to work better in order to increase the organizational performance (Tan & Nasurdin, 2011).

In developing countries, the human resource availability is quite easy but the most unfortunate part is its effective and efficient management. It is a well-established fact that it is human beings behind the machines which can drive or drown the organizations. Human behaviour and psychology is driven and motivated by varying degree of factors. The researchers across the globe have evolved and successfully practiced certain HRM techniques in order to achieve best performance and productivity from human capital (Wekesa *et al.,* 2013; Zhai *et al*., 2914).

Human Resource is the most important asset for any organization, and it is a major source of achieving competitive advantage (Arashpour & Arashpour, nd). Managing Human Resources is an extremely challenging task as compared to managing capital or managing technology. HRM practices refer to organizational activities directed at managing human resources and ensuring the fulfillment of organizational goals. Human Resource is a very essential component for an organization in terms of labour turnover, productivity as well as financial growth of an organization. Similarly, Human Resource management practices play a pivotal role in employees' retention and their productivity. (Peer-Olaf, 2008).

There are numerous factors which influence this aspect, like inadequate incentives, inadequate wages, salaries or allied benefits, poor reward system and lack of health and safety facilities (Shaukat *et al.,* 2015). Employees get frustrated due to imbalance in the work and their personal life and fail to render optimum performance (Ayesha, 2012). This had also been observed that job stress by the HR department or manager is a major challenge to the employees. Those organizations which do not evolve and implement Human Recourse Plan (HRP) often expedience HRM related issues (Shaukat *et al.,* 2015). Consequently, people cannot acquire professional development through training, mentoring or coaching. Thus the work force faces issues like; boredom or lack of challenge in the work environment (Tabassi & Abu Bakar, 2009).

As a result of globalization new corporate companies or organization cannot absolve themselves from Corporate Social Response (CSR) (Shih & Chiang, 2005). Least attention was paid towards health, safety, compensation and benefits, diversity and good working environments in the past. Perhaps the sole reason was to save the money by any menus possible. Unlike this trend, organization has to discharge their corporate special responsibilities by taking care of their human resource (Shih & Chiang, 2005).

Human Resource Management is a very complicated subject in which standardized practices cannot be implemented and followed. This is so because human beings possess varying degree of psychological behaviours, skills, expertise, emotions, motivation levels, loyalty and desire for professional growth (Tan & Nasurdim, 2011). In order to get maximum productivity of human resource operating in any field, company or organization, there is need to adopt those practices which increase the performance levels of the employees. It is not always to adopt lucrative benefits and compensation scheme rather sometimes professional growth and development of employees may serve as the best solution. The top management must consistently and periodically review the results of HR practices in their companies so that these should serve the company's mission statement and quality policy.

3. Research Method

The quantitative research design in form of descriptive and exploratory design was used and the population of the study comprises of small construction firms in Lagos State. These small construction firms consist of Architects, Builders, Engineers and Quantity Surveyors. Simple random sampling technique was used. Eighty (80) questionnaires were distributed and sixty-five (65) questionnaires were returned and used for the analysis. It gives a response rate of 81%. Statistical Package for Social Scientist (SPSS) 21 version was used to analyze the data. Descriptive statistical tool in form of mean and ranking was used. The respondents were told to rate the level of agreement of the HRM practices factors on a Likert scale of strongly disagree (1) to strongly agree (5). They were also told to rate the effect of HRM on performance on a Likert scale of no impact (1) to very high impact (5). From the analysis, 75% had worked in the construction firms between 1-10 years and 50% between 11- 20years. It shows that workers in the small construction firms tend to change their job frequently. This may be due to the deficit in the Human Resource Management Practices in the construction firms.

4. Data Analysis and Result Findings

4.1 Human Resources management practices

Table 1 displays the HRM practices adopted. From the table, performance appraisal (mean = 4.30) was ranks as the strongly agreed HRM practices adopted by the respondents. It was follows by training (mean = 4.32), employee involvement (mean = 4.20) and strategic development of staff for optimal utilization (mean = 4.07). The least rank were group harmony which can enhance cooperation and decision-making (mean = 3.67), the efficiency of affirmative action in ensuring employment opportunity (mean =3.50) and balance of power in the application of equal employment opportunity (mean = 3.47).The result shows that performance appraisal, training and employee involvement were HRM practices adopted by

contracting firms in Nigeria. Findings from a study conducted in China according to Zhai *et al*. (2014), multidimensional practice of job description, involvement of the employee, training, staff and rewards were identified as HRM practices. In addition, worker participation, team integration of all levels of management and training were identified as HRM practices in United State (Yankov & Kleiner, 2001). Training was recognized as a unique criterion for HRM practices. Tan and Nasurdin (2011) stated that HRM is a policies and practices which involved carrying out Human Resources aspect of management position. It includes human resource planning, job analysis, performance appraisal, recruitment, staffing, training and development. Zhai et al (2014) identified training and motivation of employee as a major obstacle to effective use of HRM. They therefore recommended that short and long term training of construction workers are deemed necessary at fixed location and on job training.

Table 1: HRM practices adopted by contracting firms

4.2 Factors affecting HRM practices

HRM practices variables	Mean	Rank
Performance appraisal	4.30	1
Training	4.23	2
Employee involvement	4.20	3
Strategic development of staff for optimal utilization	4.07	4
Reward system	4.02	5
Career management	3.80	6
Openness and objectivity of the recruitment and selection process	3.70	7
Flexibility in pay system	3.70	7
Career planning	3.70	7
Group harmony which can enhance cooperation and decision-making	3.67	9
The efficiency of affirmative action in ensuring employment opportunity	3.50	10
Balance of power in the application of equal employment opportunity	3.47	11

From Table 2, business strategy (Mean = 4.67) was identifies as the significant factor affecting HRM practices. It was follows by organizational structure (Mean = 4.62), organizational size (Mean = 4.62) and organizational mission/vision (Mean = 4.45). The least ranks HRM practice factors were union actions (Mean = 3.57), competitors action (Mean = 3.55) and changes in international economy (Mean = 3.37).

Business strategy, organizational structure, size and mission are parameters for the objective of any organization. These are top management function to ensure the performance of the organization. Since human resources is the tool that enhance the technology, money and equipment to be used for productivity and performance. It therefore becomes necessary that

the business strategy should be in line with the HRM for effective performance. The flow of communication based on the organization structure should also be considered.

Table 2: Factors affecting HRM practices

HRM practices factors	**Mean**	**Rank**
Business strategy	4.67	1
Organizational structure	4.62	2
Organizational size	4.62	2
Organizational mission/vision	4.45	4
Priorities of life managers	4.42	5
Commending good work done	4.37	6
Organizational culture	4.32	7
Priorities of top management	4.30	8
Good employer and employee relationship	4.30	8
Economic conditions/ charges	4.25	10
Power and politics	4.25	10
Good employer and employee relationship	4.17	12
Giving incentives	4.15	13
Political	4.12	14
HRM practices factors	Mean	Rank
Health and Safety guarantee of workers	4.12	14
Workforce demographics (location)	4.05	16
Industry characteristics	4.00	17
Changes in national economy	4.00	17
HRM staff's experiences in other organizations	3.97	19
Social (changes in population, customer behaviour)	3.97	19
Work safety mobility	3.95	21
Government regulation (legal)	3.87	22
Impact of education and training in HRM	3.77	23
Union actions	3.57	24
Competitors action	3.55	25
Changes in international economy	3.37	26

4.3 Effects of HRM on performance

From Table 3, better working experience (Mean = 4.77), improved project quality delivery (Mean = 4.77), improved employee welfare (Mean = 4.65) corporation among employees (Mean = 4.55) and technical success (Mean = 4.55) were highly ranks HRM effect on performance. It was follows by improved employer and employee relationship (Mean = 4.47), good employer and employee relationship (Mean = 4.40) and organizational trust (Mean = 4.37).

Agu and Ugochukwu (2016) opined that to enhance effective productivity in Enugu State construction industry in Nigeria, HRM Need to be enforced. Hence HRM has a high impact on employee performance. This is in support of the result of the study that a better working experience and improved quality project delivery by the employee through the human resource managers will enhance performance. Thus, HRM is a system that influences employee behaviour, attitude and performance.

Table 3: Effects of HRM on performance

HRM on performance	Mean	Rank
Better working experience	4.77	1
Improved project quality delivery	4.77	1
Improved employee welfare	4.65	3
Technical success	4.55	4
Corporation among employees	4.55	4
Improved employer and employee relationship	4.47	6
Good employer and employee relationship	4.40	7
Organizational trust	4.37	8

5. Conclusion and Recommendation

Human Resource Management (HRM) is a strategy management process to ensure organizational performance. It entails managing the human forces in the organization in order to ensure the objective of the organization is achieved. This is could be done through effective communication, motivation and training. Thus the aim of this study is to examine the HRM practices to be adopted to ensure organization performance in small construction firms.

The findings of this study show that performance appraisal, training, employee involvement and strategic development of staff for optimal utilization are the HRM practices adopted by small construction firms. Business strategy, organizational structure, organizational size and organizational mission/vision are the factors affecting HRM practices. Better working experience, project quality delivery and improved employee welfare has positive effect on the relationship between HRM and organisational performance. It therefore recommended that the human resource managers should provide adequate working environment and motivational skill for workers in order to protect the interest of the employee.

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INFLUENCE OF WEB-BASED PROJECT MANAGEMENT SYSTEM ON PROJECT DELIVERY

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Abstract

This paper aim to highlight potential benefits of Web-based Project Management Systems (WPMS) on project delivery; this is achieved by reviewing literature on features and benefits of WPMS for project delivery. Semi-structured interviews were conducted on 15 registered professionals and questionnaires distributed to 49 others to evaluate awareness and perceptions on WPMS benefits. 41 copies of questionnaires was retrieved and used for analysis representing 84% response rate. Literature revealed 13 shortcomings and highlighted 17 potential benefits of WPMS. Interview respondents (80%) revealed little are known about WPMS amongst professionals in Nigeria but agree it will enhance project delivery by facilitating new collaboration areas, improving communication, coordination and management. Another 27% insist the shortcomings are fundamental to adoption of WPMS but all (100%) interviewed have positive attitude towards WPMS adoption. Survey results reveals WPMS impacts on project delivery with enhancement of communication and collaboration activities having a mean score of 4.29 while cost reduction & time saving activities has a mean score of 4.06. It is concluded that embracing new project management methods through use of WPMS will enhance project delivery. It is therefore recommended that increasing awareness of WPMS will expose its potential benefits and impact on project delivery.

Keywords: *Built-Environment, Collaboration, Project Delivery, Project Management Methods, Web-based Project Management Systems*[44]

1. Introduction:

Ko (2011) describes the aim of project management as to efficiently and effectively meet unique goals that add value using available resources, hence it can be inferred that project managements' primary focus is to achieve projects in the most efficient and effective way. Bhzad (2012) however outlines negative issues that still affect management of construction projects to include use of inappropriate tools and systems for communication, coordination and management. The construction industry has recognised the need to increase the efficiency of information management by exchanging massive volumes of information at high speed and at relatively low cost (Deng, Tam, Shen and Love, 2001). Similarly researchers have recommended the need to enhance project management tools and techniques through the use

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of internet-based solutions to construction project management (Deng *et al*., 2001 citing Garcia *et al.,* 1998 and Walch *et al*., 1998).

The simplest way of describing the delivery process in construction is as described by Ashworth (2002) consisting of inception, design, construction and handover. During these stages, professionals in the built environment employ different management functions and skill to ensure prompt delivery. Chan *et al*. (2004) posited that the success of a construction project through these processes is affected by a number of factors among these and of significance is the project management actions and procedures which comprises communication systems, control mechanisms, feedback capabilities, planning efforts, and overall managerial actions.

Wamelink *et al*., (2002) categorized Web based services into four: Information portals, enterprise portals, electronic marketplaces and web-based project management systems. These systems which are products of the proliferation of Internet based technologies have been reported to be used by construction project team for communications, information sharing and solving problems that help manage time and cost (Alshawi and Ingirige, 2003). Bhzad (2012) opines that Communications and Project Management Systems (CPMS) such as mobile and Web-based Project Management Systems (WPMS) have helped fulfill project objectives such as quality, scope, time, and cost. Contemporary developments in the field of information technology (IT) and emergence of new concepts and philosophies (Bhzad and Sanad, 2010, Alreemy *et al*., 2016) are a pivotal reason for prominence of WPMS. Obradovic *et al*. (2014) observed that more sophisticated IT tools help Project Managers to effectively capture information in all meridians throughout the world. Hence, employing WPMS to manage construction projects should enhance the turnout of project management functions and ultimately improve construction project delivery. The emergence of web-based technologies and applications to human businesses and daily activities has helped several industries migrate from traditional ways of achieving objectives because of how they improve processes; advances were made in various professions when such professions took advantage of technological tools available (Li, 1996; Pollack-Johnson *et al.,* 1998; Oyediran and Odusami, 2005).

The main idea of this paper is to highlight the potential benefit of WPMS on construction project delivery. This is achieved through identifying the features of WPMS and benefits of employing WPMS for project management; examination of WPMS awareness level amongst construction professionals in Nigeria and evaluating built environment professionals' perception of the impact WPMS has on project delivery.

2. Literature Review:

WPMS are applications that focus on the effective implementation of project management methods. (Bhzad and Sanad, 2012) explains that the system uses wireless, satellite, internet-based or mobile tools and networks to function therefore obliterating paper trails. WPMS provides a central website, or project portal, where everyone involved in a project can have access to up-to-date project information, share documents, and participate in planning and problem solving using collaboration tools (Zou and Roslan, 2005).

2.1 Features of WPMS:

WPMS can be likened to the modern day Facebook of the Construction Industry. Zou and Roslan, (2005) citing several authors (Sifri, 2000; Doyle, 2001; Becerik, 2004), documented tools that form the content of WPMS to include the following:

- Document management tool: creates and customizes file cabinets, drawers and documents specifically to members of the project while creating security features to restrict/grant access.
- Workflow management tool: the tool enables definition of workflow process, ordering of sequence tasks, document distribution, tracking tasks, giving direction to the teams, tracking time and updating schedules within a workspace.
- Collaborative tools: this tool gives team members the ability to virtually meet when they are geographical apart and collaborate without holding face to face meetings or conference calls.
- Organizational tool: this tool enables all the project information to be organized with features like news board, contacts, links and keywords.
- Reporting and data exporting tools: the reporting manager facilitates reporting on tasks, events, news, documents and progress while data exporting tool allows data to be converted from one format to another.
- Maintenance tool: the system administrator uses the maintenance tool to add and remove users of the WBPMS site as needed and also to monitor hard disk space, archive files, set up system parameters, and maintain databases and searching catalogues. The administrator can define access control lists, and assign different permissions to users.

The tools provide platforms that have multiple user functions to improve processes of project management.

Skibniewski and Zhang, (2005) identified three choices available in current market for companies to implement WPMS as either to: develop the system in-house; to purchase packaged software from vendors and install it on company's own server or; to subscribe to an application service provider (ASP).

2.2 Identified Benefits of WPMS:

Literature documented significant benefits of WPMS to project delivery. Most significant of the reports categorised the benefits of WPMS into four main areas: Cost reduction and time saving; Enhancement of communications and collaboration; Improvement of productivity and partnership and; Supporting e-commerce and customer relations (Nitithamyong and Skibniewski, 2004). Other identified advantages include: avoiding delays because of the arrival of updated drawings documents, reducing visits to site and traveling time to meeting, avoiding drawings mistakes, reducing time and money spent on disputes, sharing and exchanging project information, automate repetitive routine processes and elimination of paper reports (Wamelink et al., 2002; Alshawi and Ingrige, 2003; Stewart *et al.*, 2004).

In a related research, a number of benefits from using WPMS technology that aim to improve project management methods were identified as: a) Enhancement of productivity of face to face meetings between project participants by providing timely and concise information in order to make more effective decisions; b) Reduction in project delays; c) Heightens all parties awareness of the project issues, and; d) Ease of access and retrieval of project information (Bhzad and Sanad, 2010 citing Wamelink *et al.*, 2002 and; Bowden, 2005). Furthermore, Bhzad and Sanad, (2010) posited that WPMS enhances project communication, documentation and control, and overturns the way in which a construction project team traditionally conducts business. They also highlighted that WPMS allow project team members to communicate and exchange project information in a fast, cost-effective, and efficient manner. Similarly, Ozorhon *et al*. (2014) opines that Web-based database systems may be used to enhance the control of knowledge flow and make better decisions because those systems are considered to increase Operational Learning (OL) based on the acquisition of data, storage of useful information in databases and retrieval of knowledge when needed. Finally, Cartlidge (2011) opined that the objective of using ICT to enhance E-commerce is primarily in order to lower cost, improve efficiency and productivity, shorten lead-in times and provide better customer service.

2.3 Shortcomings and Constraints to the use of WPMS:

Identified shortcomings from literature were described more as limitations that require attention. For instance Bhzad and Sanad, (2010); citing Dossick, (2008); Chan *et al*., (2004); Yang *et al*., (2007), Stewart and Mohammed, (2004); Nitithamyong and Skibniewski, (2006) perceived probable limitation to the full realization of potential benefits from implementing electronic information systems includes that businesses may incur extra direct and indirect cost because the road to learn how to properly use IT is rough and staff training will be required. Other limitations identified (Bhzad and Sanad, 2010) includes that it is difficult for the staff to adapt to new procedures; system reliability and security; IT applications have various critical masses; the effects might be indirect; the tangible are often short-lived; IT benefits cannot merely be measured in financial profits; IT is merely a tool that can be used either rightly or wrongly, but on its own, it does not do anything. Bhzad and Sanad, (2010) identified further shortcomings associated with communication and information systems to include that they are: time consuming, error inclined and highly dependent on human initiative and expertise.

In a study of the use of WPMS carried out in Australia, Zou and Roslan, 2005 posited that a large number of construction firms do not use WPMS. This is mainly because they do not see the need for such systems, plus the constraints of their limited financial capabilities, small turnover and limited IT skills. Cartlidge (2011) also outlined the main disadvantages of using e-technologies as initial set-up cost, loss of personal contact and retraining of staff.

2.4 Impact of WPMS on Project Delivery

A construction project like any other product is conceived and delivered through processes and stages with success through the stages sacrosanct. Chan *et al*., (2004) identified communication as part of the management actions that affect success of a construction project. Davidson and Moshini, (1990) posited that the cost of construction can be reduced by 25% through the efficient transfer of information between the construction teams. Construction professionals require different types of information during project delivery which includes; reports, material management, equipment management, cost management, schedule means and methods, jobsite record keeping, submittals, safety and quality control and quality assurance (Garza and Howitt, 1998). Thus, the amount of information and documentation generated and exchanged during the construction process is massive, even on small projects (Chassiakos and Sakellaropoulos, 2008). The information from these activities cannot be undertaken effectively and efficiently using traditional communications and information management systems as it has shortcomings in fulfilling project duties (Yang *et al.,* 2007). One of the shortcomings is that it provides limited access to information which is considered as one of the key barriers to project management practices (Vadhavkar and Pena-Mora, 2002; Pena-Mora *et al*., 2009). It is anticipated by a number of researchers that WPMS will replace traditional project management methods (Becerik, 2005; Zou and Roslan, 2005). Several reasons support this claim including increased competitive pressures, expectations of revenue growth, the ability to compete globally, and the desire to reengineer the business to respond to market challenges (Nitithamyong and Skibniewski, 2006). Therefore, an exploration into new ways of managing construction projects to improve the current practice is necessary (Zou and Roslan, 2005). Several studies by authors e.g. Patanakul *et al*. (2010); Lappe and Spang, (2014) confirmed that the project success rate increases if project management methods are used. A lot of failures in project delivery has been attributed to be caused by inadequate organization / management of the construction process, e.g. a weak coordination of processes and uncertainty about available information (Sweis, 2008). Biggs (1997) noted that the latest web-based solutions which can be linked with email or collaborative software can reduce the incidence of people related issues and overall communication problems which lead to project failures. This would ensure the smooth flow of project work, providing accurate, speedy and updated information and sorting out constructions problems quickly (Charoenngam *et al*., 2004; Davidson and Moshini, 1990).

The willingness to collaborate between professionals is assumed a direct reflection of the inherent benefits and impact it has on project delivery. Siti *et al.,* (2013) conducted a research on the factors that lead to willingness to collaborate in the industry and the important drivers found include that; collaboration will encourage teamwork, collaboration develops cooperation, stimulate information sharing, improve quality and project completion time, enhances service quality, and better communication among project members. In a related research, (East *et al*., 2004) posited that web collaborations have been seen to impact economically on the design review process which is an improvement over traditional manual

methods of comment collection and resolution by reducing time required to conduct a design review, number of participants, meeting times and travel cost by up to 73%.

3. Materials and Methods:

This study was carried out among construction professionals in the built environment employed by firms registered with the University of Ilorin to offer construction services. The research is designed to obtain secondary information from literature and primary information from a spectrum of practicing built environment professionals through interviews and questionnaires. University of Ilorin was selected as the study area because over the years the university consistently delivered construction projects on annual basis. The sample size comprises the list of One Hundred and Fifty - Eight (158) registered Firms with the Physical Planning Unit (PPU) of the University of Ilorin.

Literature was reviewed to excise the features of WPMS, the potential benefits and impact of WPMS on project delivery. Fifteen (15) semi-structured interviews were conducted to obtain information from built environment professionals on the level of awareness of WPMS and their perception on the shortcomings, constraints and benefits of using the systems. Convenience sampling was used to select professionals interviewed but ensuring they cut across several work spectrums (Table 1). Creswell (2012) defines convenience sampling as a method where the researcher selects participants because they are willing and available to be studied.

Table 1: Schedule of Interviews

Work Spectrum	**Profession Interviewed**	**Face-to-Face**	**Telephone**
Architectural firm in practice	Architect	2	2
Quantity Surveying firm in practice	Quantity Surveyor	3	1
Civil engineering firm in practice	Civil & Structural Engineer	1	1
Services engineering firm in practice	Mechanical Engineer	2	
Building Contracting Firm	Structural Engineer	2	1
	TOTAL	**10**	**5**

Source: Researchers Field Work, (2018)

All professionals interviewed are registered professionals with relevant professional institutions. Principal partners or senior managers were interviewed in the firms. The face-to-face interview took about twenty-five (25) minutes each, while telephone interviews took an average of fifteen (15) minutes each. All the interviews were recorded, and then transcribed verbatim for content analysis and discussion. Content analysis is used for revealing the significant positions from the professionals interviewed.

A survey of built environment professionals was also carried out. Professionals were purposively selected from forty-nine (49) firms, comprising a homogenous sample because of their involvement in construction projects with the University of Ilorin. Creswell (2012) explains that in homogeneous sampling the researcher purposefully samples individuals or sites

based on membership in a subgroup that has defining characteristics. The questionnaire used was constructed to elicit responses to determine the perception of professionals on the impact of WPMS on project delivery based on Seventeen (17) project activities WPMS can improve individually and subsequently impact on four (4) primary project benefit factors. Respondents were requested to measure their perception of the impact WPMS has on the project activities on a five-point Likert scale. Questionnaires were distributed by hand and via email to construction professionals employed by the firms selected. A total of 49 questionnaires were distributed while 41 was retrieved and used for analysis representing 84% response rate. Data for the study was processed and analysed with the aid of Statistical Packages for Social Science (SPSS 20.0).

The survey instrument consists of two (2) sections. The first section sought information on the personal and organizational characteristics of respondents while the second section elicited information on the perception of built environment professionals on the impact WPMS has on project activities identified from literature. The test-retest method was adopted as reliability test on the research instrument; this allows the instrument to be administered at two different times.

4. Data Analysis & Research Findings:

4.1 Interviews Results:

The first set of interview questions investigated awareness of WPMS in the industry. Twelve (12) of the respondents (80%) have limited knowledge of WPMS and were not aware of any firm or agency that uses WPMS hosted by an ASP. The other three (3) respondents (20%) have limited knowledge. All the respondents however revealed that they are familiar with using multiple web technologies in an attempt to achieve similar objectives as obtainable with WPMS.

The second set of questions investigated the perception of professionals on the shortcomings, constraints and benefits of WPMS. Eleven (73%) of the respondents interviewed agreed that in the face of the benefits the shortcomings can be seen as challenges to be solved. However 4 (27%) of the respondents insist that the constraints would be fundamental and strategic to firms and client agencies willing to employ WPMS for construction projects.

The third set of questions examined the perception of the professionals on the impact WPMS will have on project delivery. Ten respondents (67%) agree that WPMS will impact greatly on project delivery, however five respondents (33%) disagree on the perceived impact WPMS can have on project delivery.

The final set of questions investigated professionals' willingness to adopt WPMS for their projects and the likely future for it in Nigeria. All the respondents (100%) agree that where it is affordable, they are disposed to adopting it. However five (33%) respondents believe it is yet a sustainable system in Nigeria.

4.2 Main Survey Results

4.2.1 Personal and Organizational Characteristics of Respondents

Experience of professionals for the study was sacrosanct and the distribution shows a good percentage of matured professionals with 85% of the respondents above 35 years of age and 75% having more than ten years' experience in the industry. In addition the distribution showed that 55% has additional degrees with 71% being corporate members or fellows of their respective professional institutes. Hence, this confirms that majority of the respondents have requisite amount of experience to provide information for the study.

Quantity surveyors, Civil/structural engineers, and architects rank highest amongst the professionals selected with 26%, 25% and 23% respectively; mechanical services engineers are 11%; and electrical services engineers are 15%. Majority (51%) of the respondents organizations are contracting firms wile while 49% are consulting firms. All the organisations sampled have more than 5 years' experience in the industry.

4.2.2 Perception of Respondents on the Impact of WPMS on Project Delivery:

The respondent's perception was measured on a five point Likert scale with respondents who strongly disagree having a point of 1 and 5 points for respondents who strongly agree.

Table 2: Benefits of WPMS.

Primary Benefits	**Project Activities Factors**	**1**	**2**	**3**	**4**	**5**	**N**	**Mean**
Enhancement of Communication & Collaboration	Improves sharing & exchanging project information	1	4	5	13	18	41	4.05
	Eliminating paper reports and paper trails	2	1	0	14	24	41	4.39
	Improves parties awareness of project Issues	0	1	0	18	22	41	4.49
	Easy access and retrieval of project Information	1	1	2	21	16	41	4.22
	Mean Score of Benefit **4.29**							
Cost Reduction and Time Saving	Eliminating delays due to updating of drawings	2	3	1	15	20	41	4.17
	Reducing visit to site & traveling time for meetings	7	5	3	18	8	41	3.37
	Reducing time & money spent on disputes	1	1	0	15	24	41	4.46
	Reduction of general project delays	4	1	1	16	19	41	4.10
	Quick solution to managerial challenges	3	1	1	16	20	41	4.20
	Mean Score of Benefit **4.06**							
Productivity Improvement & Partnership	Reduces and avoids drawing mistakes	9	12	0	17	3	41	2.83
	Automate repetitive routine processes	5	2	2	18	14	41	3.83

Primary Benefits	Project Activities Factors	1	2	3	4	5	N	Mean
	Providing timely & concise information to enhance productivity of face - to - face meetings	0	1	0	17	23	41	4.51
	Enhancing Knowledge Management (KM) & stimulating Organizational Learning (OL)	1	1	0	17	22	41	4.41
	Mean Score of Benefit 3.90							
Supporting E-Commerce & Customer Relations	Re-engineers processes in organizations value chain	8	13	11	5	4	41	2.61
	Shorten lead-in times for material procurement	9	8	6	13	5	41	2.93
	Lower cost and input efficiency and productivity of commercial aspects of projects	5	2	1	13	20	41	4.00
	Improves customer service and e-procurement	0	0	5	17	19	41	4.34
	Mean Score of Benefit 3.47							

Source: Researchers Field Work, (2019)

5. Discussion of Findings:

Despite the existence of WPMS for over a decade, very little is yet known about it in the Nigerian Construction Industry as 80% of the respondents' clearly showed no knowledge of WPMS and the other 20% showed limited knowledge but argued that only multinationals employ WPMS on projects. This supports findings from similar research in other countries (Zou and Roslan, 2005, Bhzad and Sanad, 2010). It is encouraging that 100% of the respondents see the benefits of improved collaboration, communication, coordination and construction project management outweighing the shortcomings but 27% of the respondents observed the constraints of limited financial capabilities, apparent small turnover of individual firms, limited IT skills and the erratic power supply in Nigeria as fundamental. Thirty-three percent of the respondents believe the adoption of WPMS on projects may not improve aspects of delivery except communication, they argue that project delivery is largely dependent on the expertise of the managers and not the tools employed. They posited that despite the use of WPMS, project delivery may be hindered when the managers are not competent. However, 67% of the respondents agree that WPMS impact would be felt on project delivery by reducing time and cost. This is consistent with the main survey that revealed the perception of professionals on the impact WPMS has on project delivery. Professionals perceived that highest impact will be on enhancement of communication and Collaboration; closely followed by cost reduction and time saving activities with mean score of 4.29 and 4.06 respectively. All respondents agree that it will improve collaboration and exchange of information between organizations. This is predicated on the document management; collaborative; and data export

features of WPMS. The professionals also showed reasonable disposition to adopting WPMS where it is affordable. They however laid emphasis on the fact that ASPs' are yet domiciled in Nigeria, hence foreign exchange may make it impractical to host. Professionals also expressed optimism that where funding and client agencies adopt WPMS, beneficiaries and other project participants will have to adopt because cost transfer to individual firms will be minimal.

6. Conclusions:

The potential benefits outweighing the shortcomings and the professionals' disposition to adopting WPMS despite the constraints supports the conclusion that WBPMS provides benefits to construction, hence embracing new project management methods through the use of WPMS in Nigeria will enhance project delivery and improve collaborations. In addition, this research also revealed that it is generally agreed among all professionals, that WBPMS could improve construction productivity and, in time, could become a primary Project Management system.

It is recommended that improving awareness of WPMS will expose its potential benefits. Furthermore, encouraging funding agencies like the Tertiary Education Trust Fund (TETfund), and Client organizations like Universities to adopt WPMS will enhance its prominence amongst professionals. In short, although it is generally postulated that WBPM systems will be the dominant platform to manage and control projects and facilitate communication and collaboration in the future, more research is required to investigate limiting factors responsible for its slow adoption. Finally, it is necessary to encourage all firms, to improve on IT skills required for its adoption through skills education and training.

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ASSESSMENT OF READINESS OF NIGERIAN CONSTRUCTION FIRMS ON ADOPTION OF LEAN CONSTRUCTION PRINCIPLES

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Abstract

Nigeria Construction firms are faced with the challenges of poor performance and waste of resources during the course of construction projects. Moreover, lean construction principles have been known as effective means of reducing wastage of resources during construction projects. Therefore, the aim of the paper is to assess the level of readiness of Nigerian construction firms on adoption of lean construction principles. A total of 120 questionnaires were distributed to Engineers, Quantity surveyors, Builders and Architects in sampled construction firms in Abuja. The descriptive method of analysis was used to analyze the data obtained from the survey. The result shows that the level of awareness of the lean construction principles is still at the lowest level in the construction firms. It was also established that the construction firm's readiness on adoption of lean construction principles was still at lowest level. Especially, in the all aspect of management, process/project, employees and technology. Therefore, the paper recommended that workshop/Seminar should be organized periodically to enlighten the management and employees of construction firms as means of creating awareness of the needs and the benefits drive from the adoption of lean construction principles.

Keywords: *Building Projects, Construction Firms, Lean Construction and Project Performance*[45]

1.0 Introduction

Nigerian construction industry produces nearly 70% of the nation's fixed capital formation yet its performance within the economy has been and continues to be very poor (Isa; Jimoh and Achuenu, 2013). This can be attributed to the movement of employees away from long term employment relationships and long-term rewards and the efforts are focused on short-term rewards (Osuji, 2014; Idrus and Sodangi 2007). The Nigerian economy continues to grapple with a number of challenges that has hampered efforts at economic transformation. The economy is yet to achieve the necessary structural changes required to start rapid and sustainable growth and development, aside disarticulated and narrow productive base, while the sectorial linkages in the economy are also weak (Isa; Jimoh and Achuenu, 2013). The construction industry is generally characterized by low productivity, cost overruns, errors, poor reputation, shortage of skilled labour and poor safety (Hosseini, Nikahtar, Wong, & Zavichi,

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2012). The Nigerian construction Industry is not different from its counterpart around the globe in term of waste generation. Thus, it is the duty of the professionals to gear up and put into action, new ways of avoiding this common problem. Moreover, the lean construction principles have been established as means of minimizing the waste in the process, duration, cost and labour of construction projects (Aigbavboa, Oke & Momoti, 2016). Due to its great potential in meeting the customer's objectives in terms of increasing added value and productivity, LC is seen as an alternative approach that might be implemented by the construction industry (Marhani, Jaapara, Baria, & Zawawib, 2013). Despite the potential benefits of lean construction principles, the stakeholders in Nigeria construction firms are still left behind in the adoption of lean construction principles to improve on the performance of building projects. Therefore, Nigerian construction firms should focus attention on the adoption of lean construction principles in order to reduce or eliminate wastage, since it's have been characterized with poor quality performance and satisfy the client's objectives. Although, the concept of lean construction is still considered as a new paradigm among Nigeria Construction practitioners. There are uncertainties whether Nigerian construction firms are ready to implement this concept of lean construction principles. Based on the aforementioned factors, this research is carried at identify the level of readiness of construction firms on adoption of application of lean construction principles in Nigerian, with a view to improving project performance towards satisfaction of client's needs. The objectives of this study are: to examine the level of awareness of lean construction principles within the Nigerian Construction Industry and to assess the level of readiness of construction firms towards adoption of lean construction principles.

2.0 Concept of Lean Construction

The concept of lean principle is to generally make the construction process leaner removal of wastes regarded as non- value generating activities (Koskela, 2000). Lean construction has the potential of bringing innovative changes in the construction industry. Dulaimi and Tanamas (2001) pointed out that the adoption of lean techniques to construction eliminates non-value steps i.e. waste of resource and effort to satisfy clients objectives. Howell (1999) explained that the lean production's concept to identify and deliver value to the client and eliminate anything that does not add value. It also perfects the products and create reliable flow through stopping the line, pulling and distributing information and decision making. Aigbavboa *et al.* (2016) provided a conceptual framework of lean construction as shown in Figure 2.1.

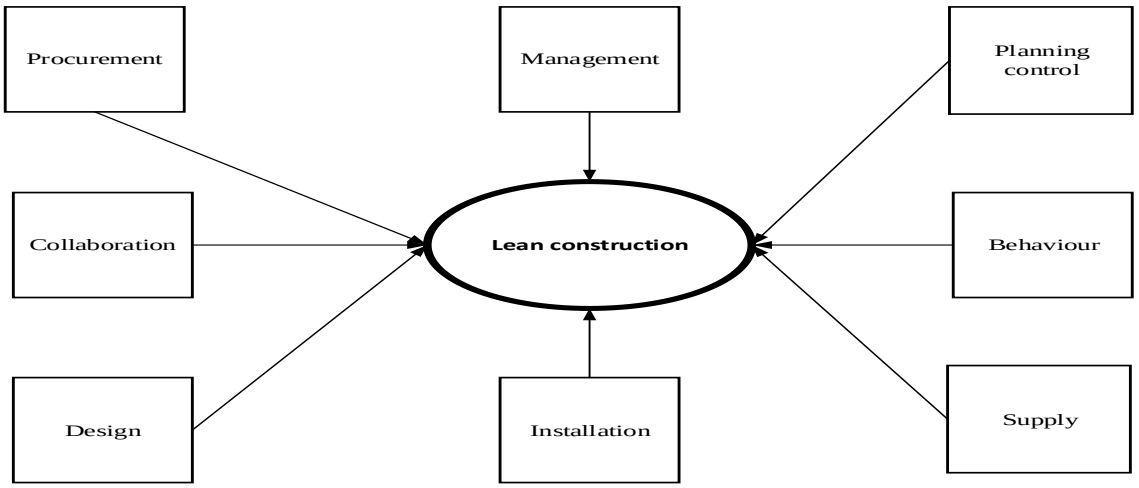


Figure 1: The conceptual frame work of lean construction, (Aigbavboa *et al.*,2016)

3.0 Research Method

This study adopted quantitative research approach via survey questionnaire to sample individuals from a population with a view towards making statistical inference about the population using the sample Creswell, (2003). And also to pull out public opinion, such as beliefs, perception, ideas, views and thought about the readiness of Nigerian Construction Firms on adoption of lean construction principles. In order to obtain the require population for this study, the stratified random sampling technique was adopted for the selection of the construction firms that participated in this study. This selection was in line with concept of Creswell and Tashakkori (2007) that respondents are arranged in strata for the convinienency in questionnaire distribution and assessment. In addition, the simple random sampling was adopted in each of the construction firms for the selection of construction players from the strata.

The questionnaire that was used to record the responses of each respondent contained mainly closed ended questions using a five- point Likert scale ranged from strongly not agree, not agree, neutral, agree and strongly agree. The scores of the respondents were computed based on the variables used in the questionnaire. As earlier explained that simple random sampling techniques was adopted in each of the construction firms for the selection of construction professionals. 120 numbers of professionals in the Construction Industry were selected. These professionals are: Quantity Surveyors fourth numbers (40), Architects thirty numbers (30), Builders thirty numbers (30) and Civil Engineers twenty numbers (20). However, only ninety-six (96) numbers of those selected professionals were able to return the questionnaire, while three (3) of the ninety-six (96) were ignored for incorrect entry.

The inference statistic was adopted to summarise the sample, rather than use the data to learn about the population and sample. In this paper, inference statistic was used to present means score, standard deviation and frequency counts. The mean value was used to rank the respondents' opinions or responses obtained and percentages was used to established the level of awareness on lean construction principles by construction firms in the Nigerian Construction Industry.

4.0 Findings and Discussion of Results

The results of the demographic profile of the respondents were presented in 4.1 to 4.3 respectively.

4.1 Years of Experiences of Respondents in Contracting Firms

Figure 1 shows years of experiences of respondents, thus with 11-15 years of working experience represent 34.41%. while 6-10 years of working experiences represent 25.81%. In addition, respondents with 16-20 years of working experiences constitute 19.35%. Furthermore, thus with 20 years of working experiences constitute 12.9%. And respondents with 1-5 years of working experiences which represent 7.53%. This indicate that majority of the respondents have working experiences in construction projects.

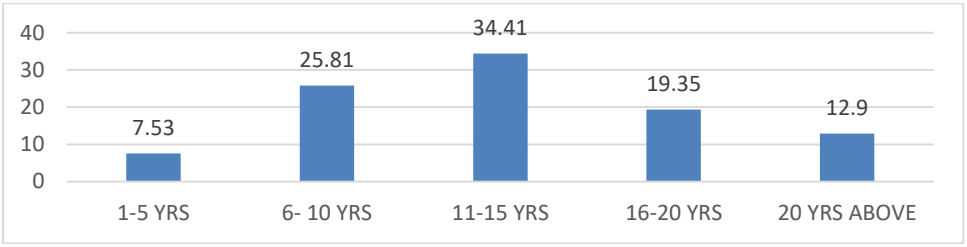


Figure 1. Years of experience in construction projects (Field work, 2018)

4.2 Qualification of the respondents

Figure 2 shows that 34.41% have B.Sc/B.Tech degree, 24.73% have MSc/M.Tech degree. In addition, 22.58% have HND and 6.45% have PGD. This signify that the respondents have required qualification in different background of knowledge of construction.

Figure 2: Qualification of Respondent (Field work, 2018)

4.3 Profession of Respondents

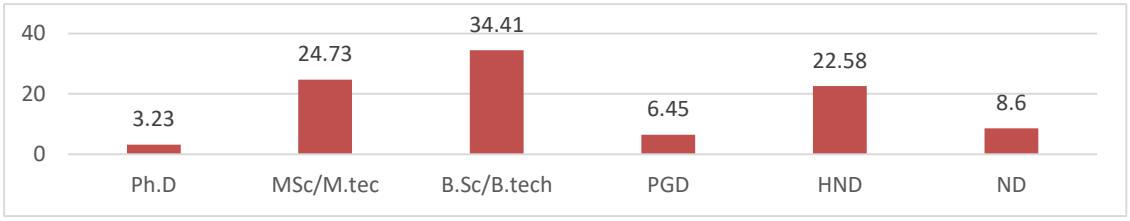


Figure 3 shows 38.71% of respondents are Quantity Surveyors, 26.88% are Architect; 18.28% are Builders and 16.13% are Civil Engineers. This reflect that the professions of the respondents are relevant to construction.

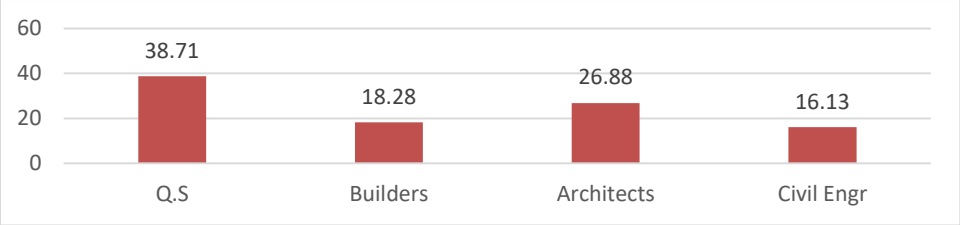


Figure 3: Profession of respondent in construction projects (Field work, 2018)

4.5 Level of Awareness of Lean Construction

The results of the level of awareness of lean construction principles by the construction firms in Nigeria were presented in Table 1 to 2 respectively.

Table 1. Awareness of Lean Construction Principles

Lean Construction Principles	None		Low		Slightly High		High		Very High	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Just in time (JIT)	21	22.6	44	47.31	19	20.43	6	6.45	3	3.23
Total Quality Management (TQM)	16	17.2	55	59.14	14	15.05	4	4.30	4	4.30
Total Productive Maintenance (TPM)	39	41.9	45	48.39	5	5.38	3	3.23	1	1.08
Continuous Improvement	31	33.3	52	55.91	3	3.23	5	5.38	2	2.15
Design for Manufacturing and Assembling (DFMA)	40	43	38	40.86	13	13.98	1	1.08	1	1.08
Supplier Management and Effective Human Resources Management	17	18.3	59	63.44	11	11.83	4	4.30	2	2.15

Source: Field Survey, (2018).

Table 1 reveals that 43% of the respondents agreed that their firms are not aware of design for manufacturing and assembling as lean construction principles. However, total quality management, continuous improvement and supplier management and effective human resources management records low awareness with 59.14%, 55.91% and 63.44% respectively. In addition, just in time, total productive maintenance, design for manufacturing and assembling record little awareness of lean construction principles with 47.3%, 48.3% and 40.8 respectively. This result implies that all the six variables used to examine the level of awareness

of lean construction principles in the study area are very low. Moreover, lean construction is achieved through a set of mutually reinforcing practices, including just-in-time (JIT), total quality management (TQM), total productive maintenance (TPM), continuous improvement, design for manufacturing and assembly (DFMA), supplier management, and effective human resource management (Jadhav 2014; Jørgensen and Stephen 2008 & Marhani, *et al.*, 2013).

Table 2. Relative Importance Index for Level of Awareness of Lean Principles

Lean construction principles	Fx	MIS	RII
Just in time	205	2.204	0.441
Total Quality Management (TQM)	204	2.194	0.439
Supplier Management and Effective Human Resources Management	194	2.086	0.417
Continuous Improvement (Kaizen)	174	1.871	0.374
Design for Manufacturing and Assembling (DFMA)	164	1.763	0.353
Total Productive Maintenance (TPM)	161	1.731	0.346

Source: Field Survey, (2018).

Table 2 shows that just in time, total quality management and supplier management and effective human resource management have the RII values of 0.441; 0.439 & 0.417 with the followings mean scores of 2.204; 2.194 & 2.086 respectively. This signifies that the above variables mentioned are high in the level of awareness of lean principles. In addition, continuous improvement, design for manufacturing and assembling and total productive maintenance have the RII values of 0.374; 0.53 & 0.346 with the mean scores of 1.871; 1.763 & 1.731 respectively. The RII indexes and mean scores of all variables used are below average, which implies that the respondents are not much aware about the lean construction principles. Although, Salem *et al*. (2006) argued that to fully and effectively apply lean principles in construction, the focus must be on the construction process. All stakeholders must be committed, involved and work together to overcome obstacles.

4.3 Level of Readiness Towards Adopting Lean Construction

The result of the level of readiness of construction firms to adopt lean construction principles were categorized into four namely; Management readiness, Process/Project readiness, employee's readiness and Technology readiness. The level of readiness indicated in Table 3 to 6 were based on RII.

Table 3. Management Readiness on Adoption of Lean Construction Principles

Variables	Fx	MIS	RII
The management is aware of LC and recognized the benefits of LC	213	2.29	0.458
Provided adequate financial resources to facilitate LC in our practices	162	1.742	0.348

LC strategy is well communicated to all levels within the organization	151	1.624	0.325
All levels of management in our organization have a LC mind approach	150	1.613	0.323
Have a policy for training and capacity building to keep our staff up to date with LC tools	146	1.57	0.314

Source: Field Survey, (2018).

Table 3 shows that the management awareness of LC and recognized the benefits of LC have RII value of 0.458 with mean score of 2.29. However, provision of adequate financial resources to facilitate LC practices, LC strategy well communicated to all levels within the organization, levels of management in the organization have a LC mind approach, and policy for training and capacity building to keep employee up to date with practice have RII values 0.348,0.325, 0.323 and 0.314 respectively. From the result, all variable used in RII indexes are below average which implies that the management of construction firms are not fully ready to adopt lean construction principles. Salem *et al., (*2006) and Hudson, (2007) agreed that the top management of every organisation has a major role to play in achieving a successful implementation of innovative strategies. The result was also supported by Azevedo *et al.* (2010) that it is important to consider the company's strategy when implementing lean construction, so that the long-term objectives are achieved and the real needs are met.

Table 4. Construction Readiness on Adoption of Lean Construction Principles

Variables	Fx	MIS	RII
Business process support and encourage interdisciplinary/inter organizational collaboration	245	2.634	0.527
Organization focus on client expectations	227	2.441	0.488
Organization is flexible enough to accommodate LC	191	2.054	0.411
Use of LC will improve Health and Safety during project delivery	185	1.989	0.398
Competent design team and construction process	184	1.978	0.396
Display high level of quality assurance	177	1.903	0.381
Current ICT infrastructure is adequate for supporting LC	160	1.72	0.344
Use of LC will reduce risks on overall project management	147	1.581	0.316

Source: Field Survey, (2018).

As indicated in Table 4 business process support and encourage interdisciplinary/inter organizational collaboration has RII value of 0.527. This implies that the construction firms are doing well in terms of business process support and encouragement of interdisciplinary/inter organizational collaboration which aids the adoption of lean construction principles. In addition, organization focus on client expectations and organization flexibility to accommodate LC have RII values of 0.411 and 0.488 respectively. However, other variables record lower RII

values, which include; use of LC to improve health and safety during project delivery, adequate competent design team and construction process, display high level of quality assurance, current ICT infrastructure is adequate for supporting LC and use of LC to reduce risks on overall project management has RII values of 0.398, 0.396, 0.381, 0.344 & 0.316 respectively. This implies that majority of the construction firms are not ready for the adoption of LC based on the RII values obtained. Song and Liang (2011) agreed with the result that implementation of lean concept requires a re-thinking of the processes and practices of conventional construction, and a change of culture and the introduction of new tools.

Table 5. Employees Readiness on Adoption of Lean Construction Principles

Variables	Fx	MIS	RII
Possession of necessary levels of IT literacy, functional expertise and skills to use LC	171	1.839	0.368
Commitment to address any issues/inhibitions that any staff may have about using LC principles	170	1.828	0.366
Organizational structure provides an environment that is well suited to use LC principles	151	1.624	0.325
Training procedures that will enable our staff to effectively use LC tools	134	1.441	0.288
Workers with ability to implement change and move quickly to adopt the use of LC	127	1.366	0.273
Importance of training required for using LC tools	120	1.29	0.258

Source: Field Survey, (2018).

Table 5 indicate level of IT literacy, functional expertise and skills of employees to use LC and commitment to address any issues/inhibitions that any employee may have about using LC principles has RII values of 0.368 and 0.366 respectively. Furthermore, organizational structure provides an environment that is well suited to use LC principles have the RII has of 0.325. Training procedure that will enable workers to effectively use LC tools, workers with ability to implement change and move quickly to adopt the use of LC and importance of training required for using LC tools has RII value of 0.288, 0.273 and 0.258 respectively. This results signifies that employees have devised trained procedure that will enable workers to effectively use LC tools. It also shows that workers have the ability to implement change and committed to adopt the LC principles. Miranda Filho *et al.* (2001) argued that lean construction can be successfully implemented, when consider the particular strategic and organizational characteristics of each company and its relationship that defines the success or failure of the implementation.

Table 6. Technology Readiness on Adoption of Lean Construction Principles

Variables	Fx	MIS	RII
Construction firms have well defined IT policy	166	1.785	0.357
Familiar with the use specialist software applications related to expertise	157	1.688	0.338
ICT systems are flexible to accommodate rapid change and scalability	150	1.613	0.323
Availability of effective intranet and extranet facilities to facilitate information sharing and interoperability	144	1.548	0.31

Source: Field Survey, (2018).

Table 6 indicate that construction firm have well defined IT policy with RII value of 0.357. In terms of whether they are familiar with the use specialist software applications related to our expertise have RII value of 0.338. For whether ICT systems are flexible to accommodate rapid change and scalability have RII value of 0.32. while availability of effective intranet and extranet facilities to facilitate information sharing and interoperability have RII value of 0.31. All variables have RII values below the average which implies that the construction firms are not ready for the adoption of LC principles in terms of availability and usability of cutting edge technologies. The result was supported by Radhika & Sukumar (2017) that IT facilitate the effective application of lean construction principles to reduce waste in construction works.

4.4 Summary of Findings

1. The level of awareness of lean construction principles.

The results obtained show the low level of awareness of the followings lean construction principles in term of total quality management, supplier management & effective human resource management, continuous improvement, total productive maintenance and Just in Time are low in contracting firms in Nigeria. This implies that the construction firms in Nigeria are not fully aware of lean construction principles. There is no adequate awareness of lean construction principles in Nigerian construction firms.

2. The level of readiness of contracting firms toward adoption of lean construction principles.

The result was summarized as follows:

a) **Management readiness**:

The result obtained under management readiness show that: (1) there are no adequate financial resources to facilitate adoption of lean construction, (2) lean construction strategy is not properly communicated to all levels in the construction firms, (3) there is low level of awareness of lean construction by management (4) all level of management in construction firms do not have lean construction mind approach. This reflects that, the top management of construction firms are not fully committed to the application of lean construction principles due to inadequate financial resources and lack of proper communication of lean construction strategies.

b) Construction readiness

As indicated, all variables analyzed under construction readiness shows the construction firms are not fully ready for application of lean construction principles: The variables are (1) inadequate ICT infrastructure to support LC, (2) Construction firms readiness to adopt LC, (3) lack of readiness by construction firms to fully adopt LC to reduce risk in overall project management, the construction firms are not fully ready to adopt LC, (4) the business process support & encourage interdisciplinary/inter-organizational collaboration, but the construction firms are still yet to utilize the opportunity and (5) the construction firms focus on clients expectation but yet to adopt LC strategies to fast track the construction process. The result deduced that, construction firms are not fully ready to accommodate the lean construction principles due to inadequate ICT infrastructure and lack of flexibility.

c) Employees readiness

Similarly, the results obtained under employee's readiness to adopt LC shows the followings: (1) the level of employees who fully understand the importance of training required to use LC tool is low (2) there is no devised training procedures that will enable the firms effectively use LC tools (3) despite the fact that the construction firms have the employees with ability to implement change and move quick to adopt the use of LC, the construction firms are not ready to adopt the LC principles. It was deduced that, the employees of construction firms have the ability to implement lean construction principles, but they lack knowledge of application of lean construction principles.

d) Technology Readiness

The result obtained under technology readiness in adoption of lean construction principles are: (1) The level of effective internet and extranet facilities to facilitate information sharing and interoperability is low in term of readiness to accommodate lean construction (2) Despite the fact that some employees are familiar with the use of specialist software application, the use of ICT facilities is very low in construction firms in Nigeria. (3) The level of flexibility of ICT system to accommodate rapid change and scalability is very low to fast track the application of lean construction principles. The study deduced that the staff of construction firms are not fully ready to adopt the lean construction principles due to the challenges of lack of training and ability to implement changes.

5 Conclusion

Lean construction principles has been identified as means of delivering value to the customers and eliminating things that do not add value to clients. Therefore, the application of lean construction principles in Nigerian construction firms will deliver expected value to the clients. This paper established that the level of awareness of the lean construction principles are still at the lowest level in the construction firms. It was also established that the construction firm's readiness to adopt lean construction principles is still at lowest level. Especially, in aspects of management, process/project, people and technology readiness. The paper recommended that workshop/Seminar should be organized periodically to enlighten the management and employees of construction firms as means of creating awareness on the needs and the benefits

drivable from the adoption of lean construction principles. The top management of construction firms should be committed and support the application of the lean construction by ensuring teamwork among the staff, avoidance of corruption and adopt the habit of changes from the traditional method of doing things. There should be adequate provision of necessary infrastructures like ICT that would facilitate the application of lean construction principles. The paper contributes to the body of knowledge by identifying the level of awareness of lean construction principles and commitment to its application in construction firms in Nigeria.

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PERCEPTIONS OF CAREER DEVELOPMENT AMONG WOMEN IN NIGERIA CONSTRUCTION INDUSTRY

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Despite the fact that women possess the required knowledge, skills, competences, training and experiences to perform effectively and efficiently, they found it difficult to break through in career advancement in built environment, thereby constitute small percentage at the top management positions. This study therefore investigates factors impeding women from being at par with their male counterparts at the highest levels of managerial positions with a view to achieving parity with their male counterparts. Data for the study were collected from construction and consulting firms in Lagos State, Nigeria, through well-structured questionnaire. A total of 150 copies of questionnaire were administered to randomly selected architects, quantity surveyors, engineers and contractors. A total of 95 copies representing 63% were retrieved and found suitable for the analysis. The data collected were analyzed through SPSS using Mean Score (MS) and Standard Deviation (SD). Findings from the analyses revealed the most important factors that constitute barrier to women carrier development in built environment were family/work life balance (MS of 4.11 and SD of 0.900),high degree of stress on the job (MS of 4.06 and SD of 0.873) and lack of flexibility work hours and schedules (MS of 4.03 and SD of 0.822). Better work/life balance and equality in career development opportunity for both male and female were the most important factors facilitating women career development in built environment with MS of 3.89 and 3.69 respectively and SD of 0.896 and 0.834 respectively. It is therefore recommended that employers should establish flexible working practices and provide equality in career development opportunity for both men and women, so that women may be at par with their male counterparts at the highest levels of the managerial positions.

Keywords: *Built Environment, Career Advancement, Gender, Managerial Position, Women Participation*[46].

1.0 Introduction

There is no doubt that significant progress has been achieved in furthering the cause of gender equality in the labour market over recent decades (Munn, 2014, Akomolafe & Muhammed, 2015).Women have been moving steadily towards occupations, professions and managerial jobs previously reserved for men. This is evident in Nigeria as shown by the increased number of women in both traditional occupations (fields like teaching, trading and nursing) and non-traditional occupations (such as law, building construction, engineering, quantity surveying, architecture and project management) (Obamiro & Obasan, 2013). The increasing participation

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of women in labour market is found to be closely linked with economic factor (Masidah, Wardah & AbdulRazak, 2015). Women want to be more economically independent (Sazali, Al-Mamun, Mohammad & Zhan 2014). Additionally, the earnings received help them to supplement their husband's income to gain better quality of life. The fact that male-dominated jobs provide higher income than the women's traditional jobs can be suggested as one of the reasons that prompt the entry of women in non-traditional occupation (Masidah, *et al.,* 2015).
Despite this welcome development, Nigerian women constitute small percentage of the top management jobs (Obamiro & Obasan, 2013; Rajkumar, Swaathi, & Sivaranjani, 2016). Akpinar (2012), found out that despite penetration of women in non-traditional professions, they are woefully under-represented at the top management levels and in most cases stuck at lower levels. Even in a woman dominated profession like teaching, for example, majority of teachers are women while top administration are men dominated. Similarly in the health field, doctors and hospital heads are very often men, while most of the nurses and support staff are women. According to Durasaro (2016) there is no task that males can perform that females cannot perform but because of conventional, traditional, physiological and religious perceptions of women, there has always been a role stereotype. People perceive women to be the weaker sex who cannot and should not perform certain roles regardless of their ability to perform such roles. Women sometimes begin their careers on an equal footing with men and started losing ground gradually over time or continue to progress on par with their male counterpart until at some point, their progress will be blocked. Although women as a whole may place less emphasis on career success than men, there are a considerable number of women who strive for top management positions and are unable to attain them (Rajkumar *et al,*. 2016). This study therefore investigates factors impeding women from being at par with their male counterparts at the highest levels of managerial positions and examines how to facilitate women career advancement with a view to achieving parity with their male counterparts.
Governments, businesses, trade unions and women's organizations have devoted much thought and energy to overcoming the attitudinal and institutional discrimination that bars women from certain jobs and hinders their career development, while the commitment to fight gender discrimination is renewed periodically at international conferences (Salma, Miranda & Griffin 2014). Yet, many of the results fall short of expectations (Akpinar 2012). In fact, the immediate past government advocated for up to 40% of women participation in strategic or managerial positions. Akunyili (2006) asserted that significant changes have occurred in gender-roles and in greater gender-based division of labour over the past and such changes are the dramatic influx of women into the workforce and the progress that women have made by entering positions and careers initially thought to be a reservation for men. But compared to men, women are often left behind when it comes to advancement even if they have the same educational background and work experiences.
Table 1 provides information on population of Nigeria men and women and their representation in position of authority.

Table 1: Nigerian Representation in Position of Authority

Position of Authority	Male (%)	Female (%)
State Governors in Nigeria	100	0
Deputy State Governors in Nigeria	83	17
Member of Nigerian Senate	93	7
Members of House of Representatives in Nigeria	96	4
Nigeria population	51	49

Source: Durosaro (2016)

Estimated population of Nigeria as of 2015 has 184,635,279, a total of 93,495,170 are males while 91,140,109 are female representing 50.6% and 49.4% respectively (Durosaro, 2016). As at 2015, all the thirty-six (36) states governors in Nigeria are male representing 100%. A total of 30 Deputy Governors are males while only 6 are females representing 83.3% and 16.7 % respectively. A total of 102 Nigerian senate members are males while 7 are females, representing 93% and 7% respectively. Numbers of members of house of representative that are males are 346, while 14 are female representing 92.2% and 3.8% respectively.

2.0. Literature Review

2.1 Career Development

Mordi, Adedoyin & Ajonbadi (2011) conceptualized career as a sequence of professional experience and organizational objectives which an individual goes through during all his life. Babatunde, Babalola & Opawole (2012) therefore described career development as a long term personal and professional growth of individuals. It is a complex process that shapes the career of the individuals over their life span. The availability of effective career development practices not only heightens the growth and self-esteem of employees for them to utilize skills and knowledge, it could also serve as an important link to retain good employees to stay with the organization. The decision for employees to stay or leave might depend on whether or not they gain support at work and personal growth (Claudi, 2010). This requires employers to provide resources, tools, and the appropriate environment to ensure continued self-development. Learning and adaptability are important for female professionals to strive for career success. Similarly, Rajkumar *et al.,* (2016) suggested training and exposure may imply a high level of concern for organizations to extend employees' potentials in the organization. Employees who receive such developmental opportunities are more motivated and have more confidence in their work. Subsequently, employees who receive such opportunities might repay their organization with the likeliness of extending their self-fulfillment, leading to reduce turnover. Akpinar (2012) concluded that construction firms aiming to improve organizational commitment among female employees should ensure women have access to career development opportunities and ensure just processes are used in allocating organizational rewards.

2.2 Barriers to Women Career Development in Construction Industry

Griffin (2013) indicated that lack of role model, poor career advice, gender biased recruitment, peer pressure and poor educational experiences are some factors that limit women's entry to

the industry which affects the career aspirations and development. According to Babatunde *et al.,* (2012) women have limited access to the wide range of developmental experiences and activities that build the credibility needed to advance in their career therefore there is lack of suitably qualified women for senior management positions. Durosaro and Ogungbemi (2014) identified high level of illiteracy among women, low self-esteem, feeling of inferiority complex and poor career aspiration. According to Akomolafe and Mohammed, (2015) women are confronted by a significant number of barriers, beginning with difficulties in joining the field of construction, the image of construction, career knowledge, family commitment, male dominated culture and work environment which made it difficult for women to capture the most senior position in the organization's hierarchy. Shanmugam, Amaratunga, Haigh, & Baldry, (2006) identified women's lack of confidence, lack of competitiveness, failure to have their contribution recognized, not being taken seriously, and fear of failure as the barrier to women entry into leadership position. Salman *et al.,* (2014) found that the most prevalent problem is sexual harassment, long working hours, isolation on the jobsite, negative perceptions of women capabilities, expectations to mimic male's aggressive behaviours, lack of mentors/role models, small representation on the jobsite, family/work life balance, slow career progression, high degree of stress on the job, lack of encouragement from supervisors, unfair assessment of training needs, low performance rating compared to male counterparts, lower salaries than male counterparts and unique safety and health concerns. Radhlinah and Jingmond (2011) identified lack of training and hiring programs, working environment, lack of flexible work hours and schedule are the issues confronting women carrier development in the construction industry. Durosaro (2016) found out that cultural practices; norms, unwritten family codes, denial of promotional opportunities in the formal work environment, psychological abuse through intimidation and negative media posturing and discrimination.

3.0 Materials and Methods

Data for the study were collected through the use of well-structured questionnaire administered on professionals in consulting and contracting firms in Lagos metropolis, Nigeria. Lagos metropolis was chosen as the study area because 60 - 65% of head offices of both consulting and contracting firms were located in this area (Babatunde *et al.*, 2012). In addition, the study area is quite active in terms of project/construction activities (Obamiro & Obasan, 2013).The professionals that were administered questionnaire include architects, quantity surveyors, engineers and contractors. Random sampling method was chosen to select appropriate sample for the questionnaire survey.

The questionnaire had three sections A, B and C. Section A encompasses personal information of respondents. Section B relates to objectives of this research which are to examine factors constituting barriers to women career advancement in construction industry. While section C describes factors that facilitate women career development in built environment.

4.0 Data Analysis and Research Findings

One hundred and fifty (150) copies of questionnaire were administered to randomly selected professionals in both consulting and contracting firms in the study area. Judgmental sampling method was adopted to select respondents from the study population who can offer the contributions sought. A total of ninety five (95) copies representing 63% were collected and found suitable for the analysis. Respondents' demographic profile is presented in Table 2. It is evident from the findings that the selected construction companies are male dominated (70%) which is similar across the globe as indicated in past studies (Obamiro & Obasan, 2013; Masidah, *et al.,* 2015; Rajkumar, Swaathi, & Sivaranjani 2016). It is shown from the findings that majority of the respondents have come of age.

Table 2: Demographic Profile of the Respondent

Demographic Profile Variable	Category	Frequency	Percentage (%)	Cumulative %
Gender	Male	66	70	70
	Female	29	30	100
Age	21-30 years	4	4	4
	31-40 years	13	14	18
	41-50 years	56	59	77
	Above 50 years	22	23	100
Specialization	Consultant	58	61	61
	Contractor	37	39	100
Highest Education qualification	SSCE/ND/NCE	12	14	14
	HND/B.Sc./B.Tech.	57	59	73
	M.Sc/M.Tech	26	27	100
	P.hD	-	0	100
Experience in construction field	0-5 years	11	12	12
	6-10 years	27	28	40
	11-15 years	25	26	66
	Above 15 years	32	34	100

About 82% of the respondents are above 40 years old. All the respondents are educated with 27% having a postgraduate degree, 59% of the respondents with a first degree. Few of the respondents (14%) have less than first degree. Analysis of respondents' work experience reveals that a significant number of the respondents (60%) had been with the companies for more than ten years while 28% had been with the companies for between 6-10 years, only 12% of the respondents had worked between 0-5 years.

4.1 Factors Constituting Barrier to Women Carrier Development in Construction Industry

Twenty eight (28) major factors that women always contend with in career progression in construction industry were presented to the respondents to indicate their opinions on a five-point Likert scale, 5 (strongly agree) to 1 (strongly disagree). In evaluating the results, the Mean Score

Table 3: Factors Constituting Barrier to Women Carrier Development in Construction Industry

(MS) and the Standard Deviation (SD) were used to rank the degree of agreement of factors that constitute barrier to women carrier development in built environment. Table 3 provides

Factors Constitute Barrier to Women Carrier Development	Mean Score	Standard Deviation	Rank
Family/work life balance	4.11	0.900	1
High degree of stress on the job	4.06	0.873	2
Lack of flexible work hours and schedule	4.03	0.822	3
Unfair perceptions of women performance capabilities	3.91	0.853	4
Gender biased recruitment	3.89	0.963	5
Lack of mentor/role model	3.83*	0.857	6
Male dominated nature of the industry	3.83*	0.954	7
Harshness of job conditions	3.80	0.901	8
Poor career guidance	3.77	0.910	9
Unfair performance evaluations by male supervisors	3.74	0.950	10
Sexual harassment	3.71	0.860	11
Lack of support from the spouse	3.57	1.119	12
Failure to have women's contribution recognized	3.51	0.919	13
Lack of encouragement from supervisors	3.49	0.818	14
Career limited to clerical/administration duties	3.17	0.785	15
Traditional/Religious restriction of women to certain work types	2.94	1.027	16
Lack of confidence and timidity	2.91	0.781	17
Fear of failure	2.86	1.061	18
Feeling of inferiority complex	2.66*	0.816	19
Low self-esteem	2.66*	0.838	20
Macho behaviour of male colleagues	2.37	1.215	21
Lack of networking opportunities	2.34	0.968	22
Loss of sense of femininity and social rejection	2.14*	0.912	23
Slow career progression	2.14*	0.944	24
Poor career aspiration or focus	2.09	0.907	25
Limited training opportunities	2.03	0.954	26
High level of illiteracy among women	1.97	1.043	27
Lower salaries than male counterparts (pay gap)	1.91	0.781	28

the summary of the statistical mean and standard deviation. The table shows that family/work life balance is the most significant factor that constitute barrier to women carrier development in built environment. It was ranked first with a MS of 4.11 and a SD of 0.900.Women experience more work-family conflicts because of the responsibility of child bearing. High degree of stress on the job was ranked second with a MS of 4.06and SD of 0.873.Lack of flexible work hours and schedule was ranked third; obtaining a MS of 4.03 with a SD of 0.822.

Unfair perceptions of women performance capabilities and gender biased in recruitments are another important factors constituting barrier to women carrier development and were ranked fourth and fifth with MS of 3.91 and 3.89, SD of 0.853 and 0.963 respectively. These were considered the most significant in this research study. According to Adeyemi, Ojo, Aina, & Olanipekun (2006) employers prefer men for tedious, dirty, hazardous tasks with long working hours on sites. Akomolafe and Muhammed, (2015) asserted that some employers believe that construction is unsuitable for women and it manifests in the recruitment process. This limits women's entry to the industry which affects the career aspirations and development (Akpinar, 2012).Nevertheless, it can also be seen from the table that traditional/religious restriction of women to certain work types, lack of confidence and timidity, fear of failure, low self-esteem and macho behaviour of male colleagues were also factors that constitute barrier to women carrier development in built environment albeit not significant. The least significant factors according to the findings include: lower salaries than male counterparts, high level of illiteracy among women and limited training opportunities for women.

4.2 Factors Facilitating Women Carrier Development in Construction Industry

Table 4 reveals the mean scores and standard deviation of the ranking of respondents with respect to improvement on career development of women in built environments. The table shows that better work/life balance was ranked the highest with MS of 3.89 and SD of 0.896. This was followed by equality in career development opportunity for both male and female (MS of 3.69 and SD of 0.834).

Table 4: Factors Facilitating Women Carrier Development in Built Environments

Factors Facilitating Women Carrier Development	Mean	Standard Deviation	Rank
Better family/work life balance	3.89	0.896	1
Equality in career development opportunity for both male and female	3.69	0.834	2
Flexible working practices	3.53	0.838	3
Improved perception of value of women's work	3.40	0.706	4
Women participation in construction management	3.35	0.861	5
Having an influential mentor	3.38	0.924	6
Leadership opportunities	3.29	0.916	7
Having support and networking opportunities	3.28	0.882	8
Fairer Pay (equal to men's pay)	3.26	0.837	9
Increased awareness of women's issues in the construction industry	3.33	0.736	10
Effective advance education	3.23	0.939	11
Specialized training	3.31	0.853	12
Consistently exceeding performance expectations	3.17	0.840	13
More training options	3.21	0.915	14
Registration with relevant professional bodies	3.16	0.804	15
Developing a style with which men are comfortable	2.92	0.850	16
Women to develop good relationship with men	2.91	0.867	17
Seeking difficult or high visibility assignments	2.97	0.929	18
Women to be tough and have strong desires to succeed	2.65	0.844	19
Taking career risks	2.96	0.785	20

More work schedule options	2.78	0.809	21

The finding is consistent with the study of Lingard and Lin (2004), they concluded that construction firms aiming to improve organizational commitment among female employees should ensure women have access to career development opportunities. Ling and Leow (2008) indicated that providing courses for women to update themselves after career breaks or childbirth are useful measures. Masidah *et al.*, (2015) posited that issues related to competence, experience and education have been widely researched and discussed among the reasons why women cannot be promoted from middle to senior management positions. This is a serious barrier to women empowerment. Abdullahi (2006) identified inadequate education, training and experience in the past, as contributive to the difficulties women experience in getting management jobs. Flexible working hour, improved perception of value of women's work and women participation in construction management were ranked third, fourth and fifth with MS of 3.53, 3.40, 3.35 and SD of 0.838, 0.706 and 0.861 respectively. Flexible working hour, improved perception of value of women's work and women participation in construction management were ranked third, fourth and fifth with MS of 3.53, 3.40, 3.35 and SD of 0.838, 0.706 and 0.861 respectively.

5.0 Conclusion

From the findings, construction employers need to access a wider pool of talent from a more diverse range of people in terms of gender in order to develop a high quality workforce that is motivated and skilled to meet growing construction needs. Hence, female professionals are needed at all levels. The findings of this study however, revealed that family/work life balance, high degree of stress on the job and lack of flexible work hours and schedule were the major factors constituting barriers to women career development in Built environment. Moreover, the result of the mean scores revealed factors that can facilitate the career development of women to be: better family/work life balance, equality in career development opportunity for both male and female, flexible working practices and improve perception of value of women's work.

From the conclusion, it is clear that women career development in built environment can be improved through establishing flexible working practices and effective career development opportunity for all.

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EFFECT OF IMPLEMENTATION OF E-PROCUREMENT ON CORRUPT PRACTICES IN NIGERIAN CONSTRUCTION INDUSTRY

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Abstract
In Nigeria, significant efforts have been made to implement public procurement Act that will enhance probity and transparency in the process, regrettably, corrupt practices in the Nigerian construction industry are procurement based. Electronic procurement (e-procurement) has been widely adopted by both private and public sectors in the developed countries using information technology to drive accountability and promote transparency in the procurement process. However, the implementation of e-procurement as an instrument of reform in the process to reduce corrupt practice has not been well researched in Nigeria. This study examines the potential of e-procurement in reducing corrupt practices in public procurement using quantitative research approach. Questionnaires were self-administered to government officers in Ministries, Departments and Agencies (MDAs) where construction works are mostly being procured. Fifty-six (56) valid questionnaires were returned which was analysed using descriptive statistics and factor analysis. The findings revealed that unjustified use of exceptions and illicit fragmentation of the procurement practice are major causes of corruption, while the best anti-corruption strategy is to reduce lithographic works and physical contacts. The study concludes that effective implementation of e-procurement will assist in reducing unethical practices in the procurement process.

Keywords: *E-Procurement, Unethical Practices, Construction Industry, Nigeria, Public Sector*[47].

Introduction

Governments in any country of the world are the major client of the construction industry. This made governments to be recognised as the greatest procurer of works, goods and services to the civil society. In the last one decade, the budgets of the Nigerian government have been in trillions of nairas for the procurement of infrastructure across the country. Government uses procurement according to Burton (2005) as a central tool to assist in the effective management of public resources. This is because on average, between 45 to 65% of a developing country's budget and 20% to 70% of their GDP is procurement related which allude to the fact that public

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sectors are the largest consumers in an economy (International Institute of Sustainable Development [IISD], 2008; United Nations Development Programme [UNDP], 2006).
However, Country Procurement Assessment Report (CPAR, 1999) indicated that prior to 1999 Nigeria lost $10 billion on a yearly basis to corruption via award of contracts. Hence, tackling corruption in public procurement is an imperative element of any effective anticorruption strategy. Adaramola (2017) reported that Bureau of Public Procurement (BPP) reiterated that most corrupt practices in Nigeria take place during public procurement. This underscored, Kaoje's (2017) assertion that corruption in the procurement process accounts for over 70 per cent of the government's total budget. World Bank (2000) and Transparency International (2006) defined 'corruption' as "the misuse of public office for private gain". Also, the UNDP (2008) viewed corruption as the misuse of entrusted power for private gain. Corruption knows no boundary and it is a global issue which constitute threats to both economic and human development of all nations.
However, it is believed that if procurement process is appropriately designed, it will bring about transparency and innovations in the way projects are procured in order to improve the services of government and enhance user's experience. To achieve this, e- procurement has been identified as the potential instrument to mitigate against corruption in the public service processes. This is due to the fact that electronic procurement assists in fighting against corrupt practices by eliminating to a considerable degree face-to-face interaction among stakeholders where most demands for kickbacks often emanate (Pictet and Bollinger, 2008). Davila,Gupta and Palmer (2003) defined e-procurement as the usage of Information and Communication Technology (ICT) such as the Internet or web-based systems intended to facilitate the acquisition of goods and services by the government or by private institutions. E-procurement is considered to be a powerful tool more than the conventional methods for the reduction or elimination of corruption. It is capable of improving the transparency and integrity of public procurement processes for example, tendering, sourcing, ordering, and auctioning. Sohail and Cavill (2008) argued that e-procurement has gained recognition as an internationally important instrument for curbing corrupt practices and misuse of power for selfish gain.
In fact, a good example as given by OECD (2005) is the implementation of e-procurement systems in Korea and Mexico, where it was demonstrated that innovation in information technology could be used to avert and control corruption in public procurement. Hence, the adoption of e-procurement systems may assist all countries most especially developing countries where corruption is endemic to enhance transparency, effectiveness in the system, and decision-making, reduction in cost, monitor supplier performance, as well as improving the quality of service delivery. However, in the Nigerian construction industry, the use of e-Procurement has not been given adequate attention both in the usage as well as in terms of research efforts (Ibem et al., 2016; Aduwo et al., 2016). More importantly lack of adoption of e-Procurement is evident in African countries, where it is being employed, the adoption is still at its formative stage in spite of benefits e-Procurement in enhancing effective project delivery (Ibem & Laryea, 2015). Hashim et al. (2013) as well as Adzroe and Ingirige's (2014) research

have shown value for money can be achieved by using e-Procurement in the construction sector in countries where it has been implemented. It was further argued that it is also capable of improving firm's performance through the use of technologies (Hashim *et al*., 2014). Against this background, this paper examines the potential of e-procurement adoption as anti-corruption tool based on the perception of the professionals working within the MDAs as a way of assisting governments in their current reform strategies to improve the economy.

Literature review

This study reviewed relevant literature from previous studies on the adoption of e-Procurement in construction and how it can assist in mitigating corrupt practices within the construction sector.

Drivers/Benefits of e-Procurement Adoption

Quite a number of studies have delineated in literature the benefits of implementing e-procurement systems as a solution for poor managerial process. Davila et al. (2003) showed that firms that adopt e-procurement system experience above 42% savings in their transaction costs as a result of the ease in the purchase process and the reduction in the cycle time required for purchase, which in turn, improves flexibility and offers updated information at the time of placing a purchase order. Hawking et al. (2004) argued that firms that implement e-procurement systems reduce their operational cost and improve on their market intelligence. These positions have been reinforced by Tai et al. (2010) who posited that e-procurement systems positively influence the performances of business both at the operational level and the strategic level. The benefits that may accrue from the implementation of e-procurement systems according to (Davila et al., 2003; Gutiérrez, and SanJosé 2008; Gunasekaran and Ngai 2008) include reduction in order cycle time, reduction in costs, improved efficiency, enhancing inventory coordination and operational control, and promoting collaboration with business partners through improved customer satisfaction. Also, Walker and Brammer (2012) discovered that the use of e-procurement directly contributes to environmental, labour, health, and safety aspects of sustainable procurement. For example, Seong and Lee (2004) asserted that the Korean government used e-procurement systems in their public sector, to assist in reducing paperwork and red tape, and increase the choice of commodity selection and enhance standardization of services. Hence, the adoption of e-procurement will assist the Nigerian government in their current reform efforts and improve accountability and transparency in the public procurement process.

Barriers of e-Procurement Adoption

A plethora number of studies have examined the barrier to the adoption of e-procurement both in the developed countries ((Eadie *et al*., 2007; 2010) and developing countries (Laryea and Ibem, 2014; Ibem et al., 2016; Aduwo et al., 2016). However, there is paucity of literature that specifically focused on public sector clients in the Nigerian construction industry. This experience is similar to that of the South African construction industry, where Laryea and Ibem (2014) argued that the degree of barriers to e-procurement usage has not been examined and

accurately expressed in the literature; which has resulted into poor understanding of the factors that hinder the usage of e-procurement in the construction sector.

However, in 2000, Bingi, Mir, and Khamaleh reported that the main worries that confront e-commerce adoption include information security and privacy of exchange, and lack of technological infrastructure required to support business operations. In a similar research conducted in Singapore, Kheng and Al Hawamdeh (2002) found that the required investment and the inadequate in-house skills constitute the main barriers confronting their firms in adopting e-procurement systems. While perceived ambiguity with respect to availability of resources and seeming difficulty of assimilating new systems with ICT system are the barriers to e-procurement implementation by firms (Subramanian and Shaw, 2004).

Although, Gunasekaran and Ngai (2008) in a research conducted in Hong Kong, stated that barriers to e-procurement may originate from people, strategy, infrastructure or culture. Therefore, identification of those barriers forms the essential part of the key management duty in the development the right way for the implementation of e-procurement. Many of these barriers may be country specific, for instance, Oyediran and Akintola (2011) highlighted among other factors, Irregular power supply, financial implications of putting up e-tendering infrastructure and poor telecommunications infrastructure as the barriers to e-tendering. However, in the South African construction industry, Laryea and Ibem (2014) pointed out that the barriers to e-procurement adoption could be related to unreliable ICT infrastructure, cultural belief, security issues and data protection, inequality in accessing IT infrastructure by all categories of firms, inadequate knowledge on e-procurement systems and legal issues. In order to adopt e-procurement to reduce corrupt practices, Isikdag et al. (2011) stated that the construction industry needs to confront various barriers in order to fully implement this new method to procurement. This supported by Doherty et al (2013) who made it abundantly obvious that barriers are obstacles that must be alleviated if we desire an effective implementation of e-procurement.

E-procurement mitigate corruption in public sector

The corrupt and unethical practices in the procurement processes have created more problems ranging from lack of transparency, accountability, poor political control and auditing, to weak professionalism in the bureaucratic process. In order to unravel the mystery as it relates to corrupt practices in the public procurement process, Bertot, Jaeger and Grimes (2010) asserted that information and communication technology (ICT) can play a significant part in reducing the menace of corruption which will enhance a better governance. The employment of ICT will promote better association between government and citizens as well as employees in tracking events, monitoring progress in the process and eliminate the risk of corrupt practices resulting from the lack of transparency, restricted access to information, and poor accountability and control at every stage in the procurement process (Bertot, Jaeger and Grimes, 2010). These stages are divided into four according to Ware et al. (2012), who named the stages as: project identification and design: advertising, prequalification, bid document preparation, and

submission of bids; bid evaluation, post-qualification and award of contract; and contract performance, administration and supervision.

However, public sector clients prefer processes that is more accountable and very transparent, but, diverse problems such as baseless or concealed procurement planning, poor or inadequate need assessments, political burden, poor monitoring capacity of agents of government, and inconsistent cost estimate (Ware et al., 2012). Many developing and developed nations have adopted e-procurement, for example, the republic of Bangladesh introduced National e-Government Procurement (e-GP) in their public tenders' process to remove corruption and collusion in the bidding practices to enhance transparency and promote competition among the tenders (Mahmood, 2010). Adebiyi et al. (2010) opined that the adoption of same e-GP system can be of help to the Nigerian government in removing the attendant bottlenecks in the current procurement system. In fact, Xinzhang and Yonggang (2011) posited that e-procurement can assist in mitigating the irregular information difficulties by improving access to information relating to the government and tenderers. Nonetheless, the procurement systems in Nigeria are paper based, hence the transfer of public procurement issues from paper based to electronic based will create a great impact in reducing problems of corrupt practices in the public sector procurement as argued by Panda and Sahu (2010).

Research method

This study examined the implementation of e-Procurement as a means of remedying corrupt practices within the Nigerian construction industry. A quantitative research approach was adopted using a questionnaire survey to obtain primary data from the target respondents. This approach has been adopted by previous researchers both in the developed countries (Neupane, 2014; Neupane et al. 2014; Eadie *et al*., 2007; 2011; Rankin *et al*., 2006) and developing countries (Ibem and Laryea, 2015; Ibem et al., 2016; Aduwo *et al*., 2016). The use of questionnaire is cheaper than other methods; ensures uniformity in responses and guarantees anonymity (Mathiyazhagan & Nandan, 2010). Initially, the study conducted an in-depth literature review, to establish all of the various e-procurement issues. Through the review of the literature, analyses of different sources of information such as scholarly articles or journals, books and conference proceedings were conducted to achieve a thorough insight into the topic e-procurement and how it could be used to reduce corruption in the procurement processes. Afterwards the design the questionnaire to be used to obtain data from the professional including procurement officers in the Ministries, Departments and Agencies (MDAs) was undertaken.

The questionnaire was divided into 8 Sections, however, the results of section 1, 5 and 6 are presented here. The first section asks questions on the background of the respondents with respect to their educational background, profession and years of experience within their organizations. Section 5 presents questions on the corruption mechanism in public sector procurement process, while section 6 focused on the anti-corruption mechanism in public sector procurement process. To obtain these data, the professionals involved in the

procurement processes in the MDAs were identified and they were requested to give the candid opinion on the potentials of e-procurement in curbing corrupt practices within the industry. In order to have a more exhaustive and succinct overview of the factors involved, the questionnaire respondents were requested to rank each of the factors on a sliding scale of 1-7 on *"agreement"*, where 1 was *"strongly agree"* and 7 was *"strongly disagree".* This offered the opportunity of gauging the level of agreement of the factors identified in the literature.

To curb several issues that often associated with questionnaire, the instrument was pre-tested amongst professional quantity surveyors in Abuja who do not form part of the target respondents. According to Sekaran (2003), pre-testing of the instrument is important for survey questionnaire to ascertain that there is no vagueness in the questions asked by ensuring that the respondents would understand the questions the way they are intended and proposed. Feedback from the pre-testing of the survey questionnaire was used to correct inherent inadequacies identified before the main survey was carried out. The study examined the reliability of the scale of measurement used in the questionnaire by using Cronbach's alpha coefficient test conducted on all the variables used. The result indicated Cronbach's alpha value of 0.973 and 0.982 for corruption mechanism in public sector procurement process and anti- corruption mechanism in public sector procurement process respectively. This is above the required threshold of 0.7 as suggested by Pallant (2013) for a reliable survey questionnaire.

Results and discussion

The study examines the possible adoption of E-procurement for public construction projects. In order to provide reliable information, the demographic data of the respondents to the questionnaire administered were obtained. The demographic data on educational qualification, years of experience and the professional affiliation of the respondents is presented and analysed in this section. The demographic data of the respondents is presented in the following Tables.

Educational Background of respondents

The educational background of all the respondents is considered to be essential to successful implementation of E-procurement in the public sector, therefore, the qualifications of the respondents were established. Table 1 shows that 48.21% of the respondents had a least first-degree qualification. Also, approximately 32.14% of the respondents also had minimum of diploma (HND) qualifications. Table 1 further indicates that 19.64% of the respondents had a master's degree in relevant fields. In addition, none of the respondents had a doctorate degree.

Professional background of respondents. Table 1 shows that 44.64% (25) of the respondents are Quantity Surveyors by training. This is followed by Architects with 32.14 %. A further of approximately 18% of the respondents who are administrative staff are trained procurement officers. Table 1 also indicates that 5% of the respondents are Civil engineers. Years of experience of respondents

To ensure that the information for this study are reliable and provided by respondents that have good understanding of the environment where the data were sourced, the experience of the individuals involved in answering the questions was considered to be important. As a result of this, the years of experience of the individual respondent was solicited. It was apparent from

Table 4.3 that the majority of the respondents, circa 78% had between above 10 years of working experience in their current position. In addition, the number of respondents with working experience of below years accounted for 21%. However, approximately 20% of the respondents had working experience above 20 years whilst 13% of the respondents had held their current position between 15 and 20 years.

Table 1: Background information of respondent

Educational Background	Number	Percent (%)
Diploma (HND)	18	32.14
Fist Degree (BSc/Btech)	27	48.21
Masters	11	19.64
Doctorate		0.00
Total	56	100
Profession		
Administrative Officer	10	17.86
Architect	18	32.14
Quantity Surveyor	25	44.64
Civil Engineer	3	5.36
Total	56	100
Years of Experience		
Less than 10 years	12	21.43
11 to 15	26	46.43
16 to 20	7	12.50
Above 20 years	11	19.64
Total	56	100

Corruption mechanism in public sector procurement process

Table 2 reveals the respondent' rankings of corruption mechanism in public sector procurement process of e-procurement in the Nigeria construction industry. Findings from literature review revealed nine (9) corruption mechanism in public sector procurement process. It shows that 'frequent and unjustified use of exceptions' was ranked 1st with a mean score of 2.71 and standard deviation of 1.30, 'illicit fragmentation of procurement in order to apply the procedure of procurement of low value' was ranked 2nd with a mean value of 2.45 and standard deviation of 1.37, 'discriminatory technical specifications' was ranked 3rd with a mean score of 2.39 and standard deviation of 1.85, 'the formation of the procurement subject so that it can be provided only by a particular bidder' and 'discriminatory conditions for the participation of bidders' was ranked 4th with a mean score of 2.38 and standard deviation of 1.76 and 1.83 respectively. In

an average ranking by respondents 'deliberate determination of unrealistic estimated value' was ranked 6th with a mean score of 2.34 and standard deviation of 1.37 while the ranking was followed by 'discriminatory criteria for the selection of the best bid' with a mean score of 2.30 and standard deviation of 1.78. The least and final ranked variables were 'purchase of unnecessary items (in content, quantity or quality)' and 'conflict of interest' with a mean score of 2.21 and standard deviation of 1.59 and 1.50 respectively.

Table 2: Descriptive statistics for corruption mechanism in public sector procurement process

Coding	Variable Description	Mean($\bar{x}$)	Std. Deviation (σX)	Ranking
CMP5	Frequent and unjustified use of exceptions	2.71	1.30	1
CMP3	Illicit fragmentation of procurement in order to apply the procedure of procurement of low value	2.45	1.37	2
CMP8	Discriminatory technical specifications	2.39	1.85	3
CMP4	The formation of the procurement subject so that it can be provided only by a particular bidder	2.38	1.76	4
CMP7	Discriminatory conditions for the participation of bidders	2.38	1.83	4
CMP2	Deliberate determination of unrealistic estimated value	2.34	1.37	6
CMP9	Discriminatory criteria for the selection of the best bid	2.30	1.78	7
CMP1	Purchase of unnecessary items (in content, quantity or quality)	2.21	1.59	8
CMP6	Conflict of interest	2.21	1.50	8

Results from Exploratory Factor Analysis

The results from the EFA on the benefits of e-procurement from the government perspective are presented in Tables 3. The data were subjected to PCA using direct oblimin rotation. The KMO measure of sampling adequacy was examined with a value of 0.897, which greater than the acceptable minimum value of 0.5 (Field, 2013) and the Bartlett's test of sphericity was also statistically significant ($P< 0.05$). Kaiser's criterion using the Eigenvalue with an Eigenvalue equal to or greater than 1 was adopted. Subsequently, the factor loading and the commonalities

(h^2) of the factors of the variables loaded were assessed (Field, 2013; Hair *et al.*, 2010). As indicated in Table 3, one (1) factor with eigenvalues exceeding 1.0 was extracted. The total variance explained by the factor extracted is 82.895. Hence, the final statistics of the PCA and the extracted factor accounted for approximately 83 percent of the total variance explained by the factor.

Table 3: Factor loadings for the Rotated Components

		Component loading	
Coding	Variable Description	1	Communalities
CMP1	Purchase of unnecessary items (in content, quantity or quality)	0.838	0.703
CMP2	Deliberate determination of unrealistic estimated value	0.822	0.675
CMP3	Illicit fragmentation of procurement in order to apply the procedure of procurement of low value	0.852	0.726
CMP4	The formation of the procurement subject so that it can be provided only by a particular bidder	0.957	0.915
CMP5	Frequent and unjustified use of exceptions	0.925	0.856
CMP6	Conflict of interest	0.893	0.797
CMP7	Discriminatory conditions for the participation of bidders	0.964	0.93
CMP8	Discriminatory technical specifications	0.968	0.937
CMP9	Discriminatory criteria for the selection of the best bid	0.96	0.922
	Total	7.461	
	% of Variance	82.895	
	Cumulative %	82.895	

KMO= 0.897, Bartlett's Test of Sphericity =780.947, df = 36, p=0.000

The study conducted principal axis factoring and this precipitated one factor with eigenvalues greater than 1 as shown in Table 3. Based on the investigation of the inherent associations among the variables that clustered on the factor, the following interpretation was made. The only factor extracted was labelled **corruption mechanism in public sector procurement process**. The name given to this factor was derived from a close inspection of the variables loaded on the factor and from the components using the variables with the highest loading factor. The essential indicators of the only factors extracted are explained below.

Factor 1: corruption mechanism in public sector procurement process

All variables were clustered on a factor without any omission and the extracted variables accounted for total variance extracted for the factor. However, out of the 9 variables loaded on the factor, the following variables showed the highest factor loadings: *Discriminatory conditions for the participation of bidders (96.4%); Discriminatory technical specifications (96.8%); Discriminatory criteria for the selection of the best bid (96%); The formation of the procurement subject so that it can be provided only by a particular bidder (95.7%); and Frequent and unjustified use of exceptions (92.5%). While Deliberate determination of unrealistic estimated value (82.2%) has the least factor loading. This cluster accounted for 82.895 percent of the total variance.*

Anti-corruption mechanism in public sector procurement

Table 4 reveals the respondent' rankings of anti-corruption mechanism in public sector procurement process of e-procurement in the Nigeria construction industry. Fifteen (15) anti-corruption mechanisms were identified from extensive review of literature. Findings revealed that 'reduced lithographic works with a mean score of 2.41 and standard deviation of 1.36 ranked 1st, 'real time access to construction project information' with a mean score of 2.32 and standard deviation of 1.22 ranked 2nd, 'adoption of BIM to eliminate unwarranted review of contract to increase cost' with a mean score of 2.30 and standard deviation of 1.46 ranked 3rd, 'declaration of conflict of interest by stakeholders involved in the procurement process' with a mean score of 2.23 and standard deviation of 1.60 ranked 4th while 'homogeneous standard for project requirements' ranked 5th with a mean score of 2.14 and standard deviation of 1.30.

In addition, 'disclosure of procurement related information' (Mean=2.07 SD=1.45) and 'elimination of ring formation, collusion and distortion of e-bidding' (Mean=2.07 SD=1.64) ranked 6th, 'automation of construction procurement process' with a mean score of 1.93 and standard deviation of 1.40 ranked 8th. In the 9th rank was 'reduced human interface and interaction in bidding process' with a mean score of 1.91 and standard deviation of 1.46, 'reduction/removal of unnecessary projects' with a mean score of 1.89 and standard deviation of 1.51.

In the least and final ranks were 'transparency in the procurement process of construction works' (Mean=1.88 SD=1.42), 'improved healthy competition among bidders and suppliers' (Mean=1.86 SD=1.34), 'accountability in procurement process through contract auditing' (Mean=1.34 SD=1.37), 'effective evaluation and monitoring of construction contracts' (Mean=1.80 SD=1.40) and 'effective record and inventory management' (Mean=1.80 SD=1.47).

Table 4: Descriptive statistics for Anti-corruption mechanism in public sector procurement

Coding	Variable Description	Mean($\bar{x}$)	Std. Deviation (σX)	Ranking
SFEC9	Reduced lithographic works and physical contacts	2.41	1.36	1
SFEC4	Real time access to construction project information	2.32	1.22	2
SFEC15	Adoption of BIM to eliminate unwarranted review of contract to increase cost	2.30	1.46	2
SFEC2	Declaration of conflict of interest by stakeholders involved in the procurement process	2.23	1.60	4
SFEC13	Homogeneous standard for project requirements	2.14	1.30	5
SFEC8	Disclosure of procurement related information	2.07	1.45	6
SFEC14	Elimination of ring formation, collusion and distortion of e-bidding	2.07	1.64	6
SFEC3	Automation of construction procurement process	1.93	1.40	8
SFEC6	Reduced human interface and interaction in bidding process	1.91	1.46	9
SFEC1	Reduction/removal of unnecessary projects	1.89	1.51	10
SFEC7	Transparency in the procurement process of construction works	1.88	1.42	11
SFEC5	Improved healthy competition among bidders and suppliers	1.86	1.34	12
SFEC12	Accountability in procurement process through contract auditing	1.84	1.37	13
SFEC10	Effective evaluation and monitoring of construction contracts	1.80	1.40	14
SFEC11	Effective record and inventory management	1.80	1.47	14

Results from Exploratory Factor Analysis

The results from the EFA on the benefits of e-procurement from the government perspective are presented in Tables 4.21. The data were subjected to PCA using direct oblimin rotation. The KMO measure of sampling adequacy was examined with a value of 0.913, which greater

than the acceptable minimum value of 0.5 (Field, 2013) and the Bartlett's test of sphericity was also statistically significant (P< 0.05). Kaiser's criterion using the Eigenvalue with an Eigenvalue equal to or greater than 1 was adopted. Subsequently, the factor loading and the commonalities (h^2) of the factors of the variables loaded were assessed (Field, 2013; Hair *et al.*, 2010). As indicated in Table 5, one (1) factor with eigenvalues exceeding 1.0 was extracted. The total variance explained by the factor extracted is 80.539. Hence, the final statistics of the PCA and the extracted
factor accounted for approximately 81 percent of the total variance explained by the factor.

Table 5: Factor loadings for the Rotated Components

		Component loading	
Coding	Variable Description	1	Communalities
SFEC1	Reduction/removal of unnecessary projects	0.886	0.784
SFEC2	Declaration of conflict of interest by stakeholders involved in the procurement process	0.881	0.776
SFEC3	Automation of construction procurement process	0.906	0.822
SFEC4	Real time access to construction project information	0.882	0.778
SFEC5	Improved healthy competition among bidders and suppliers	0.943	0.889
SFEC6	Reduced human interface and interaction in bidding process	0.852	0.725
SFEC7	Transparency in the procurement process of construction works	0.93	0.864
SFEC8	Disclosure of procurement related information	0.899	0.808
SFEC9	Reduced lithographic works and physical contacts	0.901	0.812
SFEC10	Effective evaluation and monitoring of construction contracts	0.941	0.886
SFEC11	Effective record and inventory management	0.935	0.875
SFEC12	Accountability in procurement process through contract auditing	0.883	0.78
SFEC13	Homogeneous standard for project requirements	0.838	0.702
SFEC14	Elimination of ring formation, collusion and distortion of e-bidding	0.901	0.811
SFEC15	Adoption of BIM to eliminate unwarranted review of contract to increase cost	0.876	0.768
	Total	12.081	
	% of Variance	80.539	

Cumulative %	80.539

KMO= 0.913, Bartlett's Test of Sphericity =1279.02, df = 105, p=0.000

The study conducted principal axis factoring and this precipitated one factor with eigenvalues greater than 1 as shown in Table 5. Based on the investigation of the inherent associations among the variables that clustered on the factor, the following interpretation was made. The only factor extracted was labelled **Anti-corruption mechanism in public sector procurement**. The name given to this factor was derived from a close inspection of the variables loaded on the factor and from the components using the variables with the highest loading factor. The essential indicators of the only factors extracted are explained below.

Factor 1: Anti-corruption mechanism in public sector procurement

All variables were clustered on a factor without any omission and the extracted variables accounted for total variance extracted for the factor. However, out of the 15 variables loaded on the factor, the following variables showed the highest factor loadings: *Reduced lithographic works (90.1%); Effective evaluation and monitoring of construction contracts (94.1%); Effective record and inventory management 93.5%); Improved healthy competition among bidders and suppliers (94.3%); Automation of construction procurement process (90.6%); Transparency in the procurement process of construction works (93%).* While *Homogeneous standard for project requirements* (83.8%) has the least factor loading. This cluster accounted for 82.895 percent of the total variance.

Discussion

This study examines the causes of corruption in the public procurement system in Abuja Nigeria and the potential of e-procurement in reducing corrupt practices in public procurement processes using quantitative research approach. The paper contributes to the existing literature on the seeming benefits of public e-procurement by examining how it can be used to curb corrupt practices. The findings revealed that unjustified use of exceptions and illicit fragmentation of the procurement practice are major causes of corruption, while the best anti-corruption is strategy is to reduced lithographic works and physical contacts. The finding from the analysed data supports the previous finding from Neupane *et al.* (2012) which established that the anti-corruption proficiencies of public e-procurement in developing countries. In the same vein, Pathak *et al.* (2008) highlighted that e-government initiatives such e-tendering, e-sourcing etc., often lead to enhanced government– citizen relationship and also capable of reducing corruption.

Overall, the findings indicate the causes of the corrupt practice is basically entrenched by face-to-face interaction of the stakeholders and underlined that public e-procurement anti-corruption abilities can assist to guide public, private organisations, contractors, public procurement practitioners on the perceived benefits of public e-procurement for reducing the tendencies of corruption in public procurement. The findings are in line with recent research conducted by

Neupane et al. (2014) who asserted that emerging countries needs to make a decision to adoption of e-procurement to fight corruption in public procurement.

Conclusion

This study examines the causes of corruption in the public procurement system in Abuja Nigeria and the potential of e-procurement in reducing corrupt practices in public procurement processes. The results from this study have several implications for government, academic, international agency, procurement practitioners of developing countries by promoting their understanding of the seeming anti-corruption benefits of e-procurement in reducing corruption. In overall, this study results offer a clear guideline for both the developed and developing countries with regards to the implementation of e-procurement technology so as to reduce corrupt practices in public procurement.

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4	Catholic churches, Crowd, Crowd management, Landscape, Urban development
5	Leisure, Place, Place Identity, Recreation Park, Sense of Place
6	Fire safety, Measures, Shopping malls, Users.
7	Palm kernel shell ash, cement, blended mortar, mix ratios, compressive strength.
8	Aspect Ratio, Courtyard, Configuration, Energy, Office
9	Defensible Space, Design Consideration, Mixed-Use Building, Security, Sustainable Strategy.
11	Contractors, objectives, risks, redevelopment projects.
12	Housing Development, Housing Failures, Public Private Partnership, Risk, and Risk Management
13	Civil engineering project, Construction industry, Construction project, Cost and time performance, Risk
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