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EDITORIAL PREFACE

There are ten articles in this issue. The first one which is a lead paper presented during the Faculty of Communication and Information Sciences fifth anniversary in 2012 focuses on Communication and Information Science and Technology Skills for the Lifelong Survival of the Nigerian University Undergraduate. In this article Prof. Mutawakilu Tiamiyu explained the the task of producing smart entrepreneurs, managers and workers for Nigeria, the disciplinary group known as the ñCommunication and Information Sciencesò, Nigerian University undergraduate and the digital age challenges and digital age knowledge and skill requirements for the university undergraduate. Akintola and Ibiyemi examines an HCI speech-based architecture for Man-To-Machine and Machine-To-Man communication in Yorùbá language to carry Yorùbá people along in the advancement taking place in the world of Information Technology. Dynamic Time Warp was specified in the model to measure the similarity between the voice utterances in the sound library. In addition, Vector Quantization, Guassian Mixture Model and Hidden Markov Model are incorporated in the proposed architecture for compression and observation.Jimoh Awotunde, Babatunde, Ameen, James and Fataipresents a rule based Expert System for diagnosis of malaria fever. The proposed medical diagnostic system was developed using Visual Prolog Programming language. They concluded that more advance medical diagnosis system can be designed to help in the area like drugs prescription, registering of patients as well as keeping of patientsô details and records in the medical sector.

The fourth article by Mejabi and Salihu examines the use of computerised sales systems in retail stores in Ilorin metropolis, Nigeria, with the aim of identifying the extent of deployment and to determine how the staff of the stores feel about the use of such systems. The study reveals that while 80% of the stores had very few computers connected to printers, bar code readers or debit/credit card readers. According to the study, gender had no influence on respondent opinions, but educational qualifications did, and this gaves rise to capacity building as one of the recommendations from the

study.The paper by Kosoko-Oyedeko looks at the scenario concerns about improving the teaching and learning of CRS in schools by considering introducing the use of computer games in the teaching of CRS at both the primary and secondary school levels in Nigeria. The paper focuses on the overall description of computer game and follow it up with the practicalities involved in running and playing the game.Owoeye, Familusi and Dahunsi examines the use of mobile phones by undergraduate students of Ekiti state University.The findings revealed that the use of mobile phone does not have much negative implications on studentsô academics activities since majority were not involved in chatting and receiving calls during lectures, late to the class due to mobile phone.The paper concludes that efforts should be made to educate students on the proper use of mobile phones without distracting their private personal studies.Asemah examines social media and social isolation among students of Kogi State University, Anyigba. Findings show that the students mostly use facebook and whatsapp. Findings show that social networking sites were causing social isolation among the students of Kogi State University and that the extent to which they were causing social isolation was great.This study recommends that management of tertiary institutions should raise awareness through lectures on the excessive use of the social media and make available.

The study by Udende and Chiakaan examine the role of the newspaper in creating awareness and shaping peopleôs attitude regarding climate change. The authors employed a content analysis method in 2012 to examine the story type, prominence and depth to determine the extent to which Nigeria newspapers devote to issues of climate change. The study concludes that there is low-level prominence and depth individual newspapers devote toclimate change. Additionally, most of the reports do not sufficiently address causes, effects and palliative measures. It recommends among other things that the mass media should intensify reportage on climate change with a view to effecting a positive change of attitude.

Abdulrahaman, Ayeni and Faruk presents detailed current spectrum usage profile for NTA Ilorin and Kwara Television (KWTV) which transmit on channels 9 and 35 respectively. Measurements were taken from three different locations within 24 hours for a period of one week, the data were analyzed. The results of the study were used to extrapolate for other states. The findings indicate that a large percentage of the TV spectrum is under-utilized with upper bound, lower bound and average occupancy values of 16.4%, 0% and 3.46 % respectively.

Pedro and Olarongbe investigate electronic museum readiness of museums in Nigeria so as to foreground the benefits of e-museum and identify the challenges confronting the implementation of e-museum. The paper reveals that regarding the level of electronic readiness in the museums, Email was ranked highest followed by museum website, Internet, Purchase of ICT and equipment in that order. The following paper by Popoola and Okiki examined information acquisition and utilization as determinants of organizational effectiveness of managers in large-scale manufacturing companies specializing in industrial and domestic products in Nigeria. Descriptive research design of survey type was adopted for the study. The study recommended that the management and board of directors of the companies should

encourage their managers to acquire relevant information and use it to improve their organizational effectiveness. In addition, corporate library staff should provide effective information services to the managers so as to improve organizational effectiveness of their companies.

The last article by Bello et al presents the implementation of a robust, reliable, efficient, effective, and cost-effective Synchronous Virtual Learning Solution. The Virtual Learning system consists of basically the e-learning portal and a virtual conference room. The authors concluded by pointing out that the result of the studyôs implementation, when tested with both onsite and remote users, proves its feasibility for future deployment.

Fuerthermore, Onidare, Ayeni, Ayeni, and Adeniran, looked at a collaborative authentication scheme for intrusion detection in wirelesssensor networks. Afolabi on his own considered information and communication technology and audiovisual resources management in selected academic libraries in Ondo State, Nigeria; Esohe and Sambe investigated services provision in special libraries: survey of selected special libraries in Kaduna State, Nigeria while Memudu looked at the Wide Area Netork (WAN) And Its Comparative Study.
The readers of the journal are hereby called to come along to review the contents in this edition.

Communication and Information Science and Technology Skills for the Lifelong Survival of the Nigerian University Undergraduate

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Introduction

This paper was presented by this author as a keynote address during the Fifth Anniversary celebrations of the Faculty of Communication and Information Science, University of Ilorin. Five years ago, the staff and students at the Africa Regional Centre for Information Science (ARCIS) at the University of Ibadan were elated with the establishment of the Faculty of Communication and Information Science at the University of Ilorin. The reason is as follows.
ARCIS was established by the joint efforts of national and international bodies in 1990, that is, over 20 years ago, and ten years before the start of the new millennium. ARCIS aimed to contribute to pushing two interrelated initiatives in Africa.

The first initiative is to contribute toward the rapid production of a critical mass of graduates and postgraduates in information science and technology to enable African countries to harness adequate information and knowledge resources adequately for their development. The second initiative is to provide an institutional platform for multidisciplinary approaches to producing the required graduates and postgraduates, and to research on knowledge and information technologies. Accordingly, for many years after the establishment of ARCIS, ther staff and students of ARCIS watched with keen interest how the two ideas would grow in Nigeria and on the African continent.

So there was real excitement when various other universities began, in response to digital age development after the year 2000, to create multidisciplinary departments, faculties and centres of information science, information resources management, or communication and information sciences. The is confirmed in a recent comprehensive study of global trends in the evolution of information science and technology education (Ajiferuke, TIamiyu et al., 2012; Tiamiyu, Ajiferuke et al., 2012). Thus, the Fifth Anniversary event provided an auspicious occasion to reflect in this paper on the mission that had been set for the Faculty of Communication and Information Sciences, the achievements that have been made, the challenges ahead, and the ways forward. This paper was written with this in mind.

2. The Task of Producing Smart Entrepreneurs, Managers and Workers for Nigeria

We all assembled here today are stakeholders in producing knowledgeable and skilled workers for our country. In that regard, Peter Drucker is often credited with the

assertion that ó*in the information age, the key to success is working smarter, not merely harder*.ô The assertion leads me on to the following three categories of actors and roles in all societies: the entrepreneur, who risks some resources in order to create greater value; the manager who is hired to manage the resources; and the worker who the manager must control to ensure success. Druckerôs assertion simply means that all three actors need to work smartly, not merely harder. ñWorking harderò implies using and possibly wasting physical human, mechanical or electrical energy on a piece of work. ñWorking smartlyò implies working intelligently with data, information and knowledge in a self-propagating process that creates more and better knowledge and value.

The communication and information sciences have emerged to investigate and facilitate how best people could and should acquire, communicate and use knowledge to work more smartly. Humankind comprises different kinds of workers, from which pioneering entrepreneurs and capable managers eventually emerge or are identified. Some people claim that entrepreneurship entails gambling and risk loving, while others claim that such gambling or risk-loving behaviour is DNA-dependent. Each claim may be challenged, but taken together they suggest that entrepreneurship might be an innate DNA-dependent predisposition. What about managerial ability? Are managers born or made? Your answer is as good as mine. Agreeing that entrepreneurs and managers are born implies that what humankind may need to do is to identify its best entrepreneurs and managers, and clone them. However, such cloning would only result in humankind confined to the bounded capabilities of a specific set of cloned entrepreneurs and managers. Humankind has greater capabilities and potentials than that!

Modern educational systems are built on the alternative belief that although some entrepreneurs and managers may be born, most can be made, that is, trained over time to develop abilities to take calculated risks and make smart managerial decisions in different settings. This premise is why we have schools, colleges and universities; this is why we have the University of Ilorin; this is why this Faculty of Communication and Information Science was established as a multidisciplinary institutional platform to contribute to producing the required critical mass of communication, computer and information science graduates and postgraduates to support national and global development. And, that is why we are celebrating today.

3. The Disciplinary Group known as the "Communication and Information Sciences"

So, what disciplines and professional practices can we say are concerned with investigating, discovering, creating and recommending improved information systems (i.e. systems for acquiring, processing and using information) for our evolving digital societies? In my view, they comprise at least the following:

- Communication science (arts/studies?)
- Media arts (journalism, graphic arts, design)
- Extension services
- Marketing and Public Relations
- Library science
- Records management
- Computer science
- Electrical and electronic sciences
- Information science

Communication Science is itemized first because information originates initially from some sort of human communication. Information science is itemized last because it is probably the youngest discipline to join the information sciences disciplinary group as the groupôs multi-discipline or meta-discipline by interfacing with, borrowing from and using diverse theories and methods from various other disciplines within and outside the group (e.g. Bates, 1999; Haythornthwaite *et al*., 1999; Machlup and Mansfield, 1983; Paisley, 1990). Information science, like all multi-disciplines, suffers difficulties in precisely defining and limiting its boundaries and this may instigate collaboration or friction between it and the other disciplines from which it borrows.

The above disciplines and their applied professional practices necessarily complement each other to create the following other interconnected entities:

- information and Communication Technology (ICT)
- Information systems (IS)
- Information industry
- Information economy
- Information/digital society

It is important to be clear about the fundamental differences between what **communication, information and information technology (CIIT)** scientists and practitioners do compared to what other scientists and practitioners. One or two cases would help here.

A medical scientist or doctor focuses on improving human health conditions as her ultimate goal through medical research or health care service delivery. In this endeavour, she uses various processes that involve working with data, information and knowledge. Although she may not be aware of it due to her focus on the end goals of her profession, the systems that the medical scientist uses in these processes are medical information systems. The role of the CIIT scientist or practitioner in this context is to continually understudy and research how, when, for what and why the medical scientist or doctor relates with and uses various existing medical information systems, and then apply the findings and insight to model and create improved future systems.

Another example: A rural farmer may be persuaded, after several interactions with various communication professionals or systems (e.g. agricultural extension workers, radio/TV broadcast, farmersô association meetings, etc), to acquire a mobile phone (a product of the CIIT disciplines) for use in his enterprise. But it would not be wise to assume that the farmer would understand initially how to, or would continue to use, the different information communication and sharing functions of the phone in the most efficient manner in the context of his enterprise. The information scientist or professional investigates to understand how, for what purposes, and why, the farmer uses or does not use the phone. May be, the interface of the phone is not adequately friendly for farmers in view of their usually limited literacy and education? A computer scientist then uses the findings to develop improved interface software for future versions of the phone. The farmer is primarily concerned with making a success of his farming enterprise, and the various CIIT scientists and professionals support him with appropriate communications, interactions, and research and development efforts to enable him to work not merely harder, but more smartly.

4. Nigerian University Undergraduate and the Digital Age Challenges

University undergraduates, as well as the postgraduates, are why we are here. University undergraduates everywhere are usually young and vibrant, adventurous and impressionable. They come into universities from different cultural and educational backgrounds, are studying different disciplines, and have diverse aspirations for their careers and lives.

But, the average Nigerian university student face tough and sometimes daunting challenges in todayôs digital world which might threaten such aspirations. Our students come with some of these challenges from their cultural and socio-economic backgrounds or educational experiences in our public and private primary and secondary schools. Some of the challenges also emanate from the suboptimal conditions in our universities, while others emanate from the evolving digital world itself.

Permit me to elaborate on two of the digital age challenges that our students face. The digital revolution brings both positive and negative consequences for the Nigerian undergraduate, as obtains very much similarly in other parts of the world. On the one hand, the revolution has brought the Internet, the Web, mobile devices, satellite TV, digital music, social media (e.g. Facebook, Twitter, Youtube), computer games and other edutainment software and services, and the undergraduate can now readily access, create or share whatever data, information and knowledge he wants. However, in order to attract audiences, many of the digital devices and services are designed more to capture and retain the listening, viewing and entertainment attention of a captive audience for intermittent short periods, and less to promote sustained attention required for in-depth intellectual reflection.

Accordingly, in my view, the digital revolution appears to have worsened the abilities of our undergraduates to read and reflect intensively on textual content, abilities that had been cumulatively underdeveloped at the lower levels of education. Although the social media promotes the quick contribution of ideas by anybody at anytime from anywhere, they do not promote the contribution of well reasoned ideas that comes from intense reading, thinking and reflection. With an eye on the TV, an ear to MP3 music from an IPod, fingers pinging away on a smart phone, and intermittent distraction from ringing phones, the lectures, lecture notes and textbooks that we give or recommend to our students stand very little chance of receiving adequate attention. This creates a serious learning challenge that many of our young undergraduate students are unable to overcome.

A second major challenge associated with the digital revolution, with possible adverse psychological effects on our undergraduate students, is the prevailing high level of graduate unemployment in the country. Information and communications technologies, as well as robotic machinery continue to displace human labour in repetitive business and production processes in many economic sectors. Gone are the days when a university degree automatically assured a well paid job in the public or formal private sector. Job adverts now routinely specify that graduates with second class or lower degrees should not bother to apply, and even those with better qualifications who apply are subjected to several rounds of rigorous screening tests and interviews. A graduate who was unable to acquire adequate knowledge and skills while in the university stands no chance of getting a job, except by corrupted channels and means.

We need to understand that the Nigerian undergraduateôs responses to these and other challenges could be positive or negative. A positive response would lead to the following question:

What types of knowledge and skills do I, as a Nigerian undergraduate, need to acquire and master while in the university in order to assure that I can compete and survive in the Nigerian job market and digital society?

By contrast, a negative response to the challenges would be:

In view of the prevailing situation in the job markets, do I really need to labour to acquire and master knowledge and skills that I may not eventually use due to the very high probability that I might not get a formal job after graduation?

The last two sections of this lecture address issues emanating from these questions.

5. Digital Age Knowledge and Skill Requirements for the University Undergraduate

In order to perform our different roles as entrepreneurs, managers and workers as smartly as possible, we need to know how to function effectively in the digital society where we now live. More specifically, our undergraduate students who are being prepared to play these roles need to acquire and master some generic and basic processes and skills in the communication, information and information technology (CIIT) sciences. I can perceive the following skill types that our undergraduates need for survival in the digital society, during their university education, and thereafter during their work life.

1) **Basic Literacy skills:** The abilities to read and write are expected to have been mastered even before entry into university. However, personal experiences with studentsô writings in examinations and final year projects suggest serious deficits in these skills. General Studies (GES) courses to remedy the deficiencies have proven largely ineffective, as it is difficult to remedy a skill deficiency that many years of pre-university schooling could not provide.

2) **Reading and Writing Skills beyond Basic Literacy:** This is the level of reading and writing adequate for the university level and work life. Defective writing skills at this level suggest that our undergraduates are either not reading enough or reading only to enjoy the message, without due understanding and learning of how the text being read are structured lexically, grammatical and semantically. Digital media that emphasize fast-paced video, sound, animations and captions, although very enjoyable, do not appear to encourage pausing for in-depth reflection, nor teach their audience how to write well. Popular Facebook, Twitter and SMS styles of writing and spelling aggravate the situation.

3) **Oral Communication and Presentation skills**: These skills are what discussions and seminars in traditional classrooms are intended to develop in our students. However, most Nigerian students hardly ever speak up in classroom, most likely because they had not prior to university been encouraged or enabled to develop adequate oral and public questioning and speaking skills. Even in masterôs degree programmes, only very few of the students speak or ask questions in class despite promptings, with most of them always expecting a constant monologue from their lecturer.

4) **Numeracy skills:** Beyond basic numeracy, the majority of Nigerian secondary school students and graduates avoid or do poorly in mathematics and other quantitative subjects, as statistics by WAEC, NECO and JAMB show. Although quantitative aptitude beyond basic numeracy is not critical in most arts disciplines in the university, it is a fundamental requirement for learning the natural and applied sciences, and increasingly so in some of the social sciences. It should also be a fundamental requirement for the communication and information sciences and professions, without which their claims to science would be baseless.

5) **Information Organisation skills:** Information organization concerns the various situations in which data symbols need to be selected, combined and presented in text, graphs, images and other formats to identify, describe, communicate and store information about objects or ideas. Among these contexts are narrating or writing a story, formatting an assignment or technical report, presenting a seminar, drawing a picture, constructing a data table or pie chart, organising the address book on a mobile phone, describing objects and documents, and so on. In all these, there are commonsensical but probably inefficient, as well as scientifically-proven and more effective methods and strategies. Although everyone organizes information one time or the other, the above example situations show that acquiring basic skills in effective and efficient information organisation is what earning a undergraduate degree actual entails. Basic skills in these are required of any undergraduate student, and more advanced skills are required of students in the CIIT disciplines.

6) **Information Search and Evaluation skills:** This is the corollary of the information organisation skills. For lifelong survival during and after university, the undergraduate must be able to read, understand and interrogate a written story or report, interpret a data table or a bar chart, ask intelligent questions relevant to different contexts, search for information in the library, or search for and evaluate information on a laptop or the Internet, in connection with course or work assignments. Basic skills in these are required of any undergraduate student, and more advanced skills are required of students in the CIIT disciplines.

7) **Information Technology skills:** These skills may be categorised into three levels. At the first and basic level are skills that everyone living in our digital society need to have in order to be able to use information technologies and systems in the society. Liken this to the ability to drive a motor car. The second level skills, intended exclusively for CIIT students and professionals, enable then to understand information technologies and systems beyond mere ability to use them, in order to be able diagnose use-related problems and prescribe short-term solutions to them. Liken this to the skills of a auto mechanic. The third level skills, also exclusively for CIIT students and professionals at a higher level, comprise those that enable them to research and develop new technologies as basis for new information systems. Liken this to the knowledge and skills of an auto engineer.
8) **Research and Development skills:** University undergraduates are almost required to undertake some research or development activity in order to apply or develop further some of the knowledge and skills that they had acquired during their programmes. Admittedly, research and development through undergraduate projects is not expected to be highly sophisticated, but such projects often become a source of serious stress for many students because they had not been able to acquire the various skills required to implement the project with ease or successfully. Also more worrying, many undergraduate students, rather than using the projects to improve their knowledge and skills, actually engage in academic fraud ï blatant plagiarism of Internet sources,

contracting out their projects to commercial consultants, etc. With these practices, it becomes difficult for many undergraduates to build a robust intellectual foundation to develop later in life into pioneering entrepreneurs, innovative workers, and smart workers.

9) **Managerial and Entrepreneurial skills:** Management entails taking into consideration diverse and competing social and economic factors in the process of allocating scarce resources to competing goals and actions. Undergraduate students need to begin to develop their managerial skills right from the beginning of their studies ï in relation to how they spend their monthly allowances, how they allocate their time to work and leisure, how they establish and manage their social networks, how they participate in group or team work, how they seek and evaluate information for their decision making, how they improve their knowledge and skills in different ways, and how they seek out and articulate innovative ideas or take calculated small risks that set them as innovators, leaders and role models among their peers. These may be small steps, but are the seeds for developing and honing effective managerial and entrepreneurial skills.

10) **Information and Digital Literacy skills:** Some composites of the above generic skills at the basic level constitute the Information Literacy (IL) and Digital Literacy (DL) skills.

All undergraduate students in all disciplines need to acquire and master the above skills at least the basic level. The skills are enablers for the effective learning by the undergraduates of the specialized knowledge in the different disciplines, as well as for successful careers and work life after graduation.

For undergraduate students in the CIIT disciplines however, much more is expected in order for them to be able to effectively support the other disciplines after they graduate. As noted particularly in connection with the information organization, information search and evaluation, and information technology skills, the CIIT students need to acquire much higher level knowledge and skills in them than the non-CIIT students.

Sadly however, our experiences at the Africa Regional Centre for Information Science (ARCIS) over the years in relation to the Master of Information Science programme show that the majority of the Nigerian graduates with second class or better undergraduate degrees in various disciplines (including the CIIT disciplines) from the various public and private universities who apply into the programme had not mastered many of the above skills adequately at even the basic level.

What could be responsible for this situation? It might be hypothesized that many Nigerian university undergraduates are not being trained well due to the inadequate teaching and learning conditions. However, an alternative hypothesis might be that they are responding negatively to the various challenges with the retort: *Is it really necessary for me, due to the limited available job opportunities, to labour to acquire*

knowledge and skills that I may not need to use immediately or at all after graduation? The relative importance of these and other hypotheses need to be researched, and the implications addressed by all stakeholders.

6. Should the Undergraduate Student Develop and Master these Skills?

Yes, surely. As noted earlier, gone also are the days when a university graduate possessing merely basic or underdeveloped literacy, numeracy, and information and digital literacy can secure employment easily in the Nigerian job market, or in global job markets for those graduates who may try elsewhere. Employers now have a field day in the job markets, so only graduates with excellent degrees stand adequate chance. Moreover, employers are no longer depending much on degree qualifications and letters of reference; they now want graduates who can demonstrate adequate mastery of many of the above generic skills, alongside the specialized knowledge and skills obtained from their degree programmes.

Meanwhile, irrespective of discipline or career aspirations and despite the economic, social and learning challenges that he faces, the Nigerian university undergraduate would want to finish up his programme and move on in life as quickly as possible ï get a job from the shrinking job market, set up a small business, and so on. Moreover, because of the lack of job opportunities and their own lack of job search or entrepreneurial skills, many graduates are also returning back to university as postgraduate students, although they might not have worked hard enough as undergraduates to merit admission into the top postgraduate programmes.

In all these future possibilities for the Nigerian university undergraduate, the seed of success - in getting a job quickly, in setting up a small business successfully, or in gaining admission into a good postgraduate programme, etc must be sown during the undergraduate programme, not after.

Thus, the unequivocal answer to the above question must be yes. Rather than providing defeatist reactions to the challenges that he faces, Nigerian undergraduates need to strategise to acquire adequate disciplinary knowledge, along with the generic and basic CIIT skills required to succeed as confident graduates, pioneering entrepreneurs, innovative managers and smart workers. They need to acquire adequate knowledge and skills to to be able to learn smartly immediately, and in order to be able to work smartly in their future. For this to happen, the critical success factors include personal innovativeness, versatility, discipline, dedication, determination, sacrifice and hard work.

7. Conclusion

This keynote lecture has highlighted for our reflection on this very auspicious day the following important ideas:

- the interconnected nature of the specialized disciplines and multi-disciplines that constitute the Communication and Information sciences (CIIT);

- the pivotal role that these disciplines aim and need to play in our the evolving digital societies;

- the generic and basic CIIT-based knowledge and skills that all our university undergraduates need to master in order to learn, grow and succeed not only as smart students, but also as smart workers, pioneering entrepreneurs and capable managers in their future lives.

Mr Chairman, Sir, kindly permit me to concluded this lecture by congratulating the University of Ilorin, and the Dean, staff and students of Faculty of Communication and Information Sciences for establishing the faculty five years ago, and the success that have been achieved by the faculty since then.

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NOTE: This paper is a Keynote Address delivered by the author during the 5th Anniversary of the Faculty of Communication and Information Sciences, University of Ilorin on 9th May, 2013.

An HCI Speech-Based Architecture for Man-To-Machine and Machine-To-Man Communication in Yorùbá Language

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Abstract
Man communicates with man by natural language, sign language, and/or gesture but communicates with machine via electromechanical devices such as mouse, and keyboard. These media of effecting Man-To-Machine (M2M) communication are electromechanical in nature. Recent research works, however, have been able to achieve some high level of success in M2M using natural language, sign language, and/or gesture under constrained conditions. However, machine communication with man, in reverse direction, using natural language is still at its infancy. Machine communicates with man usually in textual form. In order to achieve acceptable quality of end-to-end M2M communication, there is need for robust architecture to develop a novel speech-to-text and text-to-speech system. In this paper, an HCI speech-based architecture for Man-To-Machine and Machine-To-Man communication in Yorùbá language is proposed to carry Yorùbá people along in the advancement taking place in the world of Information Technology. Dynamic Time Warp is specified in the model to measure the similarity between the voice utterances in the sound library. In addition, Vector Quantization, Guassian Mixture Model and Hidden Markov Model are incorporated in the proposed architecture for compression and observation. This approach will yield a robust Speech-To-Text and Text-To-Speech system.

Keywords: Yorùbá Language, Speech Recognition, Text-To-Speech, Man-To-Machine, Machine-To-Man

Introduction

Human Computer Interaction (HCI) also called Man-To-Machine Interaction is a form of communication which entails the study, planning and design of communication between people and computers. It is often regarded as the intersection of computer science, behavioral sciences, and several other fields of study (Karry, 2008). It studies both human and machine in conjunction with obtaining knowledge supports from both sides. Examples of supports from machine side include the Operating Systems, Computer Graphic, enabling environment, while the human support entails linguistics, social sciences, and communication rules.

The design in HCI can be illustrated from two focal positions. Originally researchers involve in the design of prototype based studies like theories from the cognitive and the social sciences; ethnographic fieldwork; users with special needs. The prototypes are then designed. Subsequently, it is evident that contemporary HCI is not solely an

academic discipline but also a field which is reaching out to and involving consultants, researchers and designers from industry. Their projects may result in objects whose application scope is used by the general public, outside of the walls of research laboratories (Fullman, 2003).

An end-to-end communication with the system in a speech-based interaction deals with speech recognition and Test-To-Speech (TTS) which enables humans to communicate with the system in a more natural way than the use of electromechanical devices such as mouse, keyboard, joystick, printer. Speech perception refers to the processes by which humans are able to interpret and understand the sounds used in language. The study of speech perception is closely linked to the fields of phonetics and phonology in linguistics and cognitive psychology and perception in psychology (Wikipedia, 2013). Speech research has applications in building computer systems that can recognize speech, as well as improving speech recognition for hearing- and language-impaired listeners (Akintola, 2011).

Speech recognition (also known as automatic speech recognition or computer speech recognition) converts spoken words to text. Speech recognition is the ability of machines to respond to spoken commands. Speech recognition enables ñhands-freeò control of various electronic devices, a particular boon to many disabled persons and the automatic creation of ñprint-readyò dictation. Before any machine can interpret speech, a microphone must translate the vibrations of a personôs voice into a wavelike electrical signal. This signal in turn is converted by the systemôs hardware; example is a computerôs sound card which is responsible for analog to a digital signal. It is the digital signal that a speech recognition program analyzes in order to recognize separate phonemes. The phonemes are then recombined into words.

A Text-To-Speech (TTS) synthesizer is a computer based system that can read text aloud automatically, regardless of whether the text is introduced by a computer input stream or a scanned input submitted to an Optical Character Recognition (OCR) engine (Sasirekha & Chandra, 2012).

Literature Review

Speech

Speech is the vocalized form of human communication. It is based upon the syntactic combination of lexical and names that are drawn from very large vocabularies. Each spoken word is created out of the phonetic combination of a limited set of vowel and consonant speech sound units (Bhusan & Krishna, 2013).Speech starts with the intention to communicate. There are many man-made sounds that may or may not involve any intention to communicate such as a sigh and a sneeze. The goal of such sounds is typically to cause understanding or response in a listener (Thurman & Graham, 2000).

Description of the Yorùbá Language

Yorùbá language is native to Nigeria, Togo and Benin. It is spoken by about 42 million people in south west Nigeria, Togo, Benin, Brazil, UK and USA (Akintola,

2011). It is one of the three official languages of Nigeria and also a member of the Niger-Congo language family. Yorùbá is a tonal language like many African languages. Therefore, the meaning of a word is in the tone. Sounds in many languages are produced when alphabets are combined together. In tonal languages like Yorùbá, same alphabets can be combined together to give different meanings. These words are called homographs. The tonal sign put them aside and not the spelling. Yorùbá sounds can be classified into three major kinds, namely: consonants, vowel and tonal sounds.

Consonants

The Yorùbá consonants are 18 in number and are drawn from the 25 letters of the Yorùbá alphabets. The consonants are: B, D, F, G, GB, H, J, K, L, M, N, P, R, S, Ṣ, T, W, and Y.

Vowels

The Yorùbá vowels are 7 in number and are also drawn from the 25 letters of the Yorùbá alphabets. The vowels are: A, E, Ẹ, I, O, Ọ, and U.

Syllabic Nasal

There also exists in the language a syllabic nasal phoneme. They occur before other consonants in syllable junctions. The syllabic nasal phoneme is represented as N or M. The homorganic allophones of the syllabic nasal phoneme are: [m], [M], [n], [ñ], [Ñ], and [Ñm]

Tone

Yorùbá is a tonal language with three level tones: high, low, and mid. Every syllable must have at least one tone. Tones are marked by use of the acute accent for high tone (ú, á, ǘ), the grave accent for low tone (ù, à, ǜ), mid is unmarked. Examples:

- H: ó bṌ 'he jumped'; síbí 'spoon'
- M: ó bṄ 'he is forward'; ara 'body'
- L: ó bṈ 'he asks for pardon'; ọ̀kọ̀ 'spear'. (Wikipedia, 2014)

2.2.2 Alphabets

The upper and lower Yorùbá alphabets which comprises of both the consonants and vowels are;

A	B	D	E	Ẹ	F	G	GB	H	I	J	K	L	M	N	O	Ọ	P	R	S	Ṣ	T	U	W	Y
A	B	D	E	G	F	G	gb	H	i	j	k	L	m	N	O	ọ	P	R	S	ṣ	t	u	w	y

Phonology

The three possible syllable structures of Yorùbá are consonant + vowel (CV), vowel alone (V), and syllabic nasal (N). Every syllable bears one of the three tones: high ụ́, mid ụ̄ (generally left unmarked), and low ụ̀. The sentence 'mọ̀ Ì ', which means 'I did not go', provides examples of the three syllable types.

Numerals

The Arabic numerals (0-9) used for counting have Yorùbá equivalent which are: Òdo, Ení, Èjì, Èta, Èrìn, Àrun, Èfà, Èje, Èjo, Èsán.

Speech Recognition

The practice of enabling a computer to identify and respond to the sounds produced in human speech is a form of speech recognition. The computer translates speech spoken

by man to text. It is also known as Automatic Speech Recognition (ASR) or Speech-To-Text system which is a way of Man-To-Machine Communication.
Speech recognition system consists of the following:

- A microphone, for the person to speak.
- Speech recognition software.
- A computer to take and interpret the speech.
- A good quality soundcard for input and/or output

Approaches To Speech Recognition

The earliest approaches to speech recognition were based on finding speech sounds and providing appropriate labels to these sounds. This is the basis of the **acoustic-phonetic** approach of Vijay & Douglas (1998), which postulates that there exist finite, distinctive phonetic units (phonemes) in spoken language and that these units are broadly characterized by a set of acoustic properties that are manifest in the speech signal over time. Even though the acoustic properties of phonetic units are highly variable, both with speakers and with neighboring sounds (the so-called co articulation effect), it is assumed in the acoustic-phonetic approach that the rules governing the variability are straightforward and can be readily learned (by a machine).

The **pattern-matching** approach involves two essential stepsð namely, pattern training and pattern comparison. The essential feature of this approach is that it uses a well formulated mathematical framework and establishes consistent speech-pattern representations, for reliable pattern comparison, from a set of labeled training samples via a formal training algorithm. A speech-pattern representation can be in the form of a speech template or a statistical model (e.g. a HIDDEN MARKOV MODEL or HMM) and can be applied to a sound (smaller than a word), a word, or a phrase. In the pattern-comparison stage of the approach, a direct comparison is made between the unknown speeches (the speech to be recognized) with each possible pattern learned in the training stage in order to determine the identity of the unknown according to the goodness of match of the patterns. The pattern-matching approach has become the predominant method of speech recognition in the last decade (Vijay & Douglas, 1998).

The artificial **intelligence** approach of Vijay & Douglas (1998) attempts to mechanize the recognition procedure according to the way a person applies intelligence in visualizing, analyzing, and characterizing speech based on a set of measured acoustic features. Among the techniques used within this class of methods are uses of an expert system (e.g. a neural network) that integrates phonemic, lexical, syntactic, semantic, and even pragmatic knowledge for segmentation and labeling, and uses tools such as artificial NEURAL NETWORKS for learning the relationships among phonetic events. The focus in this approach has been mostly in the representation of knowledge and integration of knowledge sources. This method has not been used widely in commercial systems. A block diagram of a complete system for large vocabulary speech recognition (Robert & Frank, 2001) based on the pattern matching approach is shown in Figuren1. The first step in the processing is spectral analysis to derive the feature vector used to characterize the spectral properties of the speech

input. The second step in the recognizer is a combined word-level/sentence-level matching procedure.

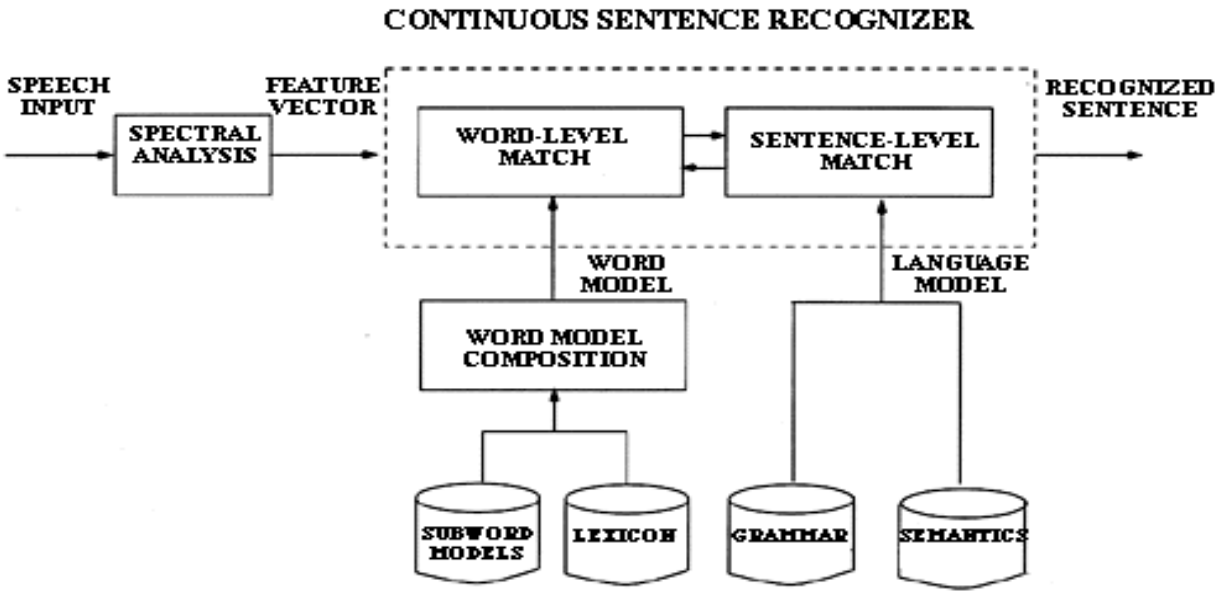


Fig. 1. Overall block diagram of subwork unit-based continuous-speech recognizer.

Pre-Emphasis Filter

Pre-emphasis Filter is used to reduce differences in power of different components of the signal. The speech is pre-emphasized with a pre-emphasis filter algorithm below.
y(n) = x(n) - a.x (n-1). Where: x(n) - value of input signal at discrete time step n
y - value of output signal at discrete time step n and a-constant a = 0.95

Frame Blocking and Windowing

The speech sample is arranged into overlapping blocks of frames. This is to analyze the speech samples in short intervals of 15-30ms. The frames are overlapped to ensure that all aspect of sample is represented and emphasized. The frame samples are then windowed to cut each small section out for analysis and to handle the problem of signal discontinuity with the aid of an algorithm. The hamming window is used for this work. The equation for hamming window is given below:

$$w(n) = 0.54 - 0.46\ \cos\left(\frac{2\pi n}{N-1}\right)$$

Feature Extraction

Feature extraction is a process that analyzes the windowed speech samples and represents or code it in a more compact vector form. These vectors represent a compact model of each uttered words.

Feature Matching

The system makes use of the DTW algorithm for solving the pattern matching problem during the recognition phase. The standard DTW algorithm is:

Initial condition:

D(1,1)=0;

Recurrence:

D(i, j) = Dist(i, j) + min[D(i-1, j), D(i, j-1), D(i-1, j-1)]

Text-To-Speech (TTS)

Text-To-Speech also known as Speech Synthesis is the computer production of human speech. It is the process of generating spoken words by machine from written input. Speech is often based on concatenation of natural speech i.e units that are taken from natural speech put together to form a word or sentence. Concatenative speech synthesis according to (Sproat & Olive, 1999) has become very popular in recent years due to its improved sensitivity to unit context. Rhythm also is an important factor that makes the synthesized speech of a TTS system more natural and understandable; the prosodic structure provides important information for the prosody generation model to produce effects in synthesized speech (Sasirekha & Chandra, 2012).

A TTS machine usually imitates what human readers do. The machine in most cases those not understand perfectly the grammatical fact of the language in question and generally can be said to understand nothing of what it is reading. TTS algorithm thus has to come up with grammatical information to decide on such things as accentuation, phrasing and intonation. Also, providing reasonable analysis for aspects of speech output that are more dependent on actual understanding. TTS can be divided into two. The first of these is the conversion of text (an imperfect representation of language into linguistic representation that includes information on the phonemes to be produced, their duration, the locations of any pauses, and the F0 contour to be used). The second is the actual synthesis of speech which takes this information and converts it into a speech waveform. The conversion stage can further be divided into the following:

1. Text preprocessing: including end-of-sentence detection, ñtext normalizationò (expansion of numerals and abbreviations), and limited grammatical analysis, such as grammatical part-of-speech assignment.
2. Accent assignment: the assignment of levels of prominence to various words in the sentence.
3. Word pronunciation: including the pronunciation of names and the disambiguation of homographs.
4. Intonational phrasing: the breaking of (usually long) stretches of text into one or more intonational units.
5. Segmental durations: the determination, on the basis of linguistic information computed thus far, of appropriate durations for phonemes in the input.
6. F0 contour computation. (Sproat& Olive, 1999)

Speech synthesis breaks down into two parts:

1. The selection and concatenation of appropriate concatenative units given the phoneme string.
2. The synthesis of a speech waveform given the units, plus a model of the glottal source.

Speech Synthesis Techniques

There are three main approaches to speech synthesis: **formant synthesis, articulatory synthesis,** and **concatenative** synthesis. Formant synthesis models the frequencies of speech signal. Formants are the resonance frequencies of the vocal tract. The speech is synthesized using these estimated frequencies. Articulatory

synthesis generates speech by direct modeling of human articulator behavior. On the other hand, concatenative speech synthesis produces speech by concatenating small, pre-recorded units of speech, such as phonemes, diphones and triphones to construct the utterance. In a case where not just one, but hundreds of realizations of each phonetic speech unit are present in an inventory, a unit selection process must take place in order to create the final synthetic unit sequence. Such speech synthesis method is also called corpus based speech synthesis.

Related Work

The earliest attempts at man-to-machine communication were made in 1950s (Anusaga & Katti, 2009), it was based on finding speech sounds and providing appropriate label for it. Since then many researchers have been working on how to improve the technology. Ibiyemi and Akintola (2012) used Melõs Frequency Cepstral Coefficients (MFCC) for feature extraction and Vector Quantitization for the data compression in a telephone voice dialing system that was limited to digits. MFCC was also used for extraction by Akintola (2011) in a speech recognition system and data compression was not done in any form; thereby resulting in a large database. Linear predictive coding (LPC) and artificial neural network (ANN) combined in speech recognition was proposed by Wijoyo and Thiang (2011). In their research, LPC was used for feature extraction and ANN for recognition method. A dictionary of common words in Arabic language was developed to enhance the system, though made the system to be dependent on a large database. In Ibiyemi and Akintola (2012), recognition phase was implemented by simple Euclidean distance measures which result in the recognition of words. According to Mohammed, Sayed, Abdulnaiem, and Moselhy (2013), MFCC produces best result out of the forms of feature extraction in speech recognition system (Ibiyemi & Akintola, 2012; Akintola, 2011; Wijoyo & Thiang 2011).

On the other hand, Test-To-Speech TTS is still very much at infancy as researchers are working round the clock to have a better algorithm. A TTS system developed by the establishment of corpus-based synthesis unit database that includes nasals, tones, stops and sadhi rules (Sher, Hsu, Chiu, & Chung, 2010), subsystems of the system includes text-input system, text-to-sound convert system, training of basic synthesis units, and the acoustic wave play system. The system has a multiple accent corpus-based database which was developed using combination of basic phonemes of vowels, consonants and tones from MLT (Modern Literal Taiwanese) books. It has limited speech input but uses large database to develop the MLT. A concatenative synthesis and bell lab approach (combination of phonetics and linguistic structure) to speech synthesis relies on designing and creating the acoustic inventory of the language by taking real recorded speech, cutting it into segments and concatenating these segments back together during synthesis (Christogiannis, Varvarigou, Zappa, & Vamvakoulas, 2000). The synthesizer then produces a concatenative system, based on a set of prerecorded acoustic inventory elements that represent all the possible phone-to-phone transitions of the language. An Arabic system that uses a rule-based hybrid system which is combination of formant and concatenative speech techniques reduces the vocabulary independence and can handle all types of input text (Zekki, Kalifa, & Naji, 2010). The system omits some vowels of the language in use and also did not take intonation into consideration.

The use of concatenative synthesis bypasses most of the problems encountered by articulatory and formant synthesis techniques (Sher, Hsu, Chiu, & Chung, 2010). Most developed systems make use of very large database that can slow the system down and also require lots of memory space. The issue of incorrect labeling due the large database can also lead to poor quality of the system. In Sak, Gungor, and Safkan (2006), their proposed system contains front-end which comprised of text analysis and phonetic analysis. The unit selection algorithm is based on Viterbi decoding algorithm of the best-path in the network of the speech units using spectral discontinuity and prosodic mismatch objective cost measures in place of Hidden Markov Model (HMM). The back-end is the speech waveform generation based on the harmonic coding of speech. The Harmonic coding enabled the system to compress the unit inventory size by a factor of three. Though, the system used transplanted prosody which does not take intonation in to consideration, where generated prosody would have been more effective for the same purpose.

Methodology

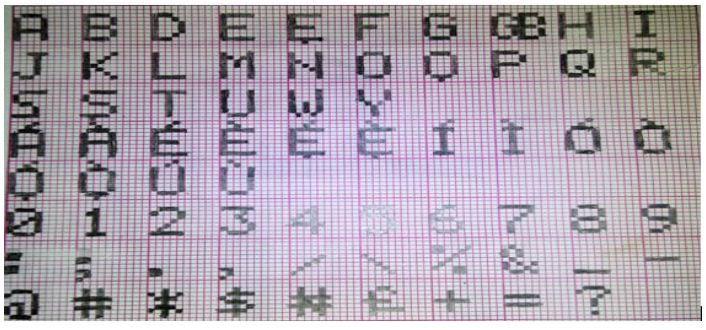
This study is specifically to design and develop a Man-To-Machine and Machine-To-Man system. It is broken into two modules which are the Speech Recognition Module and the Text-To-Speech Module. The Speech recognition module is a multileveled pattern recognition task, in which acoustical signals are examined and structured into a hierarchy of subword units (e.g., phonemes), words, phrases, and sentences. While Text-To-Speech module draws words gotten from the speech recognizer and converts it back to speech through text analysis, natural language processing and digital signal processing. Vector Quantitization, Guassian Mixture Model and Hidden Markov Model are applied to have better results. Concatenative Synthesis approach of TTS is used to form words by combining syllables.

Data collection

Speech data (**Yorùbá speech corpus**): The data collection at this stage involves adequate training and testing data of Yorùbá speech samples.

Yorùbá Character Generation: This is a distinct catalog of characters (Yorùbá Alphabet, counting numbers and special symbols) recognized by the computer hardware and software. Each of the character corresponds to a defined number in the upper ASCII character set (128 - 255). The English characters and other control characters make use of the lower ASCII set (0 - 127) leaving the remaining for any other languages such as French and German. The character set defines 110 characters (the remaining 18 for later expansion) 128-237 decimal in hexadecimal.

Examples:



Phonemes: Yorùbá phonemes are the perceptually distinct units of sound that distinguish a word from another. Table1 below shows the phonemes and pronunciation for Yorùbá alphabets.

Table 1: Thirty (30) Yorùbá phonemes

S/No.	Phoneme	Pronunciation
1	/b/	B
2	/d/	D
3	/f/	F
4	/g/	G
5	/g͡b/	Gb
6	/h/	H
7	/d̃ʒ/ or /ǔ/	J
8	/k/	K
9	/l/	L
10	/m/	M
11	/n/	N
12	/k͡p/	P
13	/r/	R
14	/s/	S
15	/ʃ/	ɬ
16	/t/	T
17	/w/	W
18	/j/	Y
19	/a/	A
20	/e/	E
21	/ụ/	Ọ
22	/i/	I
23	/o/	o
24	/ɔ/	ọ
25	/u/	U
26	/ã/	An
27	/ụ̃/	Ọn
28	/ẽ/	In
29	/ɔ̃/	ọn
30	/ũ/	Un

Syllable: Yorùbá syllable is a unit of pronunciation having one vowel sound, with or without surrounding consonants, forming the whole or a part of a word. Table 2 below shows all possible forms of Yorùbá language syllables.

Table 2: 201 (Two hundred and one) Yorùbá Syllables

A	E	Ḥ	I	O	̣	U	Ba	Da	Fa
Ga	Gba	Ha	Ja	Ka	La	Ma	Na	Pa	Ra
Sa	ɬa	Ta	Wa	Ya	Be	De	Fe	Ge	Gbe
He	Je	Ke	Le	Me	Ne	Pe	Re	Se	ɬe
Te	We	Ye	BỌ	DỌ	FỌ	GỌ	GbỌ	HỌ	JỌ
KỌ	LỌ	MỌ	NỌ	PỌ	RỌ	SỌ	ɬỌ	TỌ	WỌ
YỌ	Bi	Di	Fi	Gi	Gbi	Hi	Ji	Ki	Li
Mi	Ni	Pi	Ri	Si	ɬi	Ti	Wi	Yi	Bo
Do	Fo	Go	Gbo	Ho	Jo	Ko	Lo	Mo	No
Po	Ro	So	ɬo	To	Wo	Yo	B̀	D̀	F̀
G̀	Gb̀	H̀	J̀	K̀	L̀	M̀	Ǹ	P̀	R̀
S̀	ɬ̀	T̀	Ẁ	Ỳ	Bu	Du	Fu	Gu	Gbu

Hu	Ju	Ku	Lu	Mu	Nu	Pu	Ru	Su	ɨu
Tu	Wu	Yu	N	M	An	ʜn	̊ n	Un	Ban
Dan	Fan	Gan	Gban	Jan	Kan	Lan	Han	Yan	Pan
Ran	San	ɨan	Tan	Wan	BƇn	DƇn	FƇn	GƇn	GbƇn
HƇn	JƇn	LƇn	PƇn	RƇn	SƇn	ɨƇn	TƇn	WƇn	YƇn
B n	D n	F n	G n	Gb n	H n	J n	K n	L n	P n
R n	S n	ɨ̀ n	T n	W n	Y n	Bun	Dun	Fun	Gun
Gbun	Hun	Jun	Lun	Pun	Run	Sun	ɨun	Tun	Wun
Yun									

Homographs: Yorùbá homographic words are two or more Yorùbá words spelt the same way but not pronounced the same and have different meanings. Yorùbá language makes use of tones to differentiate these words. Table 3 below shows some of the homographic words in Yorùbá with corresponding syllable, English meaning and phoneme pronunciation.

Table 3: Yorùbá Homographic Words

S/NO.	Word	Homographs	Syllable	Meaning	Pronunciation
1	Aba	Abá	A/bá	Attempt	Abá
		Àbá	À/bá	Mat	Àbá
		Abà	A/bà	Barn	Abá
		Aba	A/ba	Staple, Incubation	Aba
2	Abe	AbƓ	A/bƓ	Bottom	abɛ̱
		AbƇ	A/bƇ	Razor	abʊ́
3	Abo	Abo	A/bo	Female	Abo
		Àbò	À/bò	Refuge	Àbò
4	Aja	Ajá	A/já	Dog	aọ́ á
		Ajà	A/jà	Attic	aọ́ à
5	AjƇ	ÀjƓ	À/jƓ	Sorcerer	àọ́ ɛ̱
		ÀjƇ	À/jƇ	Oar, Paddle	àọ́ ʊ̱
6	Ala	Àlá	À/lá	Dream	Àlá
		Àlà	À/là	Boundary	Àlà
7	Apa	Apà	A/pà	Arm	akpà
		Àpa	À/pa	Prodigal	àkpa
		Apá	A/pá	Mark, Sign	akpá
8	Ara	Ara	A/ra	Body	Ara
		Ará	A/rá	Relative	Ará
		Àrá	À/rá	Thunder	Àrá
		Àrà	À/rà	Fashion	Àrà
9	Baba	Baba	Ba/ba	Father	Baba
		Bàbà	Bà/bà	Guinea Corn	Bàbà
		Bàbá	Bà/bá	Great thing	Bàbá
10	Dana	Dáná	Dá/ná	Make fire	Dáná
		Dánà	Dá/nà	Robbery	Dánà
		Dána	Dá/na	Pay dowry	Dána
11	Ede	Èdè	È/dè	Dialect	Èdè
		Edé	E/dé	Lobster	edé
		Èdé	È/dé	Buffalo	Èdé
12	Ere	Ère	È/re	Gain	Ère
		Eré	E/ré	Game	Eré
		Èrè	È/rè	Statue	Èrè
		Erè	E/rè	Snake	Erè
13	Ewu	Èwú	È/wú	A day pounded yam	Èwú
		Ewu	E/wu	Danger	ewu

		Ewú	E/wú	Grey hair	ewú
14	нfon	нf n	н/f n	Mosquito	ụfọn
		нf n	н/f n	Arrow	úfọ́n
		нf n	н/f n	Buffalo	úfọ́n
15	нgba	нgba	н/gba	Whip	úgba
		нgbà	н/gbà	Two thousand	úgbà
		нgbà	н/gbà	Bracelet	ụgbà
		нgbá	н/gbá	Yorùbá Tribe	ụgbá
16	нrin	нrín	н/rín	Laughter	ụrọ
		нrin	н/rin	Four	ụrẹ
17	нtu	нtù	н/tù	Guinea Fowl	útù
		нtù	н/tù	Gun Powder	ụtù
		нtu	н/tu	Antelope	útu
18	нwa	нwa	н/wa	Ten	úwa
		нwà	н/wà	Beauty	úwà
		нwà	н/wà	Beans	ụwà
19	Giri	Gìrì	Gì/rì	Convulsion	gìrì
		Gírí	Gí/rí	Promptly	gírí
		Girì	Gi/rì	Suddenly	girì
20	Gba	Gbà	Gbà/	Receive	gbà
		Gbá	Gbá/	Sweep	gbá
21	Gbo	Gbo=	Gbo/	Bark, Ripen	gbó
		Gbo	Gbo/	To affect	gbò
22	Iba	Ìba	Ì/ba	Few	Ìba
		Ìbà	Ì/bà	Respect	Ìbà
		Ibà	I/bà	Fever	Ibà
23	Ibo	Ìbo	Ì/bo	Plant	Ìbo
		Ibo	I/bo	Where	Ibo
24	Idi	ÌdÌ	Ì/Dì	Bundle	ÌdÌ
		Idi	i/di	Bud	Idi
		Ìdí	Ì/dí	Waist, Reason	Ìdí
25	Igba	Ìgbà	Ì/gbà	Time	Ìgbà
		Igba	I/gba	Two thousand	Igba
		Igbá	i/gbá	Calabash	igbá
		Ìgbá	Ì/gbá	Locust beans	Ìgbá
		Igbà	i/gbà	Rope for climbing	igbà
26	Ika	Ìkà	Ì/kà	Cruelty	Ìkà
		Ìka	Ì/ka	Finger	Ìka
27	Iko	Ìkó	Ì/kó	Hook	Ìkó
		Ìko	Ì/ko	Delegate	ìko
		Ikó	I/kó	Cough	ikó
28	Obi	Òbí	Ò/bí	Parent	Òbí
		Obì	O/bì	Kolanut	obì
29	Ogun	Ogún	O/gún	Inheritance	ogụ
		Ògún	Ò/gún	God of iron	ògụ
		Ógún	Ó/gún	Medicine	ógụ
		Ogùn	O/gùn	Twenty	ogụ
		Ogun	O/gun	War	ogụ
30	Ojo	Òjo	Ò/jo	Rain	òjo
		Ojo	O/jo	Fear	ojo
		Òjó	Ò/jó	Name	Òjó
31	Okun	Òkun	Ò/kun	Sea	òkụ

		Okùn	O/kùn	Rope	okụ̀n
		Okun	O/kun	Strength	okụn
32	Orun	Orùn	O/rùn	Sun	orụ̀n
		Orun	O/run	Sleep	orụn
		Orún	O/rún	Scent	orụ́n
33	˚ ka	˚ kà	˚ /kà	Corn	ẋkà
		˚ ka	˚ /ka	Childôs disease	ẋka
		˚ ká	˚ /ká	Snake	ẋká
34	˚ k	˚ k	˚ /k	Canoe	ẋkẋ
		˚ k	˚ /k	Spear	ẋkẋ
		˚ k =	˚ /k =	Hoe	ẋkẋ
		˚ k	˚ /k	Husband	ẋkẋ
35	˚ run	˚ rún	˚ /rún	Bow	ẋrụ́n
		˚ run	˚ /run	Neck	ẋrụn
		˚ rún	˚ /rún	Hundred	ẋrụ́n
		˚ run	˚ /run	Heaven	ẋrụn
36	˚ w	˚ w	˚ /w	Honour	ẋẇẋ
		˚ w =	˚ /w =	Flock of birds	ẋẇẋ
		˚ w	˚ /w	Broom	ẋẇẋ
		˚ w =	˚ /w =	Hand	ẋẇẋ

System Design

Figure 3 shows the architecture, modules and interfaces for the proposed system to satisfy the requirements for Speech Recognition and Text-To-Speech.

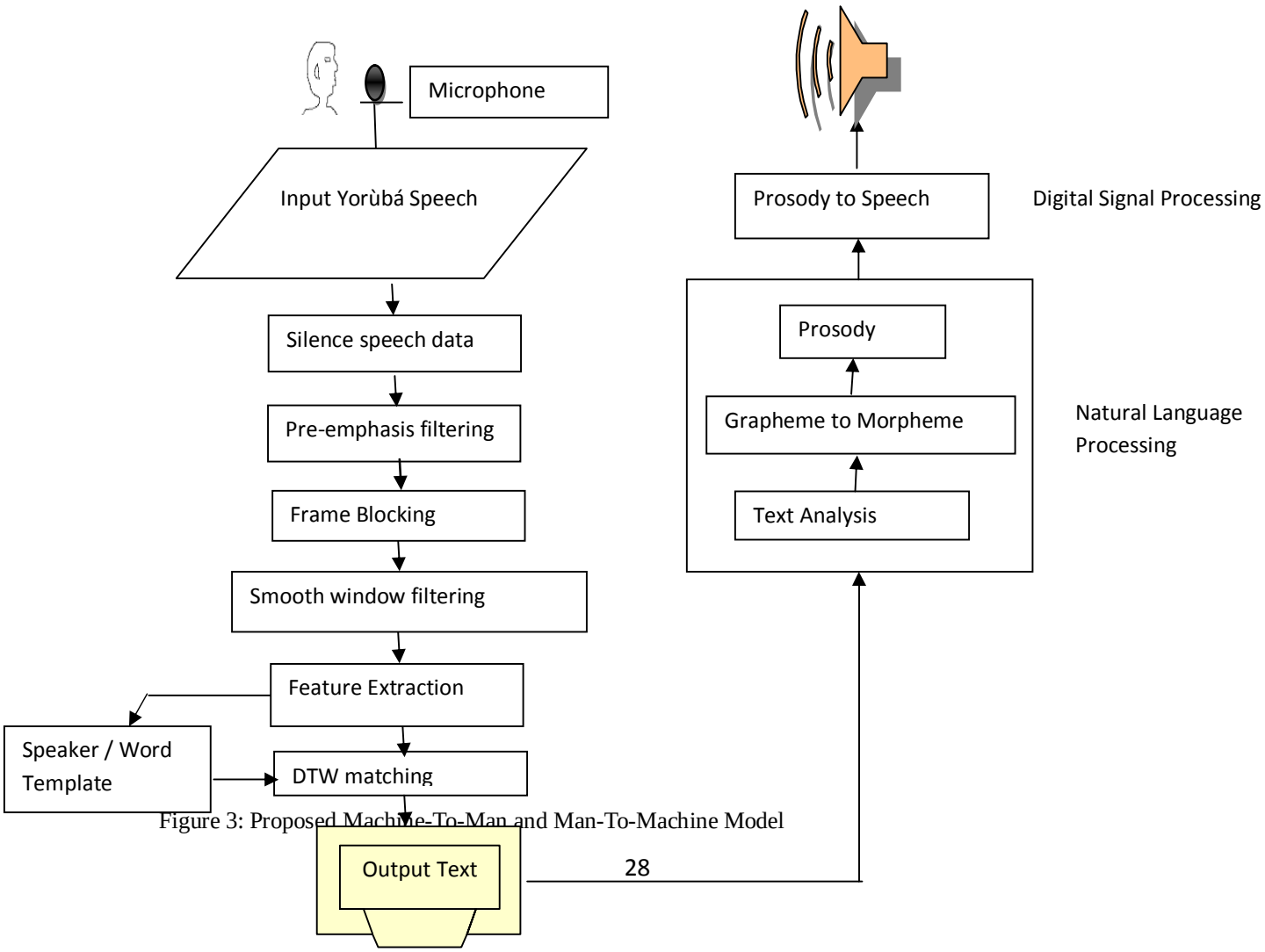


Figure 3: Proposed Machine-To-Man and Man-To-Machine Model

Sound library

The sound library houses the recorded vowels, phonemes, syllables and homographs pronunciation. The total number of sounds in the library is three hundred and thirty-three (339). The phonemes and their pronunciations are thirty (30) as shown in Table 1. All possible forms of syllable as derived from Table 2 are two hundred and one (201). This comprises of vowels (V), consonant vowel (CV) and nasal stops (M and N). The Thirty-Six (36) lexis which gave rise to (108) homographic words are also inclusive in the library.

Pseudo Code for Speech-To-Text

Speech_To_Speech ()
{ Step 1: Input speech
Step 2: Call WavReader()
Step 3: Call wordsegmentation()
Step 4: Call preEmphasisFilter()
Step 5: Call FrameBlocking()
Step 6: Call HammingWindow()
Step 7: Call DTW()
Step 8: Call StoreTemplate($word_{k,l,r}$)
Step 9: End}

Pseudo Code for Text-To-Speech

{
Step 1: Text Analysis;
Step 2: Grapheme to Morpheme()
Step 3: Prosody generation()
Step 4: Prosody to Speech()
Step 5: End}

Conclusion

Communication between man and man is by natural means such as sign language and gesture. Conversely, Man-To-Machine and Machine-To-Man communication is through electromechanical devices such as mouse, and keyboard. This communication involves application of Human Computer Interaction (HCI) which is not a natural means of communication for man. This research is aimed to design a robust architecture; for solving the non-natural means of communicating with machine in Yorùbá language using Speech Recognition and Text-To-Speech system. In order to extend HCI technology to the grass root, Machine-To-Man and Man-To-Machine communication in Yorùbá language is employed in this paper using Dynamic Time Warp, Vector Quantization, Guassian Mixture Model and Hidden Markov Model for a robust system architecture. Also, the pseudo codes for the proposed Speech Recognition and TTS system are presented.

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Simulation of Medical Diagnosis System for Malaria Using Fuzzy Logic

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Abstract
The advent of computer has led to the development of several algorithms and technologies to ensure accuracy and precision, one of such technologies is fuzzy logics which is a branch of artificial intelligence. In this paper the authors developed a medical diagnostic system using fuzzy logic; so as to enhance the accuracy and precision of the entire system. This paper present a rule based Expert System for diagnosis of malaria fever, the expert system takes user input and depending on the symptoms of the patient, diagnoses if the patient is suffering from malaria fever. The proposed medical diagnostic system was developed using Visual Prolog Programming language. More advance medical diagnosis system can be designed to help in the area like drugs prescription, registering of patients as well as keeping of patients' details and records in the medical sector.

Keywords: Malaria, Fuzzy Logic, Expert system, Diagnosis, Artificial intelligence

Introduction

Nowadays the use of computer technology in the fields of medical diagnosis, treatment of illnesses and patient pursuit has highly increased. Despite the fact that these fields, in which the computers are used, have very high complexity and uncertainty and the use of intelligent systems such as fuzzy logic, artificial neural network and genetic algorithm have been developed.

Malaria has been a challenge for the developed and developing countries of the world for irradiating. Malaria remain to be the most vital cause of morbidity and mortality in many tropical countries with complete 2 to 3 million new cases arising every year Priynka, Singh, Manoj & Nidhi (2013). Malaria is a major health problem in the world. Malaria is well-known oldest chronic and most widespread fatal disease that has plagued mankind for centuries, which also causes economical loss Priynka, et al. (2013). At present, malaria is the Third Worldôs most dreaded killer (Singh & Rahman, 2001).

In recent time, Artificial Intelligent methods have significantly been used in medical applications and research efforts have been concentrated on medical expert systems

as complementary solution to conventional technique for finding solution to medical problems. The emergence of Information Technology (IT) has opened unprecedented opportunities in health care delivery system as the demand for intelligent and knowledge-based systems has increased as modern medical practices become more knowledge-intensiveDjam, and Wajiga (2012). The diagnosis of diseases involves several levels of uncertainty and imprecision. The task of disease diagnosis and management is complex because of the numerous variables involved Eve, & Michael (2008). It is made more so because of a lot of imprecision and uncertainties. Patients cannot describe exactly how they feel, doctors and nurses cannot tell exactly what they observe and laboratories results are dotted with some errors caused either by the carelessness of technicians or malfunctioning of the instrument. Medical researchers cannot precisely characterize how diseases alter the normal functioning of the body. All these complexities in medical practice make traditional quantitative approaches of analysis inappropriate. Computer tools help to organize, store and retrieve appropriate medical knowledge needed by the practitioner in dealing with each difficult case and suggesting appropriate diagnosis, prognosis, therapeutic decisions and decision-making technique.

Diagnosis is concerned with the development of algorithms and techniques that are able to determine whether the behaviour of a system is correct or not. If the system is not functioning correctly, the algorithm should be able to determine, as accurately as possible, which part of the system is failing, and which kind of fault it is facing. The computation is based on observations, which provide information on the current behaviour. The expression diagnosis also refers to the answer of the question of whether the system is malfunctioning or not, and to the process of computing the answer. This word comes from the medical context where a diagnosis is the process of identifying a disease by its symptoms.

Among all the soft computing techniques, the concept of fuzzy logic is adopted in this research mainly due to its capability to makes decisions in an environment of imprecision, uncertainty and incompleteness of information. In addition, another advantage of choosing fuzzy logic is due to the fact that, fuzzy logic resembles human decision making with its ability to work from approximate reasoning and ultimately find a precise solution. Fuzzy expert systems incorporate elements of fuzzy logic, which is a logically consistent way of reasoning that can cope with uncertainty, vagueness and imprecision inherent in medical diagnosis.

It is widely accepted that the main components of soft computing are fuzzy logic, probabilistic reasoning, neural computing, and genetic algorithms. Fuzzy logic was adopted in this work because it is a powerful tool for dealing with the problem of knowledge representation in an environment of uncertainty and imprecision. Soft computing methods can be used in an uncertain economic decision environment to deal with the vagueness of human thought and the difficulties in estimating inputs. Fuzzy logic has been used to bridge the gap between traditional approaches of diagnosis and computer-assisted diagnosis by handling the issues of vagueness, imprecision and ambiguity inherent in medical diagnosis. Every trustworthy expert

knows that his or her medical knowledge and resulting diagnosis are pervaded by uncertainty with imprecise formulations.

One major problem that the developing countries are facing is the shortage of medical expertise in medical science, most developing countries are spending fortune to meet this challenge but still they are unable to meet the demands. Because of these, they are unable to provide good medical services to their people. Patients also find a huge queue in hospitals particularly in government hospitals. It has become of great concern to find a lasting solution to the problem of malaria in Africa because the government of these countries has spent most part of their budget on the control of malaria and related diseases. An expert system has been found to be one of the solutions to the above problems since it help to diagnosis difference types of diseases. One major problem in medical diagnostic is precision and accuracy. The traditional method of medical diagnostic is characterized with the aforementioned problems.

Where uncertainty exists such as in the medical field, fuzzy logic could play an important role in making decisions. Fuzzy logic is the science of reasoning, thinking, and inference that recognizes and uses the real world phenomenon that every-thing is a matter of degree. In the simplest terms, fuzzy logic theory is an extension of binary theory that does not use crisp definitions and distinctions. Fuzzy logic is a method that captures and uses the concept of fuzziness in a computationally effective manner

Related Studies

The history of computerized medical diagnosis is a history of intensive collaboration between physicians and mathematicians respectively electrical engineers or computer scientists. In the late 1950s Ledley and Lusted published Reasoning Foundations for Medical Diagnosis Ledley and Lusted (1959), Lipkin, and Hardy (1958), Ledley and Lusted(1962) wrote on the methods for the use of card and needle systems for storage and classification of medical data and systematic medical decision-making. In the 1960s and 1970s various approaches to computerized diagnosis using Bayes rule Wardle, and Wardle (1976) and Woodbury (1963) factor analysis, and decision analysis Ledley, and Lusted, (1962). On the other side artificial intelligence approaches came into use, e.g., DIALOG (Diagnostic Logic) Pople, Myers and Miller (1975) and PIP (Present Illness Program) Parker et al.(1976) which were programs to simulate the physicians reasoning in information gathering and diagnosis using databases in form of networks of symptoms and diagnoses.

A medical expert system for managing tropical diseases was proposed by Adekoya, Akinwale and Oke (2008). The proposed Medical Expert Solution (MES) system was to assist medical doctors to diagnose symptoms related to a given tropical disease, suggests the likely ailment, and advances possible treatment based on the MES diagnosis. The MES uses a knowledge-base which composes of two knowledge structures; namely symptoms and disease. The MES inference engine uses a forward chaining mechanism to search the knowledge-base for symptoms of a disease and its associate therapy which matches the query supplied by the patient. The MES is useful for people who do not have access to medical facilities and also by those who need first-aid solution before seeing medical consultant. Obot, and Uzoka (2008) designed

a fuzzy rule-based framework for the management of tropical diseases. The objective of the research was to apply the concept of fuzzy logic technology to determine the degree of severity on tropical diseases. The root sum square of drawing inference was employed to infer the data from the rules developed. Center-of-gravity method was used for defuzzification.

An expert system for malaria environmental diagnosis by Oluwagbemi, Adeoye and Fatumo (2009) was developed for providing decision support to malaria researchers, institutes and other healthcare practitioners in malaria endemic regions of the world. The motivation of the work was due to the insufficient malaria control measures in existence and the need to provide novel approaches towards malaria control.

Several related work have shown that malaria remains a major public health problem in Africa Khalid, Elfatih, Tarig, Salah, Abdalla, and Mahmoud, (2009). However, concerted efforts are continually been made to control malaria spread and transmissions within and between communities. In the work carried out by Utzinger, Yesim, and Burton, (2001), it was reported that monthly malaria incidence rates and vector densities were used for surveillance and adaptive tuning of the environmental management strategies; which resulted in a high level of performance. Within 3-5 years, malaria-related mortality, morbidity and incidence rates were reduced by 70-95% Utzinger et al., (2001). In a recent study, it was concluded that malaria control programmes that emphasized environmental management were highly effective in reducing morbidity and mortality Keiser, Singer, and Utzinger, (2005). Another study also showed that Environmental management of mosquito resources is a promising approach with which to control malaria, but it has seen little application in Africa for more than half a century Gerry, AKlilu, and Bart, (2004).

The great failure of malaria control in Africa, from a district perspective in Burkina Faso was highlighted in the work carried out by Kouyaté et al., (2007).An integrated approach to malaria control was presented by Clive, (2002). In the scientific commentary delivered by Jeffrey, (2001), he stressed the need for a new global commitment to disease control in Africa. In the commentary, malaria was among the diseases highlighted Jeffrey (2001). However, in the work carried out by Vincent and Thomas, (2003), it was observed that malarial control strategies consisted majorly of chemotherapy directed against the malaria parasite and prevention of mosquito vector/human contact using insecticide-impregnated bednets. This control strategy achieved minimum results Alibu, and Egwang (2003).

Another research was carried out on the island of Bioko (Equatorial Guinea). The purpose of this study was to access the impact of the two control strategies (insecticide treated nets (ITNs) indoor residual spraying (IRS) on the island of Bioko (Equatorial Guinea), with regards to Plasmodium infection and anaemia in the children under five years of age. The results obtained showed that IRS and ITNs have proven to be effective control strategies Gema, Miguel, Laura, Estefanía, Magdalena, Catalina, Jaquelina, Araceli, Jesús, Agustín, and Jorge, (2006).

Recently, a research was conducted to determine the cost effectiveness of selected malaria control interventions. It was concluded that on cost effectiveness grounds, in most areas in sub-Saharan Africa, greater coverage with highly effective combination treatments should be the cornerstone of malaria control Chantal, Jeremy, and David, (2005).

Therefore, there is a pressing need to research into the best methods of deploying and using existing approaches, such as rapid methods of diagnosis, to have effective control over malaria transmissions Guerin, Philippe, Olliaro, Piero; Nosten, and Francois; (2006)

Design of the Proposed System

Proposed Fuzzy Medical Diagnosis System

This section describes the approach adopted in developing the overall framework for the fuzzy medical diagnosis system for malaria fever. The framework comprises of three major components; User Interface, Information Manager, Knowledge Base, Fuzzy Inference System, Results output.

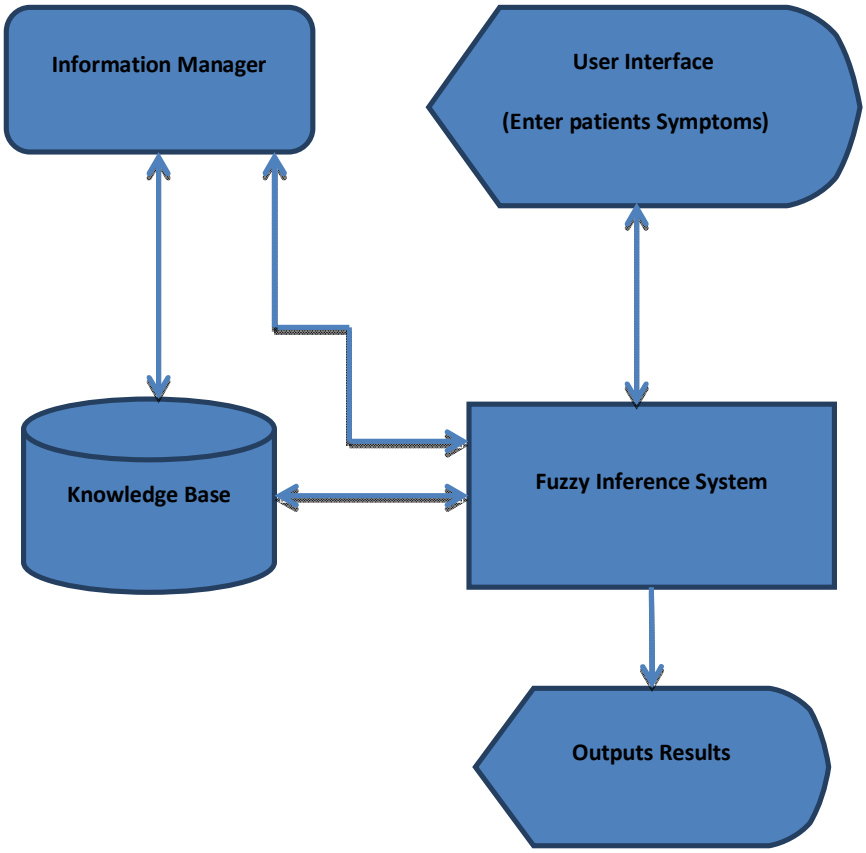

Figure 1: Fuzzy medical diagnosis system

User Interface: This provides a graphic interface showing the symptoms considered and their respective acronyms. Also provides based an interactive interface where patient can enter their symptoms in relation to its intensity during knowledge acquisition.

Information Manager: This is used in creation and manipulation of information I the Knowledge base, for maintaining the patient history. The information manager manages the Knowledge base. This system uses time series forecasting method to predict the future using past and present data.

Knowledge Base: The symptoms of the patient is keyed into the system and based on the weights of the symptoms stored in the knowledge base, the symptoms are fuzzified. Also it is base is used to store rules related to patientôs symptoms and diseases. The knowledge base maintains two tables for each entity set to store the current data and historical data separately.

Fuzzy Inference System: The inference engine has two components namely a scheduler for scheduling the rules to be fired and an interpreter that fires the rules using forward chaining inference technique. It applies fuzzy rules to make decision on diseases.

Result Output: The result is displayed which shows the diagnosis of the patient.

Algorithm for the propose system

Step 1:

Input signs and symptoms of patient complaint into the system.

Where n = number of signs and symptoms.

Step 2:

Search the knowledge-base for the disease d, which has the signs and symptoms identified.

Step 3:

Get the weighing factors (wf) (the associated degree of intensity) wf = 1, 2, 3, 4

Where 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Very Severe.

Step 4:

Apply fuzzy rules.

Step 5:

Map fuzzy inputs into their respective weighing factors to determine their degree of membership.

Step 6:

Determine the rule base evaluating (non-minimum values).

Step 7:

Determine the firing strength of the rules R.

Step 8:

Calculate the degree of truth R, of each rules by evaluating the nonzero minimum value.

Step 9:

Compute the intensity of the disease.

Step 10:

Output fuzzy diagnosis.

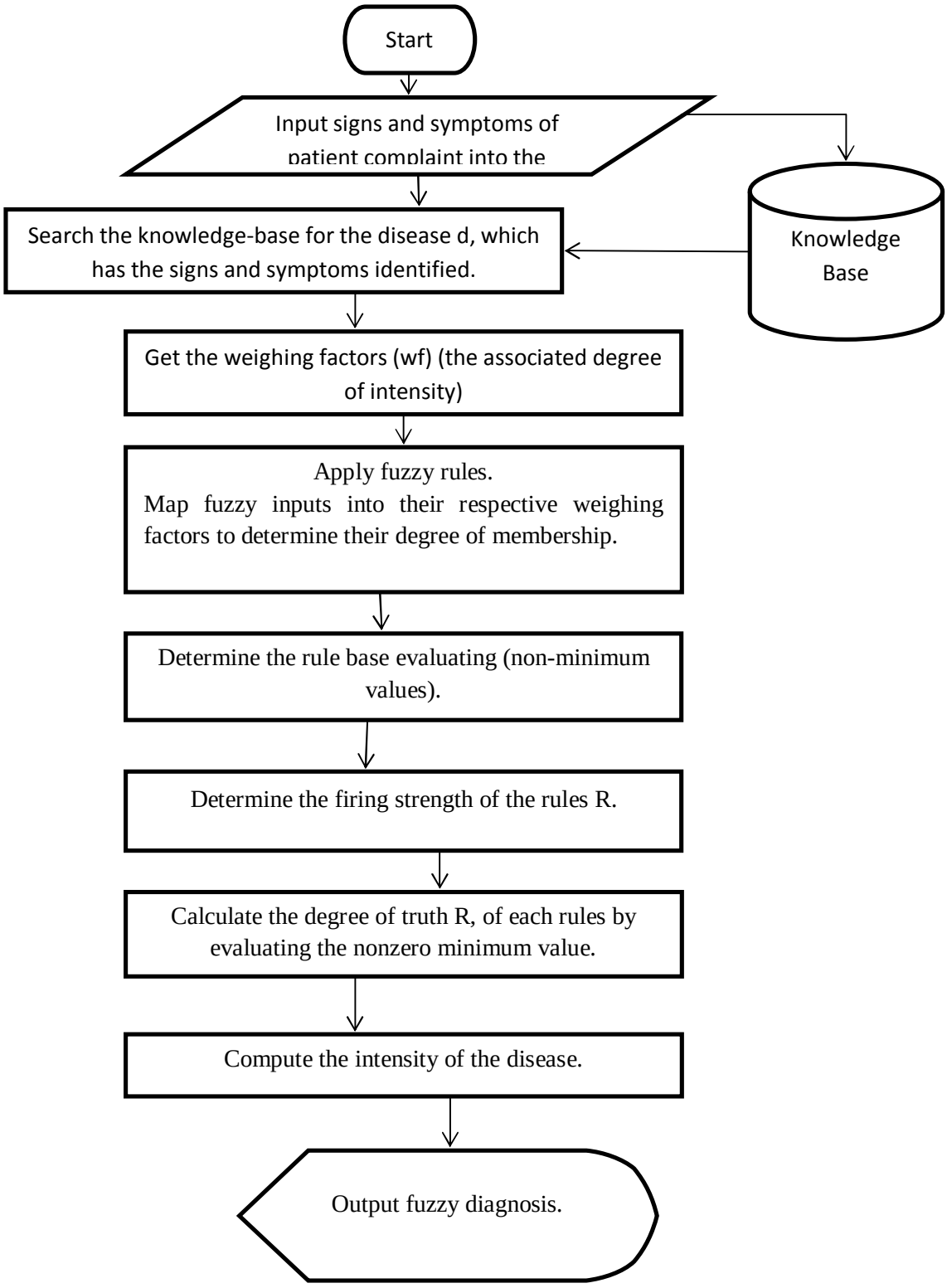

Figure2: Flowchart for the Medical Diagnosis System

Unified Modeling Language

The Unified Modeling Language (UML) analysis proposed system could be done using the following:

a. Class Diagram
b. Use Case Diagram
c. Sequence Diagram
d. Activity Diagram

Class Diagram

The class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among objects.

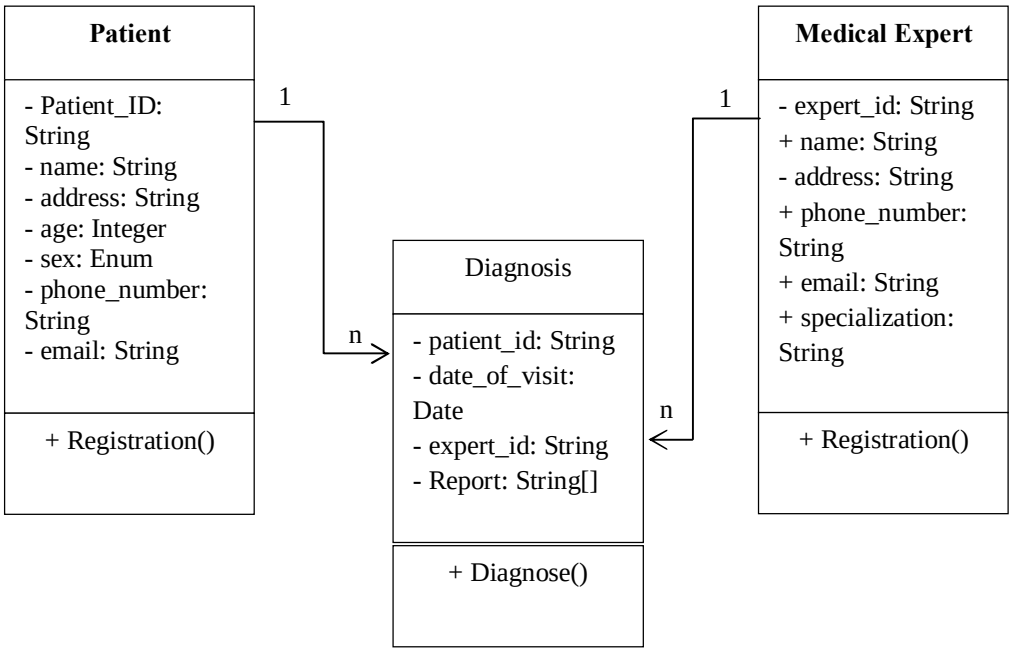

Figure 3 Class Diagram for the proposed System

Case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways that they interact with the system. This type of diagram is typically used in conjunction with the textual use case and will often be accompanied by other types of diagrams as well.

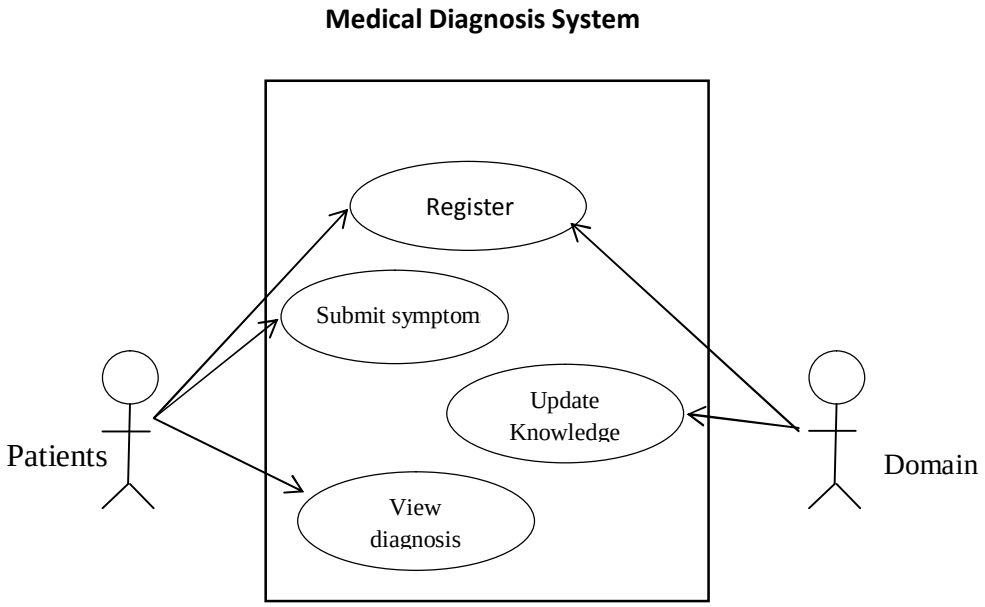

Figure 4: Use Case Diagram for the proposed System

Sequence Diagram

A sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the Logical View of the system under development. Sequence diagrams are sometimes called event diagrams, event scenarios.

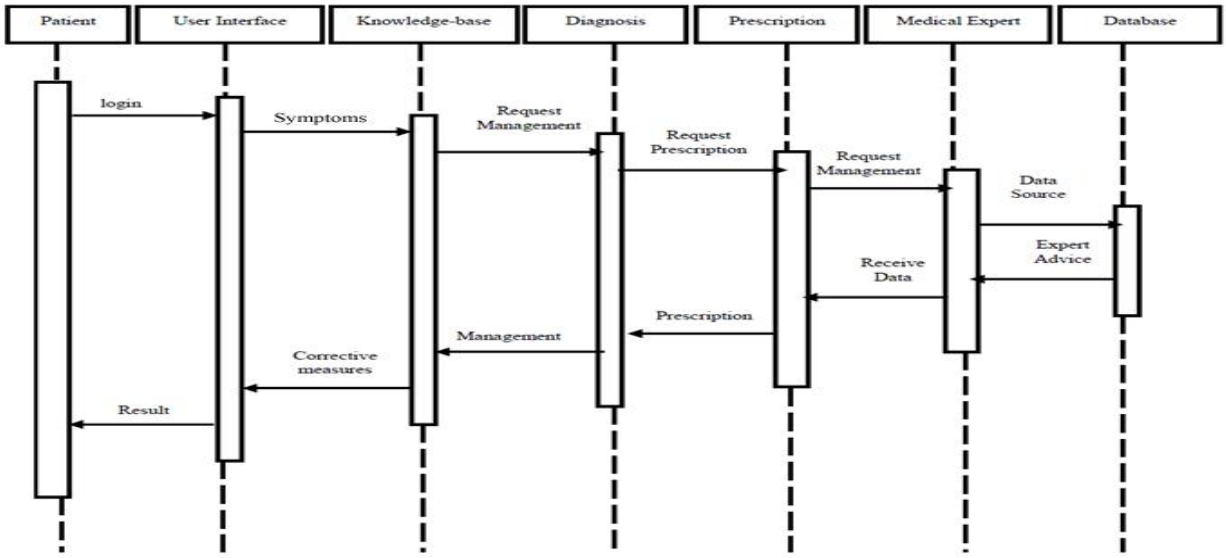

Figure 5: Sequence Diagram for the proposed System

Activity Diagram

Activity diagrams graphically show represent the performance of actions or sub activities and the transaction that are triggered by the completion of the actions or sub actions. It is a means of describing the workflow of activities.

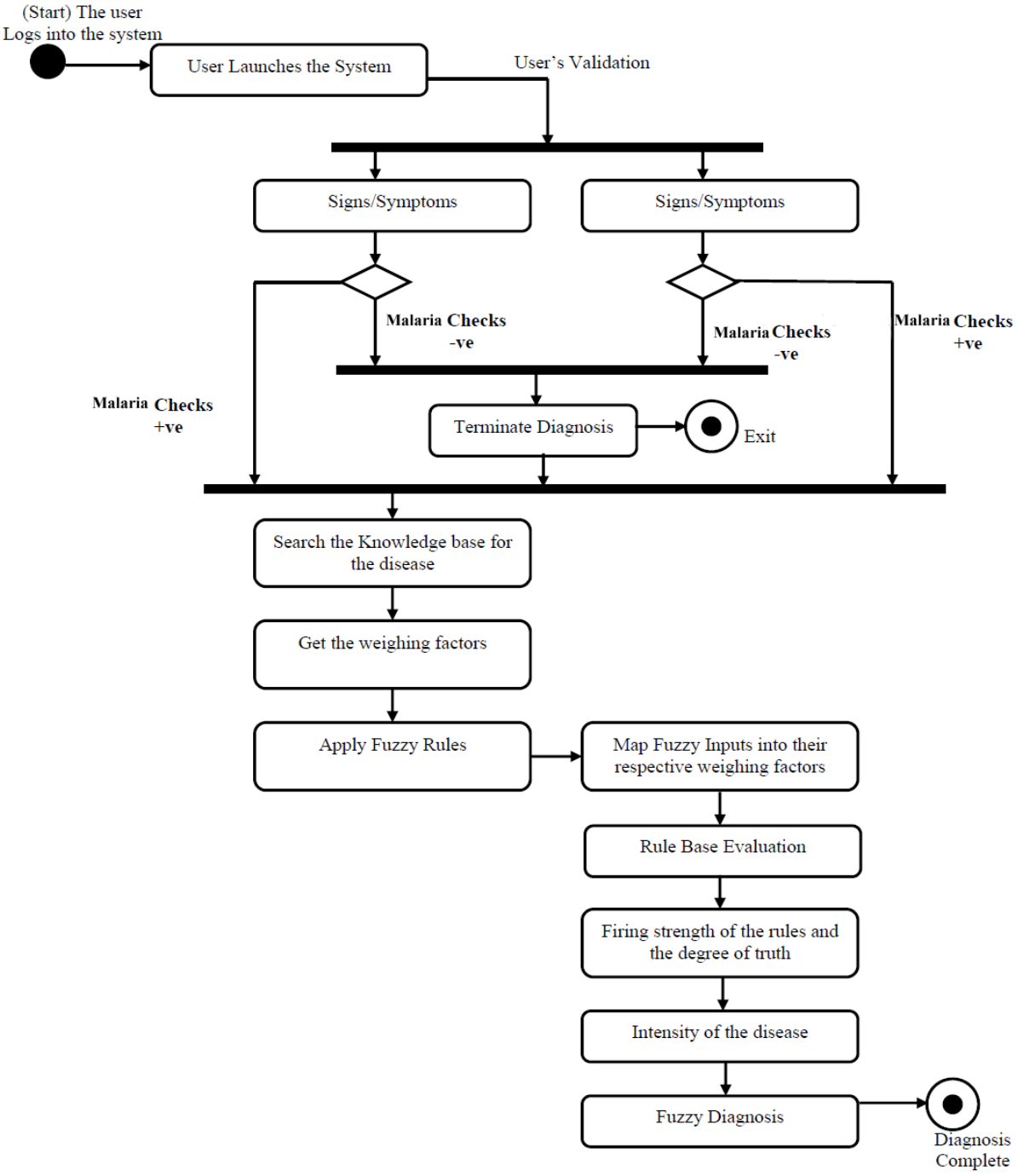

Figure 6: Activity Diagram for the proposed System

Knowledge Base Design

The system has been designed in such a way that it has a strong knowledge base. The knowledge base consists of rules for 11 symptoms in which each rule has symptoms and corresponding weight with the number of symptoms ranging from 3 to 10 depending on the part selected by the user. Moreover, there are many rules for the 11 symptoms that are created for making decisions. Each rule has symptom and their corresponding conditions based on its weight. The total number of conditions in each rule base varies from 10 to 110. Along with it, there are separate rules for common and general symptoms and conditions. For every symptom the user is selecting, the rule base generates the possible conditions from the above said table for disease diagnosis.

Discussion of Findings

It would be of great necessity to provide a computerized system that will provide a complementary medical service, such as medical disease diagnosis in places where accessibility is a problem as well as health care facilities where qualified experts are lacking, hence this research, Expert System on Malaria fever Diagnose is very timely. The system tailored for use in the diagnosis of malaria. It is an expert system with a database containing an expert knowledge. The user only uses it to determine whether he or she has the disease within its domain with the questions basic on the symptoms provided. The system has been designed to be interactive and capability eliciting from the user if they have symptoms of the disease. The user response helps the expert system to determine the level at which the disease is present. The user is further advised on what next to do. The proposed system is implemented in Visual Prolog programming environment, Health care facility should be accessible by all at all time. But some of the people that should access these facilities are far removed from these facilities. The system is used to ascertain whether the diseases could be diagnosed based on signs and symptoms by the use of expert system. It also examines a patient based on simple clinical signs and symptoms, and to improve family and community health in a society.

Conclusion

With the problems in shortage of medical professionals in medical field and due to shortage of medical specialists they are getting a huge chain of patients in hospitals. This has created very big problems especially in rural areas where we have young medical doctors or donôt have medical specialist at all. Fuzzy logic has been found to be very useful in our todayôs world ambitious by technology. When expertôs knowledge is take out and stored, such knowledge can be used to replace the expert in case of failure.

The use of fuzzy logic for medical diagnosis provides an competent way to assist inexperienced physicians to arrive at the final diagnosis of malaria more fast and proficiently. The developed Fuzzy logic based medical diagnostic system provides decision support platform to assist malaria researchers, physicians and other

health practitioners in malaria endemic regions. If the approach proposed in this study, if used smartly, could be an effective technique for diagnosing malaria. Furthermore, execution of Fuzzy logic based medical diagnostic system will reduce doctorsô workload during consultation and ease other problems associated with hospital session.

Future Work

Due to different types of malaria infections, and the complexities of medical professions, a fully automated system to handle diagnosis in general should be developed.The proposed system has the ability to diagnose a person suffering from any of the specified malaria infections, a similar system should be introduced in the health sector to assist all medical professions to make accurate and precise diagnosis. More advance medical diagnosis system can be designed to help in the area like drugs prescription, registering of patients as well as keeping of patientsôdetails and records in the medical sector.

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Computerized Point of Sale (POS) Systems in Management of Retail Stores in Ilorin Metropolis, Nigeria

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Abstract

The presence of computerised point of sales (POS) systems in retail stores are known to enhance customer satisfaction, improve efficiency of store operations, and provide the managers with important timely operational information. Yet, many retail stores in Nigeria are yet to adopt such electronic POS systems. This study examines the use of computerised sales systems in retail stores in Ilorin metropolis, Nigeria, with the aim of identifying the extent of deployment and to determine how the staff of the stores feel about the use of such systems. The survey method was used to collect data from 30 stores in Ilorin, ranging from pharmaceutical stores to supermarkets with the aid of two questionnaires, one of which was administered on 87 store attendants. Data were analysed using frequencies, cross-tabulation and Chi-square statistic at the 0.01 level of significance. The findings revealed that while 80% of the stores had computers very few were connected to printers, bar code readers or debit/credit card readers. Furthermore, although gender had no influence on respondent opinions, their educational qualifications did, and this gave rise to capacity building as one of the recommendations from the study.

Keywords: computerised sales system, point of sale systems, retail stores, Nigeria

Introduction

The advent of personal computers have had a great impact on the way businesses are managed since the 70s when the retail trade increasingly adopted computerized systems to provide quickly and accurately the information that it needed to remain profitable (Poole, 1978). However, the developments that occurred in information and communication technology (ICT) has had a greater impact on small businesses, making it easier to communicate with customers, order goods and pay for goods and generally control inventory which is defined by Williams and Waller (2010) as an asset that is owned by a business that has the express purpose of being sold to a customer. One of such transformations that occurred was the replacement of manual cash registers or manual points of sale with computerised (or electronic) point of sale systems. This change which was quite visible to customers in developed countries (Benwell, 1980) or emerging economies such as the United Arab Emirates, has barely been adopted by retail businesses in developing countries, Nigeria inclusive.

According to the Collinôs English dictionary, a retail business is a firm which sells goods to individuals and the retail sector is that part of a countryôs economy that is made up of businesses that sell goods through stores, on the internet, etc. to the public. Manual sales system, especially in retailing business operations, requires a high degree of effort in order to deliver accuracy of management information required to manage the business. When used in a retail store, errors can occur when the sales staff are under pressure in many ways. For example, when bulk orders are placed successively, it is inevitable for the cashier to commit errors in recording the transactions or if not, to omit some of them. Similarly, when a lot of customers are simultaneously waiting to be served, a manual system may be a hindrance due to its slow process. To avoid, or at least, lessen such drawbacks, computerized sales systems have since been implemented. Another reason why computerized sales systems are preferred to the manual type of sales systems is the reduction in paper work arising from the transaction processes involved in registering of goods and sales of goods and services. For overall efficiency, point of sale systems also include infrastructure for processing credit card payments (Griffin, 1998) and advanced input devices such as touch screens (Ansel & Dyer, 1999).

Success in the retailing business is thought to depend to a large extent on the capacity of the business to invest in technology, and information and communication technologies (ICT) considered to be a key factor include customer relationship management (CRM), enterprise resource planning (ERP), quick response technologies (QRT), point of sale (POS), universal product codes (UPC), radio frequency (RFID) and payment methods (Gil-Saura, Berenguer-Contrí & Ruiz-Molina, 2009). In 2003, VeriFone described a Wi-Fi-based payment solution for countertop POS installations which resulted in a 350% increase in transaction speed, averaging around four seconds, and early adopters were retailers in Ecuador and South Africa (Nickerson, 2003). Brynjolfsson and Hitt (2000) note that the whole operations process of the organisation may have to be redesigned and that the new information systems and process redesign have to be done at the same time in order to achieve the best value.

Objective of the Study

The aim of the study is to evaluate the extent to which retail stores in Ilorin metropolis, Nigeria, utilise computerised sales systems such as the POS, and the attitude of the retail store staff to such systems. The specific objectives are to:

(a) identify the components of computerised sales systems used in the retail stores in Ilorin metropolis;
(b) examine the opinion of store personnel on computerised sales systems;
(c) elicit any preferences that may impact on future adoption of POS systems;
(d) make appropriate recommendations from the findings.

Overview of Computerized Point of Sale (POS) Systems

Computerised point of sale is an automation of the sales or inventory control operations of a retail business. Automation helps with the use of machine to do or perform work easily and accurately i.e. the automation of some of the operations in the inventory department would save a great deal of time. Computerization has enormous advantages such as security and safety of information, and accuracy and timeliness of periodic inventory reports. According to Williams and Waller (2010), the following are some of the reasons why businesses embark on automation of the inventory/stock control system in a retail store:

i. **Time** - A lot of time is wasted in setting up bin-cards and posting items to the ledger, which could result in delays in customer service and stock-out of inventory.
ii. **Accuracy** ï Since setting up bin cards and posting to ledgers, in addition to tallying the sales of customers are done manually, errors occur very frequently.
iii. **Staff** ï The manual point of sale is prone to manipulations by staff
iv. **Data entry** - Errors of transcription occur frequently in a manual system as data is written unto the bin card or the sales of ledger cards. Also, incoming stock could be mistakenly recorded as issues and this may be difficult to detect thus generating discrepancies in the balances, hence there is need for proper automation.

A computerized point of sale system is a computer program which takes the best features of a manual system and electronic cash registers and presents a one-stop transaction interface in the store. An electronic point of sale provides the means of storing client and supplier records, creation of quotations which can be later converted to invoices or cash sales, and keeping track of and categorizing inventory in an easy way, while generating comprehensive reports for management decision making (Brynjolfsson & Hitt, 2000).

A software based point of sale system connects and integrates all a business's components in one application; inventory, sales, clients and suppliers are the basic components of such a system (Wisegeek, n.d.). Switching from a traditional cash register to a computerized POS system can be difficult - there are many factors to consider and some pitfalls to avoid, however, the return on investment and benefits to the business can make it worth the time, effort and investment (Perry & Whitty, 2006). A POS system is rarely totally unnecessary - most often, the only question is how soon it can pay for itself (Langdoc, Perry, & Whitty, 2008). The most basic POS system consists of a computer, a cash drawer, receipt printer, a monitor, and an input device such as a keyboard or scanner (Perry & Whitty, 2006).

In terms of saving money, the POS has the following advantages as outlined in the blog post, *Do you need a Point of Sale (POS) system?:*

(i) Eliminates shrinkage. A computerized point of sale system can drastically cut down on shrinkage, the inventory that disappears from the store or restaurant due to theft, wastage, and employee misuse. Because employees will know that inventory is being carefully tracked, internal shrinkage tends to dwindle.

(ii) Improves accuracy. Whether a barcode scanning is used or not, POS systems ensure that every item in the store or on a menu is sold for the correct price. Miss-entering or guessing prices is eliminated, and prices can be changed with ease on the computer by authorised staff.

(iii) Get better margins. Detailed sales reports can help managers focus on higher-margin items by moving items around within a retail location or promoting under-performing items, the sale of high-profit items can be boosted.

As an aid to managerial decision making, POS systems have the following benefits (ñDo you need a Point of Sale (POS) system?ò, n.d.):

(i) Know where you stand. At any point of the day, a POS system can instantly tell you how many of a particular product have sold today (or last week, or last month), how much money you have in your cash drawer, and how much of that money is profit.

(ii) Better manage inventory. Detailed sales reports make it much easier for you to keep the right stock on hand. Track your remaining inventory, spot sales trends, and use historical data to better forecast your needs. Often, the software can alert you to reorder when stocks run low. Many store owners who think they know exactly what trends affect them find a couple of surprises once they have this data.

(iii) Build a customer list. Collect the names and addresses of your best customers as part of standard transactions. Then use the list for targeted advertising or incentive programs.

POS systems increase productivity in the following ways (ñDo you need a Point of Sale (POS) system?ò, n.d.):

(i) Reduce paperwork. POS systems can dramatically reduce the time you have to spend doing inventory, sales figures, and other repetitive but important paperwork. The savings here: time and peace of mind.

(ii) More efficient transactions. In retail settings, barcode scanners and other POS features make checkout much, much faster. Restaurants will find their order process greatly streamlined as orders are relayed automatically to the kitchen from the dining room. In both cases, your customers get faster, more accurate service.

In the blog post, *"Do you need a Point of Sale (POS) system?",* it is stressed that realizing the benefits outlined above requires a commitment to utilizing the POS system capabilities to their fullest; and that without appropriate training even the most sophisticated POS system will be no more useful than a basic cash register.

A comprehensive blog post by E-Bay (2013) outlines what POS systems are as depicted in Figure 1.

Figure 1. Components of a typical POS system
Source: E-bay (2013). Complete POS PC-Based Systems Buying Guide. Retrieved from http://www.ebay.com/gds/Complete-POS-PC-Based-Systems-Buying-Guide-/10000000177627421/g.html

ñThe modern POS system keeps the price of every item in the store in a database. This database can be updated daily by the store manager by inputting new prices or items. Every item in the store comes with a barcode on the packaging that is associated with the itemôs price and other information in the POS database. At the checkout counter, the cashier uses the POS system to scan these barcodes and the price is automatically added to the customerôs total. When the cashier is finished scanning items, the POS system totals the prices. The system is also attached to a cash drawer. Cashiers can enter how much the customer is paying. The register pops open (or cash drawer) and the cashier makes change for the customer and closes the register when done. A receipt automatically prints out at the end of the transaction with the customerôs purchases, total, amount paid, and change received. POS systems are also set up to take other forms of payment, such as credit cards and checks. On the back end, the store manager is able to log into a POS system and see all the current sales information for the store. The systems are usually set up to produce easy to understand printable sales reportsò, and other financial record keeping necessary to run a small business. (E-bay, 2013, ñComplete POS PC-Based Systems Buying Guideò)

As earlier expressed in the introductory section, despite the numerous benefits, POS systems are not commonplace in retail outlets in Nigeria. Hence, this study set out to empirically determine the extent of adoption in retail outlets in the Ilorin metropolis.

Methodology

The study adopted a descriptive survey research approach using questionnaires to collect data from the respondents on the variables of the study. The population of study consisted of retail stores in Ilorin metropolis and the staff of those retail stores. It was from these populations that a sample of 30 stores was drawn based on convenience across different parts of the metropolis, and a further sample of 100 was earmarked for the survey of retail store staff. The data collection was done using questionnaires designed for the purpose. Two types of questionnaires were developed. The first one collects information on computerization at the stores, while the second one obtains the opinion of workers at the stores on the use of computerized sales systems.

The questionnaire used to collect information on computerisation activities in the store had several Yes or No questions on the presence of computers at the store, whether the store used any form of computerised system for their transactions, if the store has a POS device in the store, and whether or not the store had a debit/credit card reader. The questionnaire used is presented in Appendix I. The most senior staff in each store was asked to complete the questionnaire on checklist of store computerization. The questionnaire used to obtain the opinion of store staff on the use of computerised sales systems had two sections as shown in
Appendix II ï
Section A - dealt with the respondentsô personal information (demographic details) and included requests for the respondentôs Gender, Age group, Highest educational qualification, and Number of years of working experience.
Section B - consisted of a table of 20 statementsThe statements were meant to elicit respondent feelings and opinions about the use of computerised sales systems. Responses in this section of the questionnaire were evaluated according to a 5-point rating scale ranging from Strongly Agree (1), Agree (2), Undecided (3), Disagree (4), and Strongly Disagree (5). Additionally, the questionnaire included a question on familiarity with manual cash registers and preference between manual cash registers and computerised sales systems. All staff in each store directly connected to sales was administered a copy of questionnaire on user opinion. The questionnaires were personally administered and retrieved after respondentsô completion. In all, 100 copies were distributed and 87 completed, resulting in a response rate of 87%. The stores sampled and the number of respondents from each store are presented in Table 1.

Table 1: Number of Respondents Per Store

S/No.	Stores	N
1	Exelture Pharmacy & stores, Opposite Kwara Hotel	1
2	Gene Bendi stores, Kwara Mall	2
3	Anônur supermarkets, Sabo oke	1
4	Unilorin Bookshop	2
5	Unilorin merchandise store	2
6	Chigozie supermarket, Tanke	1
7	Supreme supermarket, Tanke	1

8	Iya Yusuf restaurant, Tanke	1
9	T & K Restaurant, Tanke	1
10	Capri chills, Oke odo	1
11	Med plus Pharmacy, Kwara Mall	1
12	Unique supermarket, Tanke	1
13	Sutura stores, Post office	1
14	Chupet supermarket, Taiwo road	2
15	Mojlat supermarket, Tanke	1
16	Chinedu supermarket, Taiwo road	1
17	Chidex supermarket, Tanke	1
18	Chinedu supermarket, Tanke	2
19	Mojlat supermarket, F.division	1
20	Sunday bookshops, Post office	1
21	Marvelous supermarket, Tanke	1
22	Sumptous meals, Kwara Mall	1
23	Martrite Stores, Tanke	3
24	Max stores, Kwara Mall	8
25	Laadim Pharmacy & stores, Commissioners rd., GRA, Ilorin	9
26	Gomola stores, Unity	3
27	Gomola fast foods, Unity	11
28	Aremokoya Pharmacy, Opposite A Division, Ilorin	15
29	Martrite stores, Government house road, GRA, Ilorin	10
30	Gomola stores, Opposite Kwara Hotel	1
	Total number of respondents	87

Data collected were coded in Microsoft Excel and analysed with the Statistical Package for Social Sciences (SPSS) including the determination of the Chi-square statistic for examination of the influence of gender on respondent opinions at the 99% level of significance. During data coding, responses to strongly Agree were coded as 1, Agree as 2, undecided as 3, Disagree as 4, strongly Disagree as 5. The means were thus interpreted as follows: 1 - 1.79 = strongly Agree; 1.8 - 2.59 = Agree; 2.6 - 3.39 =Undecided; 3.4 - 4.19 =Disagree; 4.2 - 5 = Strongly Disagree.

Results and Discussion

Results from analysis of the data collected are presented in two sections ï results from the checklist on computerisation of the 30 stores in the sample and results from the opinions of 87 respondents on computerised sales systems.

Computerisation at the stores

Presence of Computers:

Majority of the 30 stores sampled had computers (80%) while 6 (20%) did not, as shown in Table 2. Of those that had computers, there was an equal mix of laptops and desktops, although six stores as presented in Table 3, did not respond to this question. Table 4 shows the number of stores with networked computers were 15 (63%), and

that 14 (58%) of the computers were used for word processing activities while the same number of computers were also being used for sales related transactions/calculations.

Table 2: Distribution of stores and computer presence

Stores	N	%
Stores with Computers	24	80.0
Stores without Computers	6	20.0
Total	30	100.0

Table 3: Type of computers used in the stores

Type of computer used	N	%
Laptop	9	37.5
Desktop	9	37.5
No response	6	25.0
Total	24	100.0

Table 4: The nature of computer use at the store

Code	Information on Computerization at the Store	Responses		Total
		Yes	No	
CH1c	Computers are networked	15 (62.5%)	9 (37.5%)	24 (100%)
CH1d	Computers are used for word processing	14 (58.3%)	10 (41.7%)	24 (100%)
CH1e	Computers are used to carry out sales related transactions/calculations	14 (58.3%)	10 (41.7%)	24 (100%)

Use of computerised systems for store transactions:

From Table 5, the 12 stores (40%) indicated that they use computerised systems for store transactions and in all cases as shown in Table 6, the computerised system was a óstand-aloneô application although only eight stores (67%) were operating the application as a networked system.

Table 5: Stores and computerized systems for transactions

Stores	N	%
Stores using computerized systems	12	40.0
Stores not using computerized systems	18	60.0
Total	30	100.0

Table 6: Nature of the computerised systems

Code	Information on Computerization at the Store	Responses		Total
		Yes	No	
CH2b	The computerized system is a stand-alone application	12 (100.0%)	0 (0%)	12 (100%)
CH2c	The computerized system is networked	8 (66.7%)	4 (33.3%)	12 (100%)

Presence of POS device in the stores:

Of the 30 stores, 13 (43%) had POS devices while 17 (57%) did not as presented in Table 7. The nature of POS use, as shown in Table 8, reveals that 8 of the 13 POS devices are attached to computers representing 62% of the stores with POS devices, while 10 of the POS devices (77%) are attached to printers and 9 of them (69%) use bar code readers.

Table 7: Stores and POS device

Stores	No	%
Stores with POS device	13	43.3
Stores not having POS device	17	56.7
Total	30	100.0

Table 8: The nature of POS use

Code	Information on Computerization at the Store	Responses		Total
		Yes	No	
CH3b	The POS is attached to computers	8 (61.5%)	5 (38.5%)	13 (100%)
CH3c	The POS is attached to printers	10 (76.9%)	3 (23.1%)	13 (100%)
CH3d	The POS uses bar code readers	9 (69.2%)	4 (30.8%)	13 (100%)

Results of the cross-tabulation of the presence of computers against the presence of a POS device are presented in Table 9, from which it can be seen that only 37% of the stores that had computers also had a POS device.

Table 9: Computers versus POS systems in the stores

Computers present in the store	POS presence in the store Yes	No	TOTAL
Yes	11 (36.7%)	13 (43.33%)	24 (80.0%)
No	2 (6.7%)	4 (13.3%\)	6 (20.0%)
TOTAL	13 (45.3%)	17 (56.7%)	30 (100.0%)

Debit/Credit card readers:

Furthermore, only 4 stores (13%) possessed debit/credit card readers as shown in Table 10.

Table 10: Stores with Debit/Credit card readers

Stores	N	%
Stores with Debit/Credit card readers	4	13.3
Stores not having card readers	26	86.7
Total	30	100.0

Results emanating from this section, confirm the low level of automation in the retail section of the economy which is quite widespread in Nigeria. With only 37% of the stores having both computers and POS devices, the conclusion can be made that penetration of the POS, which makes transaction time shorter. Furthermore, card enabled payments which should be widespread given the extent of uptake by Nigerians so that payment can be easier and more flexible to execute is not generally available to the store customers as only 13% of the stores had card readers.

User opinion on use of computerized systems in stores

Demographic profile of respondents:

There were 87 respondents made up of 52 males (60%) and 35 females (40%). Table 11 shows the demographic profile of respondents by gender, age group, educational qualification and work experience.

The Table 11 shows that majority of the respondents (61%) were in the age group of 21-30 years, majority of whom had basic secondary school qualification of SSCE, 37 (43%), and OND/NCE, 45 (52%) with majority of 55% having work experience of less than five years although a reasonable number of 26 (30%) have work experience between 5 - 10 years. Thus, a large proportion of the work force are youthful.

Table 11: Demographic profile of store respondents

Code	Variable	Options	N	%
G	Gender	Male	52	59.8
		Female	35	40.2
		TOTAL	87	100.0
A	Age group in years	Below 21	31	35.6
		21-30	53	60.9
		31-40	2	2.3
		41-50	-	-
		Above 50	1	1.1
		TOTAL	87	100.0
EQ	Educational qualification	SSCE	37	42.5
		OND/NCE	45	51.7
		B.Sc./HND	3	3.4
		M.Sc./PHD	2	2.3
		Other professional qualification	-	-
		TOTAL	87	100.0
WE	Work experience	Below 5 years	48	55.2
		5 ï 10 years	26	29.9
		11 ï 14 years	11	12.6
		15 ï 19 years	2	2.3
		20 years and above	-	-
		TOTAL	87	100.0

Source: Study data, 2013

Results from Respondent Opinion of Statements on computerised systems

As outlined in the methodology section, a series of twenty (20) statements on respondent opinion were coded as Strongly Agree, 1; Agree, 2; Undecided, 3; Disagree, 4; Strongly Disagree, 5. The descriptive statistics for each of the 20 statement items are presented in Table 12 and the mean values were interpreted as follows:

1.00 - 1.84 = Strongly Agree,
1.85 - 2.64 = Agree,
2.65 - 3.44 = Undecided,
3.45 - 4.24 = Disagree,
4.25 ï 5.00 = Strongly Disagree.

Table 12: Summary statistics for opinion statements and interpretation

Code	Description	N	Mean	S.D	Interpre-tation
T1	Computerized sales systems like the POS makes delivery of service faster, easier and easily accessible to customers.	87	2.00	0.778	Agree
T2	Computerized sales systems have brought about better services in store management operations.	85	2.00	0.655	Agree
T3	Computerized sales systems allows for smooth electronic payments.	87	2.06	0.812	Agree
T4	Customers are satisfied with the computerized sales system.	85	2.36	1.010	Agree
T5	Computerized sales systems have come to stay in Nigeria.	87	2.43	1.007	Agree
T6	Computerized sales systems provide a secured system of making payments in supermarkets and other stores.	86	2.79	1.312	Undecided
T7	Computerized sales systems have reduced the rate of fraud in stores.	86	1.92	0.973	Agree
T8	The computerized sales system affects retail store profitability positively.	86	1.69	0.673	Strongly Agree
T9	The computerized sales system, like POS, is expensive to install.	87	2.21	1.069	Agree
T10	The computerized sales system is far better than the traditional system of sales transactions	85	2.13	0.936	Agree
T11	The use of computerized sales systems saves time and makes work easier.	87	2.00	0.876	Agree
T12	Computerized sales systems reduces queuing in the store at the point of payment.	87	1.84	0.847	Strongly Agree
T13	The computerized sales system requires constant electricity supply.	85	1.92	0.889	Agree
T14	Computerized sales system reduces the work load on retail store staff.	85	1.76	0.648	Strongly Agree
T15	Computerized sales system reduces paper work.	85	1.78	0.792	Strongly Agree
T16	With a computerized sales system the quantity of goods in stock can easily be determined.	85	2.04	0.747	Agree
T17	The computerized sales system provides information for managing the store such as how much of a certain product was sold at the end of the day.	85	1.95	0.770	Agree
T18	With a computerized sales system the purchase price of any item in the store can easily be obtained.	87	1.48	0.503	Strongly Agree
T19	With a computerized sales system, you can run your business efficiently.	87	2.07	0.643	Agree
T20	Data entry into a computerized sales systems is very easy.	87	2.30	0.941	Agree

What stands out in Table 12, is the determination of ñUndecidedò for item T6, that is, *Computerized sales systems provide a secured system of making payments in supermarkets and other stores.* This suggests that the store personnel are not familiar with this capability of point of sale systems. It can be inferred from this, that perhaps the store owners are also not aware of the capabilities hence as found earlier, only 13% of the stores have debit/credit card readers.

Apart from item T6, respondents agreed with all other 19 statements. However, there was a difference in the degree of agreement on four items where they strongly agreed. The statements were:

T8: The computerized sales system affects retail store profitability positively.
T12: Computerized sales systems reduce queuing in the store at the point of payment.
T14: Computerized sales system reduces the work load on retail store staff.
T15: Computerized sales system reduces paper work.
T18: With a computerized sales system the purchase price of any item in the store can easily be obtained.

These are all very strong benefits of computerised point of sale systems. This is in line with the assertions of many (Ansel & Dyer, 1999; Brynjolfsson & Hitt, 2000) that computerized systems reduce paper work, and allows for improved and speedy information retrieval (Tanyeri, 2007).

The surprise, though, was that respondents did not highlight the high cost of installing POS systems as framed in the statement: *The computerized sales system, like POS, is expensive to install* ï by ñstrongly agreeingò instead of just ñagreeò. The cost of installation of POS is known to be quite expensive and can be very frustrating if not expertly done (Perry & Whitty, 2006).

Although nearly all respondents (93%) were familiar with manual cash registers (as shown in Table 12), only 40% of them indicated that they preferred computerised sales systems to the manual cash registers. The preference may be attributed to the lack of knowledge of what POS systems are and what benefits they bring to a business such as retailing (ñDo you need a Point of Sale (POS) system?ò, n.d.).

Table 13: Familiarity with manual cash registers

Code	Information on Computerization at the Store	Responses		Total
		Yes	No	
T21a.	Responder is familiar with manual cash registers	28 (93.3%)	2 (6.6%)	30 (100%)
T21 b.	Responder prefers computerized sales systems to manual cash registers	12 (40.0%)	18 (60.0%)	30 (100%)

Influence of Demographics on Respondent Opinions

Results of the Chi-square statistics obtained from the cross-tabulation of the demographic variables of Gender, Age, Educational qualification and Years of work experience are presented in Tables 14, 15, 16, and 17, respectively.

Table 14: Influence of Gender on Respondents' Opinion

Code	Description	Chi-square	Df	p
T1	Computerized sales systems like the POS makes delivery of service faster, easier and easily accessible to customers.	3.942	4	0.414
T2	Computerized sales systems have brought about better services in store management operations.	1.561	3	0.668
T3	Computerized sales systems allows for smooth electronic payments.	3.376	3	0.337
T4	Customers are satisfied with the computerized sales system.	1.138	4	0.888
T5	Computerized sales systems have come to stay in Nigeria.	1.071	3	0.784
T6	Computerized sales systems provide a secured system of making payments in supermarkets and other stores.	4.310	4	0.336
T7	Computerized sales systems have reduced the rate of fraud in stores.	5.618	3	0.132
T8	The computerized sales system affects retail store profitability positively.	2.733	3	0.435
T9	The computerized sales system, like POS, is expensive to install.	4.980	4	0.289
T10	The computerized sales system is far better than the traditional system of sales transactions	0.425	3	0.935
T11	The use of computerized sales systems saves time and makes work easier.	4.326	3	0.228
T12	Computerized sales systems reduces queuing in the store at the point of payment.	3.696	4	0.449
T13	The computerized sales system requires constant electricity supply.	5.296	4	0.258
T14	Computerized sales system reduces the work load on retail store staff.	3.131	3	0.372
T15	Computerized sales system reduces paper work.	6.244	3	1.000
T16	With a computerized sales system the quantity of goods in stock can easily be determined.	1.287	3	0.732
T17	The computerized sales system provides information for managing the store such as how much of a certain product was sold at the end of the day.	9.651	4	0.047
T18	With a computerized sales system the purchase price of any item in the store can easily be obtained.	0.002	1	0.964
T19	With a computerized sales system, you can run your business efficiently.	4.627	3	0.201
T20	Data entry into a computerized sales system is very easy.	4.119	4	0.390
T21a	Responder is familiar with manual cash registers.	0.081	1	0.776
T21b	Responder prefers computerized sales systems to manual cash registers.	0.015	1	0.901

Table 15: Influence of Age on Respondents' Opinion

Code	Description	Chi-square	Df	p
T1	Computerized sales systems like the POS makes delivery of service faster, easier and easily accessible to customers.	19.111	12	0.086
T2	Computerized sales systems have brought about better services in store management operations.	16.376	9	0.059

T3	Computerized sales systems allows for smooth electronic payments.	9.269	9	0.413
T4	Customers are satisfied with the computerized sales system.	14.932	12	0.245
T5	Computerized sales systems have come to stay in Nigeria.	11.688	9	0.231
T6	Computerized sales systems provide a secured system of making payments in supermarkets and other stores.	14.251	12	0.285
T7	Computerized sales systems have reduced the rate of fraud in stores.	14.128	9	0.118
T8	The computerized sales system affects retail store profitability positively.	8.950	9	0.442
T9	The computerized sales system, like POS, is expensive to install.	11.059	12	0.524
T10	The computerized sales system is far better than the traditional system of sales transactions	5.237	9	0.813
T11	The use of computerized sales systems saves time and makes work easier.	4.969	9	0.837
T12	Computerized sales systems reduces queuing in the store at the point of payment.	11.426	12	0.493
T13	The computerized sales system requires constant electricity supply.	15.769	12	0.202
T14	Computerized sales system reduces the work load on retail store staff.	7.795	9	0.555
T15	Computerized sales system reduces paper work.	6.477	9	0.691
T16	With a computerized sales system the quantity of goods in stock can easily be determined.	6.788	9	0.659
T17	The computerized sales system provides information for managing the store such as how much of a certain product was sold at the end of the day.	12.326	12	0.420
T18	With a computerized sales system the purchase price of any item in the store can easily be obtained.	2.951	3	0.399
T19	With a computerized sales system, you can run your business efficiently.	9.631	9	0.381
T20	Data entry into a computerized sales system is very easy.	36.420	12	0.000 *
T21a	Responder is familiar with manual cash registers.	1.313	3	0.726
T21b	Responder prefers computerized sales systems to manual cash registers.	12.717	3	0.005 *

* opinions that are not independent of Age at the 0.01 level of significance

Table 16: Influence of Educational Qualification on Respondents' Opinion

Code	Description	Chi-square	df	p
T1	Computerized sales systems like the POS makes delivery of service faster, easier and easily accessible to customers.	19.097	12	0.086
T2	Computerized sales systems have brought about better services in store management operations.	8.298	9	0.504
T3	Computerized sales systems allows for smooth electronic payments.	13.835	9	0.128
T4	Customers are satisfied with the computerized sales system.	18.248	12	0.108
T5	Computerized sales systems have come to stay in Nigeria.	11.103	9	0.269
T6	Computerized sales systems provide a secured system of making payments in supermarkets and other stores.	33.956	12	0.001 *
T7	Computerized sales systems have reduced the rate of fraud in stores.	13.079	9	0.159
T8	The computerized sales system affects retail store profitability positively.	36.969	9	0.000 *
T9	The computerized sales system, like POS, is expensive to install.	14.644	12	0.262
T10	The computerized sales system is far better than the traditional system of sales transactions	22.548	9	0.007 *
T11	The use of computerized sales systems saves time and makes work easier.	34.069	9	0.000 *
T12	Computerized sales systems reduces queuing in the store at the point of payment.	29.602	12	0.003 *
T13	The computerized sales system requires constant electricity supply.	11.576	12	0.480
T14	Computerized sales system reduces the work load on retail store staff.	10.951	9	0.279
T15	Computerized sales system reduces paper work.	20.336	9	0.016
T16	With a computerized sales system the quantity of goods in stock can easily be determined.	9.670	9	0.378
T17	The computerized sales system provides information for managing the store such as how much of a certain product was sold at the end of the day.	18.823	12	0.093
T18	With a computerized sales system the purchase price of any item in the store can easily be obtained.	19.111	12	0.086
T19	With a computerized sales system, you can run your business efficiently.	10.669	9	0.299
T20	Data entry into a computerized sales system is very easy.	27.601	12	0.006 *
T21a	Responder is familiar with manual cash registers.	0.146	3	0.986
T21b	Responder prefers computerized sales systems to manual cash registers.	3.371	3	0.338

* opinions that are not independent of Educational Qualification at the 0.01 level of significance

Table 17: Influence of Years of Work Experience on Respondents' Opinion

Code	Description	Chi-square	df	p
T1	Computerized sales systems like the POS makes delivery of service faster, easier and easily accessible to customers.	19.942	12	0.068
T2	Computerized sales systems have brought about better services in store management operations.	9.453	9	0.397
T3	Computerized sales systems allows for smooth electronic payments.	8.372	9	0.497
T4	Customers are satisfied with the computerized sales system.	22.983	12	0.028
T5	Computerized sales systems have come to stay in Nigeria.	18.629	9	0.029
T6	Computerized sales systems provide a secured system of making payments in supermarkets and other stores.	8.545	12	0.741
T7	Computerized sales systems have reduced the rate of fraud in stores.	13.190	9	0.154
T8	The computerized sales system affects retail store profitability positively.	13.193	9	0.154
T9	The computerized sales system, like POS, is expensive to install.	27.050	12	0.008 *
T10	The computerized sales system is far better than the traditional system of sales transactions	7.115	9	0.625
T11	The use of computerized sales systems saves time and makes work easier.	16.140	9	0.064
T12	Computerized sales systems reduces queuing in the store at the point of payment.	6.202	12	0.906
T13	The computerized sales system requires constant electricity supply.	29.144	12	0.004 *
T14	Computerized sales system reduces the work load on retail store staff.	23.078	9	0.006 *
T15	Computerized sales system reduces paper work.	20.257	9	0.016
T16	With a computerized sales system the quantity of goods in stock can easily be determined.	11.771	9	0.227
T17	The computerized sales system provides information for managing the store such as how much of a certain product was sold at the end of the day.	25.508	12	0.013
T18	With a computerized sales system the purchase price of any item in the store can easily be obtained.	6.125	3	0.106
T19	With a computerized sales system, you can run your business efficiently.	16.932	9	0.050
T20	Data entry into a computerized sales system is very easy.	17.314	12	0.138
T21a	Responder is familiar with manual cash registers.	0.593	3	0.898
T21b	Responder prefers computerized sales systems to manual cash registers.	7.112	3	0.068

* opinions that are not independent of Years of Work Experience at the 0.01 level of significance

From the results presented in Table 14, it can be seen that Gender did not have any influence on respondent opinion since none of the variables showed a significant association at the 0.01 level of significance. However, as shown in Table 15, two variables were significant, that is,

T20: Data entry into a computerized sales system is very easy; and

T21b: Responder prefers computerized sales systems to manual cash registers.

Several items came up as being significantly influenced by the Educational qualifications of respondents ï 6 items (Table 16), and these were:

T6: Computerized sales systems provide a secured system of making payments in supermarkets and other stores.
T8: The computerized sales system affects retail store profitability positively.
T10: The computerized sales system is far better than the traditional system of sales transactions
T11: The use of computerized sales systems saves time and makes work easier.
T12: Computerized sales systems reduces queuing in the store at the point of payment, and
T20: Data entry into a computerized sales system is very easy.

On the influence of Years of Work experience on respondent opinions, 3 items were significant. These were:

T9: The computerized sales system, like POS, is expensive to install.
T13: The computerized sales system requires constant electricity supply; and
T14: Computerized sales system reduces the work load on retail store staff.

That gender had no significant influence on respondent opinions is a good sign because the expectation is always that social influences on women's relationship to technology affect their attitudes toward ICTs (Obayelu & Ogunlade, 2006). The items that show up under educational qualification emphasises the need for capacity building because items like the effect of computerised sales system on profitability, or benefits such as reduction of queues, require knowledgeable understanding of the issues. It is insightful to note that item T20, *Data entry into a computerized sales system is very easy*, was influenced by age group, educational qualification and work experience. This issue should be explored further in future studies.

Conclusion

The use of computerized point of sale systems in retail stores increases improves customer satisfaction, management information for decision making and profitability, amongst others. The findings from the study reveal that although many of the stores had computers (80%), some of which were networked (63%), only 43% of the stores had some form of POS device, and only 13% had debit/credit card readers. It can be concluded then, that very few of the stores had fully computerised POS systems and so the accruing benefits such as increased profits are being lost.

The results also reveal that many store workers are not familiar with how point of sale systems work and what benefits it can bring to the work place. Particularly, the issue of security seems to be an area of concern as this was the only item on which the study group were undecided.

In implementing POS systems on a wider, it can be concluded that gender would not be an issue as this variable did not have any influence on the opinions of respondents.

However, the need for capacity building is evident from the number of items that were significant to educational qualification.

Recommendations

Based on the findings of the study, it is recommended that more retail stores should adopt the use of computerized point of sales systems and the Chambers of Commerce and Information Technology associations should play a major role in this.There should be staff training on the use of computerized point of sales systems, but more especially, capacity building for retail store owners on the benefits of introducing POS systems should be carried out by banks and the Ministry of Trade and Industry. The stores should make better use of what they have by ensuring that the computers installed in the stores have software that would assist them in managing the store, especially in the area of inventory control. For future studies, it is recommended that a study be carried out on the availability and competence of POS suppliers / vendors in Nigeria.

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APPENDIX I
CHECKLIST FOR COMPUTERIZATION AT THE STORE

PLEASE KINDLY TICK (ã) AS APPROPRIATE

1 a)Do you have computers in your store? YES ( ) NO( )
b) What type of computer do you use? LAPTOP ( ) DESKTOP ( )
c) Are the computers networked? YES( ) NO( )
d) Is the computer used for word processing? YES( ) NO( )
e) Do you use the computers to carry out sales related transactions/calculations? YES( ) NO( )

2 a) Do you use the computerized system for your transaction? YES ( ) NO( )
b) If yes, is the computerized system a stand-alone application? YES ( ) NO ( )
c) Is the computerized system networked? YES ( ) NO ( )

3a) Do you have point of sale (POS) device in the store? YES ( ) NO ( )
b) Is the point of sale attached computers? YES ( ) NO ( )
c) If yes, Does the point of sale (POS) attached to printers? YES ( ) NO ( )
d) Does the point of sale use bar code readers? YES ( ) NO ( )

4) Do you have a Debit/Credit Card reader in the store? YES ( ) NO (

APPENDIX II

QUESTIONNAIRE ON THE USE OF COMPUTERIZED POINT OF SALES SYSTEMS IN RETAIL STORES IN ILORIN METROPOLIS

Please tick (√) as appropriate

Section A (Profile of respondent)

(1) Gender: Male ( ), Female ( )

(2) Age Distribution: Below 20 years ( ), 21 ï 30 years ( ), 31-40 years ( ), 41-50years ( ), 50 years and above ( )

(3) Educational Qualification: SSCE ( ), OND/NCE ( ), B.Sc./HND ( ), M.Sc./PHD ( ), Other professional qualification ( ).

(4) Work Experience: Below 5 years ( ), 5 ï 10 years ( ), 11 ï 14 years ( ), 15 ï 19 years ( ) 20 years and above ( )

SECTION B (Opinion of respondent)

Please tick (√) against the appropriate boxes below using the following rating options.

KEY: SA = Strongly Agree

A = Agree

U= Undecided

D = Disagree

SD= Strongly Disagre

S/No.	Statements about computerized sales systems in the management of retail stores	SA	A	U	D	SD
1.	Computerized sales systems like the POS makes delivery of service faster, easier and easily accessible to customers.					
2.	Computerized sales systems have brought about better services in store management operations.					
3.	Computerized sales systems allows for smooth electronic payments.					
4.	Customers are satisfied with the computerized sales system.					
5.	Computerized sales systems have come to stay in Nigeria.					
6.	Computerized sales systems provide a secured system of making payments in supermarkets and other stores.					
7.	Computerized sales systems have reduced the rate of fraud in stores.					
8.	The computerized sales system affects retail store profitability positively.					
9.	The computerized sales system, like POS, is expensive to install.					
10.	The computerized sales system is far better than the traditional system of sales transactions					
11.	The use of computerized sales systems saves time and makes work easier.					
12.	Computerized sales systems reduces queuing in the store at					

	the point of payment.					
13.	The computerized sales system requires constant electricity supply.					
14.	Computerized sales system reduces the work load on retail store staff.					
15.	Computerized sales system reduces paper work.					
16.	With a computerized sales system the quantity of goods in stock can easily be determined.					
17.	The computerized sales system provides information for managing the store such as how much of a certain product was sold at the end of the day.					
18.	With a computerized sales system the purchase price of any item in the store can easily be obtained.					
19.	With a computerized sales system, you can run your business efficiently.					
20.	Data entry into a computerized sales system is very easy.					

21 a) Are you familiar with manual cash register? YES ( ) NO ( )

b) If yes, do you prefer computerized sales system to manual cash registers? YES ( ) NO ( )

Thank you.

Introducing Computer Games to the teaching and Learning of Christian Religious Studies

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ABSTRACT

Christian Religious Studies serves as a fountain of moral and spiritual guidance for the pupils. It gives a sense of direction and ability to differentiate between what is right and wrong. However, findings from recent studies have shown a dwindling interest of pupils in Christian Religious Studies at the primary level and subsequently low enrolment both at the secondary and tertiary levels of education. This scenario has raised concerns about improving the teaching and learning of CRS in schools. To improve this situation, the chapter intend to look in the way of introducing the use of computer games to the teaching of CRS at both the primary and secondary school levels in Nigeria. The chapter focus on the overall description of computer game and follow it up with the practicalities involved in running and playing the game.

Keywords: Educational games, Computer games, Learning with games, Teaching, Christian Religious Studies, Nigeria.

Background

Christian Religious Studies serves as a fountain of moral and spiritual guidance for the pupils. It gives a sense of direction and ability to differentiate between what is right and wrong. This accounts for the link between the aims and objectives of religious and moral education which are closely knitted together. Religion has proved to be an institution that builds and strengthens community capacity to cope with various problems of life. However, findings from recent studies (Adegbile, 2010; Obayan, 2005; Hawkin, 1993; and Nnglass, 1986) have shown a dwindling interest of pupils in Christian Religious Studies at the primary level and subsequently low enrolment both at the secondary and tertiary levels of education. This scenario has raised concerns about improving the teaching and learning of CRS in schools. To improve this situation, the chapter intend to look in the way of introducing the use of computer games to the teaching of CRS at both the primary and secondary school levels in Nigeria. The use of computer games is a technique that has gained an increasing number of proponents. The use of computers has become the driving force in the delivery of instruction of todayôs education in Nigeria. However, it appears the CRS teachers have not been using this opportunity as the interest of learners in this subject has begin to dwindle. Though computers have become an increasingly accessible resource for educators to use in their teaching activities, most teachers are still unable to integrate it in their teaching and learning processes. Computers are used

to improve teaching quality where quality is very expensive to reproduce, or to substitute for the lack of teachers or schooling opportunities that cannot be made available with conventional teaching methodologies.

During the last decades, educators who use computer games for teaching have been concerned with how ñgoodò the game is or how well is the game social model and how much students learn from gaming experience about the concept that the instructor has defined as part of the content. Using computer games have received increased attention from researchers. However, the use of games for education was borrowed from the business community, which in turn had borrowed the idea from the military. Computer games include early graphical computer games, such as Spacewar!, which was perhaps the first computer game ever, many of the most popular were simple text inputs. The original, and perhaps most famous, of these was the Adventure game, and later games built off of its success. Eventually graphics were added to the idea of text computer gaming, with text remaining as a command input, even while simple graphics helped to build the scene

Computer games have great potential as learning tools as many require complex problem solving, theory testing, collaboration, and evaluation, all components of experiential learning (Gee 2003). Indeed, Schrader, Zheng, and Young (2006) argue that there are many benefits to be derived from the pedagogical use of computer games, particularly massively multiplayer online games (MMOGs), which allow the user to assume a role and complete quests or tasks usually by collaborating online with other users. However, their research has found that many preservice teachers are not fully aware of the pedagogical uses and benefits of these games and suggests that teacher preparation programs need to incorporate opportunities for preservice teachers to experiment with and reflect upon computer games. Similarly, Squire (2005) argues that teachers need opportunities to experience and reflect upon game use within the classroom and to consider how they can use games as learning tools.

In the light of the above, this chapter will focus on the following. First, it will give the overall description of computer game and follow it up with the practicalities involved in running the game.

Overall description

Looking at computer game and how and when learning occurs when learners interact e.g. play a game. The main characteristic of a computer game is the fact that instructional content is blurred with game characteristics. The game should be motivating, so that the learner repeats cycles within a game context. While repeating e.g. playing a game, the learner is expected to elicit desirable behaviours based on emotional or cognitive reactions which result from interaction with and feedback from game play. The purpose of a computer game is entertainment or edutainment. In adventure games there are very complex environments i.e. micro-worlds, with no deterministic problem representation. An examples of typical edutainment game is Chemicus (by Heureka-Klett publisher; or TIVOLA for the US market), a puzzle adventure game for self-directed learning of chemistry.

Similar to Chemicus one can find an entire series of titles e.g. Physicus, Hystorion, Informaticus, etc. by the same publishers built upon the same game concept. Computer games use intrinsic motivation of the player to explore the game world. Intrinsically motivating games incorporate learning activities in this game world. To increase immersion of the player, the game offers an extensive story at the beginning, often related to some murder or mystery. Game characters have to solve the mystery by solving a number of interrelated problems. In each case the problems are part of the game and players are motivated to seek for knowledge to provide a solution in order to continue with the game. In the described game, enjoyment is strongly related to the learning activity, which can be viewed as a desirable outcome.

Practicalities of running the game

Here the practicalities of playing the ócard and board gameô which is the computer game focused in this chapter for the teaching and learning of Christian religious education is explained including how to commence, the number of people involved in playing the game, etc. Computer games are more commonly referred to as computer games or PC games. They are played on the personal computer with standard computer interface devices such as the keyboard and mouse, or a joystick or gamepad. Video feedback is received by the gamer through the computer screen, and sound through speakers or headphones.

Instructional Guide on Computer Game Strategy (CGS)

This is a computer based instructional package titled ñMission 7, 8 & 9Bsò. It has content as that of the card and board game. The content of the package is only converted to computer game and can only be played with the aid of a computer. The instructions are built in the package. It is suitable for 2-4 players and good for children between the ages of 9-11.

Game Development

For the purpose of the development of these games the Pulos and Sneider (1994) development evaluation and research model was adopted. The framework is based upon the task facing any game developer or evaluator and the tasks determined that the game:

(i) includes the necessary components of the concept to be taught, that is; conceptual analysis.
(ii) is likely to help students learn the concept
(iii) helps to ameliorate the difficulty students have in learning the concept
(iv) is enjoyable
(v) leads to learning

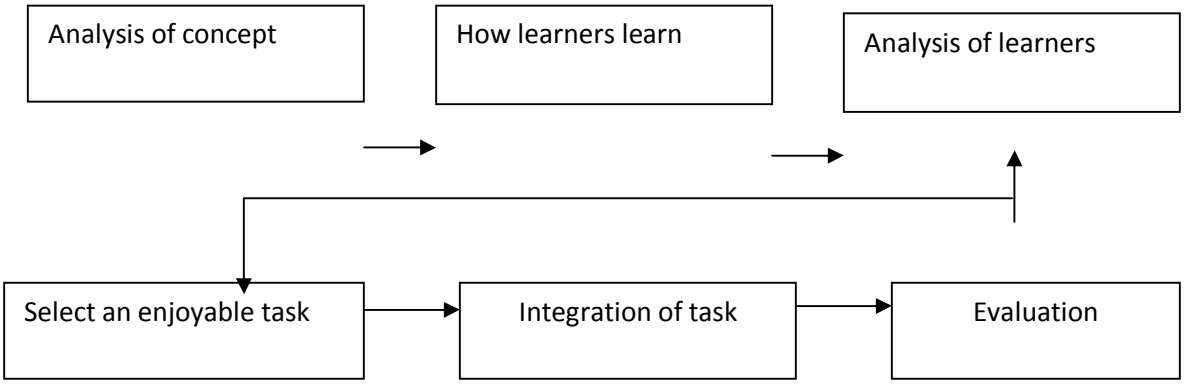


Figure 1.1.: Conceptual Model for the development of game (adapted from Pulos and Sneider, 1994).

Stage One
Analysis of Concept

The concept of this research is from the middle basic five curriculums. The topic is:

- God saves us from danger

The analysis of each concept was done to reveal what was to be taught (that is objectives for each lesson) in accordance with the guidelines given in the middle basic five Christian Religious Studies curriculum.

Stage Two: How learners learn

The learning theory upon which the decision of these games is based is on activity proposed by Vgotsky (1978) and game theory of learning proposed by John Von Neumann (1944), in collaboration with Oskar Morgenstern.

Stage Three: Analysis of Learners

Here each sub-concept was critically considered to find out similarities that could be confusing to learn while learning the concepts. For instance how many people were seen in the burning furnace in Daniel story may be confusing because three people were thrown there but four people were seen in the furnace. These similarities were borne in mind while designing the game. Based on this, lots of questions and examples of the two confusing concepts were given in the game so as to ensure better understanding.

Stage Four: Selection of an enjoyable task

The games used in this research were based on popular and interesting card and board games. The mission games were an adaptation of the Ludo game and popular card game.

Stage Five: Integration

All the concepts that were analyzed were integrated into the structure of the existing games and were modified to suit the classroom situation. All the features used were popular household named games played locally and internationally.

One game was developed: i.e. Mission As ï Card & Board games

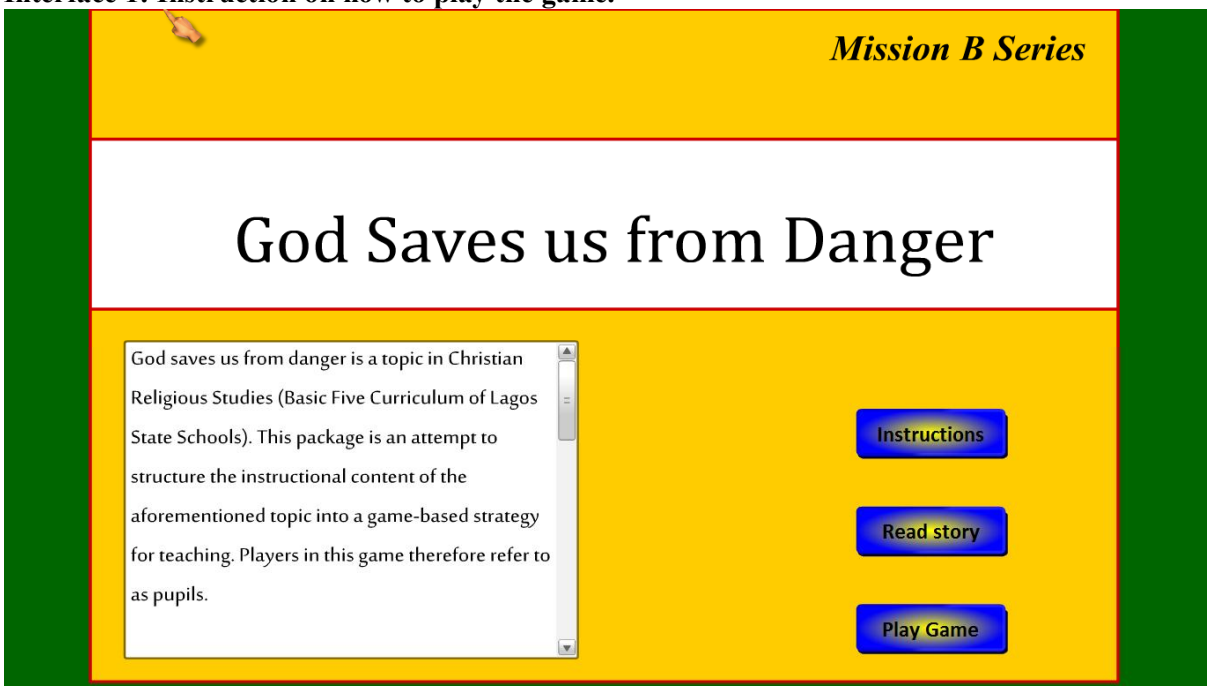
Stage Six: Evaluation

The games developed were tried out to examine their effects using different sets of pupils who were part of the study. Test of the pupils were thereafter compared. The results enable decisions making for modification where necessary.

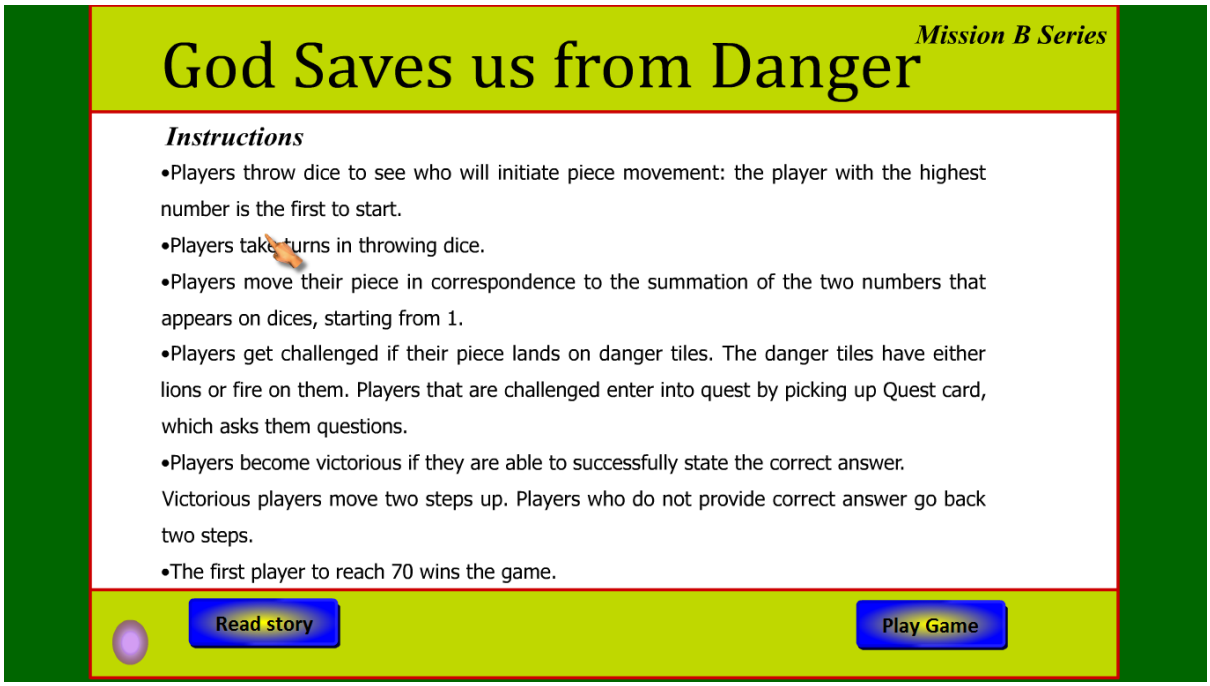
Table 1: Instruction on how to play the game

Computer Game
Teachers introduced the package to the pupils and arranged the class into groups of two to a computer.
Pupils insert the CD into the system, CD automatically runs. Pupils click on story mode menu or content.
Pupils interact with the content by reading it, after learning the content clicks on the game mode icon and the page game opens.
Click on dice the figures on dice shows up, player do this sequentially and the players with the highest figure start the game.
Players continues by moving their piece in correspondence with the numbers that shows on the dice. When players land on situation tiles they pick a question card if answered correctly, they automatically moves two steps ahead if not correct remains on the tile till next turns.
1st concept the first player to reach rest wins the game. (God creates and wants us to create)
2nd concept (God saves us from danger) Player to reach 70 in case of the 1st concept wins the game. 3rd concept (God supplies our needs) 1st to reach 100 in case of 2nd concept wins the game (15mins).
Post game review

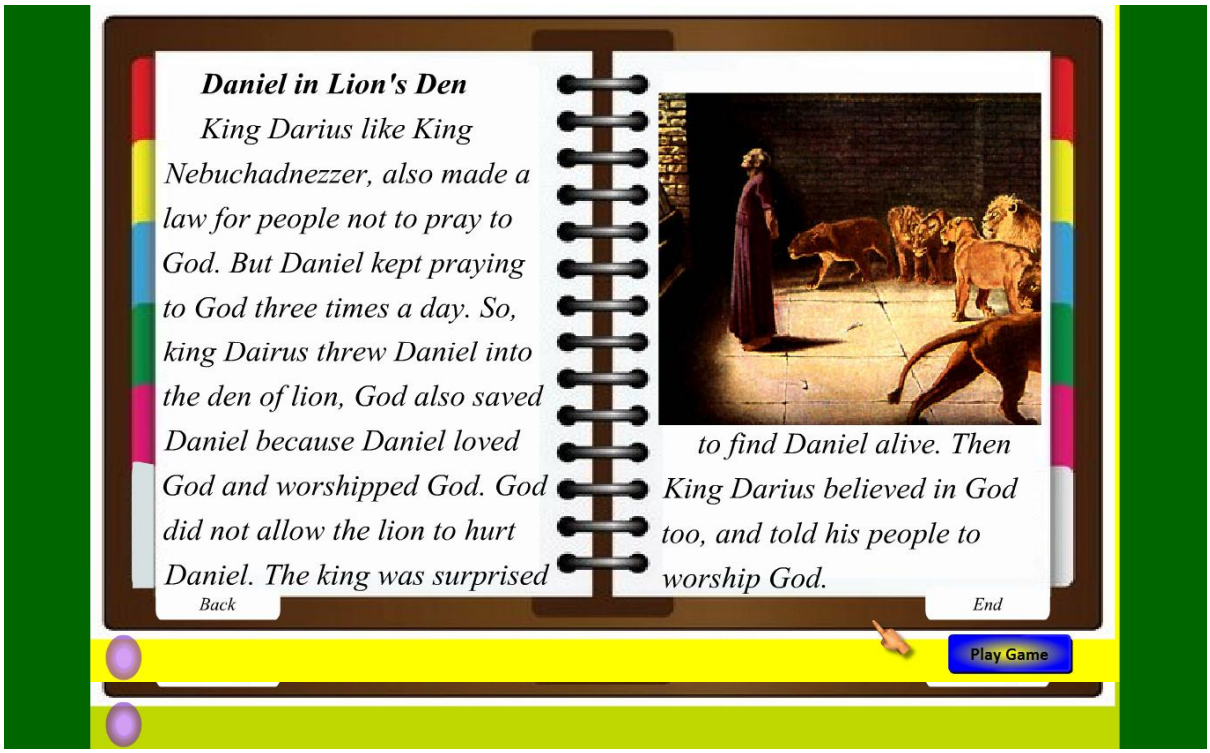
Interface 1: Instruction on how to play the game.



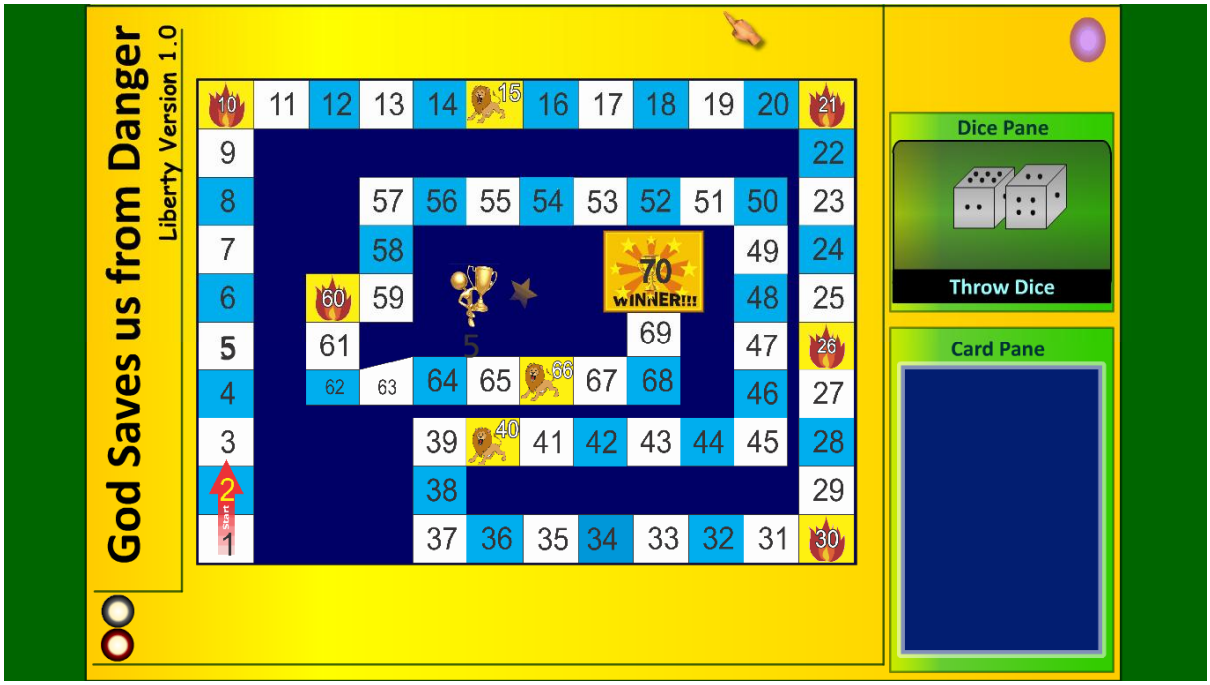
Two people are eligible to play the game. To start, one player will have to click on the game. This takes them straight to the instruction page. This will display the contents that appeared in table 1. After the reading of the instruction, the game commence with the first player clicking on 'read the story'



The 'read the story' button is the first button to the left. By clicking on this button, both players can read the story together. The story us display slide by slide. As one slide finish, the player clicks the next button to read the next page of the story. This they do till they get the slide where they see 'end' which indicate the end of the story



The slide above displays the end of the story, (see the second button to the right). The player continues by clicking on 'play the game button' as appear in the interface below.



To start, the first player throw a ódiceô, after throwing the dice, the number displayed by the two dices will be added to together. For instance, if the two dice display 4 and 6, these give a total of 10. Then, that player will move one of the buttons in the left hand side at the rear of the interface and place it where there is figure 10 on the table. The second player also throws his or her own dice. If the dices display for instance 3 and 4, these add up to 7. He or she will take the second button at the rear to where there 7 on the table. This they continue doing in turn until they get to 70. The first person to reach 70 is the winner of the game.

Details of using games for teaching, learning and assessment

This section details the use of computer games for the teaching, and learning in CRS. Itôs involves how the computer game can be introduced into the teaching of CRS, is it at the beginning of the lesson, at the middle or at the end of the lesson?

Use of Games in Christian Religious Studies

Research on games is rather new subject for religious education. An ongoing discussion posits that daily life culture and media are relevant to theology and religious education (Failing and Heimbrock, 1998; Grab, 2002). It is based on this that Scholtz (2004) assumed in concrete terms that that understanding games can be central competence for working and living with young people; not only for school work in general, but also specifically for teaching religious education. This is relevant because religious education is much about understanding young people's life world (Baumgartel, 2002), which is highly influenced by computer games. Moreover, Scholtz posited that working with computer games in religious education might offer the possibility to learn differently and/or to learn different things. He

added that games are important part of today's youth culture. The combination of modern technology and religious elements is interesting for religious education research, though one should always be aware of the risk to academic research in which the story elements are considered more important than the playing experience (Lange, 2001), because a player is usually not interested in symbols and story elements, but in solution (Scholtz, 2004). By reducing a game to a text, such an approach easily misses the very important feature of interactivity which implies a different mode of perception of story elements and aesthetic phenomena (Scholtz, 2004).

By concentrating on the explicit religious and mythological elements, religious education can discover so-called implicit religious aspects in the story of games, particularly computer games. In 1982, McFarland reflected on the ótheology of Pac Man' and came to the conclusion that 'Pac Manô is the story of life as we hear it in óJudeo-Christian tradition'. Such a context oriented approach according to Scholtz, (2004) also has to consider the gender models which the story and the visual representations impart.

Different Types of Games and Christian Religious Educaation

According to Scholtz (2004) and Lunce (2006) when talking about types of games, one refers to categories one can set up to distinguish the games. These categories do not only depend on the story, but also on the way the player can act in the game, how the virtual character is being controlled, which point of view the player have, and what is the means by which the player reach the goals of the game etc. The creation of new types of games does not only depend on the fantasy of the game designers, but also on the technical developments. So it is an ongoing task to look at the development, because new ideas and the constantly developed technical possibilities create new types of games with new implications. In religious education, it is very interesting to ask about the theological implications of the setting and structures of game, especially when they do not refer explicitly to religion. One of the possibility approaches was mentioned by Thomas (2003), a professional secular game reviewer who locates the Theology of Games, not in traditional religious story elements but in structure of games that they have a fundamentally theological message. According to Scholtz (2004), just like Christian notion of the universe, every game has a creator and that creator has a special plan in mind.

Instructional games could be very useful in religious education but an extensive discussion on its own is that of the possible negative consequences of violent computer games. Religious education research should, therefore, develop a competence to assess if a game has a religious harmful influence, such as when it uses satanic messages. It should be noted that all games have strong limitations; nevertheless they can be considered useful within these limitations. When using instructional games, there is the need to consider the effects of a manifold use of computer games, especially when its affects being a subject of players. For learning in Christian religious knowledge, it is important to consider that the use of computer game just like other media, corresponds with the level of education. The higher the level of education; the higher the chance that a young person will have a productive and balance use of games.

Instructional Games and Christian Games

A good educational game is one in which the pupils play and learn new facts. However, there is a conflict between learning facts and entertainment. And entertainment, according to Scholtz (2004), is the main motivation to play a game. To learn facts by playing is not the domain of normal games but of 'edutainment' software, which is consider to be a different category of use. Apart from learning other thing than facts, entertainment and fun is the domain of games. It becomes easier to accept this usage when play is looked at as an end in

itself, integrating the understanding of the anthropological importance of the 'homo ludens' (Huizinga, 1970) and of the theological importance of the 'feast of fools' (Cox, 1969).

For religious education assessment a game is not automatically good, when it meets naive conceptualized biblical standard or when it is located in a Christian setting (Cox in Scholtz, 2004). Explicit Christian games often take conventional games concepts and create a Christian story (Czikszentmihalyi, 1990). Religious education research has to explore what message a game communicates that prettifies a normal game concept by creating a surface with Christian story elements.

Moreover, the search for criteria for a good game leads to a dead and but the big difference between the games discovered is that, it is very difficult to find universally applicable criteria for a good game. Even if it is discovered that there are many ways to play one and the same game and even more ways to handle this playing experiences; the differences between these ways enable us to say that there are good and bad ways to play and handle a game. Therefore, the question about a good game leads to the question about a good use of games. There are several approaches to explain the fascination of games (Fritz, 2003a and b). One of the major argument is that the player often experiences a flow (Czikszentmihalyi, 1990), a condition of high concentration which implies a loss of time and forgetfulness about the world outside the game. This explanation is interesting for religious education research, because flow experiences are traditionally also a vital part of religious practices and a game seems to make it easier to reach flow experiences than mediation for example.

According to Scholtz (2004), the fact that games are able to fascinate so many people is relevant for religious education, since fascination is itself a key term for religion. Picking up this line of thought, one can ask what needs and desire become visible in the use of game. Do we find desires which are traditionally located in religion? Is there a dealing with these desires, which reveals a functional analogy to religious practice? (Scholtz, 2002). On this, Scholtz, posited that just as in many others, it seem to be promising to consider the results of non-religious research projects on games, also from natural sciences, which might help to understand the effects of gaming in its cognitive neurophysiologic and bodily dimensions better.

Social phenomenon: That persons playing games generally are less socially integrated has by general empirical studies been proven as a bias (Fritz, 2003c). On the contrary, these games can be in various ways a catalyst for social encounter and interaction. People do meet to play together, and the games provide topics of conversation even among strangers. The games can create social activities, become most obvious at the so-called LAN (Local Area Network) parties, and become an important part of today's pupils culture when hundreds of adolescents meet in a gym to play network games an entire weekend long (Baumgartel, 2002). But even if the players do not meet face to face, network gaming (e.g. on the Internet) can generate social interaction which sometimes can even be transformed into real life contracts. Evangelical missionaries have already discovered the intensity of social contacts within some online games and have started missionary work within the games (Loftus, 2003).

Learning experience with playing: Games usually do not impart knowledge in form of facts; rather learning takes place by playing them. Gee (2003) analysed extensively the useful learning principles a good game can teach though a similar comprehensive study on the negative effects is still missing. For the purpose of this study, it is necessary to explore the effects for learning that non-contend-oriented learning processes of gaming imply. Gee (2003:13) speaks for instance of a new kind of literacy that games generate and require. It has to be analysed how this literacy is related to the religious literacy (Wright, 1996).

Influence on life world and world view*:* In addition to the learning process mentioned above, it is necessary to ask how the gaming shapes the life and world view of the games is because a game influence does not end when the console is turned off (Loftus, 2003). Generally, the influence on culture can be ascertained when games create wide spread narratives like or when they shape the aesthetics and camera work of a certain type of movies is for reaching (e.g. the Matrix Trilogy). Looking at the individual level, the first thing to talk about is a temporary change of perception, because gaming requires a special way of concentration and perception, and after intensive playing sessions this specific perception is still present in daily life. This, for example, can make a normal school situation seem to take place in slow motion (Baumgartel, 2002). For Christian religious knowledge, this is very interesting because religion itself is about changing the perception of life and reality. On the long run, it is possible that certain problem-solving strategies which are successful in games are integrated into daily life. Also, the imaginative abilities highly trained by some games can influence the view on daily life may be even with positive effects for the religious competence. Moreover, certain interpretations of reality can derive from gaming. For instance, influencing the understanding of God, seeing God as analogous to the game designer, or may be more problematic for a religious worldview, taking over the world concept of many games that the world is purely determined by causal, technical relations and that everything in the world can be influenced by technical or rational actions.

The use of computers, generally, is relevant to religious education (Dinter, 2003) and especially of computer games which can contribute to young people's identity construction. Again, there is need to be aware that there is no automatism in the sense that a computer game creates an identity, but the player creates his or her identity by choosing elements that computer games (and other media) offer (Scholts, 2004).

There is need to know more about the factors that leads to a practice define as good use of games. Scholtz (2004) game two elements namely:

1. A good practice depends on the player, e.g. his or her age, gender, education, social position and personality.
2. It depends also on his surrounding: do his or her friends, parents, and teachers take note of the playing practice?

Aims of Christian Religious Education Working with Games

The first aim of religious education dealing with games picks up the concept of a good practice and tries to enable students to handle games in a better way. Such a media education, as a part of religious education, aims at a subject which can use the modern media in a self-determined and emancipatory way (Scholtz, 2004). Considering the key role modern media plays in youth culture, this ability turns out to be vital for every religious education process. But to improve the gaming practice does not primarily imply influencing the players' choice of games. It implies that the players can play their games differently and, most importantly, to deal with their playing experience differently.

The second aim of religious education dealing with game, according to (Scholtz, 2004), is that games are being used as tools to work on traditional subjects of religious education. Therefore, the use of media is not the subject itself, but part of the life world religious education deals with. But it would be counterproductive for the educational process if the games are just used as a modern surface or as an appetizer for an old-fashioned teaching concept. Looking at these two aims, Scholtz was of the opinion that, theoretically, teaching can either be done on the media 'computer games' or can use computer games as a medium for religious education teaching different contents.

When computer games is used as a medium in religious education, the medium has of course its own message (Marshall in Scholtz, 2004), but to work with computer games in religious education can be much more than teaching on computer games. One of the results of using computer games in religious education is that it levels the relation between teacher and students to a certain extent because usually the pupils turn out to be the real experts in this subject. If the teacher can handle this situation, it helps to get an intensive communication in class and to motivate the student.

Computer Games as a Theoretical Subject in Religious Education

It is possible for Christian religious education to work with computer games without playing them in the classroom, even without having a computer in classroom at all (Scholtz, 2004). Firstly, the pupils may be asked to present one game and their experiences with it for the whole class or let the pupils work as ethnographers to report about the results of their observations of other players. In doing so, it is very important not only to focus on the games and their contents, but also on the playing experiences and the function computer games have in youth culture.

Computer Games as a Practical tool for Religious Education

Another possibility for religious education to work with computer games is by playing them in the classroom. Teachers hardly find facing a technical problem with this. This is because such an activity hardly fit on the normal school time table. However, a well-chosen game offers a new and promising teaching situation. If it is possible to set a distinct frame and set of rules for playing time, one can use this approach for the topics mentioned above and for many others. Focusing on those virtual persons who are only treated like objects (e.g. the hostage of counterstrike) and then start to look at them from a different angle, could be one step in a teaching unit on the socially marginalized or empathy. It is important not only to look at a movie or read a text on such a situation, but to have the interactivity of a computer game which makes it possible to experience such a situation in a performative way. To have the game in the classroom makes it possible to concentrate on the playing experience itself. For instance, it is possible to have a mix between periods of playing and periods of reflection on the playing experience. Furthermore, it is an important possibility to use a game for an activity in which the game designer did not intend to be part of (Scholtz, 2004). This reinterpretation of a virtual world can be an example of how a bad game can lay the foundations for a good practice. With reference to a concept for series of religious education lessons presented by Waltemthe (2003), one element of a shooter game is used to let the pupils create a model of a religious room or church they do dream of and this serves as catalyst for communication about religious rooms and churches and the personal experiences with such rooms. Scholtz (2004) concluded by saying that when using games as a medium in religious education neither the explicit content of the game nor the intended playing practice necessarily defines the limit of how to use the game in religious education.

Technology components

Focus will also be on the technological components of the games. Here the technological components involve in the game will each be mentioned. This is to get the clearer picture of what the games involves in terms of technology. The technologies involve in using this game for teaching and learning of Christian religious education includes:

PC/Laptop ï A laptop is a personal computer for mobile use. A laptop integrates most of the typical components of a desktop computer, including a display, a keyboard a pointing device (a touchpad, also known as a trackpad or pointing stick) and speakers into a single unit. A laptop computer, usually called a notebook by

manufacturers, is a battery- or AC-powered personal computer generally smaller than a briefcase that can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings. A laptop typically weighs less than 5 pounds and is 3 inches or less in thickness. With this characteristic, it is also portable for children to carry. A laptop or desktop is needed for playing the card and board game successfully. The game software or CD is to be inserted into the laptop or the desktop before the game can be played.

Mouse ï A mouse is a pointing device that functions by detecting two-dimensional motion relative to its supporting surface. Physically, a mouse consists of an object held under one of the user's hands, with one or more buttons. The mouse is a computer input device that's used to move a cursor around the screen. The buttons on a mouse are used to interact with the operating system. A mouse is a small device that a computer user pushes across a desk surface in order to point to a place on a display screen and to select one or more actions to take from that position. The mouse us used to pick the cursor and then dragged to where necessary or desire by the players.

Dice ï The dice is one of the devices used to play the game. The dice usually has number in all its six sides from 1-6. The number is added up for a player to know where to place the ball on the table.

Cursor ï A cursor is a moving placement or pointer that indicates a position. In other words, it is the position indicator on a computer display screen where a user can enter text. The cursor is use to indicate the position to place the ball on the table when playing the game.

Keyboard ï The keyboard is the device that's used to input text into a computer. A keyboard is a typewriter-style keyboard, which uses an arrangement of buttons or keys, to act as mechanical levers or electronic switches

DVD (containing the game) ï DVD is an optical disc storage media format, invented and developed by Philips, Sony, Toshiba, and Panasonic in 1995. A Digital Versatile Disc (DVD) is an optical disc storage media format that can be used for data storage, including movies with high video and sound quality. DVD is an optical disc technology with a 4.7 gigabyte storage capacity on a single-sided, one-layer disc, which is enough for a 133-minute movie. This is the device on which the game is written or copied. This is inserted into the laptop or the desktop before the game commence.

Challenges

A number of challenges in incorporating games into school settings, identifying timetabling and curricular difficulties as specifically constraining the use of games, and a number of technical issues requiring resolution (such as appropriate mechanisms for saving and restarting games This section looks at the challenges of using the computer games in the teaching, and learning in CRS. In Nigeria, the context in which the chapter is written, challenges such as incessant power outage, high cost of the computer game, etc, were discussed.

Timetabling issue

For some teachers, wider timetabling issues affected their access to equipment. Where a computer room was unavailable, for example (because ñeveryoneôs gone

ICT madò), one teacher had to change her scheme of work to include more work without computers. It should be noted, however, that even within the same school, different teachers had very different experiences of booking resources such as laptops, suggesting the role that individual and personal relationships play in the distribution of access to such equipment within schools.

As suggested by earlier studies22, many teachers found the fixed length of lessons to be constraining in both the planning and implementation of games based learning in schools. In part, this seemed to be a result of the novelty of the activity: teachers were unsure how much time an activity might take, and several expressed confidence that if they were to try similar activities again they would be able to manage classroom time more effectively. The fact that the available time was fixed meant that the impact of any technical issues (loading times, crashes, etc) was more keenly felt than might have been the case had there been more flexibility in the timetable.

Age Constraints

These concerns over curriculum and assessment appeared to be more influential in selecting the age groups teachers would work with than the age rating for the games. No teacher expressed concern about using ótween gamesô, ie those suitable for 13 and over, with 11 year-olds.

Preparation

Implementing any new instructional approach requires professional development. Even teachers who are gamers do not intuitively know how to use games in the classroom. Teachers need to understand how the activities connect to the standards, what the goals are for the exercise and which students it can benefit the most. They should also introduce the games at a pace they are comfortable with.

Aside of the above, there are some problems and challenges peculiar to the Nigeria context as far as the use of game is concern including:

Incessant power outage: Compare to develop countries, electricity supply is not stable in Nigeria. This usually affects the use of game in classroom. A teacher can get to the classroom after setting up all the appliances, the power goes and never comes back until the time allocated for the lesson elapsed.

There is also challenge of high price of computers. To get a computer is very expensive. Most primary school teachers cannot afford it. The use of game in lesson demands that the teacher and all the students have computers. Most school do not have provision for computers. This is because they cannot afford it. Those schools that have, they are very limited in number and cannot go round. Meaning that the students will have to pair; and pairing usually defeat the objective behind introducing game in a lesson.

Tips for Improving Games in Teaching and Learning

Research evidence has suggested that pupils learn better with technology. This implies that games usually improve teaching and learning. In the light of this, the following tips are put forward for the improvement of game in teaching and learning. As educators continue to explore and expand these technologies, the educational community as a whole willgrow its collective body of knowledge of best practices with them. Anecdotal stories like those of Ross, Hal andKali, and John illuminate for us some common principles as a starting point for any educator.Explore. Spend time just playing with these technologies. Head out to your local electronics store and try out apopular video game. Create a FACEBOOK account or try surfing NING to see how other schools are using it (theyôrefree!). Many simulation tools, like Molecular Workbench and StarLogo TNG, are free downloads as well. Since somany of these technologies are delivered via the Internet, they are easily accessible getting familiar with them isjust an ñopen mind ñand a click-away.Partner with a colleague. Whether a long-time colleague and friend, or a new teacher on campus who teaches ina different department, great benefits can be had in all types of collaborations. Strike up a conversation at lunchabout a particular technology that interests you and see what fellow colleagues chime in with. Find ways to trythings together or share notes on things youôve done independently itôs a great way to bounce ideas off ofsomeone and learn from their successes and challenges. Canôt find anyone at your school? Attend a session at aconference, or search the Internet for teachers who use them. Remember the class on NING you that you thoughtlooked good? Contact the teacher managing that site to ask questions and get ideas. Building relationships withfellow educators around a new instructional tool is a great way to build a support network, and todayôs technologiesmake it easy to communicate with colleagues near and far.Find additional supports. Express your interest to the Academic Technologist at your school. Theyôll likely be ableto put you in touch with several resources to support your work, and help you get started. Many resources existvia the Web; for example, StarLogo TNG has a listserv where members are educators just like Hal who have questions,and insights, about using this tool in the classroom. Oftentimes you can get support from the tool designersthemselves ï feel free to ask!

Recommendations

There is no doubt about the fact that games like technology promotes learning. Just as researches have revealed that children learn better and faster when technology is integrated to facilitate teaching and learning; the same can be said of game and simulation. In the light of this, it is suggested that Christian Religious Studies teachers should endeavour to incorporate gamed in the teaching of the subject. Other subject teachers as well both the primary and secondary school levels are called upon to always introduce games in to the teaching.

It is evident that equipment to play games by the children during a lesson are expensive, in the light of this, governments should always assist the public schools to procure these equipments since most schools cannot afford these equipments. Moreover, private own schools should also see to it their proprietors make provision

for all necessary games equipments for effective use during each lesson.

School owners are also called upon to make sure that they find lasting solution to the problems that usually hinder integration of games into teaching and learning such as incessant power failure and the rest. They can do this by making provision for high power generation industrial machine. Though this could be money intensive, but with the involvement of stakeholders, the burden may be lessened.

Conclusion

Many agree that games, simulations, and social networking technologies have much to offer education. Yet while the benefits of these offerings are still making themselves apparent, a growing number of educators are making sure they are on the front-end of the wave. By appreciating that the students filling their classroom chairs have a different perspective on the world; these teachers are able to experiment with new ways to connect with kids through these technologies. Moreover, the research is supporting this work, showing that multimedia education improves both comprehension of the lesson material and studentsô interest in the lesson topic (Brady, 2004).

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Brief Biography

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The Use of Mobile Phone by Undergraduate Students of Ekiti State University

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ABSTRACT
The study examined the use of mobile phones by undergraduate students of Ekiti state University. Survey research was adopted for the study; questionnaire was used to elicit information from150 undergraduate students of Ekiti State University selected using simple random sampling techniques. Simple percentage, frequency count, bar chart, mean and standard deviation were used for data analysis. The findings revealed that students use mobile phone predominantly to stay in touch with friends and family, accessing social network sites, for searching materials to compliment class work among others. The study revealed that majority of undergraduate students of Ekiti State University prefers Nokia phone followed by Blackberry and Tecno phones respectively. The cost of mobile phones used by the undergraduate students of Ekiti State University is below twenty thousand naira while majority spent one thousand naira and above as monthly on recharge cards. The findings revealed that the use of mobile phone does not have much negative implications on students' academics activities since majority were not involved in chatting and receiving calls during lectures, late to the class due to mobile phone. However, the use of phone was found to interrupt their private studies because they receive calls, check e-mails and chat during private studies. It was found that the use of mobile phone was affecting their private studies because they receive calls, check e-mails and chat during private studies. The paper concludes that efforts should be made to educate students on the proper use of mobile phones without distracting their private personal studies.
Keywords: Mobile phone, Use, Undergraduate students, Ekiti State University, Technology

Introduction

Mobile phone is one of the most important legacies of this our democratic dispensation in Nigeria. Prior to this time, Nigeria maintained an unenviable record as the worldôs third lowest, after Mongolia and Afghanistan, with a Tele-density of 0.73% before 1999. (Okereocha, 2008) The Nigeriaôs telecom sector witnessed a

major revolution in 2001 during the administration of President Olusegun Obasanjo, with the granting of the Global System for Mobile Communication (GSM) license to providers. According to Nigerian Telecommunications Report (2008), Nigeriaôs mobile market gained more than 11.3 million new customers in the first half of 2008, expanding by 28 percent to reach 51.73 million users. By the end of June 2008, mobile penetration in Nigeria had exceeded 33 percent. (Nwagwu, 2010) This Mobile communication market is majorly operated by five GSM based network and about 13 CDMA-based network operators. The GSM-based network operators are MTEL, ZAIN (now Airtel), MTN, Globacom, and Etisalat while the CDMA-based network operators include Multilinks, Starcomms, OôNet and Visafone (Roger, 2010). Prior to this time, telephone was exclusively for the rich, but now everybody irrespective of age or social status has access to mobile phone as a result of mobile revolution we are experiencing and this had contributed in no small measure to socio and economic development of the country (Olofinniyi et al., 2012).

The use of mobile phone cuts across every social class in the society, the rich make use of mobile phone and also have the financial capacity to afford sophisticated phones with many features, the middle and low income earners are not left out because of various varieties of phones available in the Nigerian market. China phones such as techno are not expensive and come with different features that enable Nigerians to browse; watch television, video, listen to music and radio stations and some are equipped with flash light which helps in mitigating erratic power supply. This technology has a wide acceptability among Nigerians that even the aged are not left out they use it to make calls. Youths use this technology not only to make calls but also to browse the internet, check mails, connect with their friends, watch films, listen to radio and lot more. Therefore, to some extent, youth can be seen to be leading the way with how mobile phone is embraced by society as a whole (Ito & Daisuke 2002, Prensky, 2004). Raskauskas, (2007) opined that, mobile phone is far from being used as a business device as they are with adults; youth have adopted mobile phone technology to the point that it has become an integral part of their social network development. Furthermore, youth have become the early adopters of many new applications of mobile phone use which has then been taken up by adults ï in particular ótextingô. Rapid adoption of the technology by youth and the fact that adults did not understand the ways youth were using their phones have led people to question the potential erosion of culture and commonly accepted behaviours held by society. Goggin (2006) pointed it out that youth while they are often given credit for their technical facility and dexterity with mobiles, their association with the technology is often regarded as a social problem.

Objective of the study

The objectives of these studies are to:

1. examine the purpose of using mobile phone among undergraduate of Ekiti State University;
2. find out the time of using mobile phones by the undergraduate students of Ekiti State University;
3. investigate factors considered while purchasing mobile phones;
4. identify brand preferences of mobile phone used by the students ;

5. find out the cost and average monthly expenditure on mobile phones by the student and
6. investigate the distractions caused by mobile phone to academics activities of Ekiti State University students.

Research Questions

1. What is the purpose of using mobile phone by undergraduate of Ekiti State University?
2. What is the time of using mobile phone by undergraduate students of Ekiti State University?
3. What are the factors considered by undergraduate students of Ekiti State University while purchasing mobile phones?
4. What is the brand preference of mobile phone by Ekiti State University students?
5. What is the cost price of mobile phones and average monthly expenditure on airtime by the undergraduate students of Ekiti State University?
6. What are the distractions caused by mobile phone to academics activities of Ekiti State University students?

Literature Review

The mobile phone is a multipurpose communication tool, an instrument used for phone calls, text messaging, on-line services, games and much more. This was due to the astonishing technological advancement from the first Generation (1G) to fourth (4G). It is not surprising that the number of mobile phones have outnumbered landline telephones in many countries. (Balakrishnan and Loo, 2012) This technology is used to send Short Messaging Service (SMS) is known to be the most popular application for mobile phones. SMS allows users to send brief messages to other mobile phones. Mobile phones and SMS are hugely popular amongst its users, especially the younger generation. Mobile phones increase social inclusion and connectedness and reinforce relationships between close friends and families (Srivastava, 2005 and Geser, 2006).

Multipurpose nature of mobile phone makes it to have wide application and people use mobile phone for different purposes. Most adults are fond of using this device to make calls and to transact business while the youths (undergraduates) use this device for different purposes other than making calls. Evidence from many studies have shown that one of the most common reasons that the youths use the mobile phones is to feel liberated from the grasp of their family. For example, U.S. college students used mobile phones to maintain or manage privacy, but they also use them to keep in touch with their parents (Aoki and Downes, 2003). In Japan, mobile phones are recognized as a technology that gives people a sense of freedom from their family, especially among teenagers (Ishii, 2006) Mobile phones are equipped with various features that enable communication and entertainment for its young users.

Ling (2001) clearly states that Previous study found that the most popular feature used among young users were text messaging. Nurvitadhi (2003) in her study of

mobile phone usage of adolescents in Japan and USA found that a large proportion (69.53%) of Japanese adolescents preferred using the text messaging service while American adolescents (35.5%) favoured the game features of the mobile phone. Japanese adolescents (40.21%) were also found to use more of MP3 (MPEG-1 Audio Layer 3) features of mobile phones as compared to other features. Lie (2004) found that there is a certain pattern in mobile voice telephony among young adults. Men were seen to use their mobile phone more compared to women. They additionally make more business oriented calls since they are more often in managerial positions. On the other hand, women used the fixed line telephony more than men do to maintain their social network and other social co-ordination task. Women choose the fixed line telephony to socialize because it is more cost effective compared to mobile phones. Similar findings were seen in a study investigating patterns of mobile phone use amongst secondary-school students (Madell & Muncer, 2004).

Mobile technology is fast becoming an educational communication tool, apart from the fact that students can easily browse the internet from their phones to provide information to solve their assignments, at the University of Ibadan, mobile phones are studentsô companions and serve them various purposes; postgraduate and other categories of applicants in the university are notified of the result of their applications through bulk SMS. (Nwagwu, 2011) In the Philippines, students prefer mobile phones as a means of communication with both faculty members and their fellow students (Pabico, 2003; Mariano & De La Rosa, 2004). A study by Nonyongo, Mabusela and Monene (2005) in the University of South Africa established the critical role of SMS by students. Universities design SMS information systems to facilitate studentsô exchange of information with staff and to meet other communication needs.

Studies have been conducted on the frequency of using mobile phones Pew Internet and American Life Project (2002) found out that three-quarters of college students spend between 1 and 3 hours per week using the Internet for social communication, the remaining one-quarter spend 3 or more hours per week communicating socially online. Japanese mobile phone users are characterized by their frequent use of mobile e-mail services (or text messaging) According to Bianchi and Phillips (2005), extraverts spend more time using their mobile phone overall, throughout the week, and for addictive use. In particular, young extraverts are likely to be frequent mobile phone users whereas addicted/dependent users tended to be young, extraverted, and have lower self-esteem. Ehrenberg, Dip, White, and Walsh (2008) found that extraverts, as well as individuals high on neuroticism, reported frequent use of text messaging. Ling (2001) in his study found that young adult men spent more time on the mobile telephones compared to adolescent girls. Men were reported to begin spending more time in their late adolescence and peaks in the mid 20ôs. Their high level of use extends into their early 30ôs after which their length of usage drops. In addition to this, Ling also noted that although women spend more time on their mobile phones during their late adolescence, their length of use is lower than the men as they prefer more face to face communication compared to their male counterparts.

There are some factors considered in the choice of mobile phone, Karjaluoto et al. (2005) opined that price, brand, interface, and properties tends to have the most

influential factors affecting the actual choice amongst mobile phone brands. Ling, Hwang and Salvendy (2006) in their survey of college students to identify their preference of their current mobile phone, the results revealed that physical appearance, size and menu organization of the mobile phones are the most determinant factors affecting the choice of mobile phones. Mack and Sharples (2009) found out that usability is the most important determinant factor for the choice of mobile phones; other attributes particularly features, aesthetics and cost are other factors that have implication on the choice of mobile phone brand. Saif et.al (2012) in the study conducted selected four important factors i.e. price, size/shape, new technology features and brand name and analyzed their impact on consumersô buying behavior. The result revealed that consumerôs value new technology features as the most important variable that influences consumersô to go for a new mobile phone purchase decision. Eric and Bright (2008) conducted a study on the factors that determine the choice of brands of mobile phone in Ghana specifically Kumasi Metropolis. Accordingly, the results of the study showed that the first most important factor is reliable quality of the mobile phone brand and the other factor is user-friendliness of the brand of the mobile phone (Sata, 2013).

Study conducted by Patel, and Rathod (2011) revealed that there is strong brand awareness and usage of Nokia mobile phones in rural areas as 66.43% of the undergraduate college students used Nokia mobile handsets while only 18.88% of the students used other brands. Santhalingam, Revathi, and Devi (2011) found out that the top spot however, continues to remain with Nokia, which is owned by 66% of the respondents. The second and third highest owned mobile phone brands are Samsung 17% and Ericsson 7% respectively. They submitted that in their literature study they found that Samsung, which was at a distant sixth position last year, has climbed all the way up to the second spot this year in market, pushing Sony Ericsson down to the third spot. Motorola and LG owned by 6%, Philips and Reliance by 1%, Micromax owned by 2%, Sony by 5% and other mobile are 18%.

The use of mobile phone is not without cost implications. Clonen, (2002) in his study found out that school-going mobile phone users in Europe spent approximately 25 Euro a month on their mobile phone. Another study by Australian Psychological Society, (2004) revealed that a large proportion (66%) of Australian adolescents preferred to use the mobile phone pre-paid system. This system allows adolescents and their parents to monitor and control the mobile phone cost. Furthermore, more than half (57%) of adolescents claimed that they were very careful in spending money on their mobiles. However, a small number (38%) of them reported that they tend to overspend on their mobile phones due to peer expectation of receiving a reply SMS (Short Message Service) from them. A considerable proportion (13%) of adolescents even had to buy additional credit without their parentsô knowledge and 8% borrowed money from their parents to pay their bills.

Mobile phone use is not only a preferred mode of communication among college students, but it has also become an obstruction in their lives. in Amali, et.al (2012) opined that mobile phone have contributed to circumscribed students commitment to various academic works, their thinking processes, communication and language

skills, which unsuspecting parents, educators and other stakeholders are yet to appreciate the magnitude of damage done to studentsô academic commitment. In a study conducted by Massimini and Peterson (2009), they found out the negative implications of addiction to mobile phone such as; class tardiness and sleep deprivation, lost sleep due to interference of mobile phone use and texting between the late evening hours of 10 p.m. and 1:59 a.m. In a study conducted over a decade ago it was reported that many college students who use the Internet ñexcessivelyò experienced a decline in study habits and grades, and an increase in missed classes and academic probation (Young, 1996), using mobile phones while driving (Pennay, 2004) and using mobile phones inappropriately in public places such as cinemas and classrooms, among others. Mobile phone users were also found to exhibit over-dependence towards their mobile phones, eventually causing other problems such as damaged relationships, emotional stress and loss of sleep, among others (Drennan and James, 2005). Park (2005) and Etukudo (2002) cited in Amali, et.al (2012) lamented the gross damage the mobile phone has done to the lives of various categories of students most especially those in tertiary institution who play away their times on games, music, pornography and face book.

Mobile phone has tremendous advantages to various users. Ferry, (2008) while describing the educational benefits of mobile phone submitted that it can be used to help students to access web based contents, remix it, share it, collaborate with others and create media rich deliverable for the classroom teachers as well as global audience. Universities in United Kingdom (UK) have made the use of mobile phones to store and retrieve information such as e-books, instructional materials, reviewing studentsô marks thus making teaching and learning practices more effective. (Cuing and Wang, 2008) Liaw (2009) reported that in higher education mobile phones can provide course materials to students including due dates for assignments, and information about time table and room changes. In Nigeria, mobiles phones are being used by students for communicating with lecturers in charge of the courses, collect data (recordings), sending emails to lecturers, access Online Public Access Catalogue and share knowledge (Utulu, 2012).

Methodology

This study adopted a descriptive survey research design to describe the use of mobile phone by undergraduate students of Ekiti State University. The study population were undergraduate students of Ekiti State University from 100- 500 Level. The sample comprised 150 respondents selected using simple random sampling technique. An instrument tagged the *Use of Mobile Phone Scale.* The instrument was divided into two sections. The first section acquired the respondentsô bio-data information such as gender, faculty, level, and age. while the second section contained a number of issue response items.

The second section was further divided into five parts. Part 1 contained items on Purpose Undergraduate Use Mobile Phone; Part 2 included items onTime of using mobile phone. Part 3 consisted of items on Factors considered while Purchasing Mobile Phones. Part 4 presented items on The Impact of Mobile Phones on Academic

Activities of Students while Part 5 dealt with Mobile Phone Brand Preference of Undergraduate Students of Ekiti State University. The instrument was administered to the respondents in the University Campus with the support of two research assistants and the administration was completed in ten 10 days.

Data Analysis

Data collected was analysed using simple percentage and frequency count, bar chart, mean and standard deviation

Results

The results of the analysis are presented as follows:

Table 1: Bio-Data Information Summary

Gender	**No of Respondents**	**% Distribution**
Male	**70**	**47**
Female	80	53
Total	150	100
FACULTY	**FREQUENCY**	**PERCENTAGE %**
ARTS	34	22.7
AGRICULTURE	6	4
EDUCATION	30	20
ENGINEERING	7	4.7
LAW	7	4.7
MANAGEMENT SCIENCE	13	8.7
MEDICINE	3	2
SCIENCE	23	15.3
SOCIAL SCIENCE	27	18
TOTAL	150	100
LEVEL	**FREQUENCY**	**PERCENTAGE %**
100	47	31.3

200	43	28.7
300	32	21.3
400	23	15.3
500	5	3.3
TOTAL	150	100
Age Range	**Frequency**	**Percentage %**
16-19	27	18
20-25	108	72
26-30	9	6
30-35	3	2
36 & above	3	2
Total	150	100
Number Administered	150	100
Number Returned	150	100

The results in Table 1 above show that 70 respondents 47% were male while 80 respondents 53% were female. 34 respondents 22.7% which was the highest were from the Faculty of Arts, 6 respondents 4% were from Agriculture, 30 respondents 20% were from Education, 7 respondents 4.7% were from the Faculty of Engineering and Law respectively, 13 respondents 8.7% were from Management Science, 3 respondents 2% were from the Faculty of Medicine, 23 respondents 15.5% were from Sciences while the remaining 27 respondents 18% were from the Faculty of Social Sciences. 47 respondents 31.3% were in 100 Level, 43 respondents 28.7% were in 200 Level, 32 respondents 21.3% were in 300 Level, 23 respondents 15.3% were in 400 Level while the remaining 5 respondents 3.3% were in 500 Level. Students in 100 Level participated more than others in this study. Age range of the respondents revealed that 27 respondents 18% were between 16-19 years, 108 respondents 72% were between 20-25 years, 9 respondents 6% were between 26-30 years, 3 respondents 2% were between 30 -35 years and 3 respondents 2% were 36years and above. The majority of the respondents were between 20 to 25 years. The return rate of the instrument was also shown to 100%.

Research Question 1: What is the purpose of using mobile phone by undergraduate of Ekiti State University?

Ekiti State University students predominantly use mobile phones to stay in touch with friends and family, accessing social network sites, for searching for materials for assignment to compliment class work and to check e-mail and browsing the internet with 2.0 mean score respectively which was followed by discussing study related matter, listen to music or radio and video (Pre-loaded), chatting with friends and family 1.9 mean score respectively, accessing sport news and current affairs and for clock and alarm 1.8 mean score respectively followed by playing mobile games 1.6 mean score and for making night calls (extra cool) which was the least usage pattern by the undergraduate students of Ekiti State University with 1.3 mean score.

Table 2: Purpose Undergraduate use Mobile Phone

S/N	MOBILE PHONE USE PATTERN	YES		NO		MEAN	STANDARD DEVIATION
		N	%	N	%		
1	For staying in touch with friends and family?	144	96	6	4	2.0	0.16
2	Check e-mail and web browsing?	144	96	6	4	2.0	0.16
3	For accessing social network sites such as facebook, google+?	144	96	6	4	2.0	0.16
4	For searching for materials for assignment & to compliment class work?	147	98	3	2	2.0	0.14
5	For discussing study related matter?	132	88	18	12	1.9	0.33
6	Listen to music or radio and video (Pre-loaded)?	138	92	12	8	1.9	0.27
7	For chatting with friends and family?	141	94	9	6	1.9	0.24
8	Clock and alarm?	126	84	24	16	1.8	0.37
9	Accessing sport news and current affairs?	126	84	24	16	`1.8	0.37
10	Playing mobile games?	93	62	57	38	1.6	0.49
11	For making night calls (extra cool)	42	28	108	72	1.3	0.45

Source: Field survey (2014)

Research Question 2: What is the time of using mobile phone use by undergraduate students of Ekiti State University?

Table 3 below on the time of using mobile phone revealed that Undergraduate students of Ekiti University use mobile phone anytime as agreed 114 respondents 76% and rank 1st which was followed by those who use it in the evening 81 respondents 54%, followed by morning 75 respondents 50%, followed by afternoon 72 respondents 48%, followed by regular interval 45 respondents 30% and the least was those who agreed that they use it l ate in the night 27 respondents 18%.

Table 3: Time of using mobile phone

S/N	FREQUENCY	N	(%)	RANK
1	Anytime	114	76	1st
2	Evening	81	54	2nd
3	Morning	75	50	3rd
4	Afternoon	72	48	4th
5	Regular interval	45	30	5th
6	Late in the night	27	18	6th

Source: Field survey (2014)

Research Question 3: What are the factors considered by undergraduate students of Ekiti State University while purchasing mobile phones?

Factors considered while purchasing mobile phones by undergraduate student of Ekiti State University as revealed that quality was the most important factor considered before buying phones 147 respondents 98% followed by durability of the battery 94%, followed by the price 92%, followed by appearance 86%, additional features 74%, followed by brand name 68% followed by services from the manufacture or their representatives 58% userôs friendliness 56%, followed by social status and company image 48% respectively, followed by availability of service centre 46% followed by second hand value 24% which was the least factor considered by the students while purchasing their mobile phones.

Table 4: Factors considered while purchasing mobile phone

S/N	FACTORS CONSIDERED	N	%	RANK
1	Quality	147	98	1st
2	Durability of the battery	141	94	2nd
3	Price	138	92	3rd
4	Appearance	129	86	4th
5	Additional features	111	74	5th
6	Brand name	102	68	6th
7	Services from the manufacture or their representatives	87	58	7th
8	Userôs friendliness	84	56	8th
9	Social status	72	48	9th
10	Company image	72	48	9th
11	Availability of service centre	69	46	11th
12	Resale value	36	24	12th

Source: Field survey (2014)

Research Question 4: What is the brand preference of mobile phone by undergraduate students of Ekiti State University?

Table 5 below revealed that undergraduate students of Ekiti state university prefer Nokia phone 62(41.3%) followed by Blackberry 30(20%) Tecno 22(14.7%) China phone 11(7.3%) Samsung 10(6.7) Itel 6(4%) LG 5(3.3%) Etisalat 3(2%) and I phone 1(0.7%)

Table 5: Mobile phone Brand Preference

S/N	BRAND NAME	Frequency	Percentage %	Rank
1	Nokia Phone	62	41.3	1st
2	Blackberry	30	20	2nd
3	Tecno	22	14.7	3rd
4	China phone	11	7.3	4th
5	Samsung	10	6.7	5th
6	Itel	6	4	6th
7	LG	5	3.3	7th
8	Etisalat phone	3	2	8th
9	I phone	1	0.7	9th

Source: Field survey (2014)

Research Question 5: What is the cost price of mobile phones and average monthly expenditure on airtime by the undergraduate students of Ekiti State University?

Table 6 showing the cost price of mobile phones used by the undergraduate students of Ekiti State University revealed that 34(22.7%) respondent used mobile phones which cost price ranges between 1000 - 5000 naira, 6000 - 1000 naira 16(10.7%), 11000 - 15000 naira 51(34%), 16000 - 20000 naira 16(10.7%) 21000 - 25000 naira 6(4%) , 26000 ï 30000 naira 9(6%), 31000 ï 35000 naira 4(2.7%), 36000 ï 40000 naira 5(3.3%), 41000 ï 45000 naira 5(3.3%), 46000 ï 50000 naira 1(0.7%) while those using phone costing 51 thousand naira and above 3(2%) . It can be concluded that the cost of mobile phones used by the undergraduate students of Ekiti State University are not too expensive. It was few students that were using expensive phones while majority used phone below twenty thousand naira. Average Monthly Expenses on Airtime in table 7 shows that 28(18.7%) spent between 100 to 200 naira monthly on their mobile phones, 43(28.7%) spent 300 to 500 naira, 9(6%) spent 600 to 700 naira monthly, 7(4.7%) spent 800 to 900 naira on their phone while the remaining 63(42%) which was the highest spent 1000 and above monthly on their mobile phones.

Table 6: Cost Price of Mobile Phone Used by Undergraduate Students of Ekiti State University

S/N	Average Monthly Expenses (#)	Frequency	Percentage %
1	100- 200	28	18.7
2	300- 500	43	28.7
3	600- 700	9	6
4	800- 900	7	4.7
5	1000 & above	63	42
6	Total	150	100

Table 7: Average Monthly Expenses on Airtime

S/N	COST PRICE (N)	Frequency	Percentage %
1	1000 ï 5000	34	22.7
2	6000 ï 10000	16	10.7
3	11000 ï 15000	51	34
4	16000 ï 20000	16	10.7
5	21000 ï 25000	6	4
6	26000 ï 30000	9	6
7	31000 ï 35000	4	2.7
8	36000 ï 40000	5	3.3
9	41000 ï 45000	5	3.3
10	46000 - 50000	1	0.7
11	51 & above	3	2
12	Total	150	100

Source: Field survey (2014)

Table 8: Distractions Caused by Mobile Phone

S/N	MOBILE PHONE & ACADEMIC WORK	YES		NO		MEAN	STANDARD DEVIATION
		N	%	N	%		
1	I used to chat with my friends during lectures?	6	4	144	96	1.0	0.98
2	I used to receive phone calls during lectures?	12	8	138	92	1.1	0.27
3	I sometimes receive calls or chat (ping) when reading?	78	52	72	48	1.5	0.5
4	Talking on my mobile phone sometime interfere with my academic work?	27	18	123	82	1.4	0.44
5	Sometimes connect with my friends on facebook during lectures?	12	8	138	92	1.1	0.27
6	I sometimes check my e-mail during lectures?	12	8	138	92	1.1	0.27
7	I Sometimes check my e-mail during private study?	78	52	72	48	1.5	0.5
8	I do receive calls or send text messages in the library?	42	28	108	72	1.3	0.45
9	I do make and receive midnight calls (extra cool)?	39	26	111	74	1.3	0.44
10	Browsing the internet on my phone causes me to be late to class?	9	6	141	96	1.1	0.24

Source: Field survey (2014

Research Question 6: What are distractions caused by mobile phone to academics activities of Ekiti State University students?

Table 8 showing distractions of mobile phone revealed that 144(96%) disagreed that they used to chat with my friends during lectures, 138(92%) disagreed that they used to receive phone calls during lectures,78(52%) agreed that they sometimes receive calls or chat (ping) when reading 72(48%) disagreed. 27(18%) agreed that talking on my mobile phone sometime interfere with their academic work while 123(82%) disagreed, 12(8%) agreed that they Sometimes connect with my friends on facebook during lectures and check their e-mail during lectures while 138(92%) disagreed respectively.78(52%) agreed that they sometimes check my e-mail during private study while 72(48%) disagreed, 42(28%) agreed that they receive calls or send text messages in the library while 108(72%) disagreed. 39(26%) agreed that they do make and receive midnight calls (extra cool) while 111(74%) disagreed, 9(6%) agreed that browsing the internet on the phone make them to be late to class while 141(6%) disagreed.

Discussion of the findings

Telephone was sometimes a luxury in Nigeria and was exclusively for the rich because of the monopolistic nature of the industry. With the deregulation of telecommunication industry by Obasanjoôs administration, mobile phones are now accessible to various categories of people in the society irrespective of socio-economic status. Studies have shown that youth have been found to be digital nativesô and savvy (Prensky 2004), they use mobile phone for diverse purposes much more than making calls unlike adults who mainly see telephone as a means to keep in touch with their family, friends, colleagues and business associates. The study examined the use of mobile phones by undergraduate students of Ekiti State University, Ado-Ekiti.

Five research questions were generated to provide insight into the study and the findings revealed that the students use mobile phone predominantly to stay in touch with friends and family, accessing social network sites, searching for materials for assignment to compliment class work and to check e-mail and browsing the internet, discuss study related matter, listen to music or radio and video (Pre-loaded), chatting with friends and family, accessing sport news and current affairs and for clock and alarm, playing mobile games and for making night calls (extra cool). This finding was corroborated by Aoki and Downes, 2003, Srivastava, 2005, Geser, 2006, Patel and Rathod (2011). Mobile phone is a veritable tool useful for keeping in touch with friends and family members. Before the deregulation of telecommunication industry in Nigeria, communication was an uphill task, people found it difficult to get in touch with friends and family, people who were living in cities had access to fixed wire telephone line and once the phone rings and the receiver is not pick the call, getting in touch may be impossible until both of them are in the environment of the telephone when the caller calls back. Mobility of GSM telephone has almost made it part of dressing, hardly will people go out without their phones and when calls are missed, easily the caller can later be reached.

On the time of using mobile phone, the study revealed that the majority of the students used their phones anytime; others in the evening, morning, afternoon, regular interval and while some used it till late in the night. Mobile phone is more or less part of dressing, if a user is going out without mobile phone, such would fill that something is missing therefore using it anytime is possible. Undergraduate students are found of using it in the night either for making free night calls (extra cool) or chatting with their friends on social network sites. The findings shows that undergraduate students of Ekiti state university prefer Nokia phone followed by Blackberry, Tecno, China phone, Samsung, Itel, LG, Etisalat, and I phone and this corroborates the study of Patel, and Rathod (2011) and Santhalingam, Revathi, and Devi (2011) who found Nokia phone to be the most preferred brand. This may be as a result of good battery, durability, affordability and the brand name of Nokia products. Apart from these, Nokia products have some special features that readily meet the need of Nigerian such as flashlight, fm radio e.t.c. power supply is one of the problems Nigeria is still battling with and phones with lighting feature will definitely attract demand by Nigerian. Ability to listen to news and current affairs will definitely

attract students to such phones who always desire to be informed with the issues in the society.

On the cost price of mobile phones and monthly cost of buying recharge card revealed that the majority of the students used mobile phones below twenty thousand naira and those who spent one thousand naira and above monthly on recharge card were in the majority. This corroborated the findings of Olukotun, et.al (2013) in their study on the introduction of GSM services in Anyigba community and its impact on students expenditure pattern, they found that the majority ofrespondents (81%) spend N1000 ï N2000 on recharge card monthly while others spend beyond that. Clonen, (2002) in his study found that school-going mobile phone users in Europe spent approximately 25 Euro a month on their mobile phone. It also corroborated Zulkefly and Baharudin, (2009) who found that the mean monthly expenditure of mobile phone amongst the students was 16 US Dollar the result which indicated that students spent moderately in terms of time and money on their mobile phones. When GSM was first introduced to Nigerian market, people spend much to make calls per minute and the cost of sim card was expensive, but as the mobile phone service providers were recouping their investments together with stiff competition in the industry, the cost of making calls was reducing while users can choose the most suitable and affordable tariff plan. Students who use Blackberry and smart phones may be forced to spend minimum of N1000 or little above it if they want to have access to internet for the month.

The study revealed that the use of mobile phone is distracting their studies by chatting and receiving calls during lectures, making night calls, receiving calls, checking e-mails and chatting during private study. This findings corroborated Massimini and Peterson (2009), Drennan and James (2005), Park (2005), Etukudo (2002) and Olukotun et.al (2013) who categorically submitted that GSM has come to affect the way students sleep, eat, think and ultimately their health, as they indulge in night calls, it affects productivity when student waste valuable time on trivial conversation with boy and girl friends. It has eaten deep into the lean fabric of student allowances or pocket money, crashing their budget and causing discomfort to their education and lives

Conclusion

The use of mobile phone cut across every social class in the society, the rich make use of mobile phone and also have the financial capacity to buy sophisticated phones with many features, the middle and low income earners are not left out because of various varieties of phones available in the Nigerian market. Students browse; watch television, video, listen to music and radio stations on their mobile phone. They use this technology not only to make calls but also to browse the internet, check mails, connect with their friends, watch films, listen to radio and lot more. Ekiti State University undergraduate students use mobile phone to connect with friends and families, access social network sites, for searching for materials for assignment to compliment class work and to check e-mail and browsing the internet, discuss study related matter, listen to music or radio. Mobile phone has been found to be distracting

the students has revealed by the study therefore efforts should be made to continue to educate them on profitable use of mobile phones. Indeed mobile phone is an amazing technology that it really turning the world into global village because of ease of connecting anywhere in the world and some other beneficial features attached to it. It is an educational tool that if well harnessed can promote academic performances of students therefore various categories of students should be encourage to use mobile phone to access current, timely and up-to-date information that would benefit them academically.

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Social Media and Social Isolation among Students of Kogi State University, Anyigba, Nigeria

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Abstract

The researcher examined social media and social isolation among students of Kogi State University, Anyigba. It sought to determine whether students' exposure to social media is causing social isolation. Survey research design was adopted, while questionnaire was used as the instrument for data collection. Findings show that the students mostly use facebook and whatsapp. Findings further show that social networking sites were causing social isolation among the students of Kogi State University and that the extent to which they were causing social isolation was great. More so, the findings reveal that social networking sites were causing students to lose the ability of communicating on a face to face basis. Based on the findings, the researcher concluded that social media are gradually replacing the face to face communication method among college students. It, therefore, among others, recommended that the management of tertiary institutions should raise awareness through lectures on the excessive use of the social media and make available a counsel unit on efficient use of these platforms and that the government should exercise more strictness on laws prohibiting illegal usage of social media in forms of nudity, cyber bullying and sexual exposure to minors to help check some of the excesses involved with using social media.

Keywords: Social media, social isolation, students, Kogi State University

Introduction and Problem Statement

Social media are online media that expedite conversation as opposed to traditional media (newspaper, magazine, television and radio) which deliver content, but do not allow readers/viewers/listeners to participate in the creation or development of the content (Ward, 2013, cited in Edegoh, Asemah & Ekanem, 2013). Social media are important tools for socialisation and entertainment. Social media have come to facilitate and ease social interaction in contemporary society, thus, making it easier for people to unite and communicate with long lost friends, obtaining information on what is happening around the world, making use of social marketing, advertising their products, getting information on academic level and so many others (Rebea, 2008). There are several types of social media, ranging from social sharing sites such as youtube and flikr, through social networks such as linkedIn and facebook. Social media host an array of endless possibilities; the benefits of participating in social media have gone beyond simply social sharing, to building reputation and bringing in career opportunities and monetary income.Social media are becoming more and more integrated into our everyday lives and their importance cannot be overstated, likewise the dangers. Social media hold a pivotal role in determining how people relate now and in the future. This explains why Edegoh *et al* (2013) see social media as social networks

of the electronic variety that have become an inseparable part of the social culture of most societies.

Social media are the tools and platforms that people use to publish contents and interact socially online (Heathfield, 2013). According to Heathfield (2013), user generated content includes: conversation, articles, images or pictures, recipes and anything that an individual might share with others in their daily lives. Social media refer to media for social interaction which use highly accessible and scalable publishing techniques. They include the various online technology tools that enable people to communicate easily via the Internet to share information and resources (Greendhow, 2009). Global advancement in technology, modernisation and globalisation has resulted in global economic growth and unprecedented growth in social media of communication. Social networks of the electronic variety have become an inseparable part of the social culture of most societies, particularly the developed world. People have woven these networks into their routines, using facebook, 2go, linkedIn, online-gaming environment and other tools to build and maintain complex webs of professional and personal relationships. Technological changes have been one of the most significant social processes to take place in the industrialised world in the last twenty years. The development of the Internet has greatly increased the means by which people communicate with each other (Ling, 2008, cited in Parigi, 2012). While mass media, like television, seems to be primarily consumed for the sake of personal gratification, engagement in social media is often driven by the desire for interpersonal relationships. For example, Haridakis & Hanson (2009), cited in Parigi (2012) demonstrate how the exponential growth of youtube videos is in part driven by the social needs of people wanting to share content for the sake of communicating with their friends (Hanson 2008; Hollenbaugh, 2011; Parigi, 2012).

Research has shown that social networking sites are gradually causing social isolation. Social isolation is a near complete lack of contact with people and society for members of a social species. This explains why Biordi & Nicholson (2011, p. 85) argue that ñif belonging is connectedness, then social isolation is the distancing of an individual psychologically or physically or both, from his or her network of desired or needed relationships with other persons. Therefore, social isolation is the loss of place within oneôs group.ò This implies that social isolation is the absence of interaction with others, outside of that required to perform basic life functions. In todayôs society, technology dependence is a growing problem, not only can the Internet, phones, video games, etc., be an issue for interaction between human begins, but also technology is replacing reality with realism and thus, leading to emotional burdens that hinder an individualsô ability to form relationship with other individuals.

Social media as a catalyst for social isolation is evident in the time it is claiming from individuals. These highly addictive technologies place themselves as indispensable alternatives to reality. Thus, Turkle (2011, p. 1), cited in Parigi (2012) sees these technology and social media as the advertising for second life, a virtual world where you get to build an avatar, a house, a family and a social life. Technology and new social media have profoundly reshaped the ways people relate to each other and the meaning they derive from such relationships. Today, many see social media as powerful tools profoundly reshaping the ways they conduct their lives and establish relationships (Wellman, Boase & Chen,

2002). Technology, some argue, is making people feeling more isolated. People are increasingly socially isolated as a result of the usage of social networking sites. The size of core networks has declined and these relations are increasingly comprised of similar others. A likely culprit, for this unexpected change in the structure of affiliation is the rise of the Internet and mobile phones (McPherson, Smith-Lovin & Brashears, 2006). Perhaps the strongest criticism that can be made of social media networks is that they deprive us of human interaction and create virtual substitutes that still maintain emotional distance. The foregoing implies that social networking sites are gradually causing social isolation among the members of the society. The youths, especially now prefer to share ideas, messages, etc, via the social media. Thus, it becomes pertinent to ask the extent to which social media are causing social isolation. This is the trust of this paper.

Objectives of the Study

The objectives of the study are to:

1. Find out the social networking sites mostly used by Kogi State University students.
2. Determine the extent to which the students use the social networking sites.
3. Determine if social media cause social isolation among the students of Kogi State University.
4. Ascertain whether social networking sites can make students to lose the ability to communicate on face to face basis

Theoretical Underpinning and Review of Related Literature

Social presence theory provided the theoretical base for the study. Social presence theory was developed by John Short, Ederyn Williams & Bruce Christie in 1976. This theory is the groundwork for many theories on new media effects. The idea is that a mediumôs social effects are principally caused by the degree of social presence which it affords to its users. Social presence means a communicatorôs sense of awareness of the presence of an interaction partner. This is important for the process by which man comes to know and think about other persons, their characteristics, qualities and inner states (Short, Williams & Christie, 1976). Thus, increased presence leads to a better perception of someone. Social presence has been defined as a measure of the feeling of community that a learner experiences in an online environment (Tu & McIssac, 2002). The theory classifies different communication media along a one-dimensional continuum of social presence, where the degree of social presence is equated to the degree of awareness of the other person in a communication interaction (Sallnas, Rassmus-Grohn & Sjostrom, 2000). In most cases, the higher the social presence level, the better the understanding of both speaker and message (Barrow, 2010) According to social presence theory, communication is effective if the communication medium has the appropriate social presence required for the level of interpersonal involvement required for a task. This theory is foundational to this paper because the emphasis is on interactivity of the social media. Thus, the theory measures communication media based on the degree of awareness of the other person in a communication interaction.

Evidence from the U.S. General Social Surveys (GSS) suggests that during the past twenty years, people have become increasingly socially isolated and their core discussion networks have become smaller and less diverse; one explanation offered for this trend is the use of mobile phones and the Internet (Hampton, Sessions & Her, 2011). Sigman (2009) calls the

use of new communication technologies the most significant contributing factor in a historic decline in face-to-face interaction, while pronouncements about the negative consequences of new media are popular, empirical evidence in support of such a connection is limited. Similar findings were also reported in a series of surveys by Nie & Erbring (2000) who found that time spent online displaces time spent with friends and family. Similarly, a 2004 national survey found that Internet users feel very close to the same number of people as nonusers, but maintain relationships with 20% more people to whom they feel somewhat close (Boase, Horrigan, Wellman & Rainie, 2006).

Edegoh, *et al* (2013) conducted research on facebook and relationship management among students of Anambra State University, Nigeria. The authors carried out this study with the aim of investigating whether the students of Anambra University use facebook for relationship management. The study adopted survey research design in which a total of 300 copies of questionnaire were distributed to regular students of the University. Findings show that students spend a lot of time communicating on facebook. In addition, students on the platform not only make friends on facebook, but did so regularly and discovered old friends via the social platform.

Sponsil and Gitimu (2013) conducted a research entitled ó́use of social media by college students: Relationship to communication and self-concept. The purpose of Sponsil and Gitimuôs work was to examine social media use among college students and how it affects communication with others and the college studentsô selfï concept. In carrying out the study, the authors used the survey research method to obtain data from 96 undergraduate students. The authors found out that the most important reason students use social networking was to communicate with family and friends. Entertainment and boredom were also prominent reasons. This ultimately resulted to the truth that the social media was gradually replacing the face to face communication among college students. The authors, among others recommended that there should be more research done on gender and usage of social media websites to better understand the effects on the males and females using the two sites.

A 2010 studyfrom Carnegie Mellon University in Pittsburgh found that when interacting directly with friends on facebook, whether posting messages or pictures on wall, tagging photos or ó́likingôô things, feelings of well-being and sociability increased; but when they passively consumed content on facebook, the opposite was true. An earlier study from the same researcher found that increased Internet use led to a decline in communications with friends and family and increased depression and loneliness (Greig, 2013). Thus, addiction to the use of social media and the Internet is the most common symptom of isolation among students. Turkle (2011) emphasises her belief that more people need to put down their phones, turn off their computers and learn how to communicate with one another face-to-face. She argued that we have invented inspiring and enhancing technologies, yet we have allowed them to diminish us. Similarly, James (2012) contends that it is it is perhaps, fair to say that most people now depend on social media for a large part of their day; this can mean checking facebook updates, posting on twitter or just keeping up to date with a friendôs flickr stream. Block (2008) observes that internet addiction can now be identified as causing compulsive/impulsive disorders such as checking email or text constantly or always thinking the phone is vibrating. The addiction can lead to excessive use, withdrawal and tolerance ï

meaning the social media user will always want the next big thing, such as better social media applications.

On the surface, facebook provides an invaluable resource for fulfilling the basic human need for social connection, but rather than enhancing well-being, it demonstrates that interacting with facebook may have the opposite result for young adults (Lichtenberger, 2013). Facebook is interfering with our real friendships, distancing us from each other, making us lonelier; and that social networking might be spreading the very isolation it seemed designed to conquer (Lichtenberger, 2013). There have been studies that show that social media do cause isolation; people use facebook and twitter to stay distant; you no longer use the phone to actually have conversations (Walsh, 2014).

Methodology

The study adopted survey research design. The choice of survey was informed by the fact that Ohaja (2003) and Saunders, Lewis and Thornil (1997), cited in Asemah, Gujbawu, Ekhareafo & Okpanachi (2012, p. 199) aver that ñit is a study of the characteristics of a sample through questioning, which enables a researcher to make generalisations concerning his population of interest.ò Going by the advantages, therefore, survey was adopted. The population of the study is made up of the undergraduates of Kogi State University. The population of the undergraduate students is 17,920. Thus, the population of the study is 17, 920, while the sample size is 335; this was arrived at, using the Cochranôs sample size determination technique.

The study adopted purposive and simple random sampling techniques. Purposive sampling technique was used to select four out of the eight faculties in the University, while simple random sampling was used to select the 335 respondents. The data were collected, using questionnaire and the copies of questionnaire were given out personally by the researcher to the select population. In other words, the researcher did face to face administration of the questionnaire so as to play down on the ñdegree of no returns.ôô The quantitative method of data presentation and analysis were used for the study, while the data were analysed, using tables and percentages.

Data Presentation and Analysis

A total of 335 copies of questionnaire were distributed and 322 were retrieved. The return rate is 97%, while the mortality rate is 3%. With an insignificant mortality rate, the retuned copies were considered adequate enough to represent the population.

Table 1: Demographic information of Respondents

Variables	Frequency	Percentage
Sex of Respondents		
Female	148	46
Male	174	54
Total	322	100
Age of Respondents		
18-24	77	24
25-30	154	48
31-35	88	27
36 and above	3	1
Total	322	100
Level of Respondents		
100	73	23
200	109	34
300	81	25
400	59	18
500	Nil	Nil
Total	**322**	**100**

Table 1 shows the demographic information of the respondents. The table shows that 148 respondents, which represent 46% were female students, while the remaining 54% were male students. This shows that majority of the respondents were male. Also indicated in table 1 is the age of the respondents. Out of the 322 copies of questionnaire retrieved, 24% were between the ages of 18 and 24; 48% were between 25 and 30 years; 27% were between 31 and 35, while the remaining 1% fell within the ages of 36 and above.The table also shows the levels of the respondents; 73 respondents, representing 23% were 100 level students; 109 respondents, representing 34% were 200 level students; 81 respondents, representing 25% were 300 level students; 59 respondents, representing 11% were 400 level students, while none of the respondents ticked 500 level. This shows that the copies of questionnaire were duly appraised by students from different levels.

Table 2: Social networking sites mostly used by respondents

Options	Frequency	Percentage
Reddit	Nil	Nil
StumbleUpon	Nil	Nil
Pinterest	Nil	Nil
Instagram	9	3
VK	Nil	Nil
Flickr	Nil	Nil
Tumbir	Nil	Nil
CafeMom	Nil	Nil
Facebook	135	42
Twitter	44	14
Whatsapp	72	22
Black berry messenger	23	7
Badoo	Nil	Nil
2go	39	12
Foursquare	Nil	Nil
You Tube	Nil	Nil
Google+	Nil	Nil
LinkedIn	Nil	Nil
Total	322	100%

The question in table 2 was designed to ascertain the social networking sites mostly used by the students of Kogi State University. The data in the table show that the social networking sites mostly used by the respondents were facebook and whatsapp. Out of the 322 copies of questionnaire retrieved, 9 (3%) maintained that it was instagram; 135 respondents (42%) said that it was facebook; 44 (14%) maintained that it was twitter; 72 (22%) ticked whatsapp; 23 respondents, which represents 7% said that it was black berry messenger, while 39 respondents, representing 12% of the respondents ticked 2go. None of the respondents ticked reddit, stumbleupon, pinterest, VK, flickr, tumbir, cafemom, foursquare, youtube, google+, linkedin and badoo. The implication of the analysis, therefore, is that the students of Kogi State University mostly make use of facebook and whatsapp more than other social networking sites.

Table 3: The extent to which respondents use their preferred social media sites

Options	Frequency	Percentage
Very great extent	38	12%
Great extent	136	42%
Undecided	12	4%
Low extent	122	38%
Very low extent	14	4%
Total	**322**	**100**

Table 3 contains question designed to determine the extent to which the students of Kogi State University make use of the preferred social networking sites. Out of the 322 respondents who returned their copies of questionnaire, 12% ticked very great extent; 42% ticked great extent; 4% were undecided; 38% ticked low extent, while the remaining 4%

ticked very low extent. The analysis implies that the extent to which the students use social networking sites is great. This is due to the fact that majority of the respondents maintained that it was to a great extent (42%). This implies that the students of Kogi State University spend a lot of time on social media.

Table 4: Social media cause social isolation

Options	Frequency	Percentage
Strongly Agree	63	19
Agree	144	45
Undecided	19	19
Disagree	61	6
Strongly Disagree	35	11
Total	**322**	**100**

The question in table 4 was designed to determine whether social networking sites were causing social isolation among the students of Kogi State University. Majority of the respondents were of the opinion that social networking sites were causing social isolation. Out of the 322 respondents who returned their copies of questionnaire, 64% agreed; 17% disagreed, while the remaining 19% were undecided. Since majority of the respondents agreed (64%) it, therefore, implies that social media cause social isolation among the students of Kogi State University.

Table 5: Use of social media will make students to lose the ability to talk in face to face situation

Options	Frequency	Percentage
Strongly Agree	36	11
Agree	158	49
Undecided	17	5
Disagree	82	26
Strongly Disagree	29	9
Total	**322**	**100**

The question in table 5 was designed to ascertain whether social networking sites can make students to lose the ability to communicate on a face to face basis. The data in the table show that the use of social media can make students to lose the ability of communicating in a face to face situation. Out of the 322 respondents, 60% agreed, 5% were undecided, while the remaining 35% disagreed. The implication of the analysis is that studentsô ability to communicate can be reduced when they spend so much time interacting with people on social media.

Discussion of Findings

Findings show that the social networking sites the students mostly use are facebook and whatsapp. This is evident in table 2 where majority of the respondents agreed to that effect; 42% ticked facebook, while 22% ticked whatsapp. This aligns with Drusell (2012) who says

that social networking is very popular among young adults and that participation in social networking activities is highly common in todayôs technological society. More so, Edegoh, *et al* (2013) in their study also found out that among the several social networking sites, facebook was still the most used social media by students. The implication of this finding is that among the various social networking sites, facebook and whatsapp are the most popular among the students of tertiary institutions. Studentsô exposure to facebook is high; this means that a good number of students are on facebook; it also means that a lot of students make use of facebook as a social platform for exchange of ideas (Edegoh, *et al*, 2013). Advancement in technology has made it easy for students to have access to facebook as they can easily sign up and log into facebook with their cell phones, provided these phones are application and Internet enabled (Edegoh, *et al* 2013).

Findings further show that the extent to which the respondents have access to the social networking sites was great. The data in table 3 show that the respondents spend time on social networking sites. In table 3, out of the 322 respondents who returned their copies of questionnaire, 12% ticked very great extent; 42% ticked great extent; 4% were undecided; 38% ticked low extent, while the remaining 4% ticked very low extent. This therefore, implies that the extent to which the students use social networking sites is great. This perhaps explains Sponsil and Gitimu (2013) found out that social media were gradually replacing the face to face communication among college students.

Findings also show that the place of face to face communication is losing grounds to social media platforms in terms of keeping in touch with friends. This is to say that the preference of students for face to face over online contact is being repelled by the need to utilise the social media due to the advantages of the elimination of distance and simultaneity in conversing. This is in line with the social presence theory, which says that communication is effective if the communication medium has the appropriate social presence required for the level of interpersonal involvement required for a task. This implies that students who rely on social networking are losing the ability to talk with others that are offline because social media are interactive in nature. The students are fast losing the ability to talk on a face to face basis.

The findings show that social media are generally leading to social isolation; this is evident in table 4 where majority of the respondents agreed to that effect. The table shows the views of the respondents on whether social media can cause social isolation; 64% agreed; 6% disagreed, while the remaining 30% disagreed. This finding tallies with the literature review; for example, Lichtenberger (2013) contends that facebook is interfering with our real friendships, distancing us from each other, making us lonelier and that social networking might be spreading the very isolation it seemed designed to conquer. Turkle (2011), cited in Parigi (2012) emphasises her belief that more people need to put down their phones, turn off their computers and learn how to communicate with one another face-to-face. She argued that we have invented inspiring and enhancing technologies, yet we have allowed them to diminish us. Similarly, James (2012) contends that it is perhaps, fair to say that most people now depend on social media for a large part of their day; this can mean checking facebook updates, posting on twitter or just keeping up to date with a friendôs flickr stream.

The findings also show that social media can make students to lose the ability to communicate on a face to face basis. As indicated in table 6, 11% strongly agreed, 49% agreed; 5% were undecided, 26% disagreed, while the remaining 9% strongly disagreed. This implies that social media can make students to lose the ability of communicating on a face to face basis.

Conclusion

The main aim of the study was to determine social media and social isolation among students of Kogi State University Anyigba. Findings show that social media are causing social isolation, thereby leading to loss of ability to communicate on face to face basis. Based on the findings, the paper concludes that social media are causing social isolation among youths.

Recommendations

The study recommends among others that the management of tertiary institutions should raise awareness through lectures on the excessive use of the social media and make available a counsel unit on efficient use of these platforms; students should be made to realise the inherent biases in the social media so that they can control it rather than being controlled by it. This is because they are so saturated with it and because culture does not tend to turn against its technologies. More so, the government should exercise more strictness on laws prohibiting illegal usage of social media in forms of nudity, cyber bullying and sexual exposure to minors to help check some of the excesses involved with using social media.

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Newspapers Coverage of Climate Change in Nigeria

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Abstract
This study examinesthe role of the newspaper in creating awareness and shaping people's attitude regarding climate change. Employing a content analysis method in 2012, this study examines the story type, prominence and depth to determine the extent to which Nigeria newspapers devote to issues of climate change. The researchers purposely select four national newspapers, The Punch, The Sun, Thisday, andDaily Trust, between January and May, which they systematically select 68 editions at the interval of the 9th edition. Of the 61 articles identified, approximately 23% appeared in The Punch, 20% in The Sun, 16% in Thisday, and 41% inDaily Trust. The study concludes that there is low-level prominence and depth individual newspapers devote toclimate change. Additionally, most of the reports do not sufficiently address causes, effects and palliative measures. It recommends among other things that the mass media should intensify reportage on climate change with a view to effecting a positive change of attitude.

Key words: Newspaper, *climate change, ecosystem, greenhouse effect, attitude*

Introduction

Through time, newspapers coverage has proved to be a key contributor, among a number of factors that shape public understanding and attitude about daunting issues. One of these issues is climate change which has become front burner in the annals of global history. According to UNFCCC (1994), climate change means the significant and lasting changes in climate.Climate change reflects changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. Attention being focused on climate change is as a result of its causes and dire consequences on the global community.

The most reputable climate scientists from around the globe have consistently asserted that anthropogenic climate change is a serious problem that must be addressed immediately (Nakicenovic & Swart, 2000; Houghton, 2001). Human activities like deforestation and use of fossil fuel have been considered responsible for the effect of climate change on humanity and the ecosystem. Besides human

activities are processes such as variations in sunlight intensity and volcanic eruptions. In its Fourth Assessment Report, the Intergovernmental Panel on Climate Change (2007) concludes, there is a more than 90 percent probability that human activities over the past 250 years have warmed our planet.

A considerable number of Nigerians are involved in agriculture. Their continuous falling of trees, bush burning and emission of fossil fuel contribute to the depletion of ozone layer. Triggered by this concern The National Research Council Committee on the Science of Climate Change (2001, p.1) and Aldy, Orszag and Stiglitz (2001, p.1) maintain that concentrations of greenhouse gases have increased markedly during the past century; and the scientific evidence suggests that continued increases in greenhouse gas concentrations are likely to continue to have significant effects on the climate and other aspects of the earthôs ecology. This portends that except something drastic is done, the entire world will be consumed by the effect of climate change.

At the moment advanced countries of the world including United States of America, China, Japan, and Sweden with their awe-aching technology, seem to lack the capacity or indisposed to confront the tide of climate change. In Nigeria, lack of individual and collective commitment could be due to effects of climate change information deficit or the same lack of concern about information received about climate change. This lack of commitment to combat climate change is also linked to some economic considerations. Boycoff and Boycoff (2007, p.2) note that George Bushôs ties to carbon-based industry are commonly cited reasons for the USôs persistent unwillingness to follow reduction programmes aimed at fighting gruesome effects of climate change. This is borne out of a historically entrenched cultural preoccupation with free markets and economic growth along with the concomitant politics of interest groups which has caused an attitude of denial (Boykoff & Rajan, 2007).

Meanwhile, there is continuous use of the mass media campaigns globally to shape peopleôs attitude towards climate change. Sampei and Aoyagi-Usui (2008, p.203) posits that many public opinion surveys in developed countries have shown that television and daily newspapers are used as primary sources of information on climate change. In spite of this, the influence of the mass media on public has been shown to be quite short-lived because media coverage jumps from issue to issue, often from day to day (Driedger, 2007).

In Nigeria newspapers appear to be nonchalant in matters of creating awareness on climate change issues. Umejei (2010) asserts that the Nigerian medium seem to lag behind in awareness campaign on climate change and tend to leave it for individuals. Umejeiôs position is that most Nigerians are not informed on climate change and that the newspapers have the urgent duty to assume a prominent role in creating awareness on the issue. After all newspapersô reports have a relationship on the way people reason and behave. The newspapers help to close the information gap by enlightening people on environmental issues (Batta, Ashong & Bashir, 2013, p.57),

and assisting in simplifying the technical language of climate science for the people with basic or average education.

Statement of the Problem

Over the past years, climate change has emerged as one of the most important issues facing the global community. The obvious reasons for this are that concentrations of greenhouse gases have continued to increase remarkably with dire consequences on mankind and the eco-system. The consensus now exists that climate change represents a significant potential threat to the worldôs well-being. Understandably, the newspapers are key actors in the identification and interpretation of issues affecting society. In view of this the article seeks to determine how much the Nigerian newspapers have covered climate change with the ultimate aim of influencing personal, national, and international action to address climate change.

Objectives of the Study

1) To determine the extent to which Nigerian newspapers cover climate change.
2) To identify the level of prominence Nigeria newspapers give to climate change.
3) To determine the amount of space Nigeria newspapers devote to climate change.
4) To determine whether or not Nigeria newspaper reportage address causes, consequences and remedy of climate change sufficiently.

Research Questions

1) To what extent do Nigeria newspapers cover climate change?
2) What level of prominence do Nigeria newspapers give to climate change?
3) What depth or amount of space Nigeria newspapers devote to climate change?
4) Do Nigeria newspapers reportage address causes, consequences and remedy of climate change sufficiently?

Theoretical Framework

This study makes use of the Agenda-setting theory which places the media as stunningly successful in telling people what to think about (McQuail, 2006). The basic assumption of Agenda-setting theory is that the things that are reported in the media affect what people think the most important issues are in the world (Sambe, 2008, p.216; Dominick, 2011, p.450). Differently put, the theory proposes that the facts which people know about issues tend to be those which the mass media present to them. It, therefore, explains the correlation between the prominence and rate media cover a story and the extent to which people think that this story is important.

McCombs and Shaw are cited in Scheufele (2000) that in choosing and displaying news, editors, newsroom staff, and broadcasters play an important part in shaping reality. Readers learn not only about a given issue, but also how much importance to attach to that issue from the amount of information in a news story and its position. They add that in reflecting what people are saying about an issue, the mass media may

well determine the important issuesð that is, the media may set the ñagendaò of the issue.

Agenda-setting power of the media is illustrated by the ways in which people look up to the media to inform their everyday decisions on the global warming. Because of their power to reach a large audience in a small amount of time, the mass media are tools that are incredibly good at rallying the support of a variety of diverse people at once. This inclined Bennett and Entman (2001) conclude that the media are able to attract such a large audience because they simultaneously approach people as the diverse beings that they are.
The relevance of agenda-setting theory to this work rests on salience giving to climate change issues through framing or priming as well as the explanatory power of the media to explain and educate. By their agenda-setting role, the mass media bring to focus the problem of climate change issues, proffer possible solutions and ways which people and government can act.

Review of Related Literature
In developed countries, media coverage of climate change has been widely studied. According to Boykoff (2010) in the UK a peak in media coverage occurred in early 2007, and a subsequent peak was reached in late 2009, which was 50% higher. This portends that climate change is a reality, and science confirms that human activities are heavily implicated in this change. For instance, IPCC (2007) reports that the industrial activities have raised atmospheric carbon dioxide levels from 280 parts per million to 379 parts per million in the last 150 years. IPCC concludes, there is a better than 90 percent probability that human-produced greenhouse gases such as carbon dioxide, methane and nitrous oxide have caused much of the observed increase in Earth's temperatures over the past 50 years.

The combination of human and natural causes like changes in geothermal activity, forces external to the earth, like changes in solar activity (Dunlap & Michelson, 2002) leave humanity and the entire ecosystem vulnerable to negative consequences of climate change. Some changes have impacted on agriculture by affecting crops, soil, livestock, fisheries and pests. Citing Tribune.com.ng (2012), Batta, Ashong and Bashir, (2013, p.56) reports that the effects of climate change in Nigeria include flooding of many parts, erosion, unpredictable weather, continuous incursions of the desert into the northern parts of the country, decline of fishing stocks, disappearance of rare animals from the forests, etc.

On this note, newspapers which are known for their advocacy and agenda-setting role provide as a means to generate awareness on the choking effects of climate change. Mosser, (2007, p.43) affirms, the ñneed for effective communication, public outreach and education to increase support for policy, collective action and behavior change is ever present, and is perhaps most pressing in the context of anthropogenic climate changeé ò

But newspapers are constrained to some extent in providing the accurate and concise information on climate change. Journalists often either exclude climate change

dimensions of a news story because they consider it too complicated, or they present the issue in too narrow a context (Smith, 2005). This is because according to research by Dunwoody and Peters (1992:208), journalists are even less likely to have majored in science. The implication is that newspaperôreports on climate change lack depth as reporters including Nigerians often employ straight news reporting genre rather than investigative reporting. This is consistent with what Harbison, Mugara and Ambika (2006) found to be the case in analyses of media coverage in Honduras, Sri Lanka, Zambia and Jamaica.

To aggravate the problem, scientists generally employ a lexicon of caution and speak in a language of probability, which usually does not translate smoothly into the crisp, unequivocal commentary that is valued in the press. In other words, the very language scientists employ plays into scientific uncertainty as a salient theme in media coverage (Zehr, 2000). Therefore, scientific findings usually require translation into more colloquial terms in order for it to be comprehensible. This was the case in an Australian study which explored the external influence of media reports on Tropical Cyclone Justin on public understanding of climate change. The author traced mis-translations, through complex and dynamic interactions between science and the public, via mass media (Henderson-Sellers, 1998).

On attitude and perception, a number of studies have revealed that the public does not consider global warming to be an important domestic issue. This could be due to comparatively low mass-media coverage of climate change particularly in developing countries like Nigeria. Lorenzoni and Pidgeon (2006, p.88) observe: ñA risk communication strategy based on providing scientifically sound information aloneé will not be sufficient in itself. Perceptions of climate change are more complex, defined by varied conceptualizations of agency, responsibility and trust. Successful action is only likely to take place if individuals feel they can and should make a difference, and if it is firmly based upon the trust placed in government and institutional capabilities for adequately managing risks and delivering the means to achieve changeò. This brings to focus the issue of trust on the powers that be, and this is the leverage the media need to effectively function. Newspapers, in their own right have the potential to gather that support currently surrounding global climate change from the general public and turn that support into something tremendously politically and socially powerful (West, 2005).

Method

This study adopts descriptive content analysis that focuses on a specific message pool that Nigeria newspapersô outlets generated over a 5-month period. Choice to focus on print media for the duration of this study was informed by the fact that focusing on the print media is one way to cut the huge amount of mass media coverage down to an appropriate size for the scope of this work while still allowing the researchers the opportunity to comprehensively study one segment of the mass media.

In this content analysis, the researchers examined newspaper articles about climate change that appeared between January and May, 2012. The researchers examined daily print media because research has shown that people get most of their news from

these mass-media sources (Corbett, 2006). Within daily print media, four Nigerian newspapers were systematically selected ï The Punch, The Sun, Thisday, and Daily Trust. Their selection was based on the fact that they are among the most influential newspapers in the country. Beyond directly reaching their readers, they also influence news coverage of smaller newspapers across the country, because stories from these newspapers are often printed verbatim in local newspapers.

These newspaper articles were accessed through visit to the libraries. The selection procedure produced 61 news articles from the 68 editions systematically selected at the interval of the 9th edition. Of these articles, approximately 14 (23%) appeared in The Punch, 12 (20%) in the The Sun, 10 (16%) in Thisday, and 25 (41%) inDaily Trust**.** The content analysis focused on the prominence, story type, Depth, causes and effects as well as preventive measures. Data was then analysed using the Statistical Package for Social Sciences.

Data Presentation and Analysis

Table 1: Number of climate change news items published

Papers	News story	Features	Opinion	Editorial	Total
Daily Trust	21 (42%)	3 (43%)	0 (0%)	1 (33%)	25 (41%)
The Sun	8 (16%)	2 (29%)	0 (0%)	2 (67%)	12 (20%)
The Punch	12 (24%)	1 (14)	1(100%)	0 (0%)	14 (23%)
Thisday	9 (18%)	1 (14)	0 (0%)	0 (0%)	10 (16%)
Total	50 (81.9%)	7 (11.4%)	1 (1.6%)	3 (4.9%)	61 (100%)

Table one above shows that out of the 61 items identified 50 representing 82 percent were news items. Out of the 50, Daily Trust recorded 21 (42%); The Sun had 8 (16%) while 12 (24%) and 9 (18%) were from Punch and Thisday respectively. In the case of features, a total of 7 representing 11 percent items were recorded, 3 (43%) from Daily Trust, 2 (29%) from The Sun and 1 (14%) each from The Punch and Thisday. On the other hand, only the Punch had one representing 2 percent of the items on opinion. Editorial featured a total of 3 representing 5 percent items, 1 (33%) by Daily Trust and 2 (67%) by The Sun.

Table 2: Level of prominence

Papers	Front Page	Inside Pages	Back Page	Total
Daily Trust	1 (4%)	24 (41%)	0 (0%)	25 (42%)
The Sun	0 (0%)	10 (17%)	0 (0%)	10 (17%)
Punch	0 (0%)	14 (24%)	0 (0%)	14 (23%)
Thisday	0 (0%)	11 (18%)	0 (0%)	11 (18%)
Total	1 (7%)	59 (93%)	0 (0%)	60 (100)

As depicted on Table two above, 60 items was the total recorded in terms of prominence accorded the items. Accordingly, only one representing 7 percent item had a place on the front page of Daily Trust. As many as 59 representing 93 percent stories were identified in the inside pages with Daily Trust topping the list with 24 (41%) items followed by The Punch with 14 (24%). This day and The Sun had 11 (18%) and 10 (17%) respectively.

Table 3: Depth of reports or amount of space (in paragraphs) devoted to stories

Papers	1-5	6-10	11-15	16-20	21 and above	Total
Daily Trust	6 (35%)	13 (45%)	2 (25%)	0 (0%)	3 (50%)	24 (38%)
The Sun	2 (12%)	4 (14%)	3 (38%)	2 (67%)	1 (17%)	12 (19%)
The Punch	5 (29%)	6 (21%)	1 (12%)	1 (33%)	2 (33%)	15 (24%)
Thisday	4 (24%)	6 (21%)	2 (25%)	0 (0%)	0 (0%)	12 (19%)
Total	17 (27%)	29 (46%)	8 (12%)	3 (5%)	6 (10%)	63 (100%)

As shown on Table 3 above, total depth used was 63 paragraphs for all the newspapers. Daily Trust which devoted highest amount of space with 24 (38%) paragraphs has 6 (35%) stories for paragraphs one to five, 13 (45%) stories for paragraphs six to ten, 2 (25%) for eleven to fifteen, non for 16 to twenty and 3 (50%) for 21 and above. The Punch which is next with a total of 15 (24%) paragraphs has 5 (29%) and 6 (21%) stories for paragraphs one to five and six to ten respectively, 1 (12%) each for paragraphs eleven to ten and sixteen to twenty while 2 (33%) stories were captured in twenty-one paragraphs and above. The Sun and This day had a total of 12 (19%) each. However, This dayôs 4 (24%), 6 (21%) and 2 (25%) stories were captured in paragraphs one to five, six to ten and eleven to fifteen respectively. In the case of The Sun, 2 (12%) stories each were captured between paragraphs one and five and sixteen and twenty, 4 (14%) between paragraphs six and ten. Three (38%) stories were between eleven and fifteen and the remaining 1 (17%) between twenty-one and above.

Table 4: Causes of reported stories

Papers	Industry	Deforestation	Bush Burning	Others	Total
Daily Trust	0 (0%)	0 (0%)	0 (0%)	1 (20%)	1 (9%)
The Sun	0 (0%)	0 (0%)	0 (0%)	1 (20%)	1 (9%)
Punch	1 (50%)	2 (100%)	0 (0%)	0 (0%)	3 (27%)
Thisday	1 (50%)	0 (0%)	2 (100%)	3 (60%)	6 (55%)
Total	2 (18.1%)	2 (18.1%)	2 (18.1%)	5 (45.4%)	11 (100%)

On causes of climate change, the table above illustrates that out of the eleven causes reported; only The Punch and Thisday had 1 (50%) case each on industrial activities. Similarly, both The Sun and Daily Trust had 1 (20%) item each attributed to other factors while Thisday had 3 (60%) items on other factors. Again only Thisday had 2 items on bush burning just as only The Punch had 2 items related to deforestation as the causative factor of climate change.

Table 5: Reported Effects of climate change

Paper	Rising Temp.	Drought & Flood	Loss of Life & prop	Refugees	Pollution/ Erosion	Poor Harvest	Others	Total
Daily Trust	1 (50%)	6 (60%)	3 (23.1%)	1 (50%)	2 (33.3%)	1 (33.3%)	3 (37.5%)	17 (38.6%)
The Sun	0 (0%)	3 (30%)	3 (23.1%)	1 (50%)	1 (16.7%)	0 (0%)	1 (12.5%)	9 (20.4)%
Punch	0 (0%)	0 (0%)	4 (30.7%)	0 (0%)	1 (16.7%)	1 (33.3%)	1 (12.5%)	7 (15.9%)
Thisday	1 (50%)	1 (10%)	3 (23.1%)	0 (0%)	2 (33.3%)	1 (33.3%)	3 (37.5%)	11 (25%)
Total	2 (4.5%)	10 (22.7%)	13 (29.5%)	2 (4.5%)	6 (13.6%)	3 (6.8%)	8 (18.1%)	44 (100%)

Table five above shows that a total of 44 items were identified concerning the effects of climate change. Out of this number, Daily Trust recorded the highest number of 17 (38.6%) followed by This day with 11 (25%). Both The Sun and The Punch had 9 (20.4%) and 7 (15.9%) items respectively.

Table 6: Preventive measures

Papers	Federal	State	Local	Non-Govtal	Total
Daily Trust	0 (0%)	2 (40%)	0 (0%)	1 (50%)	3 (23.1%)
The Sun	1 (17%)	1 (20%)	0 (0%)	0 (0%)	2 (15.3)
The Punch	3 (50%)	2 (40%)	0 (0%)	0 (0%)	5 (38.4%)
Thisday	2 (33%)	0 (0%)	0 (0%)	1 (50%)	3 (23.1%)
Total	6 (46.1%)	5 (38.4%)	0 (0%)	2 (15.3%)	13 (100%)

In the case of different levels of governments involved in putting preventive and corrective measures in place, table six above clearly shows that a total of 13 items were identified in this regard. The Punch and The Sun had 5 (38.4%) 2 (15.3%) and items respectively while Daily Trust and This day had 3 (23.1%) each. While The Punch had 3 (50%) items on measures by federal government to check global warming, This day had 2 (33%), The Sun 1 (17%) and Daily Trust had none on Federal government. In the case of State government, 2 (40%) items each were from Daily Trust and The Punch, 1 (20%) from The Sun while Thisday had none. No item was recorded on local government but in the case of non-governmental organisations, only Daily Trust and This day had one item each.

Discussion of Findings

On the basis of data collected, Table 1 features total number of items identified. News story has the highest number of items 82%, out of which 42% are from Daily Trust which also ranks highest 41% in news story, feature articles and editorial items identified. It is instructive to note that much prominence is not given to the news items. Despite the fact that 98 percent of the items are inside stories for all the four newspapers, only one front-page item is identified in the Daily Trust which incidentally features the highest number of items amounting to 42 percent followed

by The Punch with 23 percent items. Next is This day with 18% items and lastly The Sun which has 17 percent items. This suggests that less prominence is given to issues of climate change or global warming in Nigeria newspapers. Similarly, only a total of 63 paragraphs were used to write the stories with Daily Trust which devotes 38 percent paragraphs remotely followed by The Punch with 24 percent while The Sun and This day has 19% each. Data from Table 3 reveals that paragraphs 6-10 has the highest number of stories 29 (46%), followed by paragraphs 1-5 with 17 (27%) stories. The implication here is that apart from absence of prominence accorded climate change, there is gross unequal distribution in the depth stories are written in the newspapers.

Whereas This day features 55% items which is the highest number of items on causes of climate change out of the total of eleven items identified, only the Punch has 18 percent on deforestation. This portends that less is captured by the newspapers as regard the causes of climate change. Nevertheless, a primary causative factor identified is human activities (deforestation, bush burning and industrial activities that lead to emission of gases).

Table 5 is explicit on the newspapersô reports on consequences of climate change within the period under consideration. As many as 44 items were identified. Lost of lives and property has the highest percentage of thirty per cent with The Punch topping the list with 30.7 percent. Forty-six percent of the items are on pollution/erosion while poor harvest has inconsequential 19 percent items and refugees and rising temperatures with yet a negligible number of 5 percent of the items each.

Not losing sight of the preventive and corrective measures by governments at every level, a total of 13 items are identified. Out of the number, the federal government is linked with 46 percent of the items closely followed by State governments with 38 percent, while non-governmental organisations have 15 percent of the items. Some of the preventive and corrective measures are identified as sensitisation workshops on climate change, cut in carbon and implementation of safe emission level policy, and construction of drainages.

In nut shell, Nigeria newspapers devote little attention to climate change issues. Despite their demonstrated interest which calls for commitment, it becomes clear from the analysis that their efforts are grossly inadequate. In comparative terms, however, only Daily Trust seems to be greatly disposed to coverage of climate change with 41 percent. This is compounded by lack of political will by government at all levels and other stake holders to religiously implement viable policy options with a view to mitigating climate change effects on humanity and the ecosystem.

Conclusion

The issue of climate change or global warming is not new. Governments and non-governmental organisations across the world have been demonstrating concern about the dire consequences unleashed by climate change on the global community. In exercise of its agenda-setting and social responsibility mandate, newspapers

illuminate on the origin, causes, consequences, policies and programmes at different levels to address the problem. These combined efforts seemingly fall short of expectation. Despite the fact that stakeholders are conscious of facts about climate change, the will to tackle it may be lacking. Poor disposition to climate change related issues by mass media can be seen in the quality and quantity of reports on the subject matter. Findings of this study corroborate this to a large extent as paucity of vibrant information about global warming or climate change characterise contents analysed in the four Nigerian Newspapers.

Recommendations

More prominence and depth should be devoted to news stories, opinion, analysis, pictures and editorials on climate change. By so doing, the mass media would be living up to their agenda- setting role. If sustained, society will become more knowledgeable about the causes and consequences of climate change and adjust to it. To achieve these journalists covering climate change should study extensively on climate change issues.

Newspapers should continually and clearly portray climate change as a national issue by highlighting national-scale illustrations of global climate change as well as what individual and collective solutions need to be adopted on the national level in order to cushion some of the effects of global climate change.

Newspapers reports should focus on encouraging farmers to change their farming practices such as bush burning and deforestation. A quick way of doing this is sustained education, information and training necessary to adapt to climate change.

A functional statutory body to be named Nigerian Climate Change Commission with branches at state and local levels should be established to coordinate policy and programmes on climate change mitigation and adaptation.

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Brief Biography

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TV Spectrum Usage profile and White Space for Nigeria

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ABSTRACT
The radio frequency (RF) spectrum is a natural resource that is limited and hence needs to be efficiently managed. Spectrum under-utilization is found to be one of the factors responsible for the scarcity of radio spectrum. Dynamic spectrum access (DSA) scheme is a scheme that is employed as a tool to allow for sharing and management of unused spectrum also called "white spaces", between the licensed user called "Primary user" and unlicensed user called "Secondary user" without causing harmful electromagnetic interference to the licensed user. To achieve this, accurate spectrum usage information and the activity of the primary users (TV broadcast systems) is essential. This paper presents detailed current spectrum usage profile for NTA Ilorin and Kwara Television (KWTV) which transmit on channels 9 and 35 respectively. Measurements were taken from three different locations within 24 hours for a period of one week, the data were analyzed. The results of the study were used to extrapolate for other states. Our findings indicate that a large percentage of the TV spectrum is under-utilized with upper bound, lower bound and average occupancy values of 16.4%, 0% and 3.46 % respectively. Other metrics such as the spectrum utilization efficiency (SUE), available TV white space (ATVWS) and available data rate per inhabitant were investigated. It was found that among the 36 states of Nigeria, Lagos and Adamawa had the least amount of TVWS with 328 MHz and 360 MHz respectively, while, Jigawa, Benue and Zamfara had 100 % TVWS in the UHF bands. In terms of SUE, an average of 2.25 (bps/Hz) was obtained at 30 km^2 coverage radius for KWTV, 0.75 (bps/Hz) at 40 km^2 and 0.4 (bps/Hz) at 1841.2 km^2 which accounts for the whole Kwara state. The aggregated data rate capacity per inhabitant for Kano state with 454 population/km^2 and total available data rate of 768 Mbps, each user within the state could have about 1.74 Mbps. This increase to 16 Mbps per user for Yobe state with 50user/Km^2. Therefore, it was found that,the available data rate (Mbps) per user varies as a function of amount of TV white space and the population density (user/km^2) in the state.

Keywords: Dynamic Spectrum Access (DSA), Primary User (PU), Secondary User (SU), TV White Space (TVWS), Spectrum Utilization Efficiency (SUE).

Introduction

In recent time, the demand for wireless services has increased far beyond earlier predictions and the limited availability, of useable radio frequency, calls for more

efficient radio spectrum utilization. Wireless systems have become inevitable in our daily lives; it has been evolving rapidly, bringing about an emergence of a wide range of new wireless services and applications. There are over six (6) billion mobile subscribers and more than 1.2 billion mobile web users across the world with an expectation of an increase in the near future (Global, 2012).

The TV white space can be temporal (i.e. times/periods the primary service is off), or spatial (i.e. where TV signals cannot be successfully received), technically, when the reception level is less than -116 dBm for digital TV (DTV) and -94 dBm for analogue TV. The temporal white spaces have not been subjected to extensive research because the idea is that the DTV (digital television) will be operating for 24 hours daily (Faruk, Ayeni, & Adediran, 2013). This is not the case in Nigeria as so many TV stations do not operate in 24 hours, also, space division multiple access technique could be employed to reuse the frequencies of the primary users once the activities (transmission) of the secondary users will not cause severe interference to primary receivers. Several applications have been proposed to be deployed in TVWS as reported in (COGEU, 2012) these include UMTS and LTE extension, Wi-Fi-2, Wimax and public safety and emergency networks.

The current spectrum management policy focuses on static allocation which protects the primary users who may not necessarily maximize the usage of the spectrum. Despite the limitation of this resource, the present utilization of the spectrum is inefficient with low average occupancy values of less than 10 percent as reported in (McHenry, Tenhula, McCloskey, Roberson, & Hood, 2006). Common findings, among spectrum measurements studies conducted in so many countries like New Zealand, USA (McHenry et al., 2006)(Chiang, Rowe, & Sowerby, 2007)(August & Mchenry, 2005**)**, Germany (Wellens, Baynast, & Mahonen, 2008), and in Singapore (Federal Communications Commission, 2008) show that spectrum is underutilized. Regulatory bodies, such as FCC in the United States (Federal Communications Commission, 2008), Ofcom in the UK (Ofcom, 2009), NCC in Nigeria (NCC, 2007) and Japan (MIC, 2010) have shown great efforts towards the achievement of optimal spectrum utilization. For this reasons, USA in (FCC, 2003) and UK in (Ofcom, 2009) have completed a general review of alternative spectrum management models for operating conditions of white space devices (secondary users). Japanese government took a similar step as reported in (MIC, 2010). The amount of white space that would be free for the secondary users in accordance with the regulatory guidance on interference has been under extensive studies. It has been acquired in several places across the globe, for the United States (Harrison, Mishra, & Sahai, 2010) and for central Europe in (van de Beek, Riihijarvi, Achtzehn, Mahonen, & Beek, 2011). Very few studies exist outside the United States, such as (van de Beek et al., 2011), which attempts to quantify TVWS capacity in the United Kingdom in a limited area (Nekovee, 2009), for southern Europe, and for Korea (Kang, K.M., Park. J.C., Chio, S.I., & Jeong, 2012). U.S and related studies cannot be directly extrapolated to Nigeria case due to differences in deployment scenario and activities of the primary users.

To maximize the utility of the radio spectrum, knowledge of its current usage profile is necessary. In this paper, detailed current spectrum usage profile based on the **ON** (Transmitting) and OFF (Not transmitting) periods for NTA Ilorin and Kwara Television (KWTV) were conducted. Measurements were taken from three different locations within 24 hours for a period of one week, the data were analyzed. The results of the study were used to extrapolate available TVWS for other states.

This paper is organized as follows: Section 2 focuses on the related literature to the study. Section 3 describes the measurement campaign and procedure and Section 4 presents the data analysis and processing as well as the results of our findings. While section 5 provides the conclusion and suggests the future works.

Related Work

Large amount of prior research work have been done on radio spectrum utilization and this is becoming more crucial as new wireless technologies and services are demanding more spectral resources, which are scarce in nature. One promising technology is the cognitive radio (CR), an idea coined by Joseph Mitola in 1999 (Mitola, J. and Maguire, 1999). Since then, several research works have been carried out on efficient spectrum utilization. These ranges from creating a realistic measure of opening up the TV white space to improve not only spectrum utilization but also to create an opportunity for revenue generation.

Many countries in the world are focusing on how to develop a comprehensive policy that will allow the access of the unused TV spectrum for the secondary users. For the fact that realization and deployment of the proposed cognitive technology in the TV white space has not been met, this call for alternative ways where the TV white space could actually be predicted and subsequently used by the secondary users. For this to be done, a proper understanding and the activity of the primary users is required. There is a need to have vast information about the spectrum usage pattern of different TV services and this requires adequate spectrum usage occupancy measurements.

Several spectrum occupancy measurements have been conducted around the world, in the United States, Europe and Asia. (Keith E. Nolan, 2007), performs spectrum-usage measurements on 700 MHz band from Denver to Washington DC in the United States, with concentration on the 698 MHz ï 806 MHz band and it presented how this available spectrum is being used for offline prototype wireless communications research by Centre for Telecommunications Value-Chain Research (CTVR). In (McHenry et al., 2006), spectrum occupancy measurements and analysis in the city of Chicago was conducted, and found out that the over-all spectrum usage for the city was about 17.4%. This shows that there is significant spectrum available, enough to allow a dynamic spectrum sharing (DSS). Also in (Nekovee, 2009), TV white space (TVWS) was quantified based on geolocation data base, they presented a generic methodology for determining the actual capacity of white spaces using a geolocation-based approach, that is, dynamic assignment of radio resources to TV white space (TVWS) networks according to their geographical locations. However, their work estimated for the whole of Europe with an emphasis on the countries that have adopted DVB-T. Similarly, in the work of (Erpek, T., Lofquist, M., and Patton,

2007), measurements were made in bands 30 MHz to 3000 MHz range. The measurements were made during the week (Tuesday through Thursday) which was believed to be a high usage period. They observed that the average spectrum usage during the measurement period was 1.7%. The occupancyvalue varied from less than 1% to 24.65% within the range of 470 MHz ï 512 MHz. (Sixing Yin, Dawei Chen, Qian Zhang, 2009) carried out large-scale spectrum measurement study in Guangdong province of China. The work presented detailed spectrum measurement study, with data collected in the 20 MHz to 3 GHz spectrum band at four different locations concurrently. In the work, channel vacancy and channel utilization as well as the spectral and spatial correlation was examined. They observed that channel vacancy-duration follow an exponential-like distribution, but are not independently distributed over time. Some spectrum occupancy measurement campaigns have been conducted in the United States, Europe and Asia as reported in (McHenry et al., 2006)(Nekovee, 2009)(Kang, K.M., Park. J.C., Chio, S.I., and Jeong, 2012), the majority of these studies can be categorized as single band monitoring, time - frequency analysis, and indoor vs. outdoor measurements.

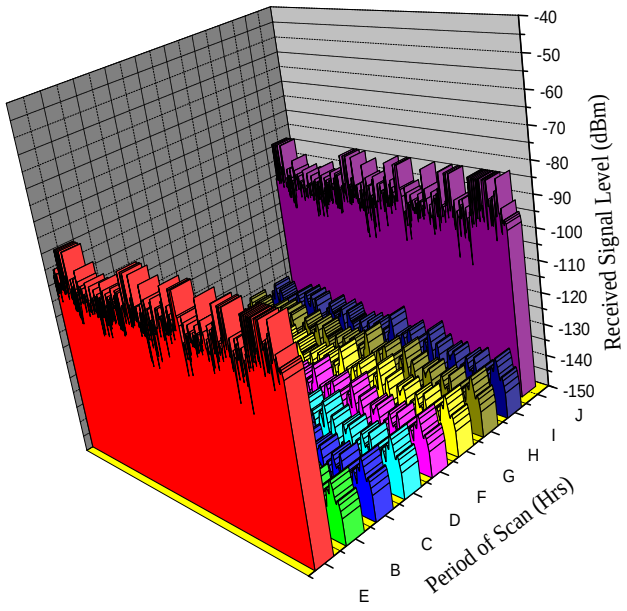
Measurement Program

An Agilent N9342C handheld spectrum analyzer with frequency range from 100Hz to 7 GHz connected to a laptop PC which was used to store the result of the data. With the help of an inbuilt preamplifier and global positioning system (GPS) receiver, current GPS location, time information as well as spectrum traces were captured at an average of every 5 seconds. A diamond RH799high sensitive Omni directional antenna attached to the receiver has a height of 1.5m and gain of 2.51 dBi in order to increase the systemôs sensitivity. The TV stationôs transmitter of Kwara TV in Ilorin was used. Kwara TV transmits on channel 35 (UHF) at 583.25 MHz. During transmission, field strength measurement was continuously taken and stored in an external storage device for subsequent analysis. Measurement was also taken across all frequency channels on UHF i.e. Channels 21 to 61 and corresponding power level (dBm) for the periods of scan were taken.

Data Analysis and Processing

The spectrum occupancy is quantified as the amount of spectrum detected above the received power threshold. **Kwara TV (Channel 35)** was considered first and readings were taken. Various line and scatter graphs were plotted including 3D wall representation. Fig 1 shows a 3D plot of received signal level (dBm) versus period of scans (Hours). The channel was scanned consecutively for 24 hours between the hours of 21:27 to 21:26 each day for 7 days (10^{th} November 2012-17^{th} November 2012). It was observed that between the hours of 5:00 pm to 12:00 am during weekdays, KWARA TVôs transmitter is ON, this can be observed with the received signal level of above -94 dBm threshold as prescribed by FCC recommendation (FCC, 2008). This indicates that the frequency channel is busy as at the time and hence, the bandwidth is occupied.However, between the hours of 12:00 am to 5:00 pm indicated as B,C,D,E,F,G,H and I respectively, same day, there was no

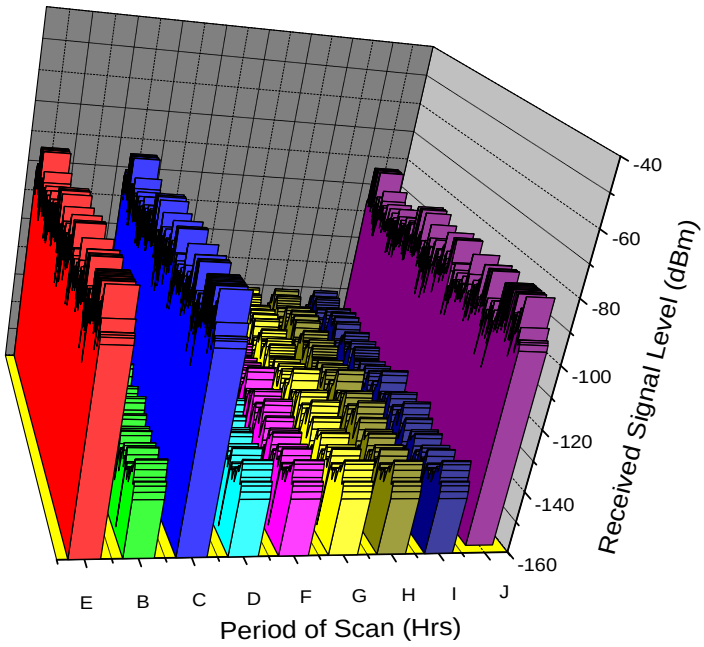
transmission from the primary user (KWTV) and hence the frequency channel as at this time is idle (OFF) and white space is available for secondary access
It is deduced that only 29.2% of the allocated 8 MHz of spectrum is occupied by the primary user representing 70.8% white space within 24 hours duration of this measurement.



Key
E: 5:00 PM-12:00 AM Hours
B: 12:00 AM-4:00 AM
C: 4:00 AM -8:00 AM
D: 8:00 AM -10:00 AM
F: 10:00 AM-12:00 Noon
G: 12:00 Noon-2:00 PM
H: 2:00 PM-4:00 PM
I: 4:00 PM-5:00 PM
J: 5:00 PM-12:00 AM

Fig 1: Activity of KWTV 24 hours period for week days

During the weekends, our findings indicate that the spectrum usage differs to that of weekdays. The primary user switches on between the hours of 7:00 am to 11:00 am and 5:00 pm to 12:00 am as shown in Fig 2. There is no transmission between the hours of 11:00 am to 5:00 pm as well as 12:00 am to 7:00 am as the received signal falls below the sensitivity level. The percentage of used spectrum at the weekend is about 45.83% and about 54.17% of whitespace is available. Similarly, readings were taken for **NTA (Channel 9)** using the same duration as above. The results show that the transmitter is usually switched ON between the periods of 06:00 am to 10:00 am and 16:00 pm to 23:00 pm daily as shown in Fig 3. This indicates that there is always an idle period (whitespace) between the hours of 23:00 pm to 06:00 am and 10:00 am to 16:00 pm. It is observed that the spectrum is only used for about 11 hours daily while about 13 hours for white space. It was found that the distribution and availability of the white space remain constant all the week.



Key
E: 5:00 PM-12:00 AM Hour
B: 12:00 AM-7:00 AM
C: 7:00 AM -11:00 AM
D: 11:00 AM -12:00 Noon
F: 12:00 Noon -2:00 PM
G: 2:00 PM-3:00 PM
H: 3:00 PM -4:00 PM
I: 4:00 PM-5:00 PM
J: 5:00 PM-12:00 AM

Fig 3: Activity of KWTV 24 hours period for weekend

Spectrum Utilization Efficiency

Spectrum utilization efficiency (SUE) is the ratio of information transferred over a distance to the amount of spectrum utilized (ITU-R, 2006), it is defined by the relation:
SUE = M/U
Where: U = B * S * T

M is the useful effect obtained with the system in question i.e. amount of information transferred
U is the spectrum utilization factor for that system
B is the spectrum bandwidth in MHz
S is the geometric space in km^2 and
T is the time denied other potential users

The useful effect (M) of a television broadcast can be determined by the number of TV receivers (location) able to receive the broadcast. This would vary with the population density of a particular area at a point in time. In this work, the useful effect (M) is determined by using the population density and distance of our location from the transmitter.Fig 4 shows a graph of SUE against the time denied other potential users (T).

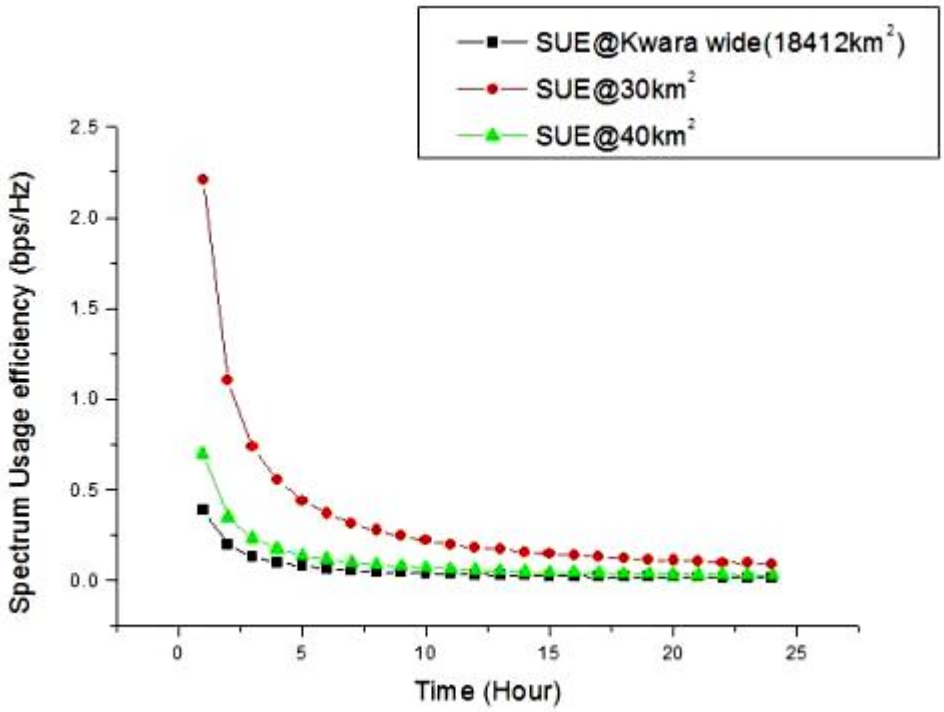


Fig 3: Spectrum Utilization Efficiency for KWTV at different Location from the transmitter

Figure 3 shows that if the value of the useful effect is high, there is expectation of high spectrum utilization efficiency (SUE).The spectrum utilization efficiency (bps/Hz) against time denied potential secondary users, T (Hour) for three different values of useful effect (M) is presented. Since the useful effect (M) is determined by the number of viewers able to receive the broadcast, it shows that there is spectrum utilization efficiency of 2.25 (bps/Hz) for the viewers around 30 km^2 location. This is because the signal is strongly received at this location and hence secondary users are denied access to the spectrum at this location.At about 40 km^2 locations, the spectrum utilization efficiency dropped due to the distance away from the primary userôs transmitter and the useful effect (M) was found to be low i.e. 0.75 (bps/Hz). Also the spectrum utilization efficiency for the whole state at 1841.2 km^2 is around 0.4 (bps/Hz) due to lower useful effect (M) achieved at around the extreme part of the border area of the state. Hence, the SUE follows exponential curve with time which varies as a function of distance.

White Space Capacity Available Per State in Nigeria

An estimation of actual whitespace capacity plays an important role in determining the commercial value of TV whitespace exploitation. In this section, we carried out an estimation of TV whitespace availability on the UHF bandwidth between 470 ï 865 MHz i.e. channels 21-70, although the UHF band ranges between 300 MHz-1GHz, but the focus of this research work is on the 470-865MHz UHF bands in Nigeria. The major channels considered being channels 21- 69 due to the fact that only 2 MHz slice of channel 70 is available for now and it is the only license free TV spectrum.

For each of the 49 channels considered in the 36 states of Nigeria, we compute the number of occupied channel(s) (NCO) per state, number of available channels (NCA) and the number of vacant channels (NVC). The results are presented in Table 2. Note we assumed the worst case scenario that all the TV channels for each of the states operate on 24 hours. The table also presents the percentage TV whitespaces (TVWS), available bandwidth (MHz) as well as available data rate for all the UHF TV stations in Nigeria.

Table 2: Table of TVWS, Available Bandwidth (MHz) and available data rate per state in Nigeria

STATES	NCA	NCO	NCV	% SPECTRUM USAGE	% TVWS AVAILABLE	BANDWIDTH AVAILABLE (MHz)	AVAILABLE DATARATE (Mbps)
ABIA(AB)	49	2(CH.47, 21)	47	4.1%	95.9%	376	752
ADAMAWA(AD)	49	4(CH. 26,28,30 and 32)	45	8.2%	91.8%	360	720
AKWA IBOM(AK)	49	1 (CH 45)	48	2.5%	97.5%	384	768
ANAMBRA (AN)	49	1(CH. 27)	48	2.5%	97.5%	384	768
BAUCHI(BA)	49	1 (CH.)	48	2.5%	97.5%	384	768
BAYELSA(BY)	49	1 (CH 28)	48	2.5%	97.5%	384	768
BENUE(BE)	49		49	0%	100%	392	784
BORNO(BO)	49	1(CH 38)	48	2.5%	97.5%	384	768
CROSS RIVER(CR)	49	3 (CH 54,27,54)	46	6.2%	93.8%	368	736
DELTA(DE)	49	1(CH 41)	48	2.5%	97.5%	384	768
EBONYI(EB)	49	1(CH 43)	48	2.5%	97.5%	384	768
EDO(ED)	49	2(CH 45,22)	47	4.1%	95.9%	376	752
EKITI(EK)	49	1(CH 41)	48	2.5%	97.5%	384	768
ENUGU(EN)	49	1(CH 50)	48	2.5%	97.5%	384	768
GOMBE(GO)	49	1(CH 25)	48	2.5%	97.5%	384	768
IMO(IM)	49	1(CH 59)	48	2.5%	97.5%	384	768
JIGAWA(JI)	49		49	0%	100%	392	784
KADUNA(KA)	49	2(CH 54,38)	47	4.1%	95.9%	376	752
KANO(KN)	49	1(CH 67)	48	2.5%	97.5%	384	768
KATSINA(KT)	49	2(CH 22,39)	47	4.1%	95.9%	376	752
KEBBI(KE)	49	2(CH 25,37)	47	4.1%	95.9%	376	752
KOGI(KO)	49	1(CH 37)	48	2.5%	97.5%	384	768

KWARA(KW)	49	2(CH 35, 41)	47	4.1%	95.9%	376	752
LAGOS(LA)	49	8(CH 21,23,27,35,39,41,43,45,)	41	16.4%	83.6%	328	656
NASARAWA(NA)	49	1 (CH 40)	48	2.5%	97.5%	384	768
NIGER(NI)	49	1(CH 21)	48	2.5%	97.5%	384	768
OGUN(OG)	49	3(CH 22,25,63)	46	6.2%	93.8%	368	736
ONDO(ON)	49	1(CH 63)	48	2.5%	97.5%	384	768
OSUN(OS)	49	3(CH 22,39,49)	46	6.2%	93.8%	368	736
OYO(OY)	49	2(CH 28,37)	47	4.1%	95.9%	376	752
PLATEAU(PL)	49	2(CH 29,53,)	47	4.1%	95.9%	376	752
RIVERS(RI)	49		49	0%	100%	392	784
SOKOTO(SO)	49	1(CH 21)	48	2.5%	97.5%	384	768
TARABA(TA)	49	1(CH 22)	48	2.5%	97.5%	384	768
YOBE(YO)	49	1(CH 28)	48	2.5%	97.5%	384	768
ZAMFARA(ZA)	49		49	0%	100%	392	784

It is observed in Table 2 that the TV spectrum is under-utilized in many states while in some states, it not even utilized at all. Lagos and Adamawa recorded the highest usage rate with about 16.4% and 8.2% spectrum occupancy respectively. The average occupancy of 3.43 % is recorded. This is comparable with occupancy value of less than 10 % presented in (McHenry et al., 2006) for United States.

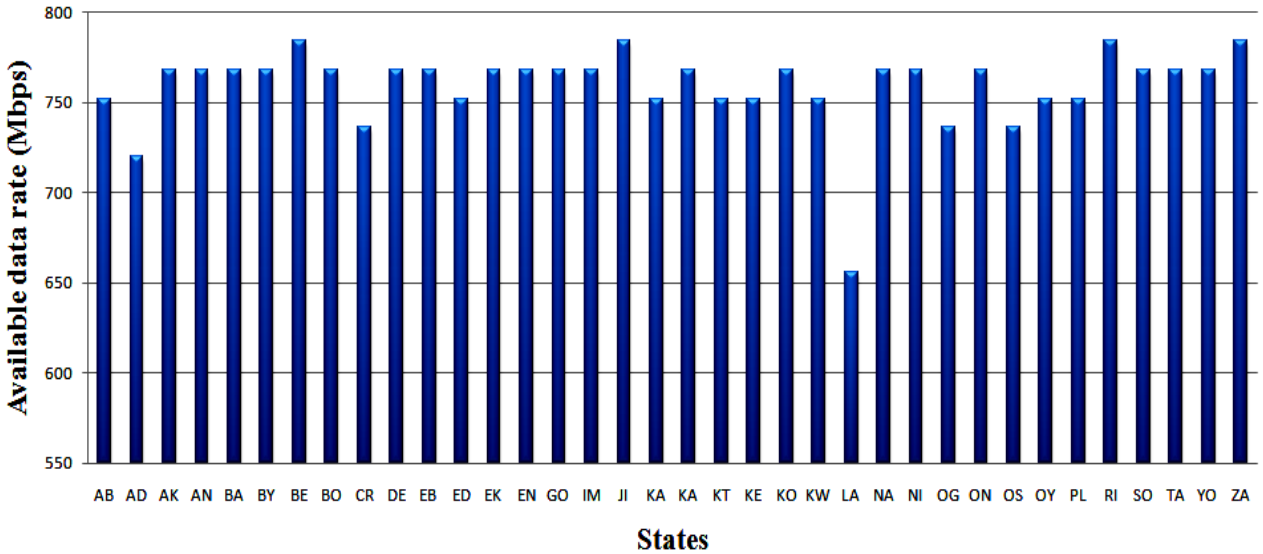


Fig 4: Statistical distribution of available data rate (Mbps) per States in Nigeria

Figure 4 shows the statistical distribution of the available data rate for each of the states in Nigeria, Benue(BE), Jigawa(JI), Rivers(RI) and Zamfara(ZA) states with the highest availability of data rates of 784Mbps. Lagos(LA) have the lowest data rate of

656 Mbps, which indicate that despite the high usage rate, there are still high value of available data rate that can still be used by secondary user.
Taking all the data rates per state together for the 36 states, an approximated average data rate capability for Nigeria is calculated and obtained as 759.11 Mbps.
This value can be translated to per-capital wireless capacity as in (Ellingson, 2005), with the assumption that a typical average spectral efficiency of 2 b/s/Hz as feasible in the Long Term Evolution Advanced (LTE-Advanced) (Iwamura, M., 2010), it can be deduced that aggregated wireless capacity of 1518.22 Mbps is available per square kilometer (km^2) for Nigeria. This means very high data rate availability as compared to other countries in Europe and Americas.
Fig 5 shows the aggregated data rate capacity per inhabitant as a function of population density. It can be observed that, Kano state with population density of 454 per km^2 (Macos, 2013) and total available data rate for the state is 768 Mbps, each user within the state could have about 1.74 Mbps. This increases to 16 Mbps per user for Yobe state with 50 user/Km^2. Therefore, it can be concluded that,the available data rate (Mbps) per user varies as a function of amount of TV white space and the population density (user/Km^2).

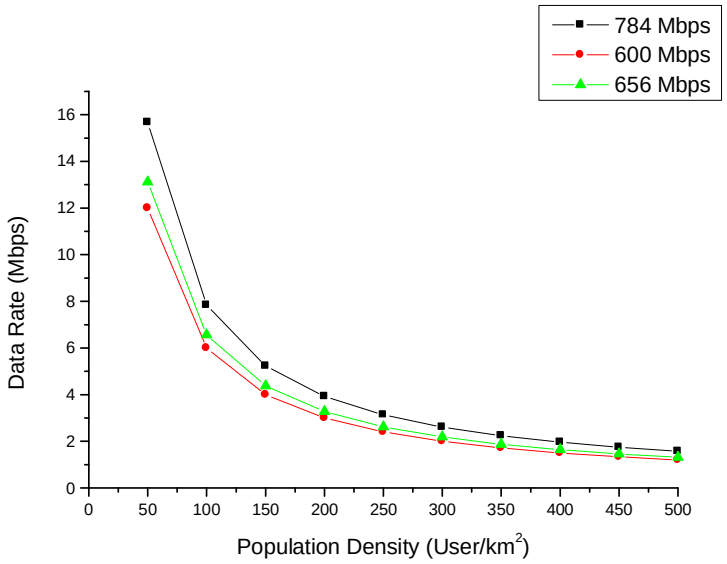


Figure 5: Graph of Data rate (Mbps) against population density

CONCLUSION AND RECOMMENDATIONS

After processing and consideration of the body of data collected, our analysis shows that there is significant amount of TV white space (TVWS) available across all the states and regions considered. The bar graph in figure 5 shows that some states like Lagos(LA) and Adamawa(AD) records high rate of spectrum usage and occupancy and despite this rate, there are still high percentage of white space available i.e., 83.6% and 91.8% respectively. Despite this large quantity of available TVWS, some states have higher amount of TVWS as much as 100%.

We also unveiled significant amount of data rate capacity that can be used through the TVWS, although there are still many possible applications of this valuable resources in order to clear the air on the issue of scarcity of the spectrum. Regulating bodies should also establish platforms, both legal and technical, for the exploitation of this available TVWS and also create necessary awareness to the broadcasting industries who are the primary occupants of this spectrum to see this as a business opportunity rather than feeling threatened by the presence of the unlicensed secondary users.

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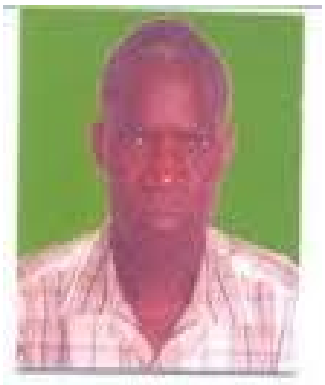

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An Appraisal of Electronic Museum Readiness in National Commission for Museum and Monument of Nigeria

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ABSTRACT
There is no doubt that the new diversity of electronic museum resources and services offer many advantages, for as it is often regularly updated, support multiple users, may provide access without regard to "opening hour," and provide greatly improved depth and scope of services to users. This study investigated electronic museum readiness of museums in Nigeria so as to foreground the benefits of e-museum and identify the challenges confronting the implementation of e-museum. Questionnaire and Interview were the main instruments used for data collection. The major findings from the study are that: Regarding the level of e-readiness; Computer (Mean=2.55) was ranked highest by their mean score rating and was followed by Email (Mean=2.53). In relation to frequent of use of e-resources; CD-ROM (Mean= 4.09) was ranked highest followed by Website (Mean=3.87) and Internet (Mean=3.54).In ranking the types of information services available; Guided tour services (Mean=3.57) was ranked highest by their mean score rating and was followed by Outreach services (Mean=3.44). Ranking the benefits of using e-resources; Faster delivery of information (Mean=3.53) was ranked highest by their mean score rating and was followed by Effective service delivery by museum staff (Mean=3.40). Regarding the challenges of e-museum; Erratic power supply (Mean=3.28) was ranked highest by their mean score rating and was followed by Poor internet connectivity (Mean=3.19). Ranking the level of electronic readiness in the museums, Email (Mean=2.31) was ranked highest and followed by museum website (Mean=2.28), Internet (Mean=2.19), Purchase of ICT equipment (Mean=2.16).

Keywords: E-Readiness, E-Resources, E-Museums, Museums, Museum Professionals, National Commission for Museums and Monuments of Nigeria

Introduction

A museum is a complex institution, and to come to term with a definition is difficult, oneôs definition would depend on either one`s likes or dislikes for museums. Eboreime (2008) argued that museum is the cultural equivalent of the central bank of

any nation. Museums are memory institutions which organise cultural and intellectual records. Museum collections contain the memory of peoples, communities, institutions and individuals, the scientific and cultural heritage, and the products throughout time of our imagination, craft and learning. They join us to our ancestors and they are our legacy to future generations. They are used by the child, the scholar, and the citizen, by the business person, the tourist and the learner. These in turn are creating the heritage of the future (Okpoko, 2006). Memory institutions contribute directly and indirectly to the prosperity through support for learning in areas like commerce, tourism, and personal fulfilment etc. According to Dempsey (2000) museums have changed from the imposing sites designed to preserve relics and to exhibit collections, to places where a mix of enjoyment, learning and experience outcomes are also pursued. Museums play a significant role in culture and tourism worldwide. Through museums, societies represent their relation to their own history and to that of other cultures and people.

Meanwhile, Information and Communication Technologies (ICTs) are affecting the modus operandi of entire industries (Crowston and Myers 2004). In recent years, museums have been given the opportunity to reach out to audiences beyond their physical vicinities with the help of the electronic museum services. Most museums maintain websites with varying degrees of museums services. Using ICTs, museums have gained the ability to provide images and information about their collections online as a preview to the visit (Hawkey, 2004). As it has progressively taken place in other areas, museums are increasing their use of electronic resources, not only to support management operations through data collection and analysis but also to be directly used by visitors, in an attempt to enhance their experience of the exhibition. Through new technologies like digital imaging, local and global networks, they are able to capture and share information on their collections in a way that have only possible in the last few years. The very nature of the electronic lends itself well to constructivism. Its non-linear, webbed nature constantly gives learners hyperlinked options concerning which path to follow, allowing them to determine both the cause and outcome of their experience (Teather 2001).

Research has shown that satisfaction is an important predictor of intention to revisit a place formally visited (Bowen 2002). However, Cosson (2006) opined that regardless of growing pressure to become more competitive and self-reliant, museums, particularly in the public sector, have been slow in subscribing to the idea of customer orientation. Museums, as a part of the cultural industry, give meaning to present lives by interpreting the past(Hawkey, 2004). With this new potential also came the fear that online accessibility would discourage the electronic user from actually visiting the museum (Sabini and Schulkin 2007). In time, museums realised that electronic readiness was not a deterrent to visiting the museum; it actually increased visitation increased competition in the cultural and tourism industry forced museum professionals to identify the variables that attract visitors and ensure their returns (Barsky and Labagh 2002).

It is eminent for museums to be present online because searching information on the internet has become part of many people`s patterns of preparing for actions. Okpoko

(2006) reiterated that more and more users consider the internet as a digital extension of their physical means of action. Comparative analysis shows, according to Wersig (2001), museums in the developed nations are opening up more willingly and connected to the net than they are in developing nations. Online electronic are reaching a very wide number of citizens, most especially younger audiences. According to Hawkey (2004) for many museums in developed countries, the number of online visitors is much higher than the number of physical visitors. However, many people who manage the museums, especially in developing nations, do not realise that visitors have high expectation for and rely on online access to information than the rigour involved in searching for information in one museum complex to the other (Eboreime 2008). Some do not realise that technological advancement has changed people`s orientation tremendously to the extent that everybody prefers to receive services at the comfort of their home (Barsky and Labagh 2002).

Every museum of any size needs some kind of electronic transmission of services but the fear of museum managers of electronic transmission of museum services is that visitors would refuse to attend museum centres and the main objective of instituting it will be defeated. In recent time, the field of ICT and object interpretation have been researched extensively. Some studies as those of (Wersig and Tang (2003), Ruikar, Annunba and Carrillo (2005), Rizk (2004) have approached the effectiveness of electronic technological appliance in museums. Some other scholars have investigated into the use of mobile audio and visual devices in the museums, Montazer (2006), Donovan (1997), Mutula (2006) and Doctor (2002). And some have investigated readiness assessment of electronic resources, e.g. Ajami and Bagheri (2013), Ajami (2011). It is observed however that museums in Nigeria do not offer e-resources and services yet and literature review has shown that there is a dearth of studies conducted to appraise the electronic museum readiness in Nigeria. Based on the foregoing, it is therefore pertinent to appraise the electronic museum readiness of National Commission for Museums and Monuments of Nigeria to fill this identified gap.

Research Question

The following are the questions to which the study will provide answers:

1. What is the level of availability of e-resources in the museums?
2. How often do museum professionals use e-resources in the museums?
3. What types of electronic information services are available in the museums?
4. What are the benefits of using e-resources in the museums?
5. What is the level of e-readiness in the museums?
6. What are the challenges of e-museum readiness in Nigeria?

Review of Literature

E-readiness is a relatively new concept that has been given impetus by the rapid rate of internet penetration throughout the world, and the dramatic advances in uses of information technology (IT) in business and industry (Choucril 2003). The e-readiness concept was originated by the intent to provide a unified framework to evaluate the breadth and depth of the digital divide between more and less developed

or developing countries during the latter part of 1990s (Mutula & Brakel 2006). The first efforts in defining e-readiness were undertaken in 1998 by the Computer Systems Policy (CSP) when it developed the first e-readiness assessment tool known as Readiness Guide for Living in the Networked World (CSP 2001). CSP defined e-readiness with respect to a community that had high-speed access in a competitive market; with constant access and application of ICTs in schools, government, offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are favourable to promoting connectedness and use of the network (Bridges.org 2001).

Since the development of the first e-readiness tool several e-readiness tools have emerged through efforts of development agencies, research organisations, academia, business enterprises and individuals (Mutula and Brakel 2006). Some of the organisations that have been on the forefront in developing e-readiness assessment tools include but are not limited to: McConnell International (MI), a global technology policy and management consulting firm (with its Ready Net.Go tool), the Centre for International Development at Harvard University (with its Network Readiness Index tool), the Economist Intelligent Unit (with its E-readiness Rankings), and the Mosaic Group (with the Framework for Assessing the Diffusion of the Internet) (Rizk, 2004).

Despite the variations in the definitions of e-readiness by different tools, they on average, measure the level of infrastructure development; connectivity; Internet access; applications and services; network speed; quality of network access; ICT policy; ICT training programs; human resources; computer literacy; and relevant content. By and large information access tends to be subsumed under ICTs and consequently gets crossly under-valued (Mutula and Brakel, 2006).

High level of e-readiness can make available quality information to individuals, reduce the digital divide between firms and the outside world, creates new business opportunities, maintains interconnectivity across nations and overcome virtual and physical isolation. The Commission of the European Communities (2002) noted that e-readiness of enterprises ensured anytime, anywhere access to information, thus contributing to effectiveness. An e-readiness appraisal should lead to the development of a strategy and the preparation of an action plan that would address the opportunities and constraints identified in order to further the objectives of a country in the area of ICTs.

However, museums are cultural institutions, that is, systems for the storage, processing and transmission of potentially interactive cultural messages, in and for a determined social context of a system of values and beliefs that inform the behaviour of people and that are articulated and expressed through social institutions (Okpoko, 2006). One of the museum`s central roles is to make information about the natural world accessible to a growing audience, its pioneering website provides scientific data, educational programmes and resource materials to millions of internet user across the globe (Natural History Museum Annual Report 2013).Meanwhile, the emergence of ICTs and digitization of the museum industry created an avenue for

museums to plunge into the ocean of online and electronic museums. Many museums now have an opportunity to interactively share and discuss their artefacts and exhibitions online with audience around the world and to offer new approaches to museum services. Further, the digitization, convergence of computer and telephony technologies which are the linchpin of the internet, have greatly influenced the way museum services are accessed and used all over the world. Virtual museums are more and more common, and the articulation between the real and the virtual, the physical and the symbolic is increasingly developing new cultural hybrids that generate the renewal of cultural communication in the world, using new forms of information and communications technology (Hawkey, 2004). It is however very important to conduct a study on the appraisal of electronic museum readiness in Nigeria. Thus, the findings of the study are expected to assist the museum professionals, museum visitors as well as the owners of museum institutions in Nigeria to become aware of the benefits and challenges of electronic museum services so that appropriate actions will be taken to address the challenges.

Methodology

Research Design

The research design employed for this study was a survey. This decision was informed by the fact that survey research design will enable the researchers to describe the nature or conditions and degree of the present situation in terms of e-museum readiness and implementation in Nigeria. Survey approach allows the researcher to draw on a large sample that is representative of the total population (Babbie, 2004).

Study Population and Sample

Out of six-geopolitical zones which made up Nigeria, two geopolitical zones were selected and used for the study (South-West and North-Central). Sixteen National Museums were involved in this study selected from the two geopolitical zones.

Table 1: Study population and sample

S/N	Museum Stations	Study Population	Study Sample
1.	Abeokuta	14	4.0 (2.0)
2.	Akure	41	10 (5.0)
3.	Esie	26	8.0 (4.0)
4.	FCT, Abuja	49	12 (6.0)
5.	Ibadan	77	16 (8.0)
6.	Ile ï Ife	60	10 (5.0)
7.	Ilorin	59	12 (6.0)
8.	Jos	150	46 (23)
9.	Lafia	13	4.0 (2.0)
10.	Lagos	112	36 (18)
11.	Lokoja	33	8.0 (4.0)
12.	Markudi	10	4.0 (2.0)
13.	Minna	50	10 (5.0)
14.	Osogbo	54	8.0 (4.0)
15.	Owo	23	8.0 (4.0)
16.	Oyo	13	4.0 (2.0)
Total		**784**	**200 (100%)**

The population for this study comprised all museum professional employees in the two selected geopolitical zones between grade levels 08ï 16 with minimum of bachelor degree or its equivalent and whose total number is 784. National Commission for Museums and Monuments of Nigeria Nominal Roll (2012). From population of 784 a sample size of 200 (25.5%) was drawn using simple random technique with Jos station contributed the highest number of respondents.

Instrument for Data Collection

Questionnaire and Interview were the instruments used for data collection. Data were collected through a self-designed questionnaire, the development of which was informed by the objectives of the study and literature review. Interview was conducted with the tourists, artists, and historians.

Validity and Reliability of the Instrument

To achieve the validity of the instrument, the instrument was given to experts for scrutiny. Their suggestions indicate that the instrument is having both the face and content validity because the items relate to what is being measured. Atest re-tests reliability method of two weeks interval using Cronbach Alpha was adopted to determine the overall reliability of the questionnaire used in this study. It provided correlation co-efficient of 0.75 suggesting the questionnaire is highly reliable and can be recommended for future use (Neuman, 2007). The 14 items questionnaire had overall reliability of 0.82, exceeding the minimum standard of 0.80 suggested for basic research (Wang and Tang, 2003).

Data Collection Procedure

The questionnaire was administered personally by the researchers to the respondents in all the selected museum stations. The administration of the questionnaire took four weeks. A total of 200 copies of questionnaire were administered and all were returned giving a 100% return rate. This was complemented with a structured interview, conducted with three categories of professionals. They are tourist, artist, and historians.

The content of the interview focused on:

1. Manual method of documenting museum objects
2. Processes involved in documentation of museum objects
3. Procedures involved in providing museum services in year past
4. Factors contributing to the e-museum readiness in museums
5. Benefits of e-museum readiness and implementation
6. Prospects of embracing electronic resources and service in museums
7. Opinion on electronic services readiness in other cultural agencies
8. Areas where electronic resources and services can be deployed and managed effectively

Data Presentation and Analysis

Methods used for the analysis of the data collected for this study involved mean, standard deviation, percentages and frequency count. The results of the study are presented using tables.

Results

Demographic Variables of Museum Professionals

Table 2: Demographic information

Sex	**Frequency**	**Percentage**
Male	112	56.0
Female	88	44.0
Total	**200**	**100**
Age range	**Frequency**	**Percentage**
18-25 years	1	0.5
26-30 years	10	5.0
31-35 years	38	19.0
36-40 years	72	36.0
41-45 years	48	24.0
46-50 years	24	12.0
51-55 years	5	2.5
55 years and above	2	1.0
Total	**200**	**100**
Professional career	**Frequency**	**Percentage**
Curator	40	20.0
Ethnographer	19	9.5
Archaeologist	13	6.5
Museum educator	66	33.0
Conservator	26	13.0
Heritage officer	16	8.0
Documentation officer	20	10.0
Total	**200**	**100**
Grade level	**Frequency**	**Percentage**
8-10	127	63.5
11-13	63	31.5
14-16	10	5.0
Total	**200**	**100.0**

There is disparity between the males and females museum professionals. More males museum professionals are recorded over that of the females, this is an unhealthy situation for a balanced and equitable development and utilization of the nation`s human resource. The majority of the respondents 60.5 percent are less than 40 years old. 39.5 percent of museum professionals are between the ages of 41-55 years. The observed results may be due to the employment of fresh university graduates to museum in the recent time. This finding supported (Ladebo, 2001). Professional career are differ in museum, but related areas of profession exist in museum. The careers are designed with the intent of satisfying the manpower as well as the culture and tourism development needs of the country. Professionals are expected to make choices among the specialization on offer and choices may differ from individuals. The results further show that among professionals sample, 33.0 percent are museum educator while the least among the professional sample, 8.0 percent are heritage officer. These findings show that heritage and other professions are not popular in the museum. The respondents between grade levels 08-10 constitute the majority with 127(63.5%). The significance of grade level in this context is that more museum

professionals are university graduates, young university graduates are known to be more ready to innovations than older ones.

Research Question 1: What is the level of availability of e-resources in the museums?

Table 3: Level of availability of e-resources in the museums

S/N	E-resources	NA	MA	A	ADA	Mean	S.D
1	Computer	24 12.0%	83 41.5%	51 25.5%	42 21.0%	2.55	0.95
2	Email	27 13.5%	80 40.0%	52 26.0%	41 20.5%	2.53	0.97
3	Museum website	47 23.5%	82 41.0%	49 24.5%	22 11.0%	2.23	0.93
4	Internet	47 23.5%	90 45.0%	39 19.5%	24 12.0%	2.20	0.94
5	Website	60 30.0%	87 43.5%	33 16.5%	20 10.0%	2.07	0.93
6	Software	105 52.5%	39 19.5%	39 19.5%	17 8.5%	1.84	1.02
7	Online databases	126 63.0%	31 15.5%	29 14.5%	14 7.0%	1.66	0.97
8	CD-ROM	131 65.5%	26 13.0%	32 16.0%	11 5.5%	1.62	0.94

Table 3 shows the ranking of the level of availability of e-resources in the museums as perceived by the respondents as follows:- Computer (Mean=2.55) was ranked highest by their mean score rating and was followed by Email (Mean=2.53), Museum website (Mean=2.23), Internet (Mean=2.20), Website (Mean=2.07), Software (Mean=1.84), Online databases (Mean=1.66) and lastly by CD-ROM (Mean=1.62) respectively. The result indicates that computer is the most available e-readiness resources in the museums.

Research Question 2: How often do you use e-resources in the museums?

Table 4: Use of e-resources in the museums

S/N	Utilization of electronic resources	Never	Occasionally	Once a month	Twice a month	Once a week	Daily a week	Mean	S.D
1	CD-ROM	91 45.5%	31 15.5%	4 2.0%	4 2.0%	19 9.5%	51 25.5 %	4.09	2.16
2	Website	17 8.5%	115 57.5%	4 2.0%	7 3.5%	2 1.0%	55 27.5 %	3.87	1.86
3	Internet	10 5.0%	106 53.0%	5 2.5%	2 1.0%	14 7.0%	63 31.5 %	3.54	1.91
4	Email	11 5.5%	91 45.5%	4 2.0%	8 4.0%	14 7.0%	72 36.0 %	3.31	1.94
5	Computer	3 1.5%	90 45.0%	2 1.0%	4 2.0%	4 2.0%	97 48.5 %	2.97	1.98

Table 4 shows the use of e-resources in the museums as follows: CD-ROM (Mean= 4.09) was ranked highest among other electronic resource in museum such as Website (Mean=3.87), Internet (Mean=3.54), Email (Mean=3.31) and Computer (Mean=2.97) respectively. The result shows that CD-ROM is the mostly used e-resources in the museums.

Research Question 3:What types of electronic information services are available in the museums?

Table 5: Electronic information services available in the museums

S/N	Information services	D	SD	A	SA	Mean	S.D
1	Guided tour services	10 5.0%	3 1.5%	50 25.0%	137 68.5%	3.57	0.76
2	Outreach services	17 8.5%	3 1.5%	55 27.5%	125 62.5%	3.44	0.89
3	Users education	21 10.5%	2 1.0%	59 29.5%	118 59.0%	3.37	0.94
4	Cultural awareness services (CAS)	10 5.0%		108 54.0%	82 41.0%	3.31	0.72
5	Selective Dissemination of information	29 14.5%	8 4.0%	108 54.0%	55 27.5%	2.94	0.95
6	Internet services	38 19.0%	77 38.5%	57 28.5%	28 14.0%	2.38	0.95
7	Photocopy services	111 55.5%	5 2.5%	51 25.5%	33 16.5%	2.03	1.22

The table 5 above shows the ranking of types of information services available in the museums. Guided tour services (Mean=3.57) was ranked highest by their mean score rating and was followed by Outreach services (Mean=3.44), Users education (Mean=3.37), Cultural awareness services (CAS) (Mean=3.31), Selective Dissemination of information (Mean=2.94), Internet services (Mean=2.38) and lastly by Photocopy services (Mean=2.03). This implies that Guided tour services are mostly information services used in the museums.

Research Question 4: What are the benefits of using e-resources and services in museums?

Table 6: Benefits of using e-resources and services in the museums

S/N	Benefits of using electronic resources and services	D	SD	A	SA	Mean	S.D
1	Faster delivery of information	18 9.0%	4 2.0%	33 16.5%	145 72.5%	3.53	0.91
2	Effective service delivery by museum staff	22 11.0%	2 1.0%	51 25.5%	125 62.5%	3.40	0.96
3	Bringing visitors into interactive with museum objects	20 10.0%	2 1.0%	55 27.5%	123 61.5%	3.40	0.93
4	Easy access to electronic resources	25 12.5%	1 0.5%	44 22.0%	130 65.0%	3.39	1.00
5	Better user satisfaction	26 13.0%	7 3.5%	41 20.5%	126 63.0%	3.34	1.04
6	Save visitorôs time on searching	27 13.5%	3 1.5%	45 22.5%	125 62.5%	3.34	1.03
7	Access to museum services off location	24 12.0%	4 2.0%	60 30.0%	112 56.0%	3.30	0.99
8	Access to more web based resources	30 15.0%	6 3.0%	44 22.0%	120 60.0%	3.27	1.08

Table 6 ranked the benefits of using e-resources as follows:-Faster delivery of information (Mean=3.53) was ranked highest by their mean score rating and was followed by Effective service delivery by museum staff (Mean=3.40), Bringing visitors into interactive with museum objects (Mean=3.40), Easy access to electronic resources (Mean=3.39), Better user satisfaction (Mean=3.34), Save visitors` time on searching (Mean=3.34), Access to museum services off location (Mean=3.30) and lastly by Access to more web based resources (Mean=3.27) respectively. The mean of ranking indicates that electronic resources makes information delivery faster in museums.

Research Question 5: What is the level of electronic readiness in your museum?

Table 7: Appraisal of electronic resources readiness in the museums

S/N	Appraisal of e-readiness	NA	NRA	RA	VRA	Mean	S.D
1	Email	39 19.5%	80 40.0%	61 30.5%	20 10.0%	2.31	0.90
2	Museum website	39 19.5%	84 42.0%	59 29.5%	18 9.0%	2.28	0.88
3	Internet	43 21.5%	97 48.5%	40 20.0%	20 10.0%	2.19	0.89
4	Purchase of ICT equipment	44 22.0%	96 48.0%	45 22.5%	15 7.5%	2.16	0.85
5	e-readiness policy	73 36.5%	78 39.0%	36 18.0%	13 6.5%	1.94	0.90
6	Software	95 47.5%	37 18.5%	56 28.0%	12 6.0%	1.92	1.00
7	Online database and social network WEB, FLICKR, TWITTER, FACEBOOK	111 55.5%	36 18.0%	40 20.0%	13 6.5%	1.78	0.98
8	CD-ROM	105 52.5%	45 22.5%	41 20.5%	9 4.5%	1.77	0.93

In table 7 above, the ranking of the level of electronic readiness in the museums is as follows:- Email (Mean=2.31) was ranked highest by their mean score rating and was followed by Museum website (Mean=2.28), Internet (Mean=2.19), Purchase of ICT equipment (Mean=2.16), E-readiness policy (Mean=1.94), Software (Mean=1.92), Online database such as WEB, FLICKR, TWITTER, FACEBOOK (Mean=1.78) and lastly by CD-ROM (Mean=1.77). This implies that Email is the only e-readiness resource which is mostly available and use by museums professionals.

Research Question 6: What are the challenges of e-museum readiness?

Table 8: Challenges of e-museum readiness

S/N	Challenges of e-museum readiness	D	SD	A	SA	Mean	S.D
1	Erratic power supply	27 13.5%	14 7.0%	35 17.5%	124 62.0%	3.28	1.08
2	Poor internet connectivity	36 18.0%	11 5.5%	32 16.0%	121 60.5%	3.19	1.16
3	Lack of software resources in museum	37 18.5%	8 4.0%	38 19.0%	117 58.5%	3.17	1.16
4	Computer malfunctioning and access to database	28 14.0%	26 13.0%	43 21.5%	103 51.5%	3.11	1.10
5	Lack of ICT skills	37 18.5%	15 7.5%	44 22.0%	104 52.0%	3.08	1.16
6	Costly to access and use	34 17.0%	22 11.0%	41 20.5%	103 51.5%	3.07	1.14
7	Technological constraints	38 19.0%	16 8.0%	44 22.0%	102 51.0%	3.05	1.16
8	Difficulty to access	45 22.5%	13 6.5%	36 18.0%	106 53.0%	3.02	1.23
9	Lack of training and support of staff and visitors	38 19.0%	24 12.0%	34 17.0%	104 52.0%	3.02	1.19
10	Lack of technical know-how	41 20.5%	19 9.5%	46 23.0%	94 47.0%	2.97	1.18
11	Social factors	38 19.0%	29 14.5%	41 20.5%	92 46.0%	2.94	1.17

Table 8 above ranked challenges of e-museum readiness as follows:- Erratic power supply (Mean=3.28) was ranked highest by their mean score rating and was followed by Poor internet connectivity (Mean=3.19), Lack of software resources in museum (Mean=3.17), Computer malfunctioning and access to database (Mean=3.11), Lack of ICT skills (Mean=3.08), Costly to access and use (Mean=3.07), Technological constrains (Mean=3.05), Difficulty to access (Mean=3.02), Lack of training and support of staff and visitors (Mean=3.02), Lack of technical know-how (Mean=2.97) and lastly by Social factors (Mean=2.94) respectively. It indicates that erratic power supply is the most challenging problem faced while using electronic resources readiness in the museums.

Analysis of Interview

In the interview had with set of tourist, historians and artists, the following conclusions are reached: Museum collections/objects are kept in accurate records process for effective management of an objects, it requires the objects manager to set

out appropriate and accurate records about the objects on acquisition and thereafter through research and comparative analysis. Objects in collections have little or no use or significance at all if there is no accompanying information as to where they come from, how they are made and used and who used them and their role in the value systems to the society. The fundamental records keeping procedures are basically the same. At the point of documentation manually, it is inventoried through accessioning by entering it into an accession register or day book and then assigned a permanent number and catalogued.

Museums have increasingly found themselves in the position of having to compete for users/visitors in the culture and tourism industry. Interactivity has become a major requirement in all spheres of the culture and tourism industry with the emergence of ICT museums are beginning to resemble entertainment centres, a trend not altogether popular among museum professionals in the third world countries. The interview reveals that most commonly used media for display in museums are video and television. It further shows that their benefits and opportunities for sustainable museum in the future are limited except e-museum readiness is brought to bear on the museums on rescue mission to serve to enhance and improve the museum use in all ramifications at ease.

E-museum readiness opens up a powerful new medium and line of communication for cultural agencies all around the world, both for potential users and for cultural administrators. It provides access to a large number of databases, directories of cultural agencies; provides cultural information services and products throughout the world through which individual can communicate with each other via e-mail and discussion groups. Cultural collections have become accessible worldwide and access is available to larger proportions of cultural wealth resources through electronic display of museum objects.

It will be a thing of laudable achievement if eventually museum objects and its services can be transmitted electronically in Nigeria following world trend because of its numerous benefits to the organisation and the users. It contributes to managerial efficiency and the production of essential management information data; improves public access to greater proportions of the museum`s total resources; enhances communication within and between museums, and with other relevant organisation. It improves marketing and public relations profile and the presentation of museum making it image more positive. Electronic museum presents the best opportunities and means to generate standardised practice, especially in compiling collection inventories and records, cataloguing and the management of National Commission for Museums and Monuments. Putting objects on electronic devices will enable the commission to compete more effectively with other visitor attractions centres and probably place it at the vanguard in this regard.

Epileptic power supply is not the only major hindrances to electronic readiness in museum in Nigeria; funding is another major barrier to progress of e-readiness. Museum does not receives regular financial grants from a parent body and rely entirely on donations, grants and fund-raising activities. The installation and

maintenance of effective electronic readiness systems under these conditions is extremely difficult. However, the overall outlook of museums is very positive if electronic measures are put in place.

Discussion of Findings

The findings identified above show that appraisal of e-resources is prerequisite to the appraisal of e-readiness study. Use of e-resources precedes any study of e-readiness. Appraisal of e-readiness is important to museum because its level of availability has strong predictor on how well a museum can perform in the service delivery.The results show that there is significant relationship between appraisal of e-readiness and use of e-museums. This implies that museum professionals need to adequately and effectively use electronic resources. In the course of establishing the significance effect of e-museum readiness on the utilization of service delivery or otherwise, the results indicate that there is significant relationship between appraisal of e-readiness and electronic information services delivery. This brings to the focus that the increased prevalence of electronic will allow museums to consider and use ICT as a channel to disseminate objects, exhibitions and museums services to current or potential visitors and researchers; however little is known of the user attitude towards this practice before now.

The findings substantiate the complement roles of appraisal of e-readiness recourses and the benefits of using the available e-resources. This means thatan e-readiness appraisal would provide policy makers with a detailed scorecard of their economy`s competitiveness relative to its international counterparts. This fact corroborates X.Buiȏs (2003) findings in which he asserts that countries are striving to become inclusive global information societies where all persons without distinction are empowered to create, receive, share and utilise information for their economic, social, cultural and political development. Therefore any country that is not electronically advanced is lagging behind in world trend.

Computer is the most available e-readiness resources used in museums by museum professionals despite all other electronic readiness resources to preserve objects as evidence of the past. This fact is fore-grounded by research question one as indicated in table 3. In a digital environment, the museum users now interact with not a collection of objects but an electronically coordinated collection and records. Electronic museum is not only proposed to be able to personalise the experience and also enhances multiple-users access concurrently. Interactive concepts of edutainment and entertainment will enhance service provision as noted by (Pierroux, 1998). Electronic can provide a mix of standardised services, and personalised services. Electronic readiness fast-tracks information delivery in the museums as confirmed by Ross (2001) in his report that more than 70% of UK population has access to web technologies, from their homes, schools or offices.

From the interview conducted, it is clearly shown that most commonly used media for display in museums are video and television. The interview shows that their benefits and opportunities for sustainable museum in the future are limited except e-readiness

is brought to bear on the museums on rescue mission to serve, to enhance and improve the museum use in all ramifications at ease. The interview also shows that electronic readiness presents the best opportunities and means to generate standardised practice, especially in compiling collection inventories and records, cataloguing and the management of National Commission for Museums and Monuments. Putting objects on electronic devices will enable the commission to compete more effectively with other visitor attractions centres and probably place it at the vanguard in this regard.

Conclusion

The study assessed electronic museum readiness in Nigeria using 16 museum stations. The museums are expected to engage in electronic services to enhance learning, experience and entertainment. However, it can be argued that an electronic museum services require adequate funding and a significant number of museum stations in Nigeria do not have sufficient or any access to the necessary technical know-how and advice in electronic readiness matters. It is very necessary for museums to resort to a wide and disparate range of sources of technical advice and support when necessary. Base on the foregoing, it can be concluded that the level of e-museum implementation in Nigeria is still very low. It is clear that the main barriers to successful implementation of e-museum relate to the availability of finance, lack of appropriate ICT facilities and prohibitive factor. Electronic museum readiness requires capital and recurring expenditure arrangements should be in place (for initial purchase, renewal and maintenance). However, with an increasing level of awareness of benefits of e-museum plus visitorsô expectations could force the introduction of electronic museum implementation in Nigeria.

Recommendations

Based on the findings of the study, the following recommendations are made: Adequate infrastructural facilities that will commensurate to electronic capacity must be provided to the museums. This can be possible through improved funding of the museums. The Federal Government must consider ways of attracting qualified personnel into helms of affairs of museums who can facilitate transmission of museums services electronically. Efforts must be geared towards the development and enhancement of teaching ICT courses in the Institute of Museology and Archaeology.It is important for museums to develop a functional website since visitors will always like to first visit museums websites to locate information and the website must be regularly updated.

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Information Utilization as Determinants of Organizational Effectiveness: A Study of Managers in Large Scale Manufacturing Industries in Nigeria

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ABSTRACT

This study examined information acquisition and utilization as determinants of organizational effectiveness of managers in large-scale manufacturing companies specializing in industrial and domestic products in Nigeria. Descriptive research design of survey type was adopted for the study. The quota sampling technique was used to select 40 managers each from the 9 large-scale manufacturing companies specializing in the production of industrial and domestic products which were quoted on the Nigerian Stock Exchange The questionnaire was used for data collection from the 360 sampled managers out of which 332 responded and the copies of their questionnaire were found valid for analysis. The study found that the studied companies had moderate organizational effectiveness. Information acquisition, information sources and services' utilization had significant relationship with organizational effectiveness of the respondents. However, information acquisition, information sources and services' utilization of the managers had significantly determined organizational effectiveness of the manufacturing companies specializing in industrial and domestic products in Nigeria. It was therefore recommended that the management and board of directors of the companies should encourage their managers to acquire relevant information and use it to improve their organizational effectiveness. In addition, corporate library staff should provide effective information services to the managers so as to improve organizational effectiveness of their companies.

Keywords:- Information acquisition, information utilization, organizational effectiveness, managers, Nigeria.

Introduction

Information which is defined as knowledge in communicable form, is recognized today as one of the essential resources like land, labour, capital, machines and energy necessary for achieving organizational effectiveness. Information is acquired, processed, and disseminated through the university library, ña place, where books and users interact together for the transmission of civilization and cultivation of human beingsò and ñthe most important resource in the pursuit of the general goals and objectives of the institution of higher learningò (Nwosu, 2000). Information is an indispensable factors in any business organization for effective communication and is defined by Adereti et al. (2006) as data that have been put into a meaningful and useful context which is communicated to recipient who uses it to make decisions Information as the fifty factor of production has increased and improved over time in that every human strata regardless of age, affiliation, or status can find relevant information to use. Hussain (2013) focuses on the traditional way of information handling methods has become almost ineffective in providing the specific information of an individual's interest.

Babu et al. (2006) states that information can be seen as data put in a meaningful form which is communicated to a recipient who uses it to make a decision. Information involves the communication and reception of intelligence or knowledge Information accessibility and utilization assist managers in manufacturing companies to better position their firms to meet current and future requirements by identifying and strengthening key functions such as planning, organizing, directing, decision making and controlling; and by developing, assessing and executing alternative structure options targeting at improving organizational effectiveness. Information availability and use enable managers in business organizations to address workload issues, lower volume of backlog, increase staff productivity, improve customer service and reduce costs of business operations by mapping core processes and carrying out detailed analysis to change, streamline, automate and or remove key activities in order to increase their organizational effectiveness.

The improvement of organizational effectiveness is what every manager aims at in any manufacturing company. Managers in manufacturing firms may acquire and use relevant information devise mechanisms for production control standards to determine various levels of resource utilization and thereby to reduce costs of production of goods. Organizational effectiveness in business organization is associated with planning, decision making, staffing and controlling. According to Choo (1994) the least frequently used information sources by the Chief Executives of Canadian telecommunications industry when acquiring information from their business environment were government officials, conferences, business trips, company library and electronic information services.

Hayashi (2004) reiterated that the key to business survival in the current environment is to gather as much information as possible and utilize it effectively as possible. If managers should utilize information effectively, they must appropriately apply information to improve their managerial functions so as to stimulate organizational

effectiveness. Information utilization in this study is operationalise as the suitable application of knowledge in communicable form capable of engendering organizational effectiveness of managers in manufacturing companies. In the 1980s, organizational effectiveness became more prominent and switched to being a concept from the status of a construct (Henry, 2011). Vinitwatanakhunôs (1998) study illustrated that organizational effectiveness should focus on human resources and organizations and help individuals to achieve skills and self-esteem in order to control the new environment and find security and support.

However, changes, events and trends take place in the business environment that continually send signals, messages and symbols which managers in organizations like manufacturing companies must detect, acquire, analyse and use to adapt to new conditions so as to improve their organizational effectiveness. The main reason why certain forms of organizations survive and thrive while others languish and perish in the business world is partly due to low perception of information, lack of gathering and use of relevant, accurate, complete, reliable and timely information by the managers for better business performance or organizational effectiveness.

Mainsail Associates (2004) noted that organizational effectiveness reflects the internal functioning of an enterprise: the commitment to goals, objectives and ethical standards, the efficiencies of practices and processes and the perfect flow of work and information. The point being stressed here is that information is a critical factor input to foster organizational effectiveness in a business enterprise like manufacturing companies producing industrial and domestic products. Sawyer, Ebrahimi and Thibodeaux (2000) found that information sources utilization of chief executives of small and medium scale manufacturing companies in Nigeria affected their company performance as measured by profit margin and return on equity. Information is one of the corporate assets that modern organizations need to achieve high turnover rate and profitability.

Williams (2000) opined that managers in business organizations need economic information such as stock markets, inflation rates, foreign exchange rates interest rates, tax payments, trade balances, government budgets, wages and salaries, unemployment rates, debt management and investment opportunities to improve their organizational performance. Sawyer, Ebrahimi and Thibodeaux (2000) found that chief executives of medium scale enterprises preferred and used external sources of information than internal sources of information to improve their firmsô business performance. Aiyepekun (1989) opined that every private sector organizations regularly invest huge sums of money to organize and update their information arsenals. They also know the consequences of using, or not using appropriate and timely information, or of having appropriately timed information used against them. Be that as it may, can one argue that information acquisition and utilization of managers in some large-scale manufacturing companies will determine their organizational effectiveness? More so, there is scanty of empirical studies in the field of Library and information science in Nigeria or elsewhere that linked information acquisition and use of managers to organizational effectiveness.

In conclusion therefore, there is not a single model of organizational effectiveness to fit all organizations. According to Balduck and Buelens (2008), the concept of organizational effectiveness in any business sector revolves round four main approaches: the system resource approach, the goal approach, the strategic constituency approach and the internal process approach. These are effective and efficient approaches which are contingent upon the type of situation to arise. Thus, the study is expected to add to the body of knowledge and raise consciousness of managers to the relevance of information acquisition and use to organizational effectiveness with special reference to managers in some large-scale manufacturing companies in Nigeria.

Objectives of the Study

This study aims at achieving the following objectives:

1. To find out the degree of multiple relationships among information acquisition, information sources utilization, information services utilization and organizational effectiveness of the respondents.
2. To ascertain if information acquisition, information sources utilization and information services utilization will determine organizational effectiveness of the respondents.
3. To find out the relative contribution of information acquisition, information sources utilization and information services utilization of the respondents to the determination of organizational effectiveness of the companies.

Research Hypotheses

The following hypotheses guided the conduct of this study and they were all tested at Ŭ= 0.05 level of significance:-

1. There is no significant multiple relationship among information acquisition, information sources utilization, information services utilization and organizational effectiveness of the respondents.
2. Information acquisition, information sources utilization, information services utilization will not significantly determine organizational effectiveness of the respondents.

Literature Review

Efforts have been made to review the related literature by going through journals/periodicals articles, books, conference proceedings, etc. Because of the fact that no study similar to the topic could be discovered during the process, the literature indicating worldview of organization effectiveness and utilization of information resources Organization effectiveness is the business process typically employed by organizations to model the organization, better understand the system, and enhancing employee efficiency, innovations, and new leadership and management approaches, amongst others (Madsen et al., 2005). Ezomo (2001) found that there existed a significant relationship between information flow and organizational effectiveness in a public service organization in Nigeria. Falola (2004) also reported that information acquisition and utilization capabilities significantly determined administrative effectiveness of employees in selected local government in Osun state in Nigeria.

The literature of utilization of information resources is vast. General treatments of library and information center usage of information resources and services include Al-Ansari and Al-Enezi (2001), Choukhande and Kumar (2004), Gautam and Srivastava (2006), Gopalakrishnan and Babu (2008), Harinaryana, Vasantha and Swamy (2008), Haruna (2004), Hussain, Krishna Kumar and Fatima (2010), Kumar, Hussain and Fatima (2011), Lohar, Manjunath and Kumbar (2007), Naushad Ali and Hasan (2006), Ogbomo and Adomi (2003),and Pushpalatha and Mallaiah (2009).

Information acquisition and use of managers for fostering organizational effectiveness in any business organization may be constrained by their level of information availability, accessibility, information literacy skills and cognitive ability. Information acquisition may be defined within the context of this study as gathering of knowledge in communicable form capable of improving organizational effectiveness of managers in manufacturing companies. Similarly, Rieth and Biderman (2003) reported that there exist a significant relationship between organizational effectiveness and authority boundary among employees of outpatient physical therapy clinics in Tennessee, Georgia and Alabama in America. Miller (2004) noted that organizational effectiveness of firms can be measured from the employeesô productivity perspective. Denison (1989) enumerated new product development, sales growth, market share, cash flow and return on assets as key indices for measuring organizational effectiveness in any business organization.

Lejeuneand Vas (2009) carried study on perceived effect of an accreditation process on culture and organizational effectiveness. The sample included 31deans and directors general of European Quality Improvement System (EQUIS) inaccredited schools. The study revealed that, there was appositive effect on some aspects of effectiveness on the respondents.The study did not report any effect associated with the bureaucracy feature of culture. The dimensions bearing the highest perceived positive effects included: the social openness and community interaction; the programs development and quality of the faculty; and the ability to obtain resources. Specifically, there were two cultural aspect swhich were closely related to organizational effectiveness market and adhocracy. In the final analysis, it shows that the cultural change created by accreditation was associated with a positive effect on performance.

An effective organization has a smooth, well-oiled internal process. Employees are happy and satisfied. Departmental activities mesh with one another to ensure high productivity. Zairi and Jarrar (2001) conducted a study in the National Health Service (NHS) in the UK to determine whether organizational effectiveness is a result of management processes, people, or a combination. The survey consisted of 464 NHS Trusts and this was to identify best practices; the response rate was 15%. The best practices were used in conjunction with the European Quality Award criteria and the McKinsey 7S Model to produce the criteria that would frame a proposed model. The criteria used included management style, organizational structure, systems, strategy/allocation of resources, shared values, staffing, and skills.

Popoola (2003) studied environmental scanning for strategic advantage of managers in oil companies in Nigeria and found that colleagues, subordinate staff, customers, government publications and newspapers/magazines were the most frequently used sources of information by them. It must be noted that external sources of business information like government publications, newspapers and magazines, trade associations, trade literature and suppliers can be invaluable in helping managers in manufacturing companies determined appropriate courses of action and plan for the future. Daniells (1993) observed that companies that do rely exclusively on internal information sources run the risk of: remaining uninformed about important trends in the larger industry-including new products/services and competitor moves-until it is too late to respond effectively; and receiving skewed information from employees whose goals and opinions may not tally with the best interests of the companies. Managers in business organizations prefer to access and use human rather than documentary sources of information.

It is very important to stress at this juncture that information is an essential ingredient for assessing organizational effectiveness of any firm. Adebisi (2006) supported this assertion when he opined that the great majority of workers constantly use data, information and knowledge- each to varying degrees in their jobs. They create, manage, share, receive and/or manipulate information to improve their organizational effectiveness. Business information comes in general surveys, data, articles, books, references, Internet and internal records that managers require and use to guide their planning, operations, and the evaluation of their business activities in an organization. Such information may also acquire through friends, customers, associates, and vendors. Published sources of information of managers in business organizations may be daily newspapers, financial, trade and association magazines, databases, government statistics, directories, technical manuals, patents and standards, directories, journals, theses and dissertations, reports, company library, and much else.

External information equally comes to the attention of managers in organizations in a variety of forms from printed materials to broadcast reports to online dissemination. Managers need to acquire and use both external and internal business information for the survival of their organization in the face of keen market competition. Okello-Obura et.al (2008) reported that managers in small and medium scale enterprises in Uganda did not consider radio broadcast, Internet/E-mail, television, conferences, libraries, telecentres, notice boards and politicians as reliable means of acquiring their needed information for use. Makenzie (2005) established that line managers in American-based corporations acquired their information needs through social networks. OôConnell and Zimmerman (1979) reported that managers in business firms in America acquired and utilized legal, economic, political, competitive, cultural and technological information to carry out their managerial functions. Fredenberger, Lipp and Watson (1997) studied the information requirements of managers who specialized in reviving failing business and they reported that financial, working capital, cost, expense, personnel, asset, and market analysis reports were either directly or indirectly used to improve cash flows while a company is in a financial crisis.

Okwilagwe (2001) found that the appropriate utilization of internally and externally generated information had significant positive effects on the organizational effectiveness of publishing companies in Nigeria. Choo (1993) posited that managers need to use information not only for decision making and making sense of changes and developments in their external environment but also to generate new knowledge which can be applied to design new products and services, enhance existing offerings and improve organizational processes. deAlwis and Higgins (2001) reported that managers in Singaporean companies used information resources to prepare report, strategic plan and executive summary. The frequency of usage of information sources by managers in the business world may be due to information richness of a source available to him/her. Daft and Lengel (1986) reiterated that information media used in organizations offer different degrees of richness.

Lesters and Waters (1989) found that managers made considerable use of online formation services. Indeed, mangers in manufacturing companies in the developing countries particular Nigeria have realized the potentials of using information and communication technologies to improve their business performance. Benzur (2005) reported that Western European companies used information and communication technologies such as telephone/telex, Internet, CD-ROM databases searching for competitive intelligence. Owen, Wilson and Abell (1995) averred that an increasing number of companies are now using information technology to support their information gathering and dissemination.

Information richness may be viewed as the high quality information carrying capacity of a source or medium in bridging the gap in knowledge of a user on a random event. Popoola (2003) found that managers in oil companies in Nigeria most frequently used colleagues, subordinate staff, customers, government publications, and newspaper/magazines to acquire information and monitoring events occurring in their external business environment. Sawyerr, Ebrahimi and Thibodeauz (2000) investigated the executive environmental scanning, information source utilization and firm performance of small and medium-sized enterprises in Nigeria and found that environmental scanning practices did not appear to affect organizational performance as measured by profit margin and return on equity. Adegboye (2006) established that environmental scanning and information usage of managers in Osun State Community banks in Nigeria significantly correlated with business performance as measured by profit making of the banks.

Information availability, acquisition and utilization may facilitate organizational effectiveness of firms in any financial or manufacturing company (Adewumi, 2006). White (1986) examined the relationship between managerôs functional roles and their information needs and uses in ten manufacturing firms in Britain. He found that there existed significant correlation between their information uses and functional roles. In addition, the major information resources used by the managers were the personal contacts which they considered as the best sources of intelligence on markets and competitors. Wilson (1985) opined that information as a stuff and processes serves people in organizations in the performance of their tasks, and the stuff and processes

whereby it is obtained or acquired and used vary form person to person, from task to task, and from level of level in the organization.

Methodology

The descriptive research design of survey type was adopted for the study. The quota sampling technique was used to select 40 managers each from the 9 large-scale manufacturing companies specializing in the production of industrial and domestic products quoted on the Nigerian Stock Exchange. A self-developed questionnaire titled: Information Acquisition, Utilization and Organizational Effectiveness (IAUOE) scale was used for data collection to elicit information from 360 managers. The data gathered were analyzed using descriptive statistics ï frequency counts, percentages, mean and standard deviations. Multiple regression analysis was used to determine the combined effect ofinformation acquisition, information sources utilization, information services utilization on organizational effectiveness of the respondents. Pearson Correlation Coefficient and Analysis of Variance (ANOVA) were used to test relationship between each of the two variables at 0.05 level of significance. A total of 360 copies of a questionnaire were administered and a total of 332, which represented 92.2% of the total number of questionnaire returned were found usable for the analysis (Table 4.1).

Table 1: **Questionnaire Distribution and Response Rate**

Companies	Number administered	Number retrieved	Response rate (%)
Eric Dynamics PLC	40	32	80
BOC Gases PLC	40	25	62.5
Niyamco PLC	40	20	50
Vono Products PLC	40	40	100
Vitafoam Nigeria PLC	40	35	87.5
Alumaco PLC	40	40	100
First Aluminium Nigeria PLC	40	40	100
Nigeria Enamel Ware Company, PLC	40	40	100
Aluminium Extrusion Industry PLC	40	40	100
Total	360	332	92.2

Results

The gender distribution of the respondents revealed that 115 (34.6%) were female managers while the rest 217 (65.4%) were male managers. This means that male managers dominated the managerial positions in the studied companies. Of the 332 respondents, 265 (79.8%) were married and 67 (20.2%) were single. The ages of the respondents ranged between 25 and 53 years with mean (x = 39.8, SD = 8.65) years. The highest educational distribution of the respondents showed that 107 (32.2%) had Bachelor degree certificate, 142 (42.8%) had postgraduate diploma certificate and 83(25%) had Master degree certificate. Their job tenure ranged between 5 and 28 years with mean (x = 18.6, SD = 6.45) years. This implies that the studied companies were blessed with highly experienced people who occupied their managerial positions. Out of the 332 respondents, 186 (56%) were junior managers, 92 (27.7%) were senior managers and 54 (16.3) were executive managers. Nevertheless, Table 1

shows the mean and standard deviation scores of types of information acquisition by the respondents.

Table 1: Mean and standard deviation scores of types of information acquired by the respondents

Types of information	**X**	**SD**
Market demand/supply	3.99	0.182
Sources of raw materials	3.99	0.191
Price data	3.97	0.174
State of technology	3.96	0.172
Market profit volume or sales size	3.94	0.184
Exchange rates	3.94	0.182
Interest rates	3.92	0.168
Tax laws	3.91	0.152
Household income or expenditures	3.84	0.163
Labour matters	3.82	0.149
Environmental management	2.68	0.032
Crime rate	2.63	0.044
Community relations	1.23	0.088

The major types of information acquired by the respondents were market demand and supply (x=3.99, SD = 0.182), sources of raw materials (x=3.99, SD = 0.191), price data (x =3.97, SD = 0.174), state of technology (x=3.96, SD = 0.172), market profit volume and sales size (x =3.94, SD =0.184), exchange rates (x=3.94, SD = 0.182), interest rates (x = 3.92, SD = 0.168 and tax laws (x=3.91, SD =0.152). Information on community relations was never acquired by the respondents. Nevertheless, table 2 presents mean and standard deviation scores of information sources utilization of the respondents. The customers (x = 3.99, SD =0.122), Company files (x = 3.98, SD =0.121), reports (x =3.98, SD=0.122), Internet/CD-ROM databases (x = 3.95, SD =0.124), newspapers/magazines (x =3.94, SD = 0.120), company library (x = 3.92, SD =0.123), journals (x =3.90, SD = 0.125), and textbooks (x =3.90, SD = 0.124).

Table 2: Mean and Standard Deviation Scores of Information Sources Utilization of the Respondents.

Information Sources	***x***	**SD**
Customers	3.99	0.122
Company files	3.98	0.121
Reports	3.98	0.122
Internet/CD-ROM databases	3.95	0.124
Newspapers/magazines	3.94	0.120
Company library	3.92	0.123
Journals	3.90	0.125
Textbooks	3.90	0.124
Patents/standards	3.89	0.120
Trade literature	3.89	0.122
Government documents	3.88	0.119
Radio/television	3.85	0.117
Professional associates	3.84	0.118
Colleagues	3.84	0.118
Subordinate staff	3.81	0.114
Indexes and abstracts	3.76	0.110
Theses/dissertations	1.22	0.019

Table 3 presents the mean and standard deviation scores of information services utilization of the respondents. The major information services utilized by the respondents were online information (x = 3.96, SD =0.119), data processing (x = 3.94, SD = 0.117), current awareness (x = 3.92, SD = 0.116), facsimile (x = 3.92, SD = 0.115), electronic data interchange (x = 3.91, SD = 0.116), photocopying (x = 3.90, SD =0.114), and documents delivery (x = 3.90, SD = 0.113). Teleconferencing and information broking were never utilized by the respondents. All the respondents indicated that

Table 3: Mean and standard deviation scores of Information Services Utilization of the respondents

Information Services	***x***	***SD***
Online information service	3.96	0.119
Data processing	3.94	0.117
Current awareness	3.92	0.116
Facsimile	3.92	0.115
Electronic data interchange	3.91	0.116
Photocopying	3.90	0.114
Documents delivery	3.90	0.113
Telephone/telex	2.95	0.109
Referral	2.93	0.106
Indexing and abstracting	2.92	0.104
Bindery/lamination	2.86	0.102
Teleconferencing	1.15	0.012
Information broking	1.14	0.011

Poor information literacy skills and uncooperative attitude of the company library personnel, long time taken to acquire the needed information were the real barriers to their information utilization when carrying out their job functions. Nonetheless, the

mean and standard deviation scores of organizational effectiveness of the companies is presented in Table 4.

Table 4: Mean and standard deviation scores of organizational effectiveness of the studied companies

Companies	***n***	***X***	***SD***	**Remarks**
Eric Dynamics PLC	32	55.82	5.68	MOE
BOC Gases PLC	25	48.64	6.42	MOE
Niyamco PLC	20	62.22	7.20	MOE
Vono Products PLC	40	59.78	5.56	MOE
Vitafoam Nigeria PLC	35	72.26	8.50	HOE
Alumaco PLC	40	81.44	6.72	HOE
First Aluminium Nigeria PLC	40	74.40	7.34	HOE
Nigeria Enamel Ware Company, PLC	40	68.88	5.40	MOE
Aluminium Extrusion Industry PLC	40	88.12	8.21	HOE
Total	332	67.95	6.82	MOE

Where:
LOE is Low Organizational Effectiveness,
MOE is Moderate Organization Effectiveness and
HOE is High Organizational Effectiveness.
The mean scores of organizational effectiveness of the studied companies ranged between (x = 48.64, SD = 6.42) and (x = 88.12, SD = 8.21). The overall mean scores of their organizational effectiveness is (x =67.95, SD =6.82). One can therefore deduce that the studied companies had moderate organizational effectiveness.

However, the result of data analysis in Table 5 showed that organizational effectiveness had a significant positive relationship with: information acquisition (r = 0.5262, P<0.05); information sources utilization (r = 0.6185, p< 0.05) and information services utilization (r = 0.5882, p<0.05) of the respondents.

Table 5: Summary of tests of significant relationship between organizational effectiveness and independent variables

Variables	***X***	***SD***	**OE(r)**	**Sig. P**
Information acquisition (IA)	18.2800	4.2500	0.5262	0.0190
Information sources utilization(ISU_1)	20.4500	5.1600	0.1682	0.0360
Information services utilization	21.9800	5.2200	0.5882	0.0280
Organizational effectiveness	67.9500	6.8200	1.000	-

Moreso, information acquisition, information source utilization and information services utilization had significant multiple relationship with the organizational effectiveness of the respondents (R = 0.6532, P<0.05). Nonetheless, the results of regression analysis of independent variables, that IA, ISU_1 and ISU_2 on the dependable variable which is organizational effectiveness (OE) as shown in table 6 revealed that information acquisition, information sources utilization and information services utilization of the respondents when taken together significantly determined organizational effectiveness of their companies. (F = 16.18, df = 3;328, p<0.05)

Table 6: Relative contribution of independent variables to the determination of organizational effectiveness of the companies

Variable	*B*	*Sig. P*	*Betain*	*SE (B)*	*T*
Constant	1.8241	0.0180	-	0.4288	4.2500
Information Acquisition (IA)	0.1128	0.0310	0.2811	0.0221	5.1000
Information Sources Utilization (ISU1)	0.3214	0.0220	0.4322	0.03214	8.3700
Information Services Utilization (ISU2)	0.2218	0.0330	0.3241	0.2218	4.8600
Multiple *R* (adjusted)	0.6532				
Multiple *R* Squared (adjusted)	0.4268				
Standard Error of Estimate (SEE)	10.9545				

The value of *R* Squared which is 0.4268 implies that the linear combination of information acquisition, information sources utilization and information services utilization of the respondents accounted for 42.68 percent of the total variability in organizational effectiveness of their companies. The results of further data analysis (Table 6) showed that information sources utilization was the most potent variable (B = 0.3214, df = 328, t = 8.37, P<0.05) apart from information services utilization (B = 0.2218, df = 328, t = 4.86, P<0.05) and information acquisition (B = 0.1128, df = 328, t = 5.10, P<0.05) in determining organizational effectiveness of the studied companies. This is predicated on the fact that information acquisition (Betain = 0.2811) contributed 28.11 percent, information sources utilization (Betain = 0.4322) contribute 43.22 percent and information services utilization of the respondents (Betain = 0.3241) contributed 32.41 percent to the determination of organizational effectiveness of their companies.

Discussion of Findings

Information is now a precious resource that managers in business organizations like manufacturing companies, are continuously seeking for, acquire and utilize for their organizational development. Any manufacturing companies that fail to acquire, manage and utilize high quality information in the production of value-added goods will find it difficult to compete favourably in the global market. The reason being that consumers are rational in nature and they will demand for the products with high quality and moderate price. However, this study found that the major types of information acquired by the respondents are market demand/supply, sources of raw materials, price data, state of technology, market profit volume/sales size, exchange rates, interest rates; and tax laws.

The information acquisition of the respondents covers economic, technological and legal matters relating to their managerial functions. This finding is in line with that of early study of OôConnell and Zimmerman (1979) who reported that managers in business firms in America acquired and used legal, economic, political, competitive, cultural and technological information to carry out their managerial functions. In the same vein, Correria and Wilson (1997) found that managers in the Portuguese chemical industry acquired information regarding social, cultural, demographic,

economic and political trends as well as market competition for managing their business uncertainty.

This study also established that the major information sources utilized by managers in the chemicals and paints companies in Nigeria include customers, company files, reports, Internet/CD-ROM databases, Newspapers/Magazines, company library, journals, and textbook among others. It is very surprising to find that the managers in the studied companies never utilized these and dissertations when performing their managerial functions. Theses and dissertations contain original and reliable information that will be useful for these managers to improve their organizational effectiveness. Popoola (2004) supported this finding when he reported that female managers in oil companies in Nigeria utilized company records, online databases, colleagues technical reports, newspapers/magazines, government publications, patents/standards, textbooks, and journals among others in their decision making process. Oladele (2008) reiterated that information utilization by workers particularly managers at both tactical and strategic levels of management is very vital in improving organizational effectiveness in both manufacturing and financial companies.

Sawyer, Ebrahimi and Thibodeaux (2000) and Elenkov (1997) confirmed this assertion when they stressed that internal source should not be neglected as they are frequently a rich and valuable source of information to managers particularly for planning, decision making and controlling. Makenzie (2005) found that line managers in American-based corporations acquired their information needs by building social networks. Kobrin et al (1980) reported that information sources used by large UnitedState of America international firms to assess their foreign social and political environments were banks, regional managers, headquarters personnel, subordinates, colleagues in other firms, known and trusted people, as well as personal observations during frequent trips to foreign companies. It must be pointed out at this juncture that managers in manufacturing companies may use information sources that are considered relevant to their needs in order to enhance their organizational effectiveness.

However, this study found that managers in the studied companies very highly utilized online information services, data processing, electronic data interchange, photocopying, and documents delivery service. Contrarily, Maxwell (2001) submitted most business managers in the developing world failed to make use of the available electronic information service for better decision making. It is noteworthy that managers in the studied companies made use of Internet for e-mail, information acquisition and marketing of their products. In their study of large United Kingdom companies,

This study also revealed that organizational effectiveness had significant correlations with information acquisition, information sources utilization and information services utilization of managers in large-scale manufacturing companies specializing in the production of industrial and domestic products in Nigeria. Okwilagwe (1995) corroborated this present finding when he reported that there existed a significant

relationship between the use of strategic information and organizational effectiveness of decision makers in publishing houses in Nigeria. Williams (2000) reiterated that managers in business organizations acquired economic and market information to enhance their organizational performance. Oladunni (2008) opined that managers in manufacturing companies should acquire and use information to improve their organizational effectiveness. Malhotra (2000) averred that managers must endeavour to acquire and use information and knowledge to improve their electronic business performance. In actual fact, organizational effectiveness of industrial organizations depend to a great extent on the ability of their workforce particularly managers to acquire, use and disseminate high quality information.

More so, this study found that information acquisition, information sources and services utilization simultaneously and independently had significantly determined organizational effectiveness of managers in manufacturing companies producing industrial and domestic products in Nigeria. And that a linear combination of information acquisition, information sources utilization and information services utilization of the managers accounted for 42.68 percent of the total variability in organizational effectiveness of the studied companies. In addition, information sources utilization of the managers had greatest relative contribution, next to it is the information services utilization of the managers and follow by information acquisition to the determination of organizational effectiveness of the studied companies.

Conclusion and Recommendations

The information needs of managers in industrial organizations are diverse in nature and they are available within their business environment such as legal, economic, geographical, educational, political, social, technological and cultural. As information needs of managers are varied, they are contained in several sources with peculiar characteristics. Managers in manufacturing companies rely on and acquire their much needed information from numerous sources of information depending on the nature of the task to be performed. Most often times, their information acquisition and use are directed at improving their organizational business performance. Managers occupy a central position in manufacturing companies and their major work activities revolve around human resources management, budgeting, social networkingôs, communications, administration, information searching, information sharing, acquisition, and utilization with sole aim of improve their organizational effectiveness. However, one of the basic findings of this study is that information acquisition, information sources utilization and information services utilization of managers in the studied companies have significant relationship with their organizational effectiveness. Moreover, information acquisition, information sources utilization and information services utilization of managers significantly determined their organizational effectiveness. It is therefore recommended that the management and Board of Directors of the chemicals and paints companies in Nigeria should encourage their managers to acquire and use information to improve their organizational effectiveness. Also, the corporate libraries must endeavour to acquire

relevant information resources and provide effective information services to meet the need of managers in the studied companies.

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An Implementation of Synchronous Virtual Learning System

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ABSTRACT
The attendant escalating demand for education at all levels, and the compelling need to provide education for all irrespective of environmental, social or cultural circumstances have meant that the country must of necessity find the most appropriate and cost effective means to respond adequately to the huge unmet demand for education. Thus, this paper presents the implementation of a robust, reliable, efficient, effective, and cost-effective Synchronous Virtual Learning Solution. The Virtual Learning system consists of basically the e-learning portal and a virtual conference room. The e-learning portal was built using PHP server side scripting language, while the conference room was developed by adopting BigBlueButton (an open source video conference server) to facilitate Synchronous communication between the students and the lecturer. The video conference server (BigBlueButton), configured with a live Internet Protocol address was hosted on a dedicated server at the campus network operating center in the University of Ilorin, to enable both onsite and remote users gain access to the e-learning system. The result of its implementation, when tested with both onsite and remote users, proves its feasibility for future deployment.

Key words: *Synchronous Learning, Virtual learning, Distance learning, ICTs.*

Introduction
Synchronous technology gradually began to find its place in the millennium era, as the need for real time communication became increasingly essential to facilitate immediate feedback and response between the students and lecturers respectively (Charles et al., 2013). It emphasizes an instructor led training which requires the instructors and students to be present at scheduled times, via a real-time platform for instruction and discussion. In real time synchronous courses the instructor and participants are simultaneously logged on and can communicate directly with each other (Benshoff &Gibbons 2011). Example of Synchronous platform includes: chat room, video/audio conferencing platform and two-way live satellite broadcast.

Instances of virtual learning systems abound in the education space of Africa. Share-point, a Microsoft content and document management system was used at, Nelson

Mandela Metropolitan University to make courses available for sharing and collaboration in a blended environment.(Ssekakubo, 2011). In the University of Ilorin Moodle (a learning management System) was deployed in 2013 to facilitate learning and correspondence between the lecturers of university of Ilorin and its open distance learning students (Post-Doctoral Diploma in education), (CODL, 2013). The University of Zambia, has implemented two learning management systems: Moodle and CMAP (only for its Cisco programme). The university hoped to de-congest classrooms, conduct distance learning and reduce training costs by re-using training materials provided on Moodle. Ssekakubo (2011), however, noted that this objective has not been achieved and the system is only used by a few lecturers and students, mainly from the science faculty. It is also important to note that most of these initiatives were not synchronous learning based. With the improvement been witnessed in the internet penetration, better Internet service delivery as well as increasing support for broadband deployment, the development of a synchronous virtual learning system is not out of place.

Several works have been carried out in the creation and adoption of e-learning systems to enhance both teaching and learning pedagogy with respect to cognitive and collaborative learning, at different level of the educational system (Jethro, et al.,2012). Some further studies reveals e-learning project carried out to making learning accessible to the physically challenged (Nganji & Brayshaw 2014). However, while there seems to be a substantial growth in the pedagogy of e-learning systems, most e-learning systems have not being built to solve challenges peculiar to the socio-economic challenges of a society, which poses a threat to having a healthy educational environment as revealed with the issues of limited classroom infrastructure and limited human resource (teaching personnel).

Those seeking access to education at all levels primary, secondary, and tertiary in Africa are increasing. In spite of this fact, educational institutions in Africa are not expanding enough to accommodate the increasing number of students who would be seeking access to higher education. Africa therefore needs an educational environment that would make it more responsive to challenges confronting the continent (World economic forum on Africa, 2013). The academic sphere in Africa is presently dotted with conducting lectures in an overcrowded classroom which is usually unproductive due to the escalating number of applicants seeking admission into universities without the required academic infrastructure to accommodate them.

Therefore, alternative ways of providing access to higher education via virtual learning systems needs to be fully explored. Hence, a self-designed application was built in order to meet the peculiarity of Nigerian and other developing countries Universities and help adequately address the challenges of infrastructural deficiency as well as limited manpower.

Objectives

The main objective of this study is to develop a synchronous virtual learning system with a view to using such to ameliorate the infrastructural deficiency obtainable in tertiary institutions in developing countries.

Methodology

Design

This study employs an iterative and incremental software development model to build the e-learning system. Implementation based on the work of Bello et al (2014). Thus the entire work was divided into three successive iterations thus: Development of the Video Conference Server, Development of the Digital Resource Center and the development of the learning management system which was integrated as a single Virtual learning system. Figure 1 shows the development overview of the entire system and the building blocks utilized in implementing a synchronous virtual learning system

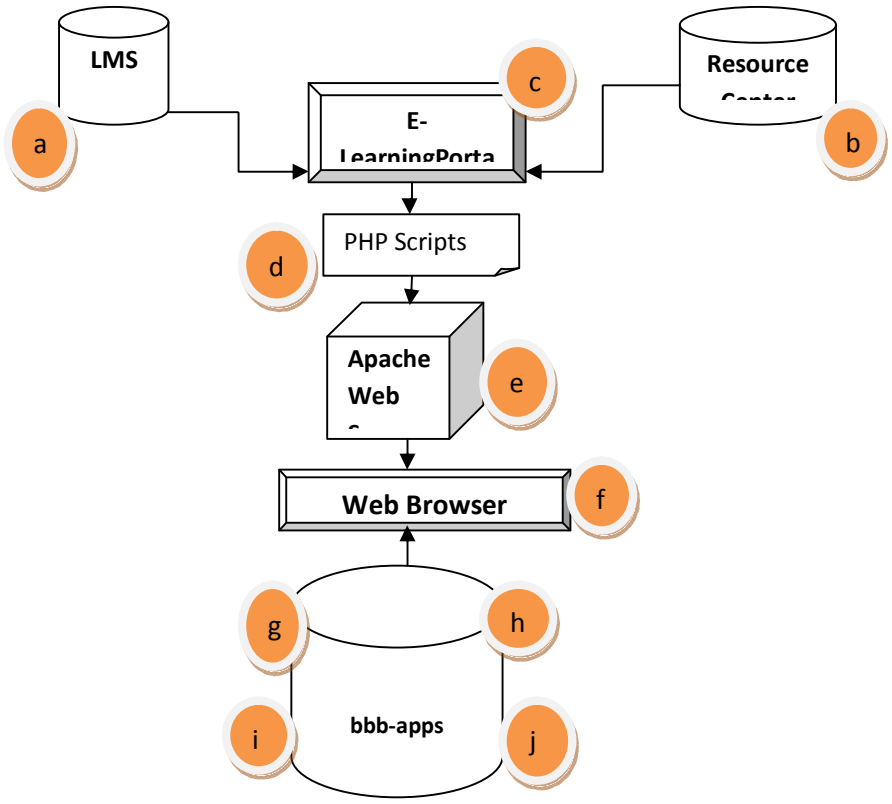

Figure 1: Development Overview

Operational Description

a. While not designed with this platform, the learning management system can be custom built or adopted from existing Learning management systems to provide facilities such as creating and submitting assignments, sharing and collaboration of files and scheduling conference.
b. The resource center is custom built to enable students retrieve digital materials relevant to their courses. Its library is built by integrating it with existing free books store and paid book stores like amazon.

c. The e-learning Portal is an integrated system formed from the combination of the resource center and the learning management system.
d. PHP Server side scripting language was used in building both the resource centre and the learning management system and also for integrating the e-learning portal with the video conference server, which facilitates the real time virtual classroom.
e. Apache Web server processes all request from the client (Students/Instructors), either to perform authentication against the database or to add or retrieve content to it.
f. Web browser is the user interface via which student, lecturers and guest log on to utilize the virtual learning service.
g. BBB-app is responsible for synchronizing all the participants in the conference room.
h. It listens for user events (joined/left/mute/un-mute/talk) and issues command to FREESWITCH.
i. An application for desktop sharing.
j. An application for video conferencing.

System technologies and software

Apache, MySQL database and PHP server side scripting language have been used in order to develop the e-learning portal system. These technologies were used because of the flexibility and scalability that it proffers as open source platforms. However, BigBlueButton was used to develop the Virtual conference room. It was adopted because of its interoperability in integrating seamlessly with any learning management system, its ability to be utilized both locally (intranet) without the internet and remotely over the internet. Additionally it has a significantly low cost of implementation. The following software versions were used:

a. Apache 2.4.4
b. MySQL version 5.6.12
c. PHP version 5.4.16
d. BigBlueButton version 0.8
e. Ubuntu version 10.04.4
f. A Tablet pad, with a stylus pen (Recommended) for lecturers to make it easier to write on the interactive whiteboard, instead of using a mouse.

Application Presentation

This section exemplifies the functional output of the Synchronous Virtual learning system, in response to the input specifications for the system. It comprises web pages in the virtual learning portal system and shows how a synchronous virtual classroom takes place in real time using the platform.

Login Page to the Virtual Learning System

The Login page is presented as a modal form, which appears dynamically on click of the ñget started buttonò on the home page. It consist of two buttons labeled ñSign inò (which is utilized by both lecturers and students of the institution), while the ñsign-in

as Guest buttonò is utilized by invited guest requested to offer teaching service to the school community via the Video Conference Platform. While the ñsign-inò button goes directly to the E-learning portal before proceeding to the conference, the ñSign in as Guestò button goes directly to the conference service, provided the date and time for the conference is due. Matter of facty, the login system has been designed to authenticate both Lecturers and Students based on their existing login details as used on the regular students portal. While the login details of the guest is usually auto-generated in the Lecturers E-learn portal and sent via mail to the invited guest.

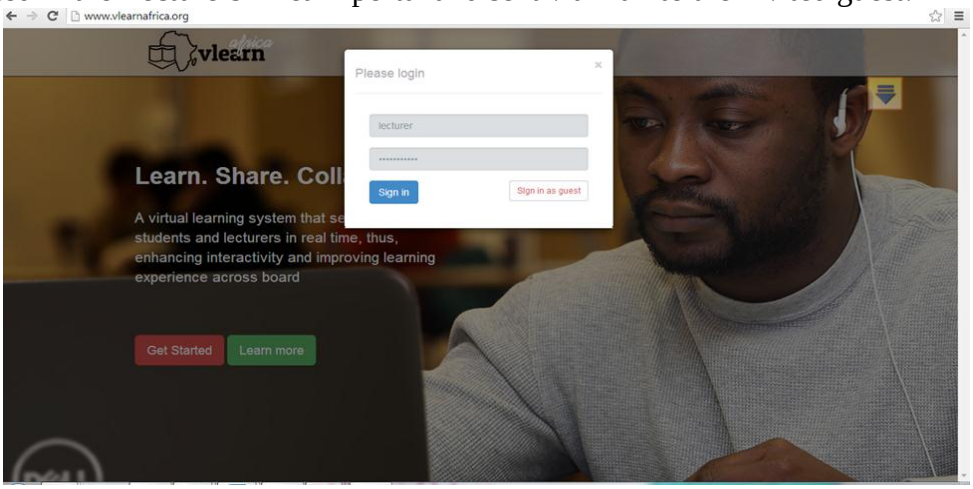

Figure 2: Login Page

The Virtual Learning Portal (Lecturers Profile)

As soon as the Lecturer Logs in, the Virtual Learning Portal is opened, showing by default the profile page of the Lecturer. The Profile Page displays the Name, Lecturers Position, Level, department, Faculty and email address as reflected in the regular school portal system. All details on this Page are simply inherited from the Lecturers Details from the regular school database. This is necessary to give a sense of identity and ownership to every authenticated user on the e-learning platform.

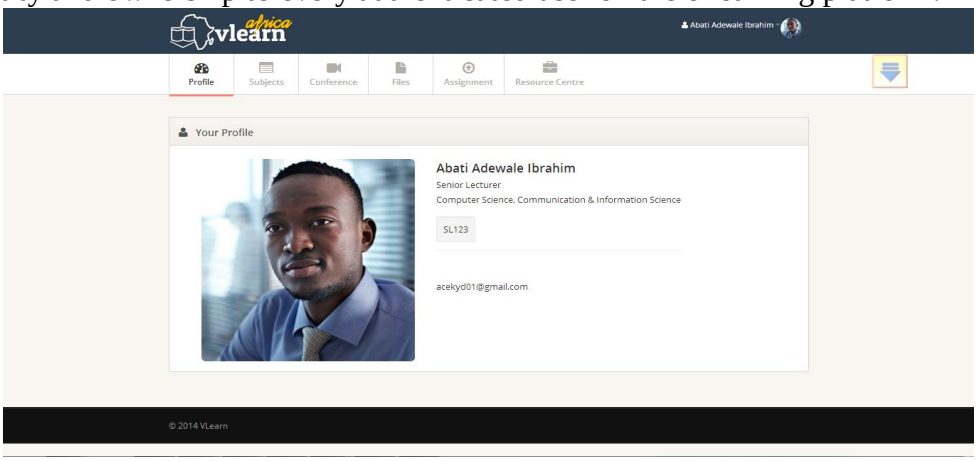

Figure 3: Lecturers Profile Page

Students Profile Page

The Students profile page shows a presentation of the studentôs name, Level, Department, matric number and faculty. These details are also inherited from the

existing school portal and automatically rendered on their profile page as soon as they are logged on to the eLearning platform. It is necessary also to establish a sense of identity on the eLearning platform.

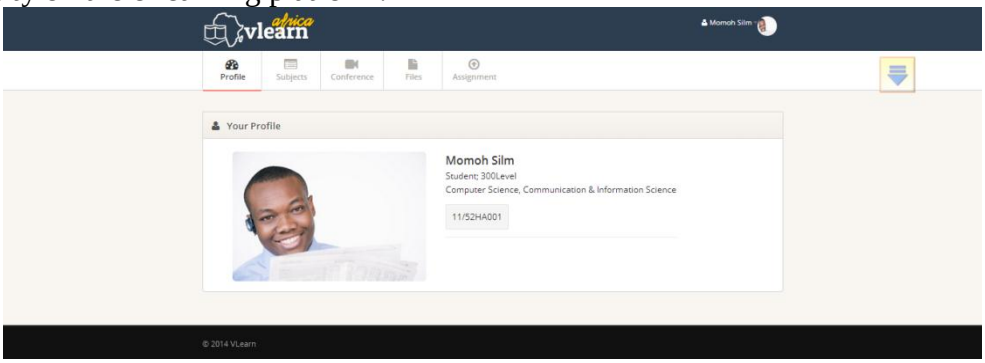

Figure 6: **Students Profile Page**

View Conference Pane

The View Conference pane displays the list of scheduled conferences, specifying at a glance its date, time description for the conference and the conference status of already scheduled conference, which serves as a source of reminder to both lecturers and students about the scheduled conference session. When the Conference schedule depicts gray it automatically tells that the conference date is passed and as such the conference would be inaccessible (thus it displays the conference statusòSession Closedò). However when the conference is in a future date it displays a red status colour (with the Conference status ñView Conference), but on the due date for the conference, the conference status colour displays green(with the conference status ñView Conferenceò), signifying that the conference scheduled for that course is due for that day

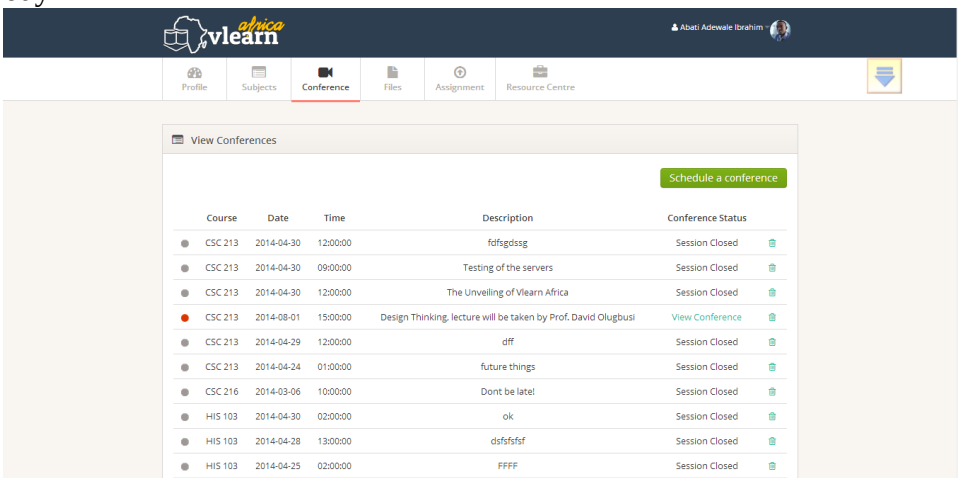

Figure 4: **Conference Pane**

File Share Page

This page contains the list of all the files shared between students and lecturers, relating to a particular course. I t specifies the course related to a particular shared file, its source and the link to download the shared file.

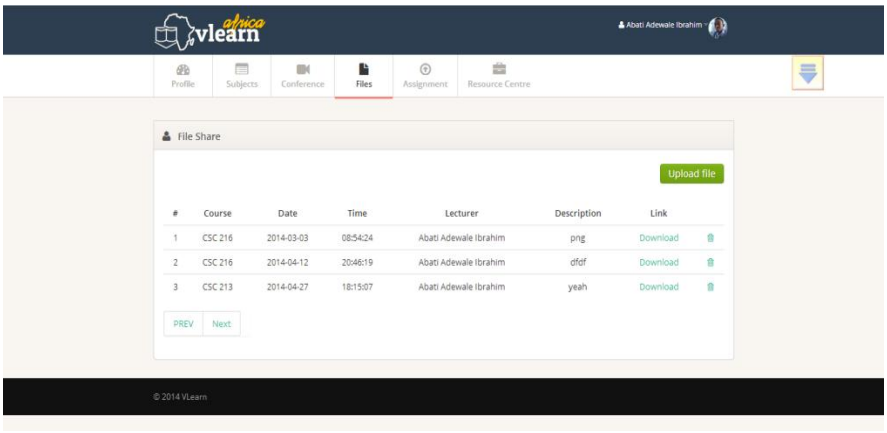

Figure 5: **File Share Page**

Assignment Detail page

The assignment detail page displays the detail of a particular assignment. It includes attributes such as: the date and time the assignment was posted and the due date and time for submission and also a link to download file attachment with respect to the assignment. It is on this page, that the submit button to make submission is found, however if the date of submission is passed it would display a message ñDate of submission is elapsedò and the submit button would be unavailable.

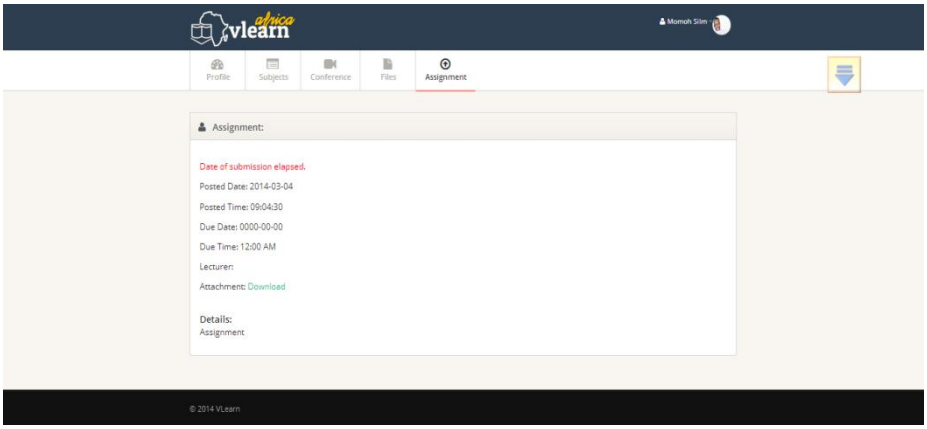

Figure 6: **Assignment Detail page**

Assignment Submissions Page

This is the page where the lecturer views all the submissions made with respect to a particular assignment, specifying the date and time that the assignment was submitted. From the view link, the lecturer is able to check specifically the contents of the assignment.

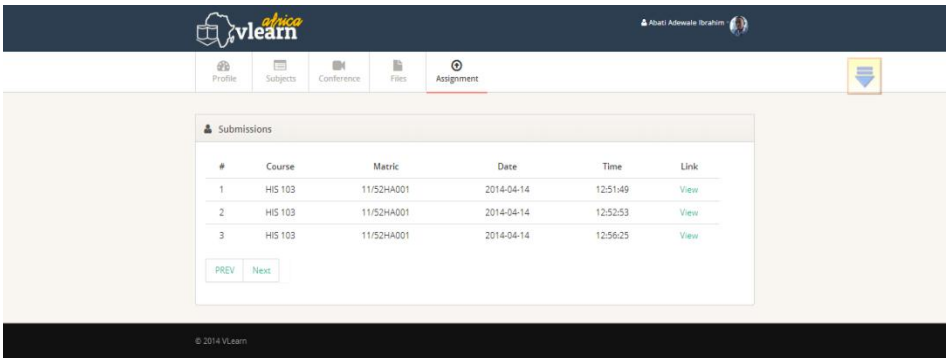

Figure 7: **Assignment Submissions page**

Resource Center Page

The resource page contains educational materials harvested from free e-book repository, paid e-book repository and educational materials added by lecturers to the resource center. And each of these sections can be accessed based on different subject categories.

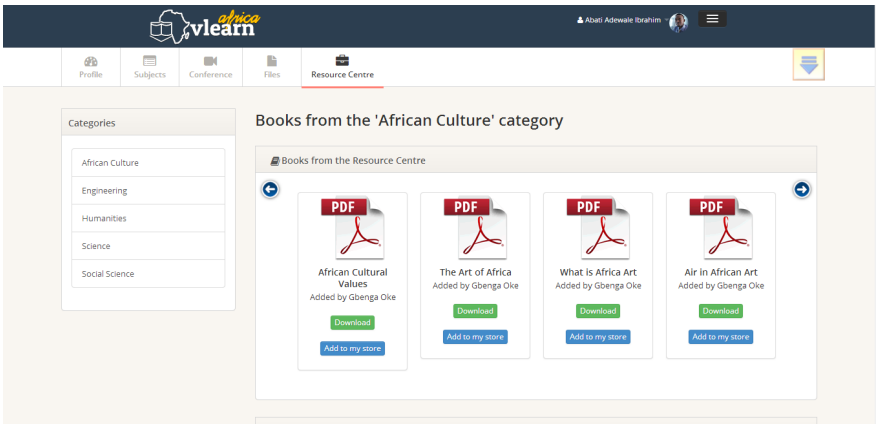

Figure 8: **Resource Center Page**

in the conference classroom both students and lecturers can view each other in real time, without respect to geographical proxy. This means that it could be used within the school premises and remotely.

Conference Room Environment

The environment is divided into four different pane. The First pane has the list of students and the instructor on board the virtual classroom. The second pane displays the webcam video of all participants. The third pane is used by the instructor to display all kind of all multimedia documents and also make nnotations and write as with a marker board, while the fourth pane enables text message transmission among participants

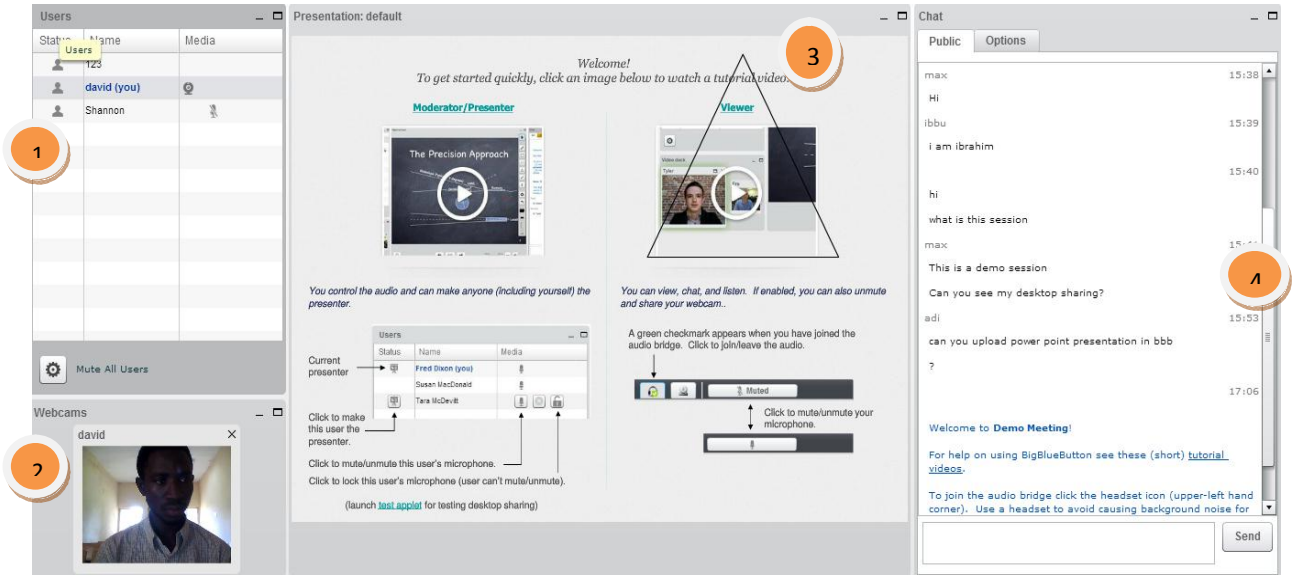

Figure 8: **Conference Room Environment**

Conclusion

In this paper, efforts has been made to show how the challenge of limited academic infrastructure and human resource can be mitigated by deploying a Synchronous Virtual Learning System built on an open source video conference server (BigBlueButton), integrated with a custom designed e-learning portal, which also has the propensity to be integrated with existing learning management system, in order to provide synchronous e-learning solutions. The learning management system and the resource center was integrated with a video conference server to provide e-learning services such as live web conferencing, file sharing, creation and submission of assignment, presentation of portable document format (pdf) and word documents, extended white board capabilities and desktop sharing. Futhermore, to enable both local and remote access to the virtual learning system, the video conference server (BigBlueButton), configured with a live Internet Protocol address was hosted on a dedicated server at a university campus network operating center, to enable both onsite and remote users gain access to the e-learning system, while the e-learning portal was hosted on the internet. Furtherance on this project would require that an empirical study be carried out on the quality of service metrics of this system to determine its efficiency with respect to access from remote areas in order to establish a research informed basis for its use in open and distance education.

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A Collaborative Authentication Scheme for Intrusion Detection in Wireless Sensor Networks

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University of Ilorin.

Abstract
Virtually all applications of WSN are critical infrastructures, yet they are characterized by low resource, making them a good and attractive target for network attackers. This necessitate the need for having an energy and resource optimizing security technology or mechanism that will ensure that WSN deployed for such infrastructures are secured at least to a degree from intrusion by malicious entities. Intrusion detection scheme (IDS) in wireless sensor networks (WSN) follows two main approaches namely; single sensing and multiple sensing. This paper presents an algorithm for a collaborative multiple sensor schemes that use the authentication of neighbour nodes and high level sensory data to detect a possible intrusion in a WSN. Besides using a collaborative multiple sensor schemes, the mechanism of the algorithm also incorporates a second layer of authentication which serves to increase the reliability and ruggedness of the proposed IDS. A simple demonstration of how the algorithm works was done through MATLAB simulation. Furthermore, a discussion of the effectiveness of the algorithm for several typical security attacks/threats against WSN was presented.

***Keywords*—WSN, IDS, Collaborative Authentication**

INTRODUCTION

Wireless Sensor Networks (WSNs) is an aggregation of low energy, low computational/processing power devices that are capable of transmitting sensory information among themselves. They have found wide range of use in infrastructure protection, environmental monitoring, surveillance systems, healthcare, and military intelligence, among others. Beyond the wide range of their applicability, WSNs implementations often times includes mission critical infrastructures, making them attractive and very vulnerable to network security attackers. This fact is exacerbated by the very nature of the deployed network. Often, nodes are deployed in a remote or hostile area, making them unprotected and susceptible to physical as well as network attacks (Roman et al, 2003). Thus, the need for the networks to be deployed with some security schemes.

Intrusion Detection Systems (IDS) are considered to act as the second line of defense against network attacks which preventive mechanisms fail to address. An IDS is therefore, a mechanism designed to detect both external and internal malicious

attempts to access or disable a network or system**.** They are put in place to detect illegitimate access to a network, which might violate the networkôs integrity. An IDS is intended to identify suspicious pattern that indicates a network is been intruded. Techniques employed in intrusion detection systems are categorized into misuse detection and anomaly detection. The anomaly detection approach identifies an intrusion, when a significant deviation from normal behaviour is observed in the activity of a user or system. Misuse detection on the other hand, base its determination of intrusive activity(s) on the characteristics of known attacks or system vulnerabilities, hence any action that conforms to the pattern of a known attack or vulnerability is flagged as an intrusion (Ning & Jajodia, 2003).

However, the characteristics of WSNs make it not only difficult or almost impossible to adopt intrusion detection system of conventional network types (both wired and wireless) but also made the development of new IDS scheme for WSN more complicated. The small volume, low energy, very limited computation ability and storage capacity makes such intrusion detection systems impracticable in WSN. Since the power source (batteries) of a sensor node cannot be changed during use, the power supply constraint and the associated impact on the lifetime of WSNs add further complications to the permutations and considerations involved in designing a network intrusion detection and prevention system. Therefore, the extra consumption of energy caused by the implementation of security functions should be rewarded by the economy gained in detecting and preventing attacks. Furthermore, as a result of the severe energy limitation, sensor nodes are prone to failures, hence the topology of a wireless sensor network changes frequently, resulting effect of which adds another factor that must be put into consideration in the development and deployment of IDS in WSNs. The aforementioned, therefore, has shown the need to provide security defense mechanism(s) that addresses the above stated inadequacies of WSNs. Intrusion detection techniques in WSN are classified as single or multi sensing. In single sensing detection, a single node is saddled with the task of monitoring the network and identifying any intrusion or malicious activity in the network. Such a node, as a part of the Intrusion Detection System, acts individually in performing the various roles associated with detection, hence it needs, not only to collect data but, also, analyze the collected data. In multi sensing detection, several special nodes in the network, designated as monitors, communicate with each other, to, collaboratively, identify an intruder. This paper, presents a multi sensing algorithm, for intrusion detection in WSN. However, unlike other multi sensing intrusion detection techniques in WSN, the scheme presented in this paper, does not have the special class of nodes designated as monitors or 'watch dogs' but adopted a completely decentralized collaboration intrusion detection where all nodes are able to sense and notify of any intrusion in the network. This work presents and validated an algorithm that makes use of simple neighbour identity information to detect and give notice to the system, of a possible malicious intruder into the system. A second layer of verifying the authenticity of intrusion notification was also incorporated in the algorithm, in a bid to increase the reliability and ruggedness of the proposed intrusion detection scheme (IDS). Furthermore, the anomaly detection approach (a significant deviation from normal behavior) is the premise on which the proposed algorithm in

this paper is based. The rationale behind the intrusion detection approach is borne out of the nature of WSN; the sensitivity of applications in which they are deployed and the limitations imposed by the inherent characteristics of devices (nodes) making up the WSN. Adopting the misuse detection approach will require setting up of different rules based on the pattern of different network attacks and system vulnerabilities. This puts undesirable demand on the resource constrained nodes of a typical WSN. Furthermore, attack on a WSN is usually (if not always) manifested as deviation in the normal behavior of node(s) in the network.

LITERATURE REVIEW

Onat and Miri (2005), proposed an intrusion detection scheme that used neighboring node information, received power rate and packet arrival rate to detect impersonation and resource depletion attacks. The draw-back of the work is that, the IDS scheme, a rule based detection scheme, is impractical because there are other factors beyond the received power rate that needs to be considered in developing the detection rules. In the work of Krontiris et al (2007), a scheme for selective forwarding and black-hole attacks detection was proposed and validated in a real in WSN. The scheme is a collaborative approach between several nodes to monitor and detect intrusion in their neighbourhood. Also in Krontiris et al (2008), a distributive IDS scheme to detect sinkhole attack was proposed and implemented in a WSN deployment. The limitation of the scheme is the communication overhead incurred in the detection process. Stetsko et al (2010), implemented a multi sensing IDS for Hello flood, selective forwarding and jamming attacks. Added to the problem of the communication overhead is the features that are used to construct the detection rules that caused a high false alarm. An insider attacker detection scheme, proposed by Liu et al (2007), explores correlating the behavior pattern of neighboring devices. Each sensor node is made to acquire, filter, and inspect some aspects of its immediate neighborsô behavior, like forwarding delay, sensor readings, packet dropping and sending rates, If the behavior observed from a node is ñextremeò in comparison with the behavior of nodes from that same neighborhood, it is suspected to be malicious. As good as this scheme is, they didnôt consider that if a sensor node is simply making comparison with the behavior of neighbor nodes, one of these nodes could also be under attack (malicious), so it will be better for the sensor node to match the identity of the suspected node with other salient information of the node it already has in its memory, and also confirming from another sensor node before it is flagged as malicious. Deng et al (2003), developed an anomaly detection scheme for ad-hoc networks, based on one-class support vector machines. The work demonstrated how the scheme can be used to detect black hole routing attacks in ad hoc networks. However, the scheme did not factor into consideration the communication cost that might be too expensive for the sensor networks. Gupta et al (2007), proposed ANDES, a centralized framework for detecting and finding devices causing anomalies (flooding attacks, selective forwarding, sinkhole, black hole) in the WSNs. In ANDES, the BS correlates the data traffic and routing data to detect and localize a malfunctioning node. ANDES use simple thresholds for the number of application

packets received, and have a high false positive rate.

The work of Lemos et al (2010) is a collaborative IDS scheme for detecting repetition attacks. This scheme has designated monitor nodes that monitors other nodes for attack on the network and supervisor nodes which correlate the detection information supplied by the monitors. A major drawback is that if the supervisor nodes are compromised, they could be sources of the whole system failure. Also the assumptions made, make for a non-flexible application of the scheme. The IDS proposed by Chi and Cho (2006) was based on fuzzy logic. Choosing the nodes to act as the monitor nodes and how many of such is enough to protect the network however constituted a problem. Also the chosen monitor nodes can become points of failure if they are compromised. Other fuzzy logic based IDS schemes in WSN are reported in the work of Moon and Cho (2009) and Ponomarchuk and Seo (2010). However, manual setting of the detection rules, the need for prior knowledge for setting of those rules and other computational requirement of Fuzzy logic made these schemes impracticable for WSNs. A data mining-based intrusion detection scheme using the fixed width clustering algorithm to build the system profile based on the node traffic behavior was proposed by Loo et al (2006). However, the clustering algorithm used made this scheme inflexible and impracticable for a typical resource constrained WSN. Doumit and Agrawal (2003), IDS scheme was based on Hidden-Markov Model (HMM). In the work, an anomaly approach based on self-organized criticality (SOC) and Hidden Markov models to detect data inconsistencies was proposed. This approach is developed based on the structure of naturally occurring events. The system organizes itself based on the knowledge it acquires from occurrences in the deployment region. It lets sensor networks adapt to the norm of the dynamics in its natural surrounding so that any unusual activities can be singled out. While this scheme has so many pros, as claimed by the authors, in reality, the use of HMM will be impracticable for processing by a power constrained network like the WSN. In the work of Murali & Lakshman (2003), game theory approach was adopted for IDS in WSN. While the proposition looks attractive, the complexity of game theory does not suit a WSN with its limited resource. There are so many other ambitious schemes that make use of machine learning, data mining and artificial intelligence (AI). While so many of theseare very exciting propositions, their practicability, in view of the nature of WSN, leaves much to be desired.

A closer look at the reviewed works and so many others revealed that so many of the proposed IDS schemes will incur significant overhead, in implementing them. This is not suitable for the severe restrictions in resources such as energy, bandwidth, and capacity processing inherent in sensor nodes. For instance, game theory, artificial intelligence, data mining and machine learning require large computational power, a luxury the sensor nodes do not possess. Even if the sensor nodes can afford the computational and processing power required by these schemes, the effect on the energy degradation and the life span of the whole network is so great that they are not just practically feasible. Another point of note is that in most of the schemes, there are always special nodes called monitors, watchdogs (Roman et al, 2003), cluster-heads

supervisors etc, that are given the task of detecting intrusion. In such situation, the designated node(s) may cause a single point of failure in its cluster or a prime target of attackers such that if compromised the control of the intrusion system is overthrown by the attacker.

To the contrary, the algorithm presented in this paper, (***tagged community policing IDS***) does not make use of a complicated technology, nor introduce complex parameters that requires rigorous processing in the detection rules. It makes use of identification criteria information that is populated in the memory of each node at deployment of the network and is updated as changes occur in the topology of the network. This makes this algorithm, really light weight and reduced the resources incurred in the detection intrusion process. Also unlike so many other multi sensing, collaborative IDS scheme, there are no specially designated monitors for performing the intrusion detection function, thereby reducing the possibility of the system failure when such nodes are compromised.

THE ALGORITHM

The proposed algorithm is meant to accomplish the understated:

- Reduction in the energy and extra resource overhead incurred by the IDS, since the parameters used are parameters that are already known or needed for communication by the nodes making up the WSN itself.
- Removing the notion of special nodes for the detection of intrusion, such that if one is compromised, others can carry out the detection scheme.
- The second layer authentication is to ensure and confirm the alarm raised by the notifying nodes.

Initialisation:

At initial setup of the WSN, all nodes are assumed to be in a secured stable state.

- The nodes are deployed in a fully connected network topology (grid, random, L-shape, T-shape etc.)
- Each node starts with the same initial energy.
- Each node unicasts in regular intervals (referred to as rounds of data gathering) a unit-packet of defined size.
- The packets are multi-hopped through the network to the base station.
- All nodes are homogenous in nature and are static.
- Nodes antennae are omni-directional and the transmission coverage area is circular

Familiarization/recognition:

Each node records sensitive identification information about neighbor nodes at the initial state. The identifying information to be recorded, by each node includes:

- Neighbour Nodes ID
- Neighbour Nodes Mac

- Neighbour Nodes location in the network coverage area
- Neighbour Nodes expected sensory information
- Energy level of each node at any point in time

In line with the energy constrained nature of a wireless sensor node, the essence of creating a neighbourhood is to reduce, the computational and processing need of storing and updating records of identifying information kept by each node.

Authentication:
When a node receives information from anothernode, the receiver matches the identity of the sender with other salient information, already stored in its memory. It is pertinent for the identity matching to be done sequentially such that, once, there is a mis-match in one of the identifying information, there is no need to waste resources testing for the other information

Intrusion suspicion:
If there is a mis-match, the receiver sends notification of a compromise or attack.

Verification of notification:
For the WSN to act on the suspected intrusion, each of the notifying nodes, will be verified by its closest neighbor nodes, to ascertain the veracity or otherwise of the intrusion claim.

- Because of the possibility of a false alarm or the compromise of the notifying nodes themselves, it is required that another node, closest to each of the notifying nodes, verifies and confirms the ID features of the notifying nodes.

Confirmation of Intrusion:
If the information, provided by the nodes, verifying the proper working condition of the notifying nodes, matches, an intrusion has been detected.

- If the ID of notifying nodes are confirmed, the reported node is flagged as malicious. If not, the alarm raised by the notifying nodes is discarded.

DETECTION OF ATTACKS BY THE ALGORITHM

This section provides a validation of the algorithm against several known attacks on a typical WSN. Before beginning a discussion of the mechanism of detection of such attacks by the algorithm, there is need to establish some premises on the WSN set-up and the workings of the algorithm itself.

Postulation 1: The distance between two nodes in the network is given by :

$$\frac{2}{3}R \leq d \leq R$$

where R is the maximum radio range of each node.
This means that the distance between two successive neighbour nodes must not exceed the maximum radio range of a sensor node.

Postulation 2: The radius r_i of the coverage area, of the sensory information provided by each node, is also given by

$$\frac{1}{3}R \leq r_i \leq \frac{1}{2}R$$

Corollary 3: From postulation 1 and 2, it follows that each node has a view of its neighbour nodes. Specifically if the right hand side of the inequality holds true, a node has half the view of the sensing coverage of its neighbour nodes while if the left side is true then, a node has a full view of the sensing coverage of its neighbour nodes.

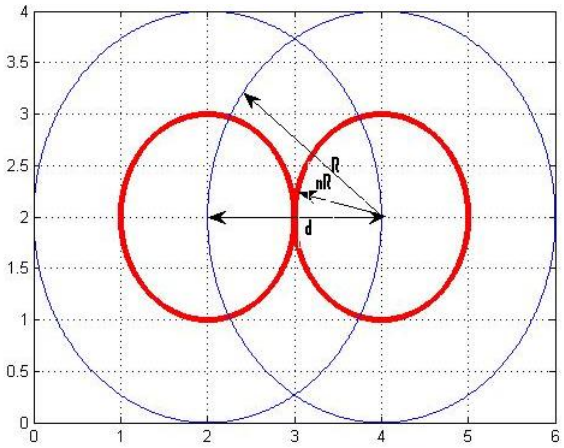

Figure 1: Diagrammatic Illustration of the Right hand side of the inequality in postulation 1 and 2.

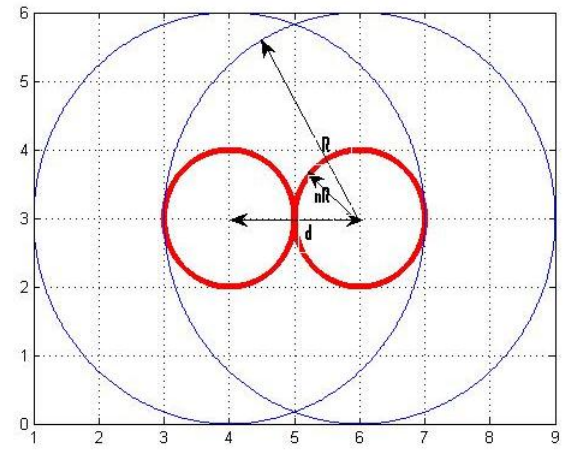

Figure 2: Diagrammatic Illustration of the Left hand side of the inequality in postulation 1 and 2.

Postulation 4: Each node has the view of the sensory information (data and timing of transmission) of its neighbours and has auxiliary responsibility for transmission of such information.

On the basis of the aforementioned, follows a discussion on the process by which this proposed light weight algorithm detects different attack.

Forged Packets

A malicious node might send fallacious measured values which would not reflect the reality of its surroundings to the base station. In some instances, the packets sent are actually malicious intended to bring a target node or degrade the performance of the network itself. When an intruder tries to insert a forged packet, the other nodes, within the neighbourhood, would be able to identify the intruder by, first, ascertaining its identity from the records of the neighbourhood earlier stored. If the intruding node's identity does not match any of the nodes in the neighbourhood, such a node is suspected as an attacker.

Data Alteration

In this kind of attack, the attacker is only interested in spoofing or altering packets of other nodes in order to misuse a routing algorithm, have an advantage in voting protocols, change measured values sent by sensor nodes to the base station or perpetrate some malicious activity on the network.Since every node knows the sensory information, of its neighbours, any attempt by any node to transmit other information apart from the expected information will be automatically and immediately suspected as an attack.

Selective Forwarding and blackhole

Selective forwarding occurs when a compromised node drops a specific portion of the packets, all of the packets (blackhole) or randomly drops some of the packets, that is bound for a particular destination. In this way, an attacker can selectively filter traffic from a particular part of the network. In this instance, the fact that neighbour nodes, have a secondary responsibility to help transmit sensory information is an additional security measure to the fact that they are aware of the data and time of transmission of each other. If a node is compromised and it's been used to perpetrate selective forwarding or black hole attack, the compromised node will be quickly identified and other nodes with a view of the sensing coverage of that node will ensure that the communication link is not disrupted until, the suspected intrusion is addressed.

Message delay, Wormhole and Repetition

In a wormhole attack, a malicious node tunnels messages between two different parts of the network via a high speed link. This can make distant nodes appear ñcloserò in the network, which can be useful as part of a Sybil attack. Moreover, if the attacker is appropriately positioned, it can disrupt the entire network by diverting traffic from the base station. In message delay and repetition attack, an attacker inserts itself in the middle of the communication link between two nodes, captures a valid data transmission which it later retransmits. In most instances, the attacker make copies of the captured packet and later retransmit those copies repeatedly and continuously to a target node in order to exhaust the target nodeôs buffers or power supplies, or to base stations and access points in order to degrade network performance. The knowledge of timing of transmission and the ability of other nodes, been able to transmit sensory

information, of their neighbours, will combine to combat the effectiveness of message delay attack, while having a view of the sensing coverage, as well as sensory data, of neighbours, will effectively thwart repetition attack. For the wormhole attack, the information distance, between nodes, will help each node to know its next hop, hence a wormhole attack can be easily suspected and subsequently detected.

Masquerade attack

In masquerade attack, an attacker impersonates another nodeôs identity to establish a connection with or launch other attacks on a victim; or the attacker might have actually hijacked a legitimate node and thus use the victimôs identity to establish a connection with other nodes or launch other attacks on behalf of the compromised/hijacked node. In a situation where a legitimate node has been compromised, it will meet all the available identification criteria since it was, once, a legitimate node, with its details stored by its neighbours. However, it will not be able to infuse a malicious packet, without been detected. This is because every node, knows what information is expected from each other and even have a view of what sensory information, its neighbour(s) are meant to send. Hence, it will be difficult for a particular compromised node to spread a malicious packet through the network

Sybil Attacks

A Sybil node is claims multiple identities. An attacker might use these multiple identities to create undue advantage in voting protocols or create routing paths for their own benefits. The malicious node can acquire identities either by fabricating new ones or by learning the identity of other nodes [15]. Communication with such malicious nodes may be direct or indirect [16]. In direct communication, the malicious node communicates with legitimate nodes while in indirect communication, the sybil node claims that it communicates with nodes that actually do not exist or to the impersonated node. This kind of attack can be easily prevented since in every neighbourhood, each node has the identification information of every node which includes the specific location of each node, the energy level at each point and other information. If these information are correlated with the sybil node and duplication is detected or there is some mis-match, the nodes will quickly detect such nodes as malicious and raise an alarm or notification of an intrusion

It is worth mentioning that, *Denial of Service (DoS) Attacks, Spoofing and Altering of Routing Information, Sinkhole Attacks* andother forms of attack on WSNs, even though, not specifically mentioned in this work can be detected by this algorithm. This is because, the basis of perpetrating the attacks on any network was effectively and adequately catered for by our intrusion detection algorithm.

VERIFICATION AND CONFIRMATION OF INTRUSION NOTIFICATION

The algorithm requires, that the identity and proper working condition of nodes providing notification of intrusion suspicion be verified. For each of the notifying nodes, the node closest to it from within the next neighbourhood will match the Identity information with what was hitherto stored against it and if all the information matches, the node sends a confirmation of the notification of intrusion earlier sent by

the notifying node. This verification, ensures that the notifier(s) have not been compromised and been used by an attacker to send malicious information about legitimate nodes in the network.

PERFORMANCE EVALUATION

The second layer of node authentication not only ensures the authenticity of intrusion notification but also makes the algorithm rugged and improves its reliability. This is more so in a situation where an attacker is able to compromise multiple nodes, probably a whole neighbourhood, other nodes in different locations has a high probability of detecting such malicious infractions and collaborates, to expose the attack. This is possible, because the neighbourhood membership of a node is not fixed and in most cases is usually more than one. To illustrate, consider a randomly deployed WSN, shown in figure 3. Table 1 shows the neighbour nodes information recorded by node 69. This means node 69 and nodes, 65, 35, 36 and 19 are in the same neighbourhood. Similarly the neighbourhood authentication node of node 21 contains information about nodes 78, 35, 58 and 19. As we can see both nodes 35 and 19 are in two neighbourhoods, that of node 65 and node 21. It goes to say that if an attacker compromises the neighbourhood of node 69, there are other nodes that have a view of nodes in that compromised neighbourhood who can raise alarm of the intrusion. Hence, it will be very difficult for an attacker to compromise a small portion of the network un-noticed or un-detected and thereby use that to disable or compromise the whole network.

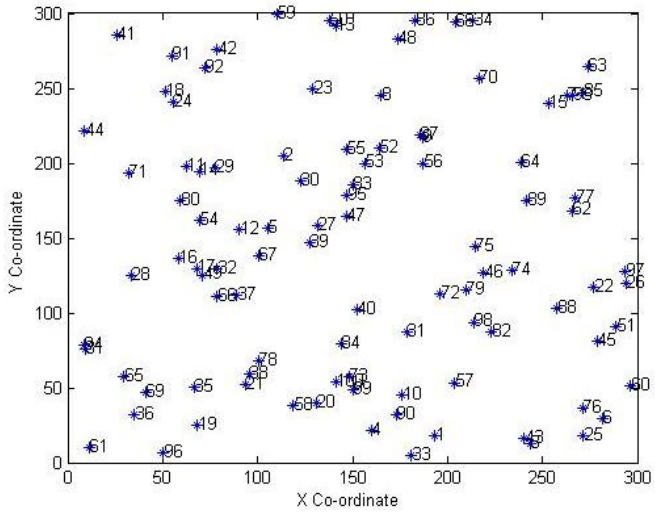

Figure 3: A randomly deployed Wireless Sensor Network containing 100 nodes.

Table 1: Neighbour information table of node 69

node ID	X-co-ord	Y co-ord	Node Energy
65.0000	29.6137	57.1300	199.9999
36.0000	35.2253	31.8649	199.9999

35.0000	66.5240	50.1505	199.9999
19.0000	68.2993	25.0409	199.9999

Table 2: Neighbour information table of node 21

node ID	**X-co-ord**	**Y-co-ord**	**Node Energy**
78.0000	100.2489	67.8563	199.9999
35.0000	66.5240	50.1505	199.9999
58.0000	118.6546	38.4043	199.9999
19.0000	68.2993	25.0409	199.9999

Figure 4 is a simulation of an attacker inserting a malicious node (node 96 highlighted with red) taking the identity of one of the nodes in the network, node 96. The neighbours of node 96 were able to discover that the node is a malicious node because it is not in the actual position of the honest node with ID 96. This is just a simple demonstration of how the algorithm works.

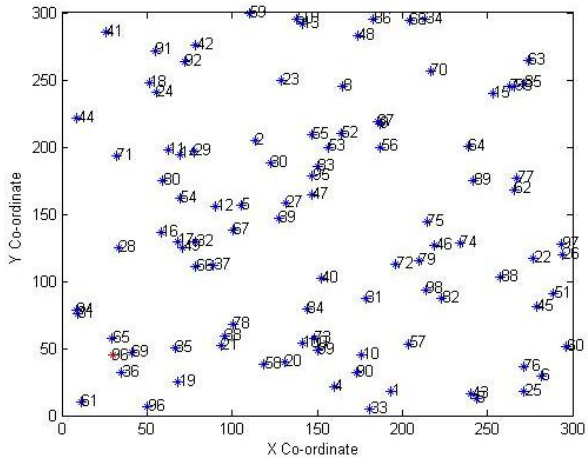

Figure 4: Insertion of a malicious node into the network.

node
69
65
36
35
suspects a malicious node at co-ordinates:
30.1200 45.0000

Another interesting point to note in the algorithm is the inclusion of the energy level of each node in the information table. This helps to reduce the rate of false alarm occasioned as a result of the battery life of a node getting exhausted. This is because at every point in time, every other node in a neighbourhood has an idea of the energy level of its neighbours. This makes it possible to either notify the base station shortly before a node battery power gets exhausted or provide a clue if a node malfunction because of its power been exhausted. An inherent problem of wireless sensor nodes is the power constraint and hence a major cause of failure in the network. Therefore, for any intrusion detection scheme in WSN to be of high performance, it must factor this into its mechanism.

CONCLUSION

The design and demonstration of a low resource, multiple nodes sensing and practicable algorithm based on double layer authentication of neighbour sensor nodes for intrusion detection in wireless sensor networks (WSNs) is presented in this paper. The working mechanism of the algorithm makes for robust IDS that can thwart several known attack types. It is believed that a physical implementation of this algorithm will ensure minimal cost in terms of computational, processing and energy resource incurred. It will be interesting to further verify the performance of this algorithm (vis- a- vis measuring its rate of false positive

and false negative) against known attack types in WSN in future research.

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Information and Communication Technology and Audiovisual Resources Management in Selected Academic Libraries in Ondo State, Nigeria

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Abstract
The study investigated the management of audiovisual and Information Communication Technology (ICT) resources among all the five academic libraries in Ondo State, Nigeria. A total 48 acquisition librarians selected from five libraries represent the sample for the study. A structured questionnaire was used to gather data from the sampled librarians. The study found that, 80% of the libraries do not have acquisition policy for the resources, 100% have internet and e-mail resources and 100% have non-print media resource section to ensure effective spark of control. The study also found that many of the librarians working in the libraries are computer literate while unstable electricity was one of the major problems militating against the use of the resources. It was recommended among others that the library should to have a reliable blueprint or media resources acquisition policy which will guide them in the development and proper management of the non-print media resource section.

Keywords; Information, Communication, Audio visual, Resources and Resources Management

Introduction

Hawkins (2002) as cited by Aniogbolu (2008) declared that information has become the most important currency for productivity, competitiveness and increased wealth and productivity. It is recently being referred to as an indispensable tool of development and management. Oguniyi et al., (2009) stated that virtually all professionals now make use of it for decision making and planning activities. Every organization need it to make contact, carry out its services effectively and use it to measure its staff performance. Hawkins (2002) noted that information has become the most important currency for wealth and productivity.

Besides, lecturers and students need information to carryout research and assignment effectively. Aniogbolu (2008) found that the best means to do this is through the use of Information and Communication Technology (ICT) and audio-visual resources. Alaku (1998) stated that teachers effectiveness and students performance are greatly enhanced by the use of appropriate methods, techniques, ICT and instructional aids.

Information and Communication Technology (ICT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textural and numeric information by a micro-electronic based combination of computer and telecommunications. It involves telephones, cable TV, Computers, Satellite and Internet. Aboyinde (2006) listed the following as the benefits that library can get from ICT: library management and administration, processing of library materials, development of on-line resources, accessing on-line resources, inter-library cooperation and video conferencing. Hence, computer has become a well-established basic tool in library operation and information work.

Moreover, audiovisual resources which comprise of television, slide, video etc have very relevant advantages. Falade (2007) found that they influence effective learning of factual information and skills in less time. They encourage pupilsô active participation and widen

their experience. Also, Adu (2002) described the presence and use of audiovisuals as a sure way of gaining attention and holding the interest of pupils. Alaki (1998) declared that they stimulate interest among pupils and induce longer retention of factual ideas. Ayinde (1999) found that an intelligent use of audiovisuals will save teachersô time and stimulate studentsô interest and Brecht (2008) discovered that students who cannot fully understand and learn at the classroom pace have the video lecturer as a slower and very thorough second lecture they can study at their own learning pace during leisure time.

Another wonderful benefit of ICT and audiovisual is the fact that both can be combined simultaneously to select, acquire, utilize, analyze or disseminate information. For instance, online lecture can be made available via internet and slide. Akintunde (2004) described this as fusion, which has given rise to the use of computer and other technologies such as projector, slide, television, video, telephone to process and transfer data.

However, in libraries, these advantages are being militated against by poor managerial skills such as unavailability, unawareness, poor funding, insufficient training, poor maintenance, insufficient planning organization and control system. Ojo, et al., (2005) stated that one of the problems facing academic libraries in Nigeria is that greater or considerable percentage could not demonstrate the necessary skills to take full advantages of electronic information system. This is a pure managerial problem. The library as a dynamic institution aimed at generating and managing information resources cannot be left out in respect of skills acquisition.

Chukwudi (2008) stated that, a well-managed library should be able to provide better service at less or no great cost, provide online access to a library catalogue, acquire new books at reasonable cost and organization of frequent training for its staff on the utilization of ICT resources.In the last few years the rapid change in technology has brought about pressure on academic libraries in the sense that they have to put in more efforts towards the use of Information and Communication Technology (ICT) and audiovisual resources towards dissemination of information to their clientele as it is being done contemporarily in the modern world. Ojo et al., (2009) declared that, Information and Communication Technology (ICT) was introduced to the academic libraries as an automated adjunct to traditional system to enhance performance in terms of information seeking behaviour of users. But this is being hampered by poor managerial tendencies, such as lack of skill, lack of definite working plan for Information and Communication Technology (ICT) and audiovisual growth and unavailability. Also, funds being pumped into this could not be justified based on low patronage and due to low level of awareness among the relevant users. It is in light of this, that this study investigated the management of Information and Communication Technology (ICT) and audiovisual resources in all higher institutions in Ondo State, Nigeria.

The study is important because the outcomes will provide for the stakeholders necessary information that will influence proper policy formulation and implementation. Moreover, the results of this study will serve as a virile tool for library advocates towards better campaign for the development of ICT and other media resources in the library. This study will expose the literacy level of libraries and the extent of their awareness on ICT. In addition, findings will help libraries to deliver more services and solutions provided for discovered problems will go a long way to propagate better service delivery.

Objectives of the Study

The main objective of this study was to examine the management of audiovisual and Information and Communication Technology (ICT) resources in selected academic libraries in Ondo State, Nigeria .The specific objectives of this study are to:

(1) Determine the availability of planning/ acquisition policy of for audiovisuals and ICT in libraries.
(2) Determine whether or not organization of resources is in a definite section.
(3) Determine the level of availability of audiovisual and ICT resources.
(4) Identify the librarians and media literacy level.
(5) Determine the availability of audiovisual and ICT maintenance in libraries.
(6) Identify the problems militating against audiovisual and ICT resources.

Research Questions

The study answered the following research questions:

1. What is the availability of planning/ acquisition policy for audiovisual and ICT in libraries?
2. What is the level of availability of audiovisual and ICT resources?
3. What is the organization of ICT resources in the libraries?
4. What are the librariansô media literacy levels?
5. What is the availability of audio visual and ICT maintenance in libraries?
6. What are the problems militating against audio visual and ICT resources?

Literature Review

Various definitions have been given to management by different authors, but this study will confine itself to two. Stoner et al., (2002) defined management as the process of planning, organizing, leading and controlling the work of organization members and of using all available organizational resources to reach stated organizational goals. Also Thompson et al (2001) defined management as the process whereby managers establish an organizationôs long term direction (goals), set specific objectives, develop strategies to achieve these objectives and undertake to execute the chosen action plans.

Besides, Chukwudi (2008) described Information and Communication Technology (ICT) as the electronic based combination of computer and telecommunications. It involves telephones, cable TV, computers, Global System for Mobile Communication, Internet and Satellite Communication. It is being used to improve productivity and efficiency. Ojedokun (2000) stated that they hold more useful, up-to-date and relevant information and contain a wealth of simple information of direct applicability to everyday subjects. According to him they offer a number of other advantages one of which is obliquity. More simultaneously users can access them from many locations and single electronic copies can also be delivered with electronic speed. Also, it reduces error and offers preservation advantages.

Equally, Ayinde (1999) described audiovisuals as materials which are designed, produced and used to achieve specific curricular/instructional goals. They combine both sound and sight effect to facilitate learning, e.g. television, motion pictures, video, slide, projector etc. Olayiwola (1996) declared that they save teachersô time and stimulate studentsô interest. They increase the retention of knowledge and stimulate the development of understanding and attitudes. In general, they help learners to pursue independent studies, create a variety of sensory activity and make instruction more powerful and immediate.

Based on the above definitions and expressions, one can therefore explain that management of ICT and audiovisuals is the process of planning, organizing leading and controlling both the human (Librarians and supporting staff) resources and material resources (ICT and audiovisual) to reach or achieve the stated organizational goals which are maximizing the benefits of Information and Communication Technology (ICT) and audiovisuals, making sure that relevant information is available to users at little or no cost and ensuring that knowledge is passed across via learning using the materials (ICT and audiovisual) in the library.

Information and Communication Acquisition Policy

The University of Waileato (2010) stated that ICT acquisition policy was put in place in the institution to set out the principles that apply to the procurement, management and replacement of equipment. This policy involves sourcing for capital, provision of computer for all staff, procurement policy etc. The policy stated that procurement of servers, desktop computers, laptops and audiovisual equipment should be capitalized regardless of their cost and whether components are purchased separately.

Library Staff and Information Technology Literacy

Adedoyin (2006) in his research on Information and Communication Technology (ICT) literacy among library staff of West African Libraries found that out of about 370 professional librarians, only 179 of them were ICT literate while the remaining 191 professional libraries were ICT illiterate. Also, out of 526 paraprofessionals, only 84 of them were Information and Communication Technology (ICT) literate. This is an indication of backwardness in the utilization of ICT as far as Africa is concerned. Besides, Ugwuanyi (2009) found that the level of ICT literacy skill among academic librarians in Enugu State is low though most of them indicated some elements of computer literacy. There is very poor ICT infrastructural facilities in the libraries studied. He found further that problems such as poor infrastructure, lack of library management interest and lack of training opportunities hinders the acquisition of skills.

Methodology

The population for this study comprised the librarians in all the academic libraries in Ondo State, Nigeria. They libraries are Federal University of Technology, Akure (FUTA), Adekunle Ajasin University, Akungba Akoko (AAUA), Rufus Giwa Polytechnic, Owo (RGPO), Federal College of Agriculture, Akure (FCAA) and Adeyemi College of Education, Ondo (ACEO). A total of 48 acquisition librarians in these selected libraries were interviewed through a researcher developed questionnaire. The questionnaire was structured to clearly identify the important variables focused in the study. These are planning/acquisition policy, Audio Visual and ICT resources availability, organization of the resources, Librarians Media Literacy, resources maintenance and problems affecting their use. The copies of the questionnaire were given to the acquisition librarians and collected back within one month. All 48 copies of questionnaire given out were properly filled and returned for data analysis.

RESULTS

The data generated from the study are presented in tables and discussed below.

Table 1: Availability of Planning/Acquisition policy for audiovisuals and ICT in Libraries

Institution	Yes	No
FUTA	ã	
AAUA		ã
RGPO		ã
FCAA		ã
ACEO		ã

Table 1 above revealed that only FUTA has a standby planning/acquisition policy towards the procurement of Audiovisual and ICT resources among the academic libraries on Ondo State. This might affect negatively the management of these resources in other libraries since there is no clear-cut principle on ground to ensure sustainability or adequate planning.

Table 2: Availability of Audiovisual and ICT Resources

Resources	FUTA	AAUA	RGPO	FCAA	ACEO
Television	ã	ã	ã	ã	ã
Radio	ã	ã	ã	X	X
Slide	X	X	X	X	X
Projector	X	X	X	X	X
Video	X	X	ã	X	ã
Computer	ã	ã	ã	ã	ã
CD-Rom	ã	ã	ã	ã	ã
Internet	ã	ã	ã	ã	ã
OPAC	ã	X	X	X	X
E-Journal	ã	ã	X	X	ã
E-mail	ã	ã	ã	ã	ã

From the above table, it is alarming to discover that items such as slide, projector, and OPAC are missing majorly in these libraries even in the information age. However, all of them have the resources such as television, computer, CDRom, Internet and E-mail. The presence of Internet and e-mail in all the libraries investigated is a pointer to the fact that they have come of age and ready to share information without barrier with their contemporaries globally. Moreso, from the table, FUTA is the richest in terms of media resources, while the FCAA is the least. This could be attributed to the fact that Universities draw money more than Colleges from the government coffer.

Table 3: Organization of Resources in a Definite Section

Institution	Yes	No
FUTA	ã	
AAUA	ã	
RGPO	ã	
FCAA	ã	
ACEO	ã	

Table 3 above shows that all the academic libraries have a definite section, where they keep the media resources in their libraries. This section is often referred to as non-profit media

resources section. This means that the libraries have come of information age and have standardized their activities.

Table 4: Librarians population and media literacy level

Institution	No	Media Literacy		
		Good	Fair	Poor
FUTA	13	7	3	3
AAUA	12	6	4	2
RGPO	8	3	3	2
FCAA	5	2	2	1
ACEO	10	6	3	1

Almost all the libraries investigated have adequate number of practicing librarians. More than 50% of them are good in media literacy in FUTA, AAUA and ACEO. Also, an insignificant population is poor in this regard. This means that librarians have caught up with other professionals in the world of ICT literacy.

Table 5: Audiovisual and ICT Maintenance in Libraries

Maintenance measures	FU TA	AAUA	RGPO	FCAA	ACEO
Periodic servicing	X	X	X	X	X
Covering with polythene bag	X	X	X	X	X
Daily dusting	ã	ã	ã	ã	ã
Air conditioner	ã	ã	ã	X	ã
Using expert	ã	ã	ã	ã	ã
Electric stability	ã	ã	X	X	X

According to the above table, the most applied maintenance measure in all the libraries are; daily dusting, using expert for repair and air conditioning the non-print media resources section. None of them applied periodic servicing and covering the resources with polythene bag. This might lead to periodic damage of the materials or even reduce their life span. Also very prominent is the inability of these libraries to stabilize electricity towards the maintenance/management of the audiovisual and ICT resources.

This study revealed some information about the management of audiovisual and ICT resources in some academic libraries. Also, it created some facts that can help to determine whether their services are in tune with information age. The study revealed that 80% of the libraries do not have planning or acquisition policy, 100% have embraced the use of Internet and e-mail and 100% have a definite section for the resources. Another major discovery was that many of the librarians are computer literate, media materials are not being serviced periodically even though experts are being used to repair them when damaged and the most popular problems militating against the use of these resources in the investigated libraries are electricity instability, insufficient and high cost of resources.

Table 6: Problems militating against Audiovisual and ICT resources

Problems	FU TA	AAUA	RGPO	FCAA	ACEO
Lack of awareness	X	ã	ã	ã	ã
Poor access	X	ã	ã	ã	X
Slow network	X	ã	X	ã	ã
Lack of IT Skill	X	X	X	X	X
Insufficient resources	ã	ã	ã	ã	ã
Poor electricity supply	ã	ã	ã	ã	ã
Lack of expert	X	X	ã	ã	X
High cost of resources	ã	ã	ã	ã	ã

From table 6 above, the most prominent problems militating against audiovisual and ICT resources are: high cost of resources, poor electricity supply and insufficient resources. Close to these are lack of awareness, slow network, and poor accessibility. Poor Information Technology skill was never regarded as a problem in all the libraries investigated.

Conclusion

In conclusion, all the academic libraries have come of information age. Despite the fact that they face some barriers or challenges, they have been able to procure necessary audiovisual and ICT resources with the employment of sizeable professionals on ground to manage them. Moreso, these materials management was being boosted by the establishment of non-print media resource section in all the libraries. This made maintenance direct and effective.

Recommendations

All academic libraries must endeavour to have a reliable blueprint or media resources acquisition policy which will guide them in the development and proper management of the non-print media resource section. Urgent efforts must be taken to procure slides and projectors in the libraries to facilitate contemporary teaching in and outside the libraries. Also, resources that are under pressure due to high population should be identified and more should be acquired. Periodic seminar or workshop should be organized for all librarians to acquaint them with latest technology, so that they will be able to relate effectively with their contemporaries and contribute meaningfully when the need arises. There should be periodic servicing of the audiovisual and ICT resources to ensure their longetivity. Government should withdraw Value Added Tax, VAT from these resources and consequently make them affordable, and also converted efforts should be employed to fix electricity in the country.

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Services Provision in Special Libraries: Survey of Selected Special Libraries in Kaduna State, Nigeria

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Abstract

The study examines the services offered by selected special libraries in Kaduna State. The study adopted a descriptive research design. The population of the study was made up of four selected special libraries with four (4) professional librarians. Data were collected through questionnaire and document examination and was analyzed using percentages while document examination was analyzed descriptively. Results show that Geological Survey of Nigeria Library which is the oldest library was established in the year 1930, Nigerian Institute for Trypaniosmiasis Research Library in 1951, Peugeot Automobile Limited Library 1979 and Nigerian National Petroleum Corporation Library in 1981. The libraries offered such as loan, indexing and abstracting services, photocopying services, bibliographic services, personal file services, microform services, reference services, cooperative, CAS, SDI, interlibrary loans, binding services and translation services. These services are hindered by inadequate space for collections and users' accommodation. The study recommends that adequate accommodation be provided for the libraries collections and user comfort to explore their information needs.

Keywords: Services, Services Provision, Special Libraries

Introduction

Libraries are indispensable tool in the life of any organization. This is because they are the source of organizational development as they provide information and access to information resources to the publics of the organization so as to achieve its goals. Based on this, it can be articulated that the successful nature of being of any organization is highly dependent on the quality of information available and used by such organization. Libraries are of different kinds but concentration will be more on special libraries. Special libraries are said to have come into existence in the year 1909 in a meeting held by a group of twenty-six librarians at New-Hampshire where special Librarians Association was born at the end of the meeting.

A special library is a library that provides specialized information resources on a particular subject, serves a specialized and limited clientele, and delivers specialized services to that clientele (Shumaker, 2009). Similarly, Shidi, Aju and Ashaver (2014) saw a special library as a library or information centre which is established and maintained by government agencies, corporations, associations, business organizations, and individuals and so on. The researchers has agreed with these definitions but also defined special libraries in the context of the study as libraries that are found in corporate organizations, government agencies, judicial service commissions or law schools or faculties, medical institutions, museum, news houses, and monetary organizations such as banks etc. They are instituted to support their institutions mission in the area of provision of quality information and services.

Special libraries are different from other libraries in the sense that they are more concerned with a single subject with its related disciplines. In other words, they are special because they have specific users than other libraries (like national, public and university libraries) and they also deal with more specialized kinds of information. This is one of the reasons that they are called special. Again, they are termed special because of the emphasis laid on the services they offered to their clientele. According to King (2013) its collection is based on a particular profession or organization of the body it serve. Its monopolistic collection calls for unique users with compatible interest. It has limited number of users mostly members of a profession or organization. It is usually located within an organization (parent body) which does not allow non-members access to the library. Staff members are limited in number sometimes one member of staff. The head may have few supporting staff members and the librarian may have the responsibility of providing information needs of the staff at their door posts. Even when they do not visit, the staff search and provide the information (King, 2013).

Though, other libraries offer services as one of their activities, it is not number one. But in the case of special libraries, service is number one while other library activities sub serves it. This means service is the backbone of special libraries. This also explains their slogan ñputting knowledge to workò. Special libraries clientele are those within the organization who are usually specialists in the subject or discipline that the library is serving. Shidi, Aju and Ashaver (2014) observed that their clientele (users) are limited; usually members of a profession or organization, government department, educational institution and their collection are tailored to suit a limited field of knowledge.

It has been observed that most special libraries may not be rendering the services expected of them to their users. This may greatly affect their parent institutions in realization of their goal. In spite of this no investigation is seem to be carried out to the best of the researchersô knowledge. This reason has therefore called for the survey of services rendered by selected libraries in Kaduna State to verify the problem.The findings from this study will be significant to special libraries in Kaduna as it will create awareness of the services expected of them to render to their clientele accordingly.

Purpose of the Study

This study is designed to determine the services rendered by the selected special libraries in Kaduna. Specifically, the study sought to:

1. Find out when the libraries were established, the number of staff the libraries kicked off with, the current professional staff strength and whether or not they are sufficient for the running of the libraries
2. Identify the kind of services offered in the libraries
3. Measure the services offered with the expected services to be rendered by the special libraries

Research Questions

The study is guided by the following research questions

1. What is the year of establishment of the libraries, the number of staff the libraries kicked off with, the current professional staff strength and whether or not they are sufficient for the running of the libraries?
2. What kind of services is offered in the libraries?
3. What is the Measure of the services offered with the expected services rendered by the special libraries?

Literature Review

Over the years, quite a large number of studies have been done on the activities of special libraries which the services they render are one. But for the purpose of this study quite a few of them shall be reviewed to acquaint the reader with what would be looked into later as the study progresses. Though this study concerns services alone as the title depicts, other library matters and activities shall be touched briefly since knowledge is not isolated. According to Larson (1983), special libraries can vary so widely in their organizational structure, purpose, function, level of support and size that it is difficult to generalize about them. The source described special libraries as those with collections devoted to materials on a single subject or related group of subjects (art libraries, business libraries, law and medical libraries); others may be described by the form of material collected (map libraries and picture libraries). Many can be described in terms of their parent organizations (museum libraries and government libraries). Furthermore, special libraries may be either publicly or privately supported. Special libraries according to Omekwu and Ugwuanyi (2009:7) are distinctive for the specialized services which include: reference and research services through answering reference questions and assisting the users in their searches. Current awareness services-design to keep users aware of new information resources received in the library; and selected dissemination of information services which are integrated to the information need profile of users.

According to Kelley (2000) the services a special library provides a parent organization is perhaps the area in which it differs most significantly from other libraries. Among the many services the special library provides as identified by Kelley (2000) are the routing of Materials Current Awareness Services (CAS) which includes Selective Dissemination of Information (SDI) and the circulation of library bulletins; and extended research projects. Apart from the services mentioned above, special libraries offer other services. These services according to Cornell University (2014) include library to library book delivery services, document delivery, and borrow direct, interlibrary loan services, study space services and office visits services. Library to library delivery services is a kind of service in which patrons are allowed to make online request using their library catalogue that a material of their need be shipped from one library to a library of their choosing for more convenient pick-up. Borrow direct on the other hand is a kind of service that enables users of the library to search through the union or combined library catalogues of other libraries and directly makes their request expedited free delivery of circulation items. Interlibrary loan is that which enable users to request books, newspapers, journals or journal articles that are not owned by the university library free of charge. Study space is that which permit library visitors to set aside research materials from day to day in a designated study area while office visits is that which librarians subject themselves to go from office to office for assistance for any kind of services without them coming to the librarians offices.

Special libraries acquire their information resources in different ways. According to Evans and Saponaro (2012) there are eight types of acquisition methods followed by libraries. These include firm orders, standing orders, approval plans, blanket orders, subscriptions, leases, gifts, and exchanges which is also a process of consortia. Tribhuvan University Central Library (2016) identified five methods of acquisitions in special libraries as purchase, gift, exchange, depository and International Standard Book Number National Coordinating Agency.

Methodology

The study employed a descriptive research design. The study focused four selected special libraries in Kaduna State namely Peugeot Automobile Nigeria Limited Library, Geological Survey Library, Nigerian Institute for Trypaniosmiasis Research Library and Nigerian National Petroleum Corporation Library. All the 4 professional librarians in the four named special libraries in Kaduna State constitute the sample of the study. Questionnaires, interviews and document analysis were used as instrument for data collection. Data collected was analyzed using percentages while interviews and document examination was analyzed descriptively.

Results

Table 1: Year of establishment

S/N	Libraries	Year of Establishment
1	Peugeot Automobile Nigeria Limited Library	1979
2	Geological Survey Library	1930
3	Nigerian Institute for Trypaniosmiasis Research Library	1951
4	Nigeria National Petroleum Corporation Library	1981

Source: Fieldwork, 2016

Table 1 show that year of establishment of the four libraries under study. Result in the table reveals that Geological Survey of Nigeria Library which is the oldest library was established in the year 1930. The Nigerian geological survey which has the library is one of the oldest institutions of the federal government of Nigeria. It was established as a result of the need to survey Nigeria so as to know its region and their mineral resources. To support the institution, geological survey library was then established. Twenty-one years later, Nigerian Institute for Trypaniosmiasis Research Library was founded (1951). This was followed by Peugeot Automobile Limited Library which was instituted in 1979 and Nigerian National Petroleum Corporation Library in 1981.

Table 2: Number of Professional Staff

S/N	Libraries	No of Professional Staff at the start	Current No of Professional staff	Decision
1	Nigerian Institute for Trypaniosmiasis Research Library	1	**7**	Sufficient
2	Nigeria National Petroleum Corporation Library	1	1	Not Sufficient
3	Geological Survey Library	1	None	Not Sufficient
4	Peugeot Library	None	None	Not sufficient

Source: Fieldwork, 2016

Table 2 presents the number of professional staff that the libraries kicked off with. Data presented in the table show that 75% of the libraries studied had 1 professional staff, while 25% of the libraries studies had none. Currently, 25% (NITRL) reveals that it has 7 professional staff, 25% (NNPCL) has 1 professional staff while GSL and PANLL has none.

On the question of sufficient, 50% of the four libraries studied indicated that the professional staff is sufficient while 50% are of the opinion that the professional staff is not sufficient.

Table 3: Services Rendered by the Libraries

S/N	Services	Peugeot Library	Geological Survey Library	NITR Library	NNPC Library	Percentage
1	Loan services	Yes	Yes	Yes	Yes	100%
2	Cooperative services	No	Yes	Yes	No	50%
3	Current awareness services	No	No	Yes	Yes	50%
4	Selected dissemination of information	No	No	Yes	Yes	50%
5	Reference services	No	Yes	Yes	Yes	70%
6	Interlibrary loans	No	Yes	Yes	No	50%
7	Indexing	Yes	Yes	Yes	Yes	100%
8	Abstracting	Yes	Yes	Yes	Yes	100%
9	Bibliographic services	Yes	No	Yes	Yes	75%
10	Personal files	Yes	No	Yes	Yes	75%
11	Photocopying services	Yes	Yes	Yes	Yes	100%
12	Translation services	No	No	Yes	No	25%
13	Binding services	Yes	No	No	Yes	50%
14	Microform services	No	Yes	Yes	Yes	75%

Source: Fieldwork, 2016

Table 3 presents services provided by the libraries studied. It reveals that 100% of the libraries offered loan services, indexing and abstracting services as well as photocopying services. While 75% offered bibliographic services, personal file services and microform services, 70% offered reference services and 50% offered cooperative, CAS, SDI, interlibrary loans and binding services and 25% of the libraries offered translation services.

Table 4: Method of Acquisitions in the Libraries

S/N	Item	Peugeot Library	Geological Survey Library	MITR Library	NNPC Library	Percentage
1	Through purchase	Yes	Yes	Yes	Yes	100%
2	Through gift	No	Yes	Yes	No	50%
3	Through exchange	No	Yes	Yes	No	50%

Source: Fieldwork, 2016

Table 4 reveal methods of material acquisition for the services rendered. It reveals that 100% acquire materials for the services they rendered through purchase while 50% acquire their resources through gift and exchange.

Discussion

Result in the table reveals that Geological Survey of Nigeria Library which is the oldest library was established in the year 1930. The Nigerian geological survey which has the library is one of the oldest institutions of the federal government of Nigeria. It was established as a result of the need to survey Nigeria so as to know its region and their mineral

resources. To support the institution, geological survey library was then established. Twenty-one years later, Nigerian Institute for Trypaniosmiasis Research Library was founded (1951). This was followed by Peugeot Automobile Limited Library which was instituted in 1979 and Nigerian National Petroleum Corporation Library in 1981.

On the number of professional staff that the libraries kicked off with, the study reveals that the libraries studied such as Nigerian Institute for Trypaniosmiasis Research Library, Nigeria National Petroleum Corporation Library and Geological Survey Library had 1 professional staff each while Peugeot Library had none. Currently, NITRL has 7 professional staff, NNPCL has 1 professional staff while GSL and PANLL has none. However, the professional staff is said not to be sufficient as some libraries GSL and PANLL are still lacking professional staff.

On the kind of services provided to users, the study reported that all the studied libraries offered loan services and they loan out two books to a user. Majority of the studied libraries allow its users to stay with the books they borrowed for a stipulated period of two weeks while only MITR Library is reported allowed its users to stay with the borrowed materials for 4 weeks. Other services provided by the studied libraries include indexing and abstracting services, photocopying services, bibliographic services, personal file services, microform services, reference services, cooperative, CAS, SDI, interlibrary loans, binding services and translation services. This implies that almost all the services expected by a special library are offered by all the studied libraries. At the same time, quite a number of them such as indexing, abstracting, translations and microform services just to mention a few are not provided on regular basis. This is in line with Kelley (2000) and Omekwu and Ugwuanyi (2009) who identified the services of a special library as the routing of Materials, Current Awareness Services (CAS) which includes Selective Dissemination of Information (SDI) and the circulation of library bulletins; and extended research projects; reference and research services through answering reference questions and assisting the users in their searches. Current awareness services-design to keep users aware of new information resources received in the library; and selected dissemination of information services which are integrated to the information need profile of users.

The studied libraries such Geological survey Library and MITR library operate between 8am-4pm while NNPC Library operate between 8am-4.30pm and Peugeot library operate between 8am-5pm daily during working days. The major way of acquiring special collection resources in these libraries is through purchase. This means the major way of getting materials into these libraries is to buy the resources with money. This method is complemented by gift and exchange. This agreed with Tribhuvan University Central library (2016) that identified five methods of acquisitions in special libraries as purchase, gift, exchange, depository and International Standard Book Number National Coordinating Agency.

However, from the analysis and interpretation of the data collected, it has been gathered that most of the libraries complained of inadequate space for their collections and users. On the number of professionals on employment and whether they were sufficient or not, most of the libraries had one each, except one which had none. Most of these libraries responded negatively to the question of sufficiency.

Recommendations

Based on the results of the study, the following recommendations are made. More professional staff should be employed in the libraries especially NNPC, Geological and Peugeot libraries. Other services such as internet services be provided in the libraries to save space and usersô time. More provision should be made for accommodation to accommodate the entire collections and users

Conclusion

Libraries are service oriented institutions. Based on this, special libraries are instituted in their parent institutions to help or support in the achievement of their objectives. Conclusion could therefore be made that the libraries provides different kinds of services to their parent institutions. These include loan, indexing and abstracting services, photocopying services, bibliographic services, personal file services, microform services, reference services, cooperative, CAS, SDI, interlibrary loans, binding services and translation services. These services are hindered by inadequate space for collections and usersô accommodation. The study recommends that adequate accommodation be provided for the libraries collections and user comfort to explore their information needs.

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SHORT COMMUNICATION

Wide Area Netork (WAN) And Its Comparative Study

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This paper examined the different networks that are used for internet connectivity including LAN, MAN, WAN and place more emphsis on WAN. The paper tried to identify differencess between the networks that are applicable when Internet is to be made available. Th study also identified the hardware usually found in each types of network and the ones that are used to connect the various components and explained some security issues involved. The paper commented on the transmission media ownership issues and how the privately owned systems connect with the third party system for interporability. The paper concluded by bringing forward the effectiveness of the WAN network and the protocol used for the same.

Keywords: Internet, network, LAN, WAN, Transmission media, Hardware, Seucirty issues

Introduction

The earliest network were mainframe computers with dumb terminals connected in a start configuration with all processing actvity centered on the mainframe. A Local Area network (LAN) is an axample of intelligence sharing. This shared intelligence is sought to bring additional imagenmanagement and security issues. As intelligence began to be shared between the mainframe and terminals, new hardware and software concepts were needed to support the new configurations. When multiple local networks are connected over a metropolitan area to share computing power and data storage, this network is called a Metropolitan Area Network (MAN). A network that span a more global range is called a Wide Area Network (WAN). The discussion in this short communication therefore considered issuues like transmission media ownership, harware, security issues, protocols used, conclusion and recommedations.

Transmission Media Ownership

The different modes of possession, authority and control that exist over both individual systems and collections of heterogenous systems are refered to as the ownership. For the interoperation of the system, the purview of this discussion also include ownnership of the process. There are cases when single entity may completely control all elements and that of a system. However, as the world of interconnected systems grows more and more complex, it is more likely that no single entity is responsible for the overall composite system (Carney,

2005). It is of paramount importance to discuss the topic of ownership in many domains. Carney has devoted considerable amount of energy and time in studying the naunces of ownership and how they can be applied to different area such as law, economics, telecommunications, landusage and right, taxation, industrial dynamics, public policy and many others. In the field of computer systems and software, the topic is currently receiving significant interest, particularly from thte vantage point of intellectual property (Network Categories, nd*).

Harware

Whenever there is need to make network connections, some hardware are required. For the different networks, differnet hardware are required such as local area network (LAN), a connection is formed when two or more computers are linked together. The hardware devices that are introduced can range from switches used to connect hardware like computers and printers, to routeer, wireless access points and servers designed to centrally provide applications and services as the size of the LAN increases.

Switches are primarily hardware component in network functioning and effiecnitly, thus enabling proper network communication. To establsihed a LAN, cabling is run to each hardware device on the network. Switches are used to interconnect the hardware cabling throughout the LAN and permit the flow of data. There are ports for network connections in each switch and the number of ports are based on the size of the switch. Switches run 24 hours a day, 7 days a week and have features ranging from redundant power supplies to quality of service to priotize different types of LAN traffic (Wide Area Netowrks, n.d*).

Wireless access points can be introduced into LAN to provide greater flexibilty and reudce cabling requirements. Radio waves are not sent to computers using antenna through this hardware thus enabling workplace mobility. Some of the popular installation points are conference rooms and open-space area like cafeterias. The access point connects to a LAN switch to extendnetwork service. Security feature including the ability to encrypt data are important qualities when introducing this device into a LAN. (Zadorozhny, 2008).

The services that are provided at the workplace through these enterprising servers range from messaging, virus protection, application and collaboration tools. Like switches, servers operate 24hours a day, 7 days a week to meet the demands of the work place. These are equiped wih multiple proicessor, power supplies and increased memory. Components in the server can be swapped out while it is running to maintain up time. Serves are designed for high availability and are located in secured computer rooms and data centers (Fontaana, 2008).

Thin client hardware which are smaller profile hardware devices designed with fewer parts provide a good alternative to desktops. This device requires less power so it reduces operating costs. It connects to the LAN and also provides ports for a monitor, mouse and keyboard. This device relies on servers to provide application services for workers. In contrast to a desktop computer which can store files locally. Thin cleint rely on storage

attached to the LAN. This central approach to file storage and application services simplifies administration and improves security.

Security Issues

Just like every other thing, wireless networking is also prone to certain security issues. Hackers have found wireless network are relatively easy to break into and they even use wireless technology to hack into wired networks. It is therefore very importsnt that entrprises define effective wireless security policies that guide against unauthorised access to important resources. Wireless Inrtrusion Prevention System (WIPS) or Wireless Intrusion Detection System (WIDS) are commnoly used to enforce wireless security policies (Carney, 2005).

The risks to users of wireless technology have increased as the services has become more popular. There were relatively few dangers when wireless technology was first introduced. Diring that initial phase, the hackers had not yet had time and intelligence to latch on to the new technology and wireless network were not commonly found in the work place. But with time, there have been many security risks associated; and, with the current wireless protocols and encription methods the situation is even worse. There is also a huge amount of careless and ignorance that exist at the user and corporate IT level. With the wireless technology, hacking methods have become much more sophisticated and innovative. Hacking has also become much easier and more accessble with easy to use Windows or Linux-based tools being made available on the web at no charge (Landwehr, 1997).

There is a wide range of protocols included in IP and they are used for a variety of purpose on the network. The set of protocols that are part of TCP/IP is called the TCP/IP protocol stack or the TCP/IP suite of protocols. There are four TCP/IP layers which include: link, network, transport, and application. The link layer is the hardware that provide ability to send messages between multiple location. In the case of this discussion, Ethernet provides this capability:

1. Essential- Without this all other categories are irrelevant
2. Critical- The network as designed is useless without this ability
3. Important ï The network could function but would be difficult to use and manage
4. Advanced ï Includes enhancements that make the network easier to use and manage
5. Useful ï Functionality that you would like to be able to use as a network user.

Conclusion

This short communication has considered the wide area network in comparsion with other networks like MAN and LAN. It has pointed out that for connectivity between networks to take pleace, some hardwares are required. However, these are prone to security issues such as hacking. Based on this security issues, the paper recommended that entrprises should define effective wireless security policies that guide against unauthorised access to important resources. These may include: Wireless Inrtrusion Prevention System (WIPS) or Wireless Intrusion Detection System (WIDS).

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