DESIGN AND IMPLEMENTATION OF SUSTAINABLE BUILT ENVIRONMENT: THE ROLE OF SURVEYING AND GEO-INFORMATICS TOWARDS EFFECTIVE COLLABORATION WITH OTHER PROFESSIONALS

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Abstract

Built environment sustainability has become an issue of national concern, owing to the constant threat posed by its negative impacts on the survival of man. This has made it necessary for a study on how there can be collaboration for sustainable development in the built environment, in order to reduce or completely eliminate its negative impacts (such as climate change, environmental degradation, desert encroachment, etc.). This paper proposes the identification of the role of professionals in the design and implementation of built environment, as a means of enhancing effective collaboration for sustainable development in the built environment. The roles of Surveying and Geo-informatics in design and implementation stage of the built environment were investigated through a review of literature, after which a research questionnaire was issued to professionals in the built environment to seek their assessment on how each role could serve as a collaborative support towards achieving sustainable development in the built environment. Descriptive statistics (mean score) was used to analyze and gain an overview of the data obtained. The results showed that all the roles of Surveying and Geo-informatics at the design and implementation stage of built environment would support and enhance effective collaboration for sustainable development in the built environment.

Keywords: *Built Environment, Sustainability, Surveying and Geo-informatics, Design, Implementation, Collaboration*

1.0 INTRODUCTION

Built environment refers to Man-made space in which people live, work, and recreate on a day to day basis. This includes; buildings, parks and transportation systems (Roof and Oleru, 2008). Built environment can also be referred to as everything that shows the activities of man in the natural environment, such as the design and construction of buildings and infrastructure (Huges, 2010).

The importance of having a built environment are numerous, and cannot be overemphasized. One of its greatest importance which was identified by Burton (2011), is the fact that children's well-being is been enhanced positively. That is, living in a well built up environment is important to children's good health and up-bringing.

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However, built environment also have some negative impacts, such as climate change, depletion of natural resources, global warming, Ozone layer depletion, and environmental degradation (Ilha et al, 2006; Dassah and Nimlyat, 2010; Wong, 2016; Tan et al, 2017). The effects of these impacts tend to constantly threaten the survival of Man and the Eco-system. For example, in August 2018 it was discovered that climate change was causing Indonesia's largest metropolis to sink at an average of 1 to 15cm per year. Also, in October 2018, series of Earth tremors were experienced across parts of Abuja in Nigeria, and it was found to have resulted from environmentally degrading activities of Man, such as rock blasting and indiscriminate drilling of bore holes.

Owing to the devastating nature of these impacts, and their effects on the environment, it has become necessary for a study on how to effectively collaborate for sustainable development in the built environment in order to reduce or completely eliminate its negative impacts.

Sustainable development in the Built Environment implies meeting the current needs of the present without affecting those of the future (Cesar and Ryan, 2014; Pero *et al*, 2017). This literarily means developing the environment to suit the present needs, without destroying or compromising it for the future. The challenge therefore is how to collaborate to achieve sustainable development. Research works that have been carried out on sustainable development include the works of (Sarkis et al, 2009; Kamar et al 2010; Dassah and Nimlyat, 2010, Wong, 2016; and Pero et al, 2017).

This paper seeks to investigate the roles of Surveying and Geo-informatics professionals at the design and implementation stage of built environment, that will facilitate effective collaboration with other professionals for a sustainable development in the built environment.

2.0 LITERATURE REVIEW

Sarkis et al, (2009), established a framework for the evaluation of the most effective method of integrating sustainability in the built environment, such that a win-win opportunity may be maximized, through an extension of ecological modernization theory, at the organization level. Dassah and Nimlyat (2010) tried to investigate the role and responsibilities of professionals in the built environment in contributing towards achieving sustainable development. Kamar et al (2010) tried to explore a collaborative initiative on green construction as a means of enhancing sustainable development in the Malaysian construction industry. Wong (2016) investigated the roles of quantity surveyors in sustainable building, through review of literature and case studies. Pero et al (2017) investigated the role of environmental collaboration of supply chain partners in achieving sustainable development in the construction industry.

3.0 MATERIALS AND METHODS

A review of past literatures was undertaken, to put together the major roles of the Surveying and Geoinformatics professionals in the design and implementation stage of the built environment. Thereafter, a research questionnaire was designed to seek the assessment of 6 different professionals in the built environment, on the extent to which each of the roles could serve as a collaborative support towards achieving sustainable development in the built environment. Table 1 shows a list of roles the Surveying and Geoinformatics professionals could offer as support at the design and implementation stage of built environment.

Table 1: Roles of Surveying And Geo-Informatics Profession In Design And Implementation Stage of Built Environment.

S/N	Role	Purpose	Source
1	Reconnaissance Surveys	The information provided from a reconnaissance survey could be used to select the best location for a proposed infrastructure, and to decide on the choice of material to be used.	Kavanaugh, 2009; Uren and Price, 1994
2	Carry out topographic surveys for the provision of topographic maps	Topographic maps could be used by professionals in the built environment for proper planning and design of engineering structures such as dams, bridges, roads, etc.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
3	Provision of Land Use, Land cover information	Land use Land cover data helps in proper planning and management of natural land resources, thereby preventing the environment from being degraded.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
S/N	Role	Purpose	Source
4	Design data acquisition	most built environment infrastructures require accurate information about the existing ground surface for their design. Examples include; the design of Roads, Bridges, and Dams.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
5	Setting out	Needed for the establishment of design points on the ground during construction	Ghilani and Wolf, 2012; Schofield and Breach, 2006; Uren and Price, 1994
6	As-built Surveys	used to show that construction of a project has been performed according to the approved construction drawings, specifications and contracts.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Uren and Price, 1994
7	Provision of Horizontal and Vertical control network	needed for preliminary surveys (surveys made to collect data) and construction surveys (setting out of propesed construction features	Kavanaugh, 2009; Uren and Price, 1994
8	Monitoring of Ground and Structural stability	Constructed structures such as dams and high-rise buildings need to be monitored due to changes in ground conditions and Earth movements.	Ghilani and Wolf, 2012; Kavanaugh, 2009; Schofield and Breach, 2006; Uren and Price, 1994
9	Cadastral survey	Needed for land parcel delineation, property surveys and boundary definition	Kavanaugh, 2009

10	Bathymetric Surveys	needed for determining the depth of a water body, and its surface topography. It is usually required for dredging activities and constructions made on water, such as foundation of a bridge built across a water body	Ghilani and Wolf, 2012; Kavanaugh, 2009

The questionnaire which comprised the compiled roles alongside a likert scale which ranged from 1 to 5 (1 – important; 2 – fairly important; 3 – moderately important; 4 – important; 5 – very important) was issued to 6 different professionals of the built environment residing within Kwara state. The method of random sampling was used, and a sample size of 300 was extracted from the 6 professionals involved. This is tabulated in table 2.

TABLE 2: SAMPLE FRAME

Professionals	**Sample size**	**Response**	**Percentage**
rchitects	50	32	10.7
Civil Engineers	50	35	11.7
Estate Surveyors	50	41	13.7
Quantity Surveyors	50	37	12.3
Surveyors	50	39	13
Town planners	50	34	11.3
Total	300	218	73

A total of 218 valid responses were received. This represented a response rate of 73%, which was considered as satisfactory, since it conforms with the general rule of thumb pointed out by Leedy, (1997) and Chan, (2012), which states that a minimal sample size of 30% is sufficiently large to provide an effective normal approximation regardless of the shape of the population frequency distribution.

Descriptive statistics, specifically the mean score was afterwards used to analyze and gain an overview of the data obtained from the questionnaire survey.

4.0 DATA ANALYSIS AND RESEARCH FINDINGS

TABLE 3: MEAN AND STANDARD DEVIATION OF ROLES

S/N	Roles	Professionals											
		Architects		Civil Engineers		Estate Managers		Quantity Surveyors		Surveyors		Town Planners	
		Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation	Mean Score	Standard Deviation
1	Reconnaissance Surveys	4.151	0.626	4.091	0.619	4.091	0.699	3.747	0.827	4.483	0.621	4.139	0.723
2	Carry out topographic surveys for the provision of topographic maps	4.073	0.739	3.794	0.617	3.796	0.682	4.041	0.791	3.987	0.656	3.533	0.76
3	Provision of Land Use, Land cover information	3.927	0.839	3.429	0.698	3.52	0.724	3.977	0.745	3.543	0.714	3.632	0.682
4	Design data acquisition	4.277	0.567	4.411	0.685	4.104	0.645	4.421	0.739	4.412	0.595	3.256	1.091
5	Setting out	4.552	0.541	4.643	0.587	4.421	0.739	4.537	0.532	4.565	0.627	3.754	0.758
6	As-built Surveys	4.027	0.706	3.952	0.538	3.792	0.769	3.974	0.728	3.389	0.56	2.845	0.853
7	Provision of Horizontal and Vertical control network	4.532	0.53	4.357	0.648	3.759	0.989	3.798	0.924	4.567	0.516	3.694	0.833
8	Monitoring of Ground and Structural stability	3.893	0.754	4.373	0.63	3.445	1.037	3.238	1.124	3.916	0.592	3.009	0.741
9	Cadastral Surveys	3.469	0.692	3.574	0.587	3.739	0.651	3.439	0.654	4.152	0.517	3.643	0.699
10	Bathymetric Surveys	3.757	0.761	4.142	0.481	3.561	0.549	3.524	0.795	3.805	0.513	3.444	0.801

5.0 DISCUSSION OF FINDINGS

As shown in the results on table 3, the mean score of each role is above 1.0, which indicates that respondents were generally in agreement with the fact that these roles could facilitate effective collaboration of the Surveying and Geoinformatics professionals with other professionals in the built environment, towards achieving sustainable development in the built environment. Furthermore, all the roles are perceived as moderately important to very important (above 2.0) which also indicates that all the roles would facilitate effective collaboration of the Surveying and Geoinformatics professionals with other professionals in the built environment, towards achieving sustainable development in the built environment.

6.0 CONCLUSION

The roles of the surveying and Geo-informatics professionals in the design and implementation stage of a sustainable built environment have been investigated, and the results shows that all the identified roles would facilitate effective collaboration of the Surveying and Geoinformatics professionals (Surveyors) with other professionals in the built environment, towards achieving sustainable development in the built environment.

The paper concludes that proper identification of the roles of professionals in the design and implementation stage of built environment, and sharing of ideas is necessary for an effective collaboration for sustainable development in the built environment. Further studies may investigate more roles of the Surveying and Geo-informatics professionals, and try to find out if they would facilitate effective collaboration for a sustainable development in the built environment. Also, more professionals of the built environment may be included in further studies, as only six professionals of the built environment were considered in this research.

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