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Exploring Alternative Library Services (ALS) in Enhancing Public Library Patronage in Nigeria: An Architectural Contribution

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Abstract

Alternative Library Services (ALS) is based on the principle that the library needs to provide a leisurely environment by serving various functions of entertainment and social activities. The essential goal of ALS is to attract more patrons to visit libraries in person. This study contends that the public library is an ideal physical and psychological space for public interactions, and thus, there is need to rethink what the library is all about, in terms of what is needed, what will be used, what is applicable, and introducing services that are attractive to the user. Therefore, this study focused on exploring ways in which library services can be redefined through architectural design, to be able to meet the demands of the present and future users. An exploratory research method was used to carry out the study and the sampling was done purposively while the population was limited to the users of the library in the study area. Three public libraries were purposively selected as cases for the study; these are the Kaduna State Library Board, Kogi State Library Board and Lagos State Library Board. These case studies were chosen deliberately to increase the likelihood of showing or expressing important variations of several features of the facility, and can be used to illustrate an architectural style or issue. One hundred and five (105) questionnaires were administered on the respondents (35 from each of the cases studied). Results from the questionnaires show that 46% of users are attracted to libraries because of the available services, while others are accessibility (13%), quality of service (12%), patron satisfaction (21%) and location (8%). This study reveals the importance as well as emphasizes the necessity of alternative library services, and their effects on the patron's choice of library, showing the need for better consultation between the users, librarians and professionals concerned in the study and design of public libraries. Furthermore, there is need to look beyond the traditional library spaces and to consider the changing needs and modern ways of keeping the library patrons.

Keywords: *Alternative library services, future libraries, users, patronage, public library.*

INTRODUCTION

Song (2009) posits that libraries are now faced with unprecedented challenges to the extent that their survival often becomes an issue for discussion. These libraries were generally designed first and foremost as places to collect, access, and preserve print collections and thus, are comparatively static buildings. Planning and design of these facilities were primarily devoted to the preservation and security of materials and to the efficiency of the library collection services. Prime space is routinely reserved for processing

materials, given this longstanding practice. It is no surprise that the traditional library we inherit today is not the library of the future, since it lacks the extra services that meet the needs of the present users. To meet today's users' needs as well as those of the future, Freeman (2005) opines that the library must reflect the values of the communities of which it is a part, while also accommodate new services and learning technologies and improving the ways we access and use them. Therefore to achieve these goals, existing services provided by the libraries need remodelling and need to embody new pedagogies to meet the emergence and *integration of information technology.* Although for now information technology has not replaced print media and is not expected to do so in the foreseeable future, it has nonetheless had an astonishing and quite unanticipated impact on the role of the public libraries in the community. Therefore once we understand the potential of the library as a place, its role and the value it adds to the educational development of its community by the services rendered, a detailed program can be developed to explore alternatives to bridge the gap between current library services and actual user needs. Isaac (2000) highlighted the need for a radical change in the concept of public libraries. The author opined that they must serve all sectors of the population; urban and rural dwellers, literate and non-literate, children, adults, and that the services have to be rooted in the Nigerian oral culture, playing the role of disseminating and preserving this culture.

This study contends that the public library is an ideal physical and psychological space for public interactions, and thus, there is need to rethink what the library is all about, in terms of what is needed, what will be used, what is applicable and introducing services that are attractive to the user. Therefore, this study will focus on exploring ways in which the library services can be redefined, through architectural design, to be able to meet the demands of the present and future users.

LITERATURE REVIEW

The Concept of Alternative Library Services (ALS)

ALS is based on the principle that the library needs to provide a leisurely environment by serving various functions of entertainment and social activities. The essential goal of ALS is to attract more patrons to visit libraries in person. Digital collections and online information will not and cannot replace the traditional library. A survey showed that 94 percent of patrons agree that the library is still a place for lifelong learning (American Library Association 2006). The traditional image of library environment can be characterized as a formal, quiet and individual learning place. That is one of the key reasons why fewer patrons visit libraries today. They prefer to stay home to access library information while playing their favorite music and sipping a cup of coffee. Shen (2006) postulated that "Why walk to the library when all the information you could ever need is available at your fingertips in the comfort of your home?" This view is shared by Barefoot (2006), who believed that some patrons think that the library as a place is "too quiet to study in" and it is a sort of museum, a place that belongs to the past, not the present. All these point to the fact that there is need to provide services that are attractive enough for this new generation of users growing up in a

multimedia environment. In support of the above Limberg & Alexandersson (2003) further opine that public libraries should also function as a place of leisure and places of refuge providing reading and learning resources, instead of just the traditional functions. They should be able to strike a balance between work and leisure or between control and freedom. In addition a library should be a green and sustainable building which includes both internal and external constructions. External constructions for a green library, according to Drew (2001), should include beautiful landscape, access via public transportation, drive-up to pick up library materials, and drive-up book drops, site, sunshine, airflow and rainwater. Internally, it should provide comfortable furniture and interior design in order to enhance patron and staff comfort, increase library accessibility (Chism, Bickford, Powell, and Deborah 2002). Limberg and Alexandersson's (2003) view, "the architecture and the interior design of the library provide teachers and librarians with the possibility of creating and exploiting spaces as a resource for particular kinds of library interaction."

Human touch and interpersonal communication should play an important role in ALS since learning is a human process, which needs special interactions and effective engagement between patrons and librarians. Limberg and Alexandersson (2003) argued that two theoretical perspectives can improve the understanding of using the library as a learning space. They believe that the library can be seen as a cultural tool that has a communicative function, while the other is that place and space are never disconnected from people, because locations "are of great existential significance for people," contributing to personal identity. In addition to impersonal factors of resources and environment, Streatfield and Markless (1994) also think ALS should be supported and promoted by personal factors such as staff, librarians, and patrons because library is indeed "a cultural tool with a communicative function" (Limberg and Alexandersson, 2003).

Jamieson (2005) argues that libraries should be required to shift from their traditional role as repositories of information and other resources for individuals' passive learning, to places where learners meet, collaborate, and interact in learning processes that are much more dynamic. While Limberg and Alexandesson (2003), opine that a library is no longer "a warehouse for books," but "a space for collective rather than individual action" as supported by Forrest and Hinchliffe (2005), when they state that group discussions have become common components of the teaching and learning process. Furthermore, Rafste (2005) indicated that the library use does not end in only educational activities. Additionally, Dressman (1997) in his bid to identify the differences between classrooms and libraries indicated that while classroom is basically devoted to literacy as work, library is space devoted to literacy as the pursuit of personal desire.

Based on the foregoing, it is clear the traditional public library models cannot satisfy the present day users, which has resulted in public libraries failure in fulfilling their role within society. This failure could also be attributed to the fact that these libraries were formally built for a small percentage of users i.e. the ones with access to formal education systems. Additionally, the provisions of library services now are not taking the social and economic realities of the country into

consideration and as such were bound to fail. Then, in the face of those challenges what need to be done to enhance the patronage?

Challenges to Enhancing Patronage of Libraries

Patronage is defined as the position, encouragement, influence, or support of a patron, as toward an institution (Webster 2015). Lack of patronage could be attributed to the fact that the Public library facilities are not very impressive as no widespread usage of digitization is visible in those libraries. This de-facto indicates the lack of knowledge at policy level, Abiola and Olatokunbo (2002) believed that without the introduction of digital libraries it is not possible for the country to meet the challenge of improving literacy through the libraries. Nwokocha (1998) identified key indicators used in the assessment of patronage for libraries which includes accessibility, quality of service, available services, location, patron satisfaction, demand for available services and cost of services. The author believes these indicators will help in determining the rate of patronage of a library.

As libraries try to develop new kinds of activities in supporting research, teaching and learning, librarians are very much aware of the need to sustain the momentum of innovation in developing new approaches and new services to support changes in institutional missions and in the workflows of both patrons and staff. Sustaining momentum will depend increasingly on how they find balance between the content/space and staffing challenges (Denise, 2001). Content/space is discussed briefly being one of the major subject matters in this study.

Content/Space

Well-resourced libraries cannot hope to acquire and provide access to all the content that their patrons want. Therefore Selective development of their collections remains a fundamental part of the role of public libraries. According to Denise (2001) the shift in libraries away from print and towards digital content is driven by powerful forces including the constraints of space and finance, and above all user demands. However despite the progress of digitization and the increasing drive in digital content, Nigeria is still far from the position where all the content of interest to patrons will be available digitally. Thus, in the short term, most libraries in Nigeria are likely to remain hybrid, with both print and digital content.

In countries with hybrid libraries, some of the libraries are interested in exploring how they might build co-operative, distributed models for library collections, that is both digital and in print that are shared across a group of libraries, regionally, nationally, or defined by their subject interests. Low-use print material can thus be shared by users across a number of libraries, and locally managed collections replaced by co-operative agreements. For digital material, there is increasing interest in moving towards co-operative collection-development plans and co-operatively managed digital aggregations, or even ‘cloud-sourced’ collections (Ranseen 2002).

Nwokocha (1998) opines that the shift from print to digital resources provides libraries the opportunity to focus more on providing services than on managing collections of content. Many libraries are keen to develop in this way, with new services to help users create, manage and manipulate information. Libraries are thus interested in helping to develop more

effective arrangements for managing, sharing and preserving data created or gathered by researchers, if they are to develop new services or enhance existing ones. However, Denise (2001) suggested that for libraries to achieve these they must first tackle these key challenges.

Firstly, they must reduce if not eliminate what is routine in order to make space for new activities, for it is unlikely that additional resources or funding will be available. Outsourcing of what can be done more efficiently or effectively by others is likely to be part of the answer in areas including cataloguing and the hosting of library websites. Secondly, they must ensure that users are fully engaged in the development and implementation of new services. Thirdly, they must develop new models of working co-operatively to exploit the resources and expertise of their colleagues in the sector as a whole.

Current Trends in Public Library Service Designs

Public libraries continue to provide what is referred to as traditional services such as the borrowing and use of library material. However, it is also clear that our local communities expect public libraries to provide additional services. These services reflect the role of modern public libraries as community facilities where people can meet, share and learn. The changing demographics and social trends, ever-increasing financial constraints for government and rapidly changing information technology, all point to the direction that the design and function of libraries must evolve to meet these and other new challenges so as to remain relevant, by providing a public library building that is well designed and consistent. However Drew (2001) opines that to ensure they continue to have the capacity to provide traditional library services as well, our future public libraries must be buildings that:

i. Provide a cultural hub and focal point for the community.
ii. Include functional and multipurpose spaces, accommodating a range of activities and uses.
iii. Enable user-friendly access to the latest in technology.
iv. Attract a wide range of users providing areas for relaxation, research, leisure and learning.
v. Have effective and efficient delivery of services.
vi. Develop from a co-operative approach between all stakeholders to ensure that the changing needs of the community are met.
vii. Are good values in the longer term and contribute to Environmental Sustainability.

Finally, the underlying revelations discuss some space design trends in public library design which was developed in 2001 by Harrington, Director at Oregon's Pacific University library. In his report on the current trends in library spaces, Drew examined projects and proposed that there are six trends in today's library spaces. The six trends are:

1. Self-service and operational efficiency.
2. Extreme flexibility and integration of technology.
3. Green/ sustainable buildings.
4. Collaborations between public and school/collage libraries.
5. A renewed interest in aesthetics.
6. Customize your library to the local community.

However, it should be borne in mind that the application of the six trends only without engaging the users (patrons) throughout the development cannot

succeed in enhancing patronage in public libraries.

RESEARCH METHODOLOGY

An exploratory research method was used to carry out the study and the sampling was done purposively while the population was limited to the users of the library in the study area being Nigeria. Three public libraries were selected as cases for the study. These are Kaduna State Library Board, Kogi State Library Board and Lagos State Library Board. These case studies were chosen deliberately to increase the likelihood of showing or expressing important variations of several features of the facility, and can be used to illustrate an architectural style or issue. One hundred and five (105) questionnaires were administered on the respondents (35 from each case study).

The questionnaire is designed to elucidate data towards achieving the study objective which is to determine the users' perception regarding the ALS in order to facilitate architectural contribution. The questionnaire in this study is divided into three sections. Section A contains demographic information of respondents such as sex, age, level of study and occupation, while Section B contains questions regarding patronage of library. Section C attempts to identify ALS resources and service they will like to see in the library. The questionnaire was made up of Likert-type scale questions on available library facilities, and any new services respondents would like to see in the library, frequency of use of library by users, and the problems of using the public libraries. Descriptive statistics was used in analyzing the data elucidated from the questionnaire.

DATA ANALYSIS, FINDINGS AND DISCUSSION

Analysis were made on the available library services and services to be incorporated in future library designs, thereby seeing if it have any effect on patronage in public libraries. The following were revealed.

User Perception of Factors That Enhance Public Libraries Patronage

1) Accessibility to the library site

The question on how close they stay to a public library, the result in Figure 1, shows that about 15% of users in Kaduna are very close to a library and about the same percentage are extremely far from the libraries, but this cannot be compared to the 42% of users who live far from the libraries and as such shows that the distance of the library is not as influential in library patronage as the services they provide.

2) Influence of alternative library services in patronage

From Figure 2 below, it can be observed that 82 percent of the respondents indicated that collective learning was their topmost priority. Following closely was leisure style, while 63 percent opted for a library with personal human interaction.

3) Attraction to the library

Table 1 shows that 46 percent disclosed that their choice of library is dependent on the available services while 21 percent feel their level of satisfaction derive from using the library. Eight percent believe the location of the library is what influences their choice of library.

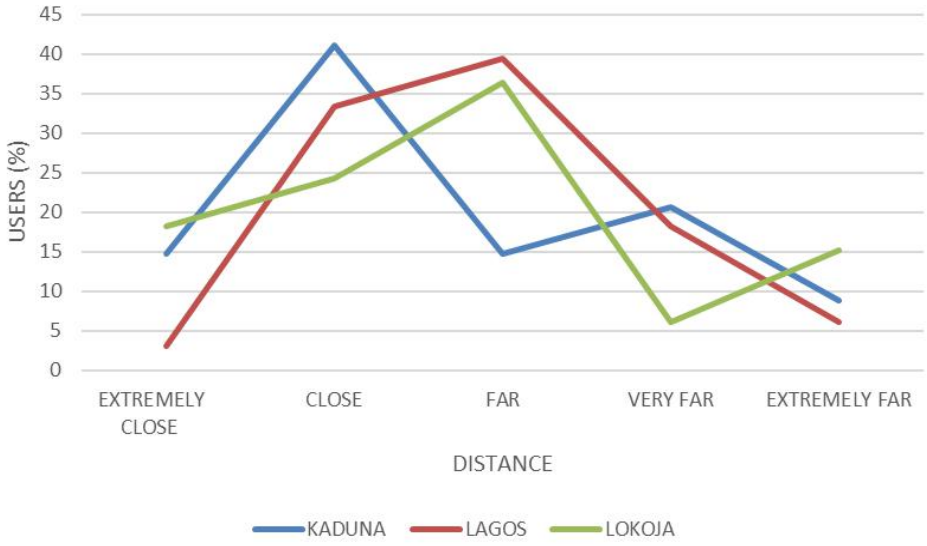


Figure 1: Graph showing effects of distance. Source: Fieldwork, 2015

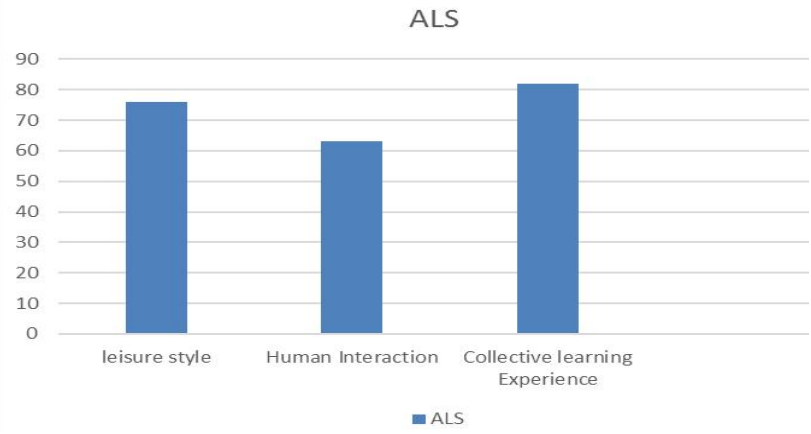


Figure 2: Graph showing chronological ranking of factors

Table 1. *Attractions to the library*

S/No	Indicators	%
1	Accessibility	13
2	Quality/cost of service	12
3	Available Services	46
4	Patron satisfaction	21
5	Location	8
	Total	**100**

CONCLUSION

The results from the study revealed that public library spaces play a major role in user's satisfaction, which directly affects patronage. Specifically, the study indicated that public library designers must take into cognizance that the library patrons are a priority without whom, library as a whole stands the chance of being deserted; the study further stressed

the need for the incorporation of alternative library services as an essential tool in the design of public library which could go a long way in increasing patronage. As such social activities and leisurely means of studying and relaxation should be included in the library design, instead of just its traditional functions and should be included in the library design to replace its traditional functions, providing a balance between work and leisure or between control and freedom.

Finally, the study highlighted the need for consultation between the users, librarians and professionals concerned with the study and design of public libraries to design strategies that considers varieties of learning types, which incorporates not only virtual spaces but also variety of support services to look beyond the traditional library spaces to adopt changes and modern ways of keeping the library patrons (Brown and Lippincott, 2003)

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Impact of Materials on Construction Project Success in Lagos State, Nigeria

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Abstract
The study of construction project success is gaining increasing attention as the industry faces problems of time and cost overruns. It appears that construction materials are one of the major contributors to time and cost overruns of construction projects. This paper therefore aims at examining the impact of materials on success rate of construction of housing project in Lagos State of Nigeria. Three hundred and seventy (370) randomly selected residential projects were assessed through questionnaire. The result of the study revealed that 20% of the total project delays were due to the late delivery of materials and these material delays accounted for 18% of total project cost overruns in construction process. It is therefore recommended that adequate preparation and monitoring of material movement schedule should be put in place after purchase order is placed with the vendor and conduct pre-transportation inspection where necessary.

Keywords: *Cost Overrun, Frequency Distribution, Materials, Project Success, Residential Projects, Time Overrun*

INTRODUCTION

The construction sector is the backbone of the economic growth and social-economic development of a nation (Nguyen, Ogunlana and Lan, 2004; Ofori, 2015). It interacts with nearly all fields of human endeavours (Nguyen, Ogunlana and Lan, 2004; Akanni, Oke, and Akpomiemie, 2015). Unfortunately, the intrinsic complexity, uncertainty and dynamics of most construction projects create difficulties for the clients and contractors in terms of project duration and cost. The duration and cost of construction projects right from inception to completion is assuming great importance in the construction industry (Nkado, 2007). A construction project is commonly acknowledged as successful when it is completed on time, within budget and in accordance with specifications and to stakeholders' satisfaction (Ashworth, Hogg, and Higgs, 2013; Ogunsemi, 2015). Chan and Kumaraswamy (2001) remarked that a building project can only be regarded as successful if it is delivered at the right time, at the appropriate price and quality standards and provides the clients with a high level of satisfaction. A successful project is illustrated in Figure 1.



Figure 1*. Project Success Determinant*

It can be seen from Figure 1 that a successful project means that the project is completed on time, within cost and to the required quality standard. In construction, projects generally experience time-delays and cost overruns during their implementation phase (Akanni, *et al.,* 2015; Ogunsemi, 2015; Jagboro, 2016). For example, examination of construction projects by Jagboro (2016) showed those projects were rarely completed on scheduled time or within the allocated budget. Other researchers have also observed that time and cost overruns are common place in the construction industry worldwide (Assaf, Al-Khalil, and Al-Hazmi, 1995; William, 2001; Chan and Chan, 2002; Vandevoorde and Vanhoucke, 2005; Jagboro, 2016). A comprehensive classification of causes of construction delays has also been recommended by Mansfield, Ugwu, and Doran (1997) and Chitkara (2011). They studied the causes of delay and cost overrun in construction projects in Nigeria. The results showed that the most important factors are shortage of material, financing, poor contract management, changes in site conditions and improper planning. Ogunlana, Prokuntong, and Jearkjirm, (1996) studied the delays in building projects in Thailand. They concluded that the problems of the construction industry in developing economies rested on shortages or inadequacies in industry infrastructure and main supply of resources. Darvik and Larsson (2010) studied the cost and performance of construction projects in Sweden and found out that material delivery deviation was responsible for poor cost performance of construction projects. Koushki and Kartam (2004) included the inadequacy of resource supplies, client and consultant shortcomings and contractor incompetence. McKim (2000) established the major factors that affect poor project success to include inadequate resources, high fluctuation in workload, technical expertise, managerial skills and other items. Koushki and Kartam (2004) performed a comprehensive analysis of factors, which contributed to projects time and cost overruns. The researchers identified the problem causes at the micro level and developed a ranking of causal factors based on their relative contributions to causes of delays. The factors and their ranks are presented in Table 1. The finding in these studies all point to the importance and significant contribution of construction materials and supply inadequacies to causes of delays.

INFLUENCE OF CONSTRUCTION MATERIALS ON CONSTRUCTION TIME AND COST OVERRUNS

Broadly, construction materials cover all types of materials used in construction including electrical and mechanical fittings, fixture, devices and instruments that are incorporated during the construction of permanent works and temporary supporting works at site. According to Chitkara (2011), materials account for more than 40% of the project cost. No project can ever be started without materials. Construction materials are increasingly becoming scarce and their procurement is a time consuming process. The schedule aids in forecasting of materials and their timely supply determines the economics and progress of work.

***Table 1**. Factors contributing to project time-delays*

Factors	Rank
Late delivery	1
Damaged materials	2
Poor planning	3
Equipment breakdown	4
Improper equipment	5
Unreliable supplier/subcontractor	6
Inadequate fund allocation	7
Poor quality	8
Absenteeism	9
Lack of facilities	10
Inappropriate practices/procedures	11
Lack of experience	12
Attitude	13
Poor monitoring and control strike	14
Shortage of personnel	15
Delay payment to supplier/subcontractor	16
Inefficient communication	17
Wrong method statement	18
Unavailability of proper resources	19
Deficient contract	20
Interference with other trades	21
Too many responsibilities	22
Subcontractor bankruptcy	23
Low morale/innovation	24

Source: Koushki and Kartam (2004)

The construction industry is strongly dependent on the supply of materials (Darvik and Larsson, 2010). Costs for purchasing material and services for example represent 75% of the turnover for Sweden's three largest construction companies (Dubois and Gadde, 2000), and purchases of material correspond to at least 40% of the contract sum in a construction project (Boverket, 2005). Hadikusumu, Petchpong, and Charoenngam (2005) stated that material delivery deviations, such as delayed deliveries, incorrect quantity and quality defects, are common in the construction industry. Although materials have a great impact on costs, quality and time in construction projects, there are few studies investigating how materials affect these parameters. This paper therefore aims at exploring the effects of materials on construction project success. The specific objective of this paper is to evaluate the effects of construction materials on time-delay and cost overruns in the construction of residential projects in Lagos State of Nigeria.

The Study Area

Lagos State is one of the thirty-six states in the Federal Republic of Nigeria. It lies between Latitudes 6^{o} 22' and 6^{o} 42' North of the Equator and between Longitudes 2^{o} 42' and 3^{o} 22' East of the Greenwich Meridian (African Newspapers of Nigeria (Plc) and Lagos State Government, 1999). Lying in the south-western portion of Nigeria, Lagos state stretches for more than 180 kilometres along the Guinea Coast of the Atlantic Ocean and it is bounded on the North and East by the sister state of Ogun, and on the West by the neighbouring Republic of Benin (IBLL,

1998). The metropolitan Lagos consists of island endowed with creeks and Lagoon (Figure 2). Lagos metropolitan areas are bounded in the west by Oyo and Ijamikin, Lekki Peninsula in the east and Ikorodun and Alagbado towns in the north. It covers an area of about 1,183 km^2 out of the 3,577km^2 total area of Lagos State (George, 2002). The research was carried out in Lagos State, Nigeria, because Lagos is listed as one of the 25 megacities of the world with numerous construction projects executed by the public sector to meet housing, economic and infrastructure requirements of the emerging megacity. (Amuda, 2006; Ameh and Osegbo, 2011).



***Figure 2**: Lagos State showing the Lagos Metropolis*

METHODOLOGY

This research was carried out in two stages. Firstly, literature survey of the construction material variables affecting construction project success was first identified through literature review and interviews with industry practitioners (Architects, Quantity Surveyors and Engineers). Secondly, a convenience sampling technique was adopted for the administration of survey questionnaire. However because of the slow response rate, the sampling technique was supplemented with snowball sampling technique. These techniques were adopted because of the nature of the study, which requires the opinion of highly experienced industry practitioners for reliable response. A total of three hundred and seventy (370) small, medium and large private residential projects, spread across Lagos State of Nigeria were randomly selected for the analysis of time-delays and cost overruns. The selection of the case study was based on the representation of the geographical and land-use (measures of accessibility), population density (measure of traffic congestion) and the socio-economic traits of households in Lagos. These projects were either just completed or near completion. The owners of the selected projects were identified, personally interviewed and requested to respond to questions concerning their socio-economic and various characteristics of the residential project.

RESULTS

An average residential project had a cost of ₦28.5m and required 16 months of time to complete. The cost of land of an

average residential project was in excess of ₦10m. The mean increases in projects' duration and budget were 1.1 month and ₦5.45m respectively. On average, ₦3.49m of a projects' cost increase was due to its material component. Results were summarized in tables for clear understanding.

Selection of Construction Materials

The frequency distribution of material-related variables is presented in Table 2. From the analysis on selection of construction materials, about 13% of the respondents' preferences were the main reason for the selection of construction materials. 16% of the respondents considered quality, only 6% considered price as the main factor in the selection of construction materials for the residential projects. The remaining 65.1% of the owners however selected the project's materials based on a combination of personal choice, material quality and price.

Table 2. *Construction Material-Related Variables*

Material related variable	**Distribution traits**	
	Frequency	*%*
Selection of Construction materials		
Personal preference	49	13.2
Quality	59	16
Price	21	5.7
Combination	241	65.1
Selection time-duration (months)		
1	201	54.3
2	54	14.8
3	43	11.8
4-8	56	15.3
≥9	14	3.8
Responsibility for material delivery		
Contractor	89	24
Client/Owner	252	68.1
Supplier	11	3
Combination	18	4.9
Material type		
Local	127	34.3
Imported	49	13.2
Combination	194	52.5
Availability in the market		
Yes	261	70.5
No	32	8.7
Partly	77	20.8

Materials Selection Time

Table 2 also shows that about 54% of the owners spent 1 month for the selection of construction materials. Approximately 42% allocated 2, 3, or from 4 to 8 months of time, each for the selection of materials, and the remaining 4% allocated more than 8 months for the selection of construction materials.

Responsibility for material delivery

As shown in Table 2, the responsibility for the delivery of material was mainly assumed by the owners (68% of the respondents) and followed by the

contractors (24% of the respondents). Only 3% of the respondents believed otherwise (supplier was responsible for the delivery of construction materials), and for the remaining 5% of the respondents, the three shared the delivery of materials: the owner, the contractor and the supplier.

Type of Construction Materials

On the type of materials, the analysis indicated that about 53% of the sampled project, projects' owners utilized a combination of local and imported materials in the construction of the residential projects. About 34% used only local materials and the remaining 13% used imported materials as shown in Table 2.

Availability of Materials in the Local Market

On the availability of materials, the Table 2 shows that for nearly 70% of the residential projects the selected materials were available at the local market in Lagos, Nigeria. 30% of respondents indicated that materials used were not available at the local market in Lagos. Those materials were brought in from other parts of the country.

Delivery Period of Construction Materials

Table 3 shows the timeliness of the delivery of construction materials. 26% of the projects received their materials on schedule while the deliveries of construction materials were delayed in about 42% of the sampled projects.

Period of Delay

Table 3 indicates that 155 out of the 271 sampled projects had delay in the delivery of materials. 81% of the period of delay was within a month, while 19% of the delay period was more than a month.

Delivery Cost of Construction Materials

From the analysis, 94% of the construction materials were delivered on agreed cost while 21% of the materials were not delivered on the agreed price. This is presented in Table 3.

Table 3. *Material-related time delay and cost increases*

Variable	**Distributional traits**	
	Frequency	*%*
Was material delivered on time?		
Yes	95	25.7
Not always	120	32.4
No	155	41.9
Delivery time-delay (month)		
1	125	80.7
>1	30	19.3
Was the delivery on the agreed price?		
Yes	349	94.4
No	21	5.6

Effects of Material Type and Project Time and Cost Overruns

A cross-classification analysis, along with a test of chi-square was performed on the data to identify and examine the contribution of a number of factors to the on-time delivery of construction materials. Results are presented in Table 4. A trend was found to exist between the material type and on-time delivery of materials to the construction site. Imported materials were delivered to the site more on-time than either the local or a combination of local and imported materials. The statistical significance of this trend is also confirmed by the test of chi-square ($x^2 = 18.9$, df = 4, $p < 0.001$).

DISCUSSION

The analysis of the identified construction material variables affecting construction project delivery is discussed from the perspective of the respondents. The analysis was carried out from the perspectives of the clients in Lagos state.

The selection of construction materials is majorly based on the quality recommended by the project supervisor in most private residential projects. The choice of these materials was mostly made within a month. Clients assumed the responsibility for the delivery of the materials in most private residential projects.

Table 4. *Material Type, Project Time and Cost Overruns*

Material Type	**Material delivery on time**			**Material delivery at the cost**	
	Yes	*Partly*	*No*	*Yes*	*No*
Local	23	31	96	89	11
Imported	55	47	28	134	7
Combination ($x^2 = 18.9$, df = 4, $p < 0.001$)	17	42	31	126	3

Materials are often delivered later than promised in the delivery announcement. Late deliveries cause delays and shifting of work assignments but above all forces construction workers to go back and do rework, which takes longer time than if all work could be performed as planned.

The types of materials used in the construction of residential projects also affects project time and cost overruns. Surprisingly, projects built with imported materials experienced the least amount of time and cost overruns when compared to those constructed with either only local or a combination of local and imported materials. This finding is, nonetheless in accordance with the expectations, since owners and contractors who intend to use imported materials must ensure the availability of such materials prior to the start of the construction phase. The general reliance on the availability of local materials in the local market often results in disappointments. Material availability at the local market demonstrated a pronounced impact on projects' cost overrun. Material unavailability at the local market in Lagos resulted in a significant increase in the project cost overrun due to cost increases.

CONCLUSION AND RECOMMENDATION

The paper presents contribution of materials on construction time and cost overrun of residential building projects in Nigeria. The analysis was based on questionnaire survey. Information from a total of three hundred and seventy (370) small, medium and large private residential projects spread across Lagos state of Nigeria was collected. It was found out that in most of the studied projects the delivery of materials was in line with the agreed price while not more than 50 % of the projects received their materials on time. 20% of the total project delays were due to the late delivery of materials and these material delays accounted for 18% of total project cost overruns in construction process.

The selection period, the type of construction materials and their availability at the local market all affected the extent of delay and cost overruns. From the survey, a month was the optimum time period allocated for the

selection of materials. Imported materials contributed the least to the construction time and cost overruns. Large and costly projects experienced longer time delay and higher cost increases due to the late delivery of construction materials on site. It is therefore recommended that adequate preparation and monitoring of material movement schedule should be put in place after purchase order is placed with the vendor and conduct pre-transportation inspection where necessary. The owners and contractors who intend to use imported materials must ensure the availability of such materials prior to the start of construction and obtain periodical information on shipment/transportation status of such imported materials also to keep ready the documents necessary for clearing customs and other formalities during transit. There should be planning in advance for receiving materials at the site. These include unloading place, machinery for handling at site, persons for inspecting materials for correctness, storage arrangement and the construction site/persons who are to be intimated on arrival. Finally, material management should be notified of any discrepancies for further action including timely replacement or reordering.

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ARCHISEARCH

Evaluation Of Self – Shading Built Forms For Optimizing Passive Cooling In Warm–Humid Climatic Region Of Nigeria

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Abstract
This paper investigated how built forms can enhance passive cooling in buildings for warm-humid climate. Five geometric forms (cylinder, cuboid, sphere, cone and trapezoidal) with same volume and same floor area were investigated using Ecotect building assessment software. From the results, it was observed that geometric forms with straight walls achieve a higher percentage of self - shading which assists in cooling while forms with slanting walls tend to acquire more heat gain.

Keywords: *Building Assessment, Geometric forms, Warm-humid climate*

INTRODUCTION

The primary function of all buildings is to adapt to the prevailing climate and provide an internal and external environment that is comfortable to occupants (Nwofe, 2014). Mahajan (2012) posit that buildings contribute as much as one third of total greenhouse gas emission which consumes up to 40% of all the energy.

Adeleke (2010), reported that in this era of climate change and global warming, providing comfort for the occupants of a building is quite challenging because it requires a huge amount of energy which is detrimental to the environment, unless priority is given to strategies which can enhance the performance of buildings at a minimised energy consumption rate. Bromberek (2009), suggests designers should design in response to heat sourced from the incident solar radiation in the tropics where heat is the dominant problem throughout the year, and buildings are meant to keep the occupant cool rather warm. This implies that the heat sources can be modified to meet the required cooling needs passively in a specific climatic region through specific design variables that can optimize passive cooling such as building geometric forms. Wang *et al* (2006), advocates that consideration of geometric forms and other relevant design variables can reduce up to 40% energy consumed in buildings. Lam *et al*. (2005) proposed that one way to reduce energy consumption would be to limit heat gain into the buildings and hence reduce the demand for air-conditioning during hot summer months. Lam *et al*., (2005) further posits that efforts to reduce cooling load can be done by blocking and filtering solar radiation from entering the building solar radiation is the most major contributor to heat gain in buildings. The prediction of average solar insolation for any day, month, season or year is needed in estimating the cooling load arising from radiation received on walls or transmitted through windows. Solar insolation refers to the total amount of cumulative incident solar

radiation on a point or surface over a specified period (Bromberek, 2009). Understanding the characteristic of solar insolation strikes on different geometric shapes and orientations are crucial (McKeen & Alan, 2014). Capeluto (2003), and Chia (2007) conducted a study for high rise buildings in Malaysia and suggested that self-protected form is one of possible ways against the impact of solar radiation. Although several parametric studies have focused on the relationships between cooling loads and geometric configuration of buildings, the results from various findings are incomparable due to diverse climates. Nigeria has six (6) distinct but intricately related climatic zones. Lagos region has one of the most extreme of both warmth and humidity. The climate of the zone is influenced by the equatorial maritime air mass, which is characterized by high humidity, associated with discomfort for about eleven months of the year. Thus, a parametric study of Lagos climate could aid in proffering solutions to other less extreme climatic regions of the country. Agboola, (2011), reported in his study that the Lagos climate falls under warm-humid climatic region based on Geiger Koppens classification. The climatic zone lies within the sub-equatorial rainforest, which encompasses the coastal region, forest and transitional region. The main rain occurs between April and October and the maximum temperature is never within comfort limit. Lawal, (2013) also revealed all monthly and climatic plots of Lagos State falling out of comfort zone with thermal neutrality of 27^0C. This implies the need to apply passive technique in buildings in the region to enhance thermal comfort and minimize active energy consumption. The study aims to investigate which amongst five major tropical residential building geometric forms maximizes passive cooling at low consumable energy rate for buildings in Nigeria. Table 1 indicates the monthly incident solar radiation in watts hour (Wh) for Lagos climate regardless of building typology and it is used to determine the monthly indoor variation in temperature for the forms analyzed in the study.

Table 1. *Lagos State, Monthly incident solar radiation in Watts hour (Wh)*

Month	Monthly incident Solar Energy (Wh)
Jan	147855
Feb	147712
Mar	176994
Apr	170487
May	178670
Jun	144258
Jul	139421
Aug	130917
Sep	135689
Oct	153855
Nov	176610
Dec	144490

CHARACTERISTICS OF BUILT FORMS

The Energy Conservation Building Code (ECBC) (2009) states that building form can affect solar access and wind exposure as well as the rate of heat loss or heat gain through the external envelope. The volume of space inside a building that needs to be heated or cooled and its relationship with the area of the envelope enclosing the volume affect the thermal performance of the building.

Ling et.al, (2007) expressed geometric forms in terms of width to length ratio (W/L ratio) and state that irrespective of built form adopted, the one with 1:1 W/L ratio has minimum exposure to solar radiation.

Further studies in Muhashin and Abed (2013) identify the relationship between W/L ratio and surface to volume ratio

(S/V). Form with higher surface to volume ratio increases heat loss during winter season and heat gain due to exposure to solar radiation during summer season. Geometric forms with higher value of (W/L) ratio contain lower value of S/V (Basam, 2002).

Apparently, a form with minimum solar exposure depends on geometric properties which enhance self-shading effect, and less energy consumed throughout the year for indoor cooling (Bromberek, 2009). Keeping other variables constant, Muhaisen and Huda, (2015) describe higher W/L ratio form to have greater shading tendency throughout the year because shaded and unshaded surfaces are equal at any given time and a lower surface volume ratio (S/V) to have a larger contained heated volume with smaller surface exposed. A self-shaded form is considered the best solution for improvement in thermal performance of buildings (Muhaisen & Huda, 2015). It is found from all the previous studies that surface to volume ratio are responsible for thermal response in different geometric forms. However, different geometries with the same volume and base area are not extensively investigated to determine the self-shading tendencies of these geometries in the adopted climatic zones.

METHODS

Energy Simulation Program

ECOTECT (ECOTECT Version 11) is a software with an intuitive 3-D design interface with a comprehensive set of performance analysis functions and interactive information display (Autodesk, 2011). Ecotects' simulation can display the graphical distribution patterns and availability of solar insolation over the surfaces of an entire building, which gives it an advantage over other simulation softwares.

For this study, ECOTECT V 11 is used to simulate data for cumulative incident solar radiation on vertical surfaces on a daily and monthly basis. All simulations are calculated based on the available hourly direct and diffuse horizontal solar irradiance data from ECOTECT Weather Tool for Lagos Nigeria.

The effect of geometries towards energy consumption of five (5) different forms with similar floor area and volume were investigated using ECOTECT simulation software under Lagos climatic condition.

Dependent and independent variables are:

(i) Independent Variables:

- Cuboid,
- Cylinder,
- Cone,
- Sphere and
- Trapezoid;

(ii) Dependent variables:

- Incident solar heat gained in (KWh/m^2),
- Shaded area (%),
- Diffuse horizontal solar irradiance (KWh/m^2),

RESULTS

From the analysis carried out, the annual cooling loads to attain 18^0C-27^0C comfort band in Lagos climatic region for five different building forms with the same floor area, volume and thermophysical properties were calculated. Tables 2 to 6 show total energy consumption and percentage of self – shading. Results from Tables 2 and 5 indicate a lower average absorbed solar heat gain and higher self – shading percentages whilst Tables 3, 4, and 6 indicate higher average absorbed heat gain and lower self – shading percentages.

Table 2. *Monthly Heat Absorption and self-shading percentage for Cuboidal Form*

Form Description	Vol. (m^3)	Incident Heat Gain (kWh)	Absorbed Solar Heat Gain (kWh)	Self-Shading (%)	Total Energy Consumption (/m^2)
		147.85	31.50	50%	
		147.71	29.55	50%	
		177.00	34.41	50%	
		170.48	34.28	50%	
		178.67	34.97	50%	
		144.25	29.04	50%	
Cuboid	300	139.42	28.51	50%	378.8 KWh / m^2
		130.91	27.68	50%	
		135.69	27.87	51%	
		153.86	32.16	50%	
		176.61	34.27	50%	
		144.49	30.58	50%	
	Average	153.91	31.24	50.08%	

Source : Ecotect V 11 (2015)

Table 3. *Monthly Heat Absorption and self-shading percentage, Trapezoidal Form*

Form Description	Vol. (m^3)	Incident Heat Gain (kWh)	Absorbed Solar Heat Gain (kWh)	Self-Shading (%)	Total Energy Consumption (/m^2)
		147.85	43.08	37%	
		147.71	41.76	37%	
		177.00	49.67	32%	
		170.48	48.93	31%	
		178.67	49.66	36%	
		144.25	40.56	37%	
Trapezoidal	300	139.42	39.51	37%	525.1 Kwh / m^2
		130.91	38.37	33%	
		135.69	39.35	29%	
		153.86	44.63	36%	
		176.61	47.86	37%	
		144.49	41.69	37%	
	Average	153.91	43.76	34.92%	

Source : Ecotect V 11 (2015)

Table 4. *Monthly Heat Absorption and Self-Shading Percentage for Spherical Form*

Form Description	Vol. (m^3)	Incident Heat Gain (kWh)	Absorbed Solar Heat Gain (kWh)	Self-Shading (%)	Total Energy Consumption (/m^2)
		147.85	36.82	19%	
		147.71	35.40	17%	
		177.00	42.51	18%	
		170.48	41.67	17%	
		178.67	42.31	16%	
		144.25	34.30	18%	
Sphere	300	139.42	33.41	20%	445.3 Kwh / m^2
		130.91	32.47	18%	
		135.69	33.41	17%	
		153.86	37.80	17%	
		176.61	40.40	21%	
		144.49	34.87	22%	
	Average	153.91	37.11	18.33%	

Source: Ecotect V 11 (2015)

Table 5. *Monthly Heat Absorption and Self-Shading percentage, Cylindrical Form*

Form Description	Vol. (m^3)	Incident Heat Gain (kWh)	Absorbed Solar Heat Gain (kWh))	Self-Shading (%)	Total Energy Consumption (/m^2)
	300	147.85	28.08	52%	330.8 Kwh / m^2
		147.71	25.73	53%	
		177.00	30.20	54%	
		170.48	30.32	55%	
		178.67	30.19	53%	
		144.25	25.33	52%	
		139.42	25.15	52%	
		130.91	24.70	54%	
		135.69	25.05	55%	
Cylinder		153.86	28.62	53%	
		176.61	30.08	52%	
		144.49	27.33	52%	
	Average	153.91	27.57	53.08%	

Source : Ecotect V 11 (2015)

Table 6. *Monthly Heat Absorption and Self Shading percentage for Conical Form*

Form Description	Vol. (m^3)	Incident Heat Gain (kWh)	Absorbed Solar Heat Gain (kWh)	Self-Shading (%)	Total Energy Consumption (/m^2)
Cone	300	147.85	46.41	22%	583.9 kWh / m^2
		147.71	45.71	19%	
		177.00	55.75	19%	
		170.48	55.34	18%	
		178.67	56.40	18%	
		144.25	46.05	18%	
		139.42	44.85	20%	
		130.91	43.32	19%	
		135.69	44.06	19%	
		153.86	49.43	21%	
		176.61	51.66	24%	
		144.49	44.78	26%	
	Average	153.91	48.65	20.25%	

Source : Ecotect V 11 (2015)

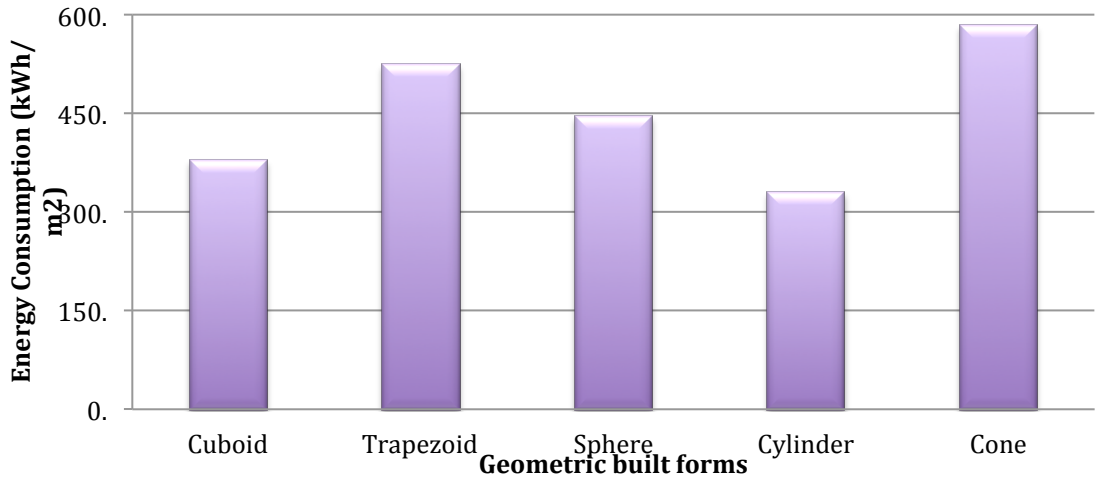


Figure 1. *Comparison of Annual Energy Consumption for form types*

DISCUSSION

From Table 6, results revealed that more heat is gained in the year by conical form and it requires 583kwh/m^2 annually for cooling which is about 43% larger than the cylindrical form (330kwh/m^2), which has the least average heat gain throughout the year. Cuboid takes 12% of its annual consumption larger than the cylindrical form while spherical and trapezoidal respectively has 26% and 37% difference compared to that of cylinder in terms of energy consumed. Capeluto (2003) and Chia (2007), concluded that self-shading building envelopes are the best form of natural solar prevention. From results of this study, it seems that the more compact the form, the more self-shading obtained. These findings are in accordance with the findings of Basam Besch (2002) who through a study reported that minimal heat loss (in cold regions or heat gain in warm regions) through the fabric of a building can be achieved through a compact shape. Thus, the most compact orthogonal building would then be a cube since the cuboid shape has more self-shading. Nonetheless, the results of Basam Beschs' studies were derived for hot climate and not for warm humid climatic regions. Results for warm humid regions indicate that the cylindrical form has the outmost performance in terms of heat loss and self -shading. It is observed that self-shading and absorptive tendencies of built form contribute to the factors that determine energy required for cooling the warm humid climate. Based on these results, cylindrical form has the highest shaded surface with low heat gain and lesser consumable energy throughout the year compared to cuboidal and trapezoidal form respectively.

Surface volume ratio has an impact on the heat gain in built forms according to Ling & Huda (2007). Similarly, it is observed in the case of spherical and conical forms which almost have similar geometric configuration (circular base, curved and slanted surfaces) that despite more shaded region in cone, more energy is consumed compared to sphere. This is because the cone has a larger exposed surface to contain the same volume a spherical form will take which invariably requires more energy to cool it down.

CONCLUSION

Passive cooling in buildings can be achieved by critically examining the factors affecting the thermal performance of the building. Use of appropriate built form helps to minimize cost of HVACs in through heat gain minimization in the warm – humid climate.

This paper has shown that cylindrical, followed by cuboidal forms are most suitable for buildings located in Tropical warm – humid climatic region because they both have a comparatively lower consumable energy due to lower heat gained and higher self-shading tendency throughout the year, compared to other selected forms in the same climate. However, this study did not consider other design variables such as building materials, orientation, wall or glazing thickness etc., in change of internal, temperature and energy consumption. Thus, more research need to be carried out in search for the best design strategy that needs to be adopted in this climatic region to significantly cut down the human impact on climate change.

RECOMMENDATIONS

This paper has assessed various built forms in optimizing passive cooling in warm humid climatic region of Nigeria, based on this research, the use of built

forms with highest self-shading tendencies are recommended in Nigeria warm-humid climatic region. However, keeping other design variables constant, cylindrical form will have the greater tendency to optimize passive cooling in the warm-humid climatic region of Nigeria and it is therefore recommended at early stage of design. This will have a substantial reduction in the burning of fossils fuel due to HVACs usage in buildings located within the warm – humid climatic region of Nigeria.

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ARCHISEARCH

The Use of Information and Communication Technology (ICT) in Construction Project Planning by Nigerians Indigenous Contractors

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Abstract

Information and Communication Technology (ICT) is a general expression covering the use and integration of computers, telecommunications and electronics. Computers have proven to be a reliable tool in all spheres of human endeavour. Research indicates that the emergence of ICT capability has aided companies to implement project management speedily through the use of computer based software for project planning, estimating, scheduling, and control. The use of computer applications and ICT to perform the core task of project management in project planning, cost data base, cost estimation and document management, have been found to improve project success, project profitability of the construction process, and improve bid success ratio of construction companies. Despite these identified benefits, research in developing countries has shown that such computer applications and ICT were not being used effectively for planning and avoidance of cost/time overrun and other planning related problems. A study was carried out in order to assess the applicability and potential benefit of computerized systems and ICT in project delivery among Nigerian indigenous contractors. Sixty (60) registered construction companies fully owned and managed by Nigerians were self-administered with structured questionnaire. Responses from fifty (50) companies were completed, returned and analyzed for differential and inferential statistics. Results were presented in tables and graphs. Findings from the study show that computerized systems and ICT usage in construction planning has the ability to improve effectiveness of contractor's construction planning, which has the ability to avoid cost and time overrun, abandonments of project and reduction in contractors' profit. In order to improve effectiveness of construction planning, the paper concludes that Nigerian indigenous contractors should provide an ICT compliant communication forum in any project. The forum should be accessible to all project members and should provide regular update on events, progress or changes as they occur throughout the project life cycle.

Keywords: *Construction, ICT, Indigenous Contractors, Project Planning*

INTRODUCTION

Information Technology (IT) was defined by Kasim (2011) as the use of electronic machines and programs for the processing, storage, transfer and presentation of information. According to Anyakoha (1991), information technology is "the use of man-made tools for the collection, generation, communication, recording, re-management and exploitation of information". Hawkridge (1983)

describes information technology as a revolution, which has penetrated almost all fields of human activity, thus transforming economic and social life. The United Nations Development Programme UNDP (2001) asserts that even if sustainable economic growth facilitates the creation and diffusion of useful innovations, technology is not only the result of growth but can be used to support growth and development.

UNDP (2001) credited ICT with the ability to transform economic and social life with significant changes expected from their widespread use in Africa. From this standpoint, Africans can take maximum advantage of the new technologies even if major challenges remain. These challenges include adapting ICTs to local conditions and uses in developing countries, and allowing each to country understand those innovations and adjust them to their own developmental needs. Mutesi and Kyakula (2009) show Information to be a stimulus that has some contextual meaning for its receiver, while communication is a process whereby information is enclosed in a package discreetly and imparted by a sender to a receiver through an identified channel.

For an effective completion of a construction project, there is need for an effective collaboration and coordination among the diverse project participants, Prasanna and Ramanna (2014) assert that the effective way of achieving the necessary collaboration in construction projects is by means of communication between all the project participants. Sorensen *et al* (2009) reported that Danish government has promoted enhanced use of modern Information and Communication Technology (ICT) in order to facilitate increased productivity through better coordination between the different phases of the building project. Sorensen *et al* (2009) further indicated that it is expected that improved use of similar ICT technologies in the construction phase may reduce defects and increase quality in construction by improving knowledge and information handling, project transparency, project and quality management methods as well as knowledge capture in general.

POTENTIALS OF ICT IN CONSTRUCTION MANAGEMENT

Traditionally, building projects are hardly treated without communication means, such as face-to-face meetings and the exchange of paper documents. Mutesi and Kyakula (2009) characterized construction industry with inaccurate and untimely communications that often result in costly delays. Brewer and Gajendran (2009) report the industry to be frequently described as fragmented, information intensive and adversarial.

The key advantage of ICT to professionals in the construction field is the possibility to consider and produce project changes at any time (Kalinichuk, 2014). The advantage of using ICT in construction management further include its ability to create the big integration into construction industry such as in Building Information Modeling (BIM) or Green Design.

Love, *et. al.* (2000) found that construction firms might lose competitiveness or risk losing contracts if they did not recognize the potential of ICT. Meanwhile, suppliers and small construction firms who adopted ICT to establish partnering alliances with larger construction firms were more likely to have competitive advantage compared to SMEs who had not implemented ICT (Walker and Rowlinson, 2000).

Kasim (2011) asserts that almost 60% of the total working capital of any industrial organization consists of materials costs. Material management is defined in Kasim (2011) as a coordinating function responsible for planning and controlling materials. Hence, proper handling and managing of materials will cause a huge benefit in cost, time and quality of projects. ICT implementation may be the answer to overcome the challenge of materials management in the construction industry through effective tracking, recording and efficient use of materials and resources in a construction project.

METHODOLOGY

Descriptive Field survey approach was adopted for data collection. The data was collated using two sets of questionnaires, which were self-administered to respondents. The target population was made of up management staff and production senior staff of indigenous construction companies in Abuja, Nigeria. Even though the target construction companies are based in Abuja, they however do not have any restriction on working in any part of Nigeria. Cooperate Affairs Commission (CAC) (2014) list of building and general contractors in Nigeria indicated that up to 20% of the companies were shown to have their head office in Abuja, while another 40% of the companies whose head offices are not in Abuja were shown to maintain branch offices in Abuja.

Population size of 1920 registered building and general contractors in Abuja was provided by CAC (2014). The list does not state whether a company is fully owned and managed by Nigerians or otherwise, because of this heterogeneity in the list, purposive sampling was used to select only those companies that are fully owned and managed by Nigerians. Israel (1992) argues that research in social science and management can be carried out at 90% confidence level or less. Sample size of 50 companies was determined using Kish Formula (Kish, 1965) at 90% confidence level.

The data from the questionnaires was tabulated and analyzed using Statistical Package for the Social Sciences (SPSS) software for descriptive and inferential analysis. Results of descriptive statistics were presented in tables and bar charts. Cross tabulation tables were used for inferential statistics to show relationship between research data.

Relative Importance Index (RII)

Scott and James (2011) advocate for the wider use of relative importance index (RII) as a supplement to multiple regression analysis. This according to them is that relative importance indices provide information, which is not readily available from indices typically produced from multiple regression. This study employs the use of relative importance index (RII) to show the ranking of related variables presented on same table.

(RII) is determined by dividing the mean response with the highest value on the Likert scale used. Decision relating to most significant factor was taken based on the factor having the highest RII point in the group of the identified variables.

FINDINGS AND DISCUSSION

Respondent's Perception on Effectiveness of Planning Process in Organization

In order to assess the effectiveness of the current planning process of Nigerian contractors, Contractors were asked to indicate which statement was true with respect to planning in their respective organizations. The options provided were, "the current planning process needs major

improvement for it to be sufficient", "The current planning process is sufficient; nothing should be added or removed", "Little improvement is required on the planning process" and "There is need for total overhaul of the current planning process".

Results of respondent's responses relating to effectiveness of planning in their organizations were collected and presented as percentages in a bar chart in Figure 1. The height of each bar represents the group percentage for each response type from the total population.

Results in Figure 1 highlight the urgent need for improvement in planning among Nigerian contractors. This is evident given that a total of 98% of contractors surveyed believe that there is need to improve planning in their organisations compared with only 2% who believed planning in their organisations is sufficient.

How to Improve Construction Project Planning

Figure 1 shows the need to improve construction planning among Nigerian Contractors. In order to find ways of improving construction planning, possible alternative ways were presented to contractors in which they were required to indicate how likely they were to agree how each of the alternatives could improve planning. The result is presented in Table 1.

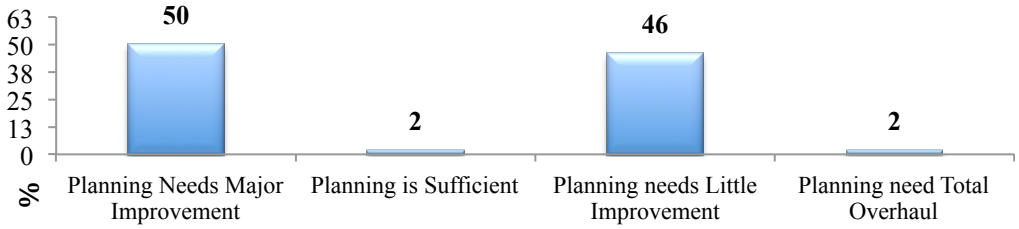


Figure 1. *Effectiveness of Current Planning Process among Nigerian Contractors*

Table 1*. Modalities to Improve Construction Project Planning*

Events	Frequency					∑F	∑FX	Mean	RII	Rank
	1	2	3	4	5					
Use of Computers and ICT	1	0	2	11	36	50	231	4.62	0.92	1st
Plan should be monitored and controlled throughout project duration	0	0	2	15	33	50	231	4.62	0.92	1st
Progress meetings and briefing to review plan	0	0	1	22	27	50	226	4.52	0.90	3rd
Application planning techniques	1	0	3	22	24	50	218	4.36	0.87	4rd
Making project plan a compulsory document	1	5	8	11	25	50	204	4.08	0.82	5th
Every member of project team should be part of the planning process	2	2	8	14	24	50	206	4.12	0.82	5th
Resources for planning should be allocated in the BOQ	1	7	11	8	23	50	195	3.90	0.78	7th
Only trained Project managers should plan project	1	6	14	17	12	50	183	3.66	0.73	8th

Note, RII=Relative importance index. 1= strongly disagree, 2=disagree, 3=likely agree, 4=agree, 5=strongly agree.

ICT was ranked first with an RII of 0.92 which shows that the contractors surveyed believe Information and Communication Technology (ICT) can be used to improve planning. The result further demonstrates belief and acceptance of ICT by Nigerian contractors.

Method and Effectiveness of Construction Planning In Organisations

The relationship between how organization plans construction project and effectiveness of the plan is shown in Table 2. The result shows that 33.3% of organisations that use computer application and experience agree that their organizations planning process needs major improvement. This value is lower than those for other organizations that plan differently. Fifty percent (50%) of Organisations that use only computer applications to plan reported that their organisation needs major improvements. Forty percent (40%) of organisations that plan with manual planning tools said their organisation need major improvement while 75% of organization that rely on experience and intuition to plan said their organization need major improvement. Results also show that organizations that use computer application and experience in planning construction project record better satisfaction with performance of the planning compared with organizations that plan otherwise. Considering 61.1% organizations that use computer applications and experience reported that construction planning in their organization needs minor improvement, 5.6% agree that planning in their organization is sufficient and 33.3% agree there is need for major improvement of construction planning in their organization.

CONCLUSION AND RECOMMENDATION

Results from this study indicated that contractors agree that current planning of construction project in their organization is insufficient. This is demonstrated by 50% of respondents who agree that there is need for major improvement, 46% of the respondents agree there is need for minor improvement and 2% agree there is needs for major over haul, while 2% of the respondents agree that the current planning of construction project in their organization is sufficient.

The results also indicated that Planning can be improved through application and adoption of computerized systems and ICT with RII=0.92, continuos monitoring and control of projects throughout its life cycle with RII=0.92, progress meeting and briefing with RII=0.90, and by engaging project team members in planning the project with RII=0.84. The study recommends that Nigerian indigenous contractors can improve effectiveness of construction project planning through adoption of ICT and provision of interactive means of communication among project team members specific for each of their projects.

***Table 2**. Cross Tabulation on Method of Construction Project Planning and Effectiveness of the Planning*

			Planning in Organizations				
			Needs Major Improvement	**Sufficient**	**Needs Little Improvement**	**Needs Total Over Haul**	**Total**
How Organization Plans	Experience and Intuition	Count	12	0	3	1	16
		% within Organization Plans	75.0%	0.0%	18.8%	6.2%	100%
		% within Effectiveness of plans	48.0%	0.0%	13.0%	100.0 %	32%
		% of Total	24.0%	0.0%	6.0%	2.0%	32%
	Manual Application of Planning Techniques	Count	4	0	6	0	10
		% within Organization Plans	40.0%	0.0%	60.0%	0.0%	100%
		% within Effectiveness of plans	16.0%	0.0%	26.1%	0.0%	20%
		% of Total	8.0%	0.0%	12.0%	0.0%	20%
	Computer Application of Project Management Software	Count	3	0	3	0	6
		% within Organization Plans	50.0%	0.0%	50.0%	0.0%	100%
		% within Effectiveness of plans	12.0%	0.0%	13.0%	0.0%	12%
		% of Total	6.0%	0.0%	6.0%	0.0%	12%
	Computer Application and Experience	Count	6	1	11	0	18
		% within Organization Plans	33.3%	5.6%	61.1%	0.0%	100%
		% within Effectiveness of plans	24.0%	100.0%	47.8%	0.0%	36%
		% of Total	12.0%	2.0%	22.0%	0.0%	36%
Total		Count	25	1	23	1	50
		% within Organization Plans	50.0%	2.0%	46.0%	2.0%	100%
		% within Effectiveness of plans	100.0%	100.0%	100.0%	100.0 %	100%
		% of Total	50.0%	2.0%	46.0%	2.0%	100%

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ARCHISEARCH

Socio-Environmental Dimensions Of Urban Stormwater Drainage Development In An Unplanned Neighbourhood Of Zaria, Nigeria

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Abstract
Informal urbanism is the major driver of city development in African cities. In such a scenario where most settlements do not have defined or formal layouts, urban drainage development can become quite a challenge. This paper examines the phenomenon of urban stormwater drainage development in Palladan, an unplanned neighborhood in Zaria, in order to understand how informal urbanism shapes the development of urban drainage. The study focused more on the social and environmental aspects. A case study, field survey approach was adopted with 150 households selected through systematic random sampling. The questionnaires were administered to them to get socio-economic data and their opinions on the environmental and social aspects of drainage development in their neighborhood. Simple descriptive statistics were used to analyze the data. The findings reveal that drainage provision at neighborhood level is largely subject to individual, household or communal efforts. There is also no defined drainage hierarchy and connectivity in the area, while solid waste is often dumped in existing drainage. These result in cases of some residents experiencing perennial flooding. The paper also found that residents in the area had at one time or the other been involved in drainage related social conflict. On the positive side, most of the respondents were owner occupiers who are ready to contribute and make sacrifices towards drainage development. The paper concludes by suggesting strategies for sustainable stormwater drainage development in unplanned neighborhoods, which includes a coordinated collaboration of actors in drainage development.

Keywords: *Development, Neighborhood, Socio-Environmental, Urban Stormwater drainage, Unplanned*

INTRODUCTION

City development in Africa and the Global South in general, is largely driven by informal urbanism. As asserted by Nwaka (2005) "…only about 20 – 40% of physical development in Nigerian cities is carried out with formal government approval". The density of development in most unplanned neighborhoods leaves little or no space for the provision of services. In such a scenario where most urban settlements do not have defined or formal layouts, urban drainage development can become quite a challenge. Formal intervention in such informal neighborhoods is usually like 'a drop in the bucket'. As noted by Hall and Pfeiffer (2013) residents of informal neighborhoods usually create local organizations to manage their local

environment and urban needs. The social environment according to Barnett and Casper (2001) refers to the immediate physical and social setting in which people live or in which something happens or develops. In a recent study of informal settlements, Armitage (2011) emphasized the need to cater for greywater (domestic wastewater) in addition to storm water in high density urban areas. Armitage (2011) was of the opinion that high density, unplanned urban areas should be given more serious consideration in the area of adequate drainage provision via pertinent strategies. Jiusto and Kenney (2015) corroborate Armitage's position in their study of a series of small projects in South Africa. Very few studies have focused on urban drainage development particularly in the area of informal urbanism. In the case of Jiusto and Kenney (2015), and Armitage (2011), their studies were based on the South African context where state policy has increasingly embraced upgrading since the advent of full democracy in 1994, though its successful realization on the ground remains challenging. (Graham, 2007). There is therefore a need to examine the socio-environmental dimensions of urban drainage development in other climes such as a Northern Nigerian unplanned neighborhood context in order to understand how informal urbanism shapes stormwater drainage development.

This paper examines urban neighborhood drainage development in the social and physical context of unplanned urban development in Palladan given the social environment and peculiarities of the neighborhoods. It assesses how the neighborhood urban drainage is provided and maintained; the challenges of drainage development in such areas, and strategies that are best in promoting urban drainage development in the area.

LITERATURE REVIEW

Informal Urbanism

Informal urbanism is development occurring outside the purview of state planning or administrative systems (Prescott, Vollmer and Heisel, 2013). It should be noted that the development being referred to could relate to the informal economy, and informal housing or built environment. A characteristic of industrializing cities is the presence of both formal and informal settlements. Formal settlements are planned areas with established zoning, infrastructure and municipal services supplied by governments. While informal settlements are areas where residents often lack official property rights (Huchzermeyer and Karam 2006). Werthmann (2014) notes informal urbanism ranges from poor rural migrants who build their homes in an emerging community through gradual processes of informal land occupation and consolidation to the developer who subdivides land without complying with all regulations. The informal situation cannot be simply equated to illegal, since the informal may be the only possible way of urbanization in cities where no other options exist; the informal cannot be equated to inferior or marginal, since there are many examples where informally developed communities become better places to live than dysfunctional public housing projects and housing estates produced by commercial developers. Also, the informal cannot be equated to poor, since increasingly middle class families (even millionaires) find their housing

and place to live in non-formal neighborhoods. In fact, as asserted by Hall and Pfeiffer (2013) "Informal neighborhoods through local self-management and local taxes spent according to local political decisions, spread rapidly through emulation. These areas progressively become middle-class suburbs. Informal urbanism is an urban phenomenon that defies clichés; its only common denominator is its origin." For this paper, informal settlement refers to the unplanned context of urban development, particularly prevalent in the cities of developing countries.

Urban Drainage

Urban drainage is defined by Armitage (2011), as '[including] the removal of all unwanted water from urban areas. Such water includes wastewater including sewerage and greywater and stormwater,' (Table 1). The responsibility for urban drainage development in most unplanned areas is usually characterized by sharp differences between residents, local authorities, politicians and civil society groups. These tensions are usually exacerbated by severe resource constraints (Jiusto and Kenney, 2015).

Table 1. *Sources and Types of Urban Drainage*

Stormwater	Greywater	Sewage
Heavy precipitation	Dishwater	Flooded or clogged toilet blocks
Flooding from higher ground	Bathwater	Night soil
Water accumulation due to poor soil drainage	Laundry water	Private latrines

Source: Adopted from Jiusto and Kenney (2015).

Principles of urban stormwater drainage development

According to Tucci (2001), the experience in flood control of many countries has led to the development of some principles in urban drainage management. Although these principles may require some adaptation to the conditions of each country, the principles are listed below:

i. Flood control evaluation should be done in the whole basin and not only in specific flow sections.
ii. Urban drainage control scenarios should take into account future city developments.
iii. The impact caused by urban surface wash-off and others related to urban drainage water quality should be reduced.
iv. More emphasis should be given to non-structural measures for flood plain control such as flood zoning, insurance and real time flood forecasting.
v. Management of the control starts with the implementation of Urban Drainage Master Plan in the municipality.
vi. Public participation in the urban drainage management should be increased.
vii. The development of the urban drainage should be based on the cost recovery investments.

Challenges of urban stormwater drainage management in unplanned settlements

Urban drainage development and management in unplanned settlements particularly in cities of developing countries, is fraught with several challenges among which are:

- Urban development in cities of developing countries occurs fast and

unpredictably. Usually the tendency of this development is from downstream to upstream which increase the challenges (Tucci, 2001).

- Suburban and risk areas (flood plains and hill side slopes) are occupied by low-income populations of unplanned settlements without infrastructure services. Spontaneous housing development are on land prone to flooding e.g. Bangkok, Bombay, Guayaquil, Lagos, Monrovia, Port Moresby and Recife; hill sides prone to landslides e.g. Caracas, Guatemala City, La Paz, Rio de Janeiro and Salvador (WHO, 1988).
- Local Government and residents of unplanned settlements usually do not have sufficient funds to supply the basics of water, sanitation and drainage needs (Tucci, 2001).
- Lack of appropriate garbage collection and disposal decreases the water quality and the capacity of the urban drainage network due to filling. Desbordes and Servat (1988) mentioned that in some African countries there is no urban drainage and when system drainage exists it is filled with garbage and sediments. Tokun (1983) also mentioned this type of problem in Nigeria where the drainage systems are used as garbage collector.
- There is no prevention program for risk area occupation and when the flood occurs non-returnable funds are given to the local administration to cope with the problem, without any requirement of future prevention programs (Tucci, 2001).
- Population, States and Local Governments administration do not have enough knowledge on how to deal with floods using the above principles (Tucci, 2001).
- Lack of institutional organization in urban drainage at a local level such as: regulation, capacity building and administration. In Asian cities there is a lack of comprehensive project organization and clear allocation of responsibilities; adequate urban land-use planning and enforcement; capability to cover all phases and aspects of technical and non-structural planning (Ruiter, 1990).

Governance of urban stormwater drainage

As depicted in Table 2, Porse (2013) in his study of stormwater governance and future cities, states that, 'while cities with existing infrastructure (developed countries) seek to integrate "greener" approaches, cities lacking existing infrastructure (less developed countries) face stark challenges to expand system capacity and reliability'. These realities show that, while cities in the developed world are aligning with larger regional growth plans to promote smart and sustainable growth via Sustainable Urban Drainage Systems (SUDS), cities in less developed countries are still befuddled with the task of understanding urban growth patterns and meeting infrastructure needs for industrialization.

Table 2 clearly points out the wide gap existing in drainage governance between cities in developed countries and those of less developed countries. To borrow from Jiousto and Kenney (2015), SUDS and other drainage techniques will simply not work in the context of informal urbanism, which is characterized by unplanned settlements unless adapted carefully to their particular social, legal, and environmental realities. Also, without local community consultation,

participation and buy-in, most drainage interventions will fail. Lastly, drainage strategies informed by experience and designed explicitly for unplanned settlements are needed to deal with the unique and variable circumstances within these communities, which are often distinctly different even from neighboring communities within the same city.

Figure 1, illustrates an SUDS example from Cambourne, England. It was a showcase project using the SUDS for the Lamb Drove community. The project managed rainfall by using natural processes in the landscape to reduce flooding, control pollution and provide amenity for the community.

METHODOLOGY

The Study Area

Palladan is an unplanned but fast growing neighbourhood in Zaria urban area of Kaduna state, in northern Nigeria. This fast growth could be attributed to its proximity to two major institutions in Zaria. The first is the Nigerian College of Aviation Technology (NCAT) to the South-west of the area, while the Nigerian Institute of Transport Technology is to the North-west. To the South-east of the area lies Kabama, a planned residential layout adjoining the study area, as seen in Figure 2 and 3. Palladan is inhabited by a heterogeneous population from several parts of Nigeria, although the larger percentage of residents in the area are indigenes of Hausa/ Fulani origin. The study area is plagued with problems of very poor drainage provision and maintenance; lack of street gutters and culverts, refuse dumping in existing drains, among other urban service problems. The area is generally characterized by haphazard urban development and poor urban facilities and services provision.

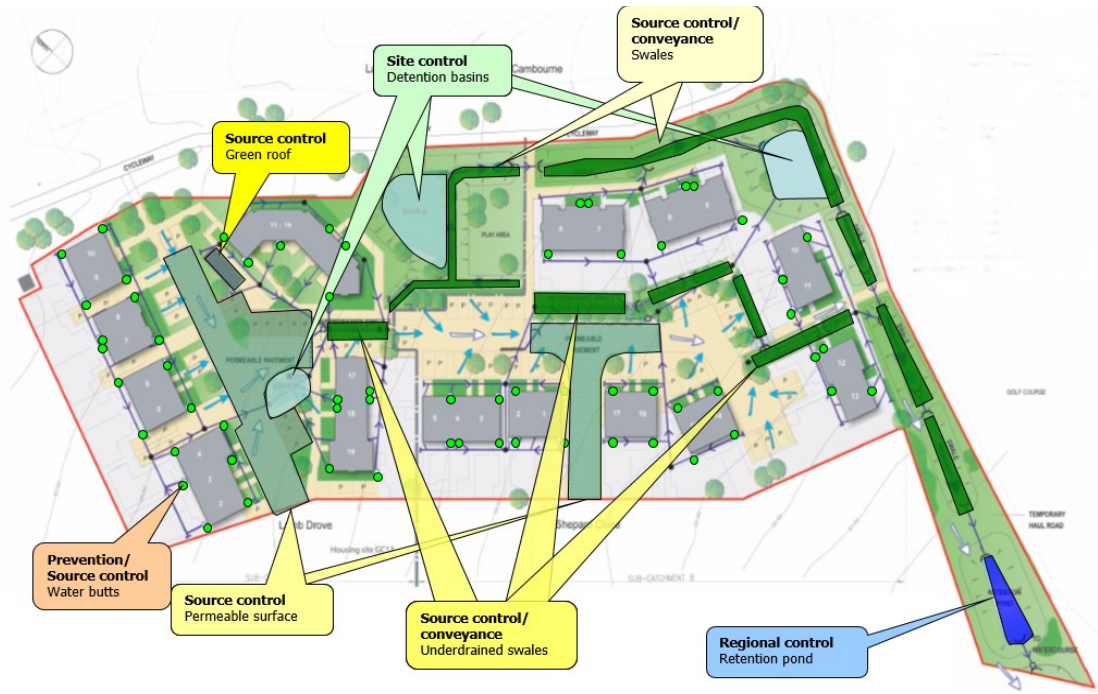


***Figure 1**. The Lamb Drove Sustainable Urban Drainage Systems (SUDS) Showcase Project (Cambourne, England). Source: Adopted from www.ciria.org/suds*

***Table 2**. Urban stormwater management priorities in cities.*

Goal	Cities with Established Stormwater Management Systems	Cities Lacking Established Stormwater Management Systems
Municipal Management Capabilities	● Meet budgetary requirements ● Satisfy municipal codes ● Meet standards for reliability and performance ● Align with larger regional growth plans to promote smart and sustainable growth ● Engage residents in management programs	● Expand services to keep pace with rapid growth in planned and unplanned areas ● Reduce corruption ● Increase system reliability ● Leverage training and knowledge transfer from external sources to develop internal expertise ● Reduce illegal system draws by residents while also servicing the population ● Secure capital for infrastructure improvements ● More comprehensive planning for long-term growth and urban development
Environment	● Satisfy local, regional and national environmental standards ● Improve local water quality ● Facilitate healthy ecosystems for recreation and economic benefits ● Minimize effects of Combined Sewer Outflows	●Reduce environmental impacts at little cost ●Improve quality of urban runoff ●Expand infrastructure capacity to consider supply, treatment and runoff
Public Health	● Prevent transmission of disease and infections ● Meet public health standards	● Improve system capabilities to reduce disease transmission and ensure clean water supplies ● Promote evacuation during floods
Social	● Enable citizen action and engagement ● Facilitate adoption of Best Management Practices by landowners ● Contribute to regional goals with inconstraints of social attitudes	● Enable local citizens access to clean water and municipal services at affordable prices ● Understand urban growth patterns and to meet infrastructure needs for industrialization

Source: Adopted from Porse (2013).

Sources of data, sampling techniques and data analysis

The study adopted a case study and field survey approach. Primary data were captured via personal observation, semi-structured questionnaires administered to households and also, interviews held with community leaders, officials of the Primary Health Department at the Sabongari Local Government, officials of the Kaduna State Urban Planning and Development Authority (KASUPDA), officials of the Kaduna State Public Works Agency (KAPWA), and officials of the Kaduna State Environmental Protection Agency (KEPA). Secondary data was acquired from Google satellite imagery of the area, web search on urban drainage development, and both published and unpublished literature on urban drainage,informal urbanism and other related works.

The study area has a population of 21,384 and a total of 2,673 households, estimated by assuming a household size of 8 persons per household, given the socio-cultural background of the area *(estimates from the Primary Health Department,*

Sabongari LGA). The questionnaires were administered through systematic random sampling within three clusters (*The three wards; Palladan core, Anguwan Fulani, and Layin Zomo; Figure 2*), selecting one out of every five households. Kabama Layout was not sampled in this paper because it is a planned layout and the paper does not intend to do a comparative analysis. 150 households were selected, representing 5.6% of the total number of households in the study area. 20 field assistants were utilized in the field surveys and data of gathering. Simple descriptive statistics were used to analyze the data gathered and conclusions were subsequently drawn.

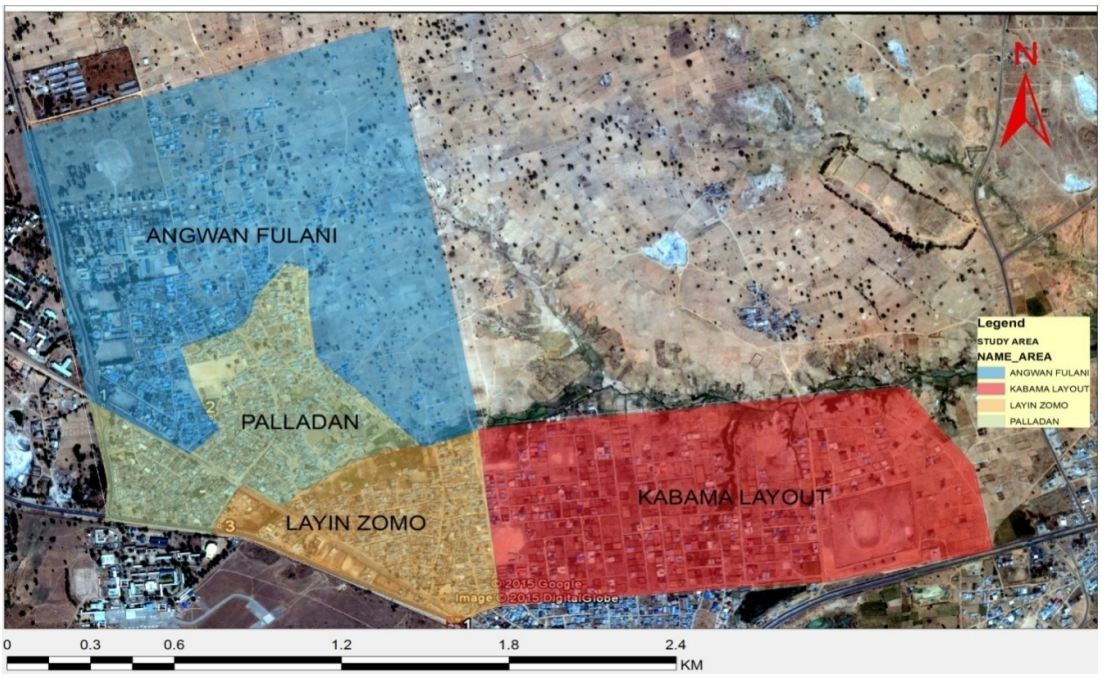


Figure 2. *Satellite imagery of Wards in Palladan Neighbourhood*

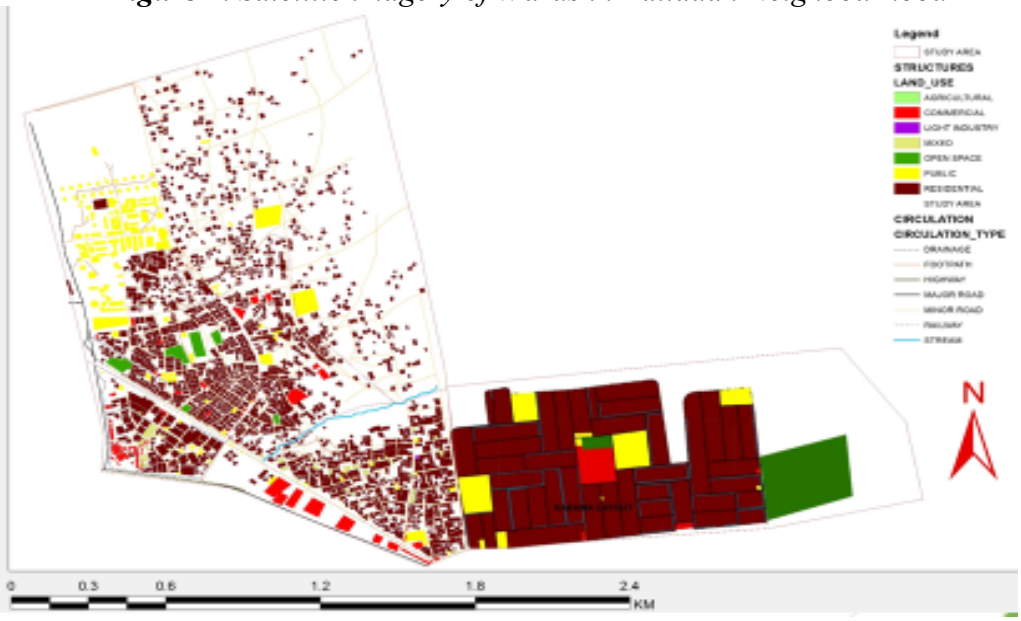


Figure 3. *Land Use of the Study Area*

FINDINGS AND DISCUSSIONS

During the field survey, it was observed that the existing drainage situation in Palladan was grossly inadequate. The nature of housing development in the area leaves little or no space (setbacks) in-between buildings. Even in cases where spaces are left more often than not the spaces are used as passages/footpaths and for refuse/sewerage disposal. This scenario would make drainage provision more costly and difficult. 127 street links were identified during the survey. Out of these, only 61 (48.03%) street links had stormwater drainage provided. As Table 3 depicts, 60.7% of the 61 stormwater drains are improvised hand-dug drains, while 39.3% are lined drains. Also, the neighbourhood drainage system is disjointed and not connected to the primary city-wide drainage system (Plate 1 and 2). In fact, even the Zaria Urban Area drainage system lining the primary and district road distributors, lack connectivity and continuity at several points. Moreover, 47 (77%) of the existing drainage in the study area have been converted to refuse disposal points, consequently blocking the drains, impeding stormwater flow and causing perennial flooding in the area during rainfall. It was also apparent from the field surveys and discussions with the community leaders that drainage provision and maintenance in Palladan is largely a community affair. Government intervention has been limited to drains along primary and district distributors. As illustrated in Table 4, available drains have been provided either by individuals, households, or youth organizations in the study area, usually supported by willing individuals and households.

***Table 3**. Types of storm water drainage identified in the study area*

Types of Drainage	Number of Cases	(%)
Hand dug	37	60.7
Lined drainage	24	39.3
Line and covered drainage	Nil	Nil
Total	**61**	**100**

***Table 4**. Drainage providers in the study area*

Drainage Provider	Number of Cases	(%)
Individuals & households	13	21.3
Local Government	6	9.8
CDAs (Youths)	42	68.9
Total	**61**	**100**





***Plates 1 and 2:** A stand-alone paved stormwater drain along Kasuwan Mata street and a blocked drain in the study areaSocio-economic and cultural context of drainage development*

From the surveys, 33% of the respondents were found to be indigenes of Hausa/Fulani origin, while the remaining 67% were non-indigenes. This accounts for the significant presence of traditional mud compounds in the area, which has implications for drainage and sanitation due to the nature of such housing design and the large number of household members in such a Hausa/Fulani setting. Most of the residents in the study area fall into the low-income category because out of the 150 households surveyed, 76% (114) earn below 50,000 Naira (about 250 US Dollars) monthly (see Table 5).

***Table 5**. Income of respondents*

Level of Income (Naira)	Number of Cases	(%)
Below 18,000	57	38
18,000-30,000	15	10
30,000-50,000	42	28
>50,000	36	24
Total	**150**	**100**

This could affect their ability to contribute to infrastructure upgrading in the area. Most of the residents are also literate and educated. 60% have attained secondary or tertiary level education and only 20% are informally educated. This depicts a potential for higher awareness on the health implications of drainage development. The study also revealed that most residents (82%) were owner-occupiers' while only 18% of the respondents were tenants, as depicted on Table 6.

***Table 6**. Tenure status of households*

Housing Tenure Type	Number of Cases	%
Owner occupier	123	82
Renting	24	16
Leasing	3	2
Total	**150**	**100**

Drainage induced social conflicts

In some cases, while a resident makes effort to solve his drainage problem, it creates a problem for another neighbour. There was more cooperation in drainage development observed at Anguwan Fulani, towards the North, the area is less dense in development and harbors the more enlightened and middle class residents. Palladan core and Layin Zomo have more dense development and more drainage conflicts. The field data reveals that out of the 72% who claim to have had drainage related conflicts with neighbors, only 8% came from Anguwan Fulani, while 64% were from Palladan core and Layin Zomo. This shows that there are more drainage conflicts/challenges in the denser parts of the study area. Table 7 shows the range of types of drainage related conflicts experienced by neighbors/residents in the study area. Neighbors not cooperating in drainage maintenance (30%) take the highest number of cases.

***Table 7**. Reasons for drainage conflicts*

Nature of Conflict	Number of Cases	%
Deliberate Blocking of drain passage	39	26
Dumping of refuse	24	16
No Maintenance	45	30
No response	42	28
Total	**150**	**100**

Failure of governance Institutions

The Sabongari Local Government Health Department is responsible for ensuring that the existing drains are kept clean by engaging in regular inspections, awareness creation on health implications of environmental situation, conflict resolution on drainage issues, fining of environmental offenders,

among other responsibilities. However, the study revealed that the department rarely carried out their responsibilities. Respondents in the study area reported that officials from the local government office are only seen when a resident takes a report to them.

The Kaduna Public Works Agency (KAPWA) informed the survey team that no drainage project has been carried out in the study area, and there is no future plan for such. Kaduna Environmental Protection Agency (KEPA) and the Kaduna State Urban Planning and Development Authority (KASUPDA) also confirmed that they were not involved in any form of drainage development initiative in the study area. Therefore most of the existing drains in the area are hand-dug by the residents (Plates 3 and 4).





***Plates 3 and 4**: Hand-dug drains for greywater in Palladan*

Potentials for urban drainage development

All respondents (100%) consider drainage development to be important mostly because of health reasons. Although 16% of the respondents were not willing to contribute to drainage development in the area, 84% were willing to contribute financially and through manual labor. Also, studies have shown that secure tenure promotes willingness to contribute to infrastructure development in informal settlements (Choguill and Choguill, 1996). This probably explains the large number of those willing to contribute to drainage improvements, considering 82% of the respondents are owner-occupiers in the study area.

CONCLUSIONS AND RECOMMENDATIONS

The findings in Palladan corroborate the assertions of Jiusto and Kenney (2015), highlighting the reality that governments in developing countries mostly avoid interventions in drainage development in unplanned neighbourhoods. In the Palladan example, it is clear that Government intervention in urban drainage development, when found, largely focuses on city primary drains. This is unlike South Africa where state policy clearly embraces upgrading of informal settlements. It is also clear from the Palladan context that drainage development in Nigerian cities take on a very myopic approach that is still far from the regional SUDS perspective as rightly observed by Porse (2013). This

assertion is arrived at because of the disjointed and unconnected existing drainage system observed in the study area. Considering the high incidence of indiscriminate solid waste disposal into open drains in the study area, it is also obvious that until an integrated approach to solid waste and sewerage management is adopted in unplanned neighbourhoods, drainage development will continue to pose a great challenge. Given the effort already being made by residents in the study area, more progress can be made in drainage improvement if government institutions can be more committed and offer technical support to communities that are already involved in drainage development.

There is also need for proper public enlightenment and participation in urban drainage management in our cities. This is important, in order to educate people on their roles in achieving sustainable urban drainage systems for city regions.

The study has shown that social and environmental factors shape urban drainage development particularly in unplanned neighbourhoods like Palladan. It is clear that the development pattern and social environment will inform the kind of strategies that can be employed in drainage development for specific unplanned neighbourhoods. The Millenium Development Goals (MDGs) had a target of improving the lives of 100 million slum dwellers by the year 2020. The task is an arduous one. However, when the political will and right strategies are adopted, incremental upgrading efforts can be made in selected informal settlements to make a difference over time. Governments in cities of developing nations should not view urban drainage development just at the micro-neighbourhood level but rather at the macro-regional level where Integrated Urban Water Management (IUWM) and Sustainable Urban Drainage (SUD) considerations are made.

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ARCHISEARCH

Evaluating the Benefits of Partnering Applicability in the Nigerian Construction Industry

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Abstract
The Nigerian Construction Industry is faced with a lot of challenges, and with the advent of partnering it is possible that adopting this system will improve projects success in the industry. This paper evaluates the benefits of application of partnering among stakeholders in the Nigerian Construction Industry. Through literatures review 10 benefit of partnering were established. Structured questionnaires were administered to clients, contractors and consultants respectively to obtain their assessment of the benefits. Relative Importance Index (RII) was used to establish the relative importance of the benefits. Benefits were then ranked. Beneficial factors identified in implementing partnering in the Nigerian Construction Industry, were; 'achieving better buildability', 'reduction in the rate of litigation' and 'better opportunity for innovation and value engineering' with RII values of 0.96, 0.76 and 0.86 by the clients, contractors and consultants, respectively. This indicates that application of partnering in the Nigerian Construction Industry would be beneficial to the industry. However, acquiring adequate skills and knowledge on partnering process is needed beforehand for proper implementation. Therefore, it is recommended that both the consultants and the contractors should adopt partnering in order to gain the benefits of such system.

Keywords*: Partnering, Nigerian Construction Industry, Clients, Contractors, Consultants.*

INTRODUCTION

The construction industry is important in any nation's economy as it contributes to the process of development (Wahab, 2010). The team for a project is assembled from a disparate collection of professionals; subcontractors, craftsmen, artisans, labourers and suppliers within and outside the industry (Jimoh 2012). As Davis, Love and Baccarini (2008) posit that the greater the integration between project members, the more likely a project is in achieving a successful outcome.

Unfortunately, construction work has become more complex technically and administratively, and there are several challenging engineering and management problems, which occurs (Jimoh, 2012). Construction firms are now searching for better management approaches for maintaining a competitive advantage and improved performance. One of such approaches is 'Partnering'. Partnering is defined by Al-Amoudi (2011), as a strategic commitment between companies or firms in order to develop their performance in a mutual project. It is

driven by a clear understanding of mutual objectives and co-operative decision-making by multiple firms all focused on using feedback to continuously improve their joint performance. The partnering concept can be practiced to give positive impacts to the construction industry (Adnan, Heap-Yih, Idris and Ahmad 2011). Al-Amoudi (2011) stated that the main target of partnering is to develop the efficiency and skills of the teamwork.

LITERATURE REVIEW

Nigerian Construction Industry

Oyedele (2013) stated that the Nigerian Construction industry faces a significant number of challenges; including lack of local skilled labour, power shortage, unavailability of materials, and unethical practices. Awodele (2012) posited that, there is huge embrace of partnering due to perceived failings of traditional system of procuring construction contract that calls for changes.

Partnering

Al-Amoudi (2011) stated that partnering concept is relatively a new approach which requires companies to change the old traditional relationships and replace it with the idea of sharing, trust and commitment to reach the determined mutual target. It represents a fundamental shift from the traditional adversarial relationships in construction as seen by Bygballe, Jahre and Sward (2010). In general, partnering can be defined as a strategic commitment between companies or firms in order to develop their performance in a mutual project (Al-Amoudi, 2011). Several researchers noted that, even if integration is costly and takes time to become beneficial. Partnering is still possible because many projects last for several years and include repetitive processes (Bygballe *et al* 2010). The effectiveness and success of partnering is to start it in the early stage of projects (Al-Amoudi,2011).

Partnering may not resolve all the problems encountered in the construction process, however, it does create a framework for conflict resolution, improved communications, reduced litigation and cost containment on potential overrun. Ekung, Siriwardena, and Adeniran (2013) also emphasized that partnering stand unequivocally unchallenged in terms of cost and time certainty, better risk allocation, flexibility, quality design and construction. In fact, it has even been described as the most significant development to date as a means of improving project performance (Bygballe *et al* 2010). It remains most suitable for the realization of integrated project objectives (Ekung *et al* 2013).

RESEARCH METHODOLOGY

Data Collection

Primary and secondary data were the sources employed for acquiring data for the research work. Primary data was obtained from the questionnaires administered to the construction stakeholders while the Secondary data was obtained from books, journals, magazines, seminar papers and internet. Documents and theories regarding partnering in construction industry were examined. Structured questionnaires were administered to collect information from clients, contractors and consultants among the major stakeholders in the construction industry.

Population of the Study, Sampling Technique and Sample Sizing

For this research, the target population is the consultants, contractors and the clients in Abuja, Nigeria. The population

size for both the consultants and contractors were established from the number of registered consulting and contracting firms in Abuja, registered by the Federal Inland Revenue Service of Nigeria. Random sampling technique was employed for this survey and the rationale for adopting the random method was because of its feasibility and the need to ensure fair representation of the population as well as increase precision (Okae-Adow 2013). A total of 245 and 814 (FIRS: Corporate Taxpayers by Business Line 2014) were the established population sizes for both the contractors and consultants respectively in the study area. Clients' population was infinite.

To establish sample size Kish formula for calculating a finite population (contractors and contractors) was adopted. While the formula adopted by Israel (1992) for an infinite population was used for the clients, as there was no established data for number of clients.

According to Agbodjah (2008), Kish formula for a finite population is defined by:

$$n = \frac{M}{1+ {}^{M}/_{N}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (eq.1)$$

Where n = Sample Size, N = Total population size

$$M = \frac{\delta^2}{\gamma^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (eq.2)$$

$$\delta^2 = \rho \times (1-\rho) \ldots\ldots\ldots\ldots\ldots\ldots (eq.3)$$

Where γ the standard error of the sampling distribution, δ is the maximum standard deviation of the population element and ρ is the proportion of population elements belonging to the defined class.

Sample size for contractors (245);

Using a total error of 0.1 at 95% confidence interval, γ is 0.05 and ρ is 0.3

$\delta^2 = 0.21$, $M = 84$, $N = 63$

Mathers *et al.* (2009), stated that the allowance for the expected non-response to the survey should be noted and added to the initial sample size.

N = 69 (Adding 10% of 63 for non-responsiveness)

Sample size for consultants (814),

Using a total error of 0.1 at 95% confidence interval, γ is 0.05 and ρ is 0.3

$\delta^2 = 0.21$, $M = 84$, $N = 76$

N = 84 (Adding 10% of 76 for non-responsiveness)

Sample size for the clients,

Sample size for clients was calculated according to Israel (1992) using Equation 4 by:

$$n = {}^{z^2 \rho q}/_{d^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (eq.4)$$

Where n is the sample size,

z^2 Is the abscissa of the normal curve that cuts off an area α at the tails (1-α equals the desired confidence level, e.g., 95%), d is the desired level of precision, ρ is the estimated proportion of an attribute that is present in the population, q, is $1-\rho$. The value for z is found in statistical tables, which contain the area under the normal curve.

Using 90% confidence level, $(\alpha = 0.10)$ and critical value of$(z\,\alpha/2 = 1.64)$, ρ is 0.3, n = 57

n = 63 (Adding 10% for non-responsiveness)

Therefore sixty-nine (69), eighty-four (84) and sixty-three (63) were the established sample size for the contractors, consultants and clients respectively for the survey.

The questionnaire for this survey was designed and used to allow respondents rank 10 identified benefits of the application of partnering in a 5-point Likert scale, "5" indicating "Very Relevant" (i.e.100%) and "1" indicating

"Very Irrelevant" i.e. (0%). Two different questionnaires were administered for this research work; one for the client and the other for consultant and contractor.

METHODS OF ANALYSIS

Relative Importance Index (RII)

The data collected was analyzed using Relative Importance Index (RII) on a "5" point Likert Scale. Computation of the mean using the weighted average formula was adopted; tables and charts were subsequently used to express the results.

$$X = \frac{\sum fx}{\sum f} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (eq.5)$$

Where: X = mean, x = Points on the Likert's scale (1, 2, 3, 4 and 5) and f = frequency of respondents' choice of each point on the scale

i. Computation of the Relative Importance Index (RII) for each item of interest, using the formula:

$$\text{RII} = \frac{\sum fx}{\sum f} \times \frac{1}{k} \ldots\ldots\ldots\ldots\ldots\ldots (eq.6)$$

Therefore,

$$\text{RII} = \frac{x}{k} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (eq.7)$$

Where k= maximum point on the Likert's scale (in this case, k= 5)

ii. Ranking of the items under consideration was based on their RII values. The item with the highest RII value was ranked first, the next second and so on.

iii. Interpretation of the RII values was achieved through the following as recommended by Mbamali and Okotie (2012) and Shodhganga (2014):

RII < 0.60, item is assessed to have low rating (low importance).

0.60 ≤ RII <0.80, item assessed to have high rating (high importance).

RII ≥ 0.80 items assessed to have very high rating (very high importance).

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Out of the 63 questionnaires administered to clients in the construction industry, 33 were returned and all found useful (accounting for 52% of the questionnaires administered to the clients). 60 questionnaires (87%) were returned out of the 69 administered to contractors and also found usable. 84 questionnaires were also distributed for consultants and 74 (88%) were returned and found usable and significant for analysis.

The National Academy of Sciences (2009) noted that every construction project is initiated by an owner, which may be a government entity, a corporation, or an individual.

Figure 1 depicts 60.6% for the public, 30.3% for the private and 9.1% for the corporate as the types of client as indicated by the respondents (clients). Both contractors and consultants were also asked to indicate the types of clients handled, as Hong *et al* (2010) emphasized that partnering is best when led by the client organization indicating that the client is seen as pivotal in bringing partnering into practice. Higher responses were indicated for the public clients for both firms as 61.7 % and 68.9 % were indications made by contracting and consultancy firm respectively. However, Very few responses were indicated for the corporate type of client as 21.7% for contracting and 9.5% is for consultancy was indicated in the figure above. This result is in conformance with the statement made by Ekung *et al* (2013) and Mbamali and Okotie (2012) that the public sector constitutes the major client of the construction industry in Nigeria.

The respondents were requested to indicate their profession. Figure 2 shows that the clients respondents were predominantly builders and architects as depicted by corresponding percentages of 30.3% and 27.3%, respectively. However, 33.3% respondents account for architects in the contracting firm while 33.8% respondents account for that of the consultancy firm of the same profession. For building profession, higher responses were indicated with 50.0% responses from the contracting firm and 13.5% for consultancy. The structural/civil engineers account for 8.3%and 12.2% for the contracting and consultancy firms respectively while the quantity surveyor accounts for 5.0%and 35.1% for both contracting and consultancy respectively.

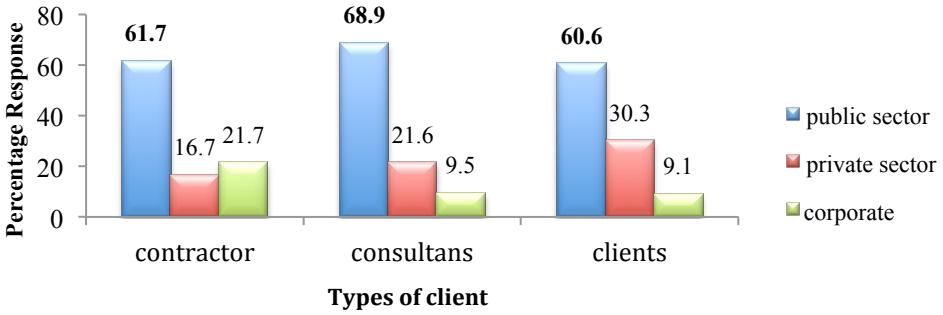


Figure 1. *Types of clients*

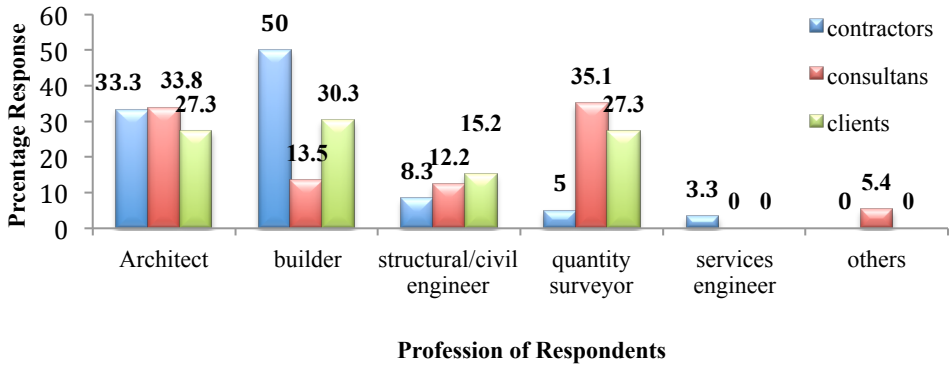


Figure 2. *Profession of Respondents*

There are various benefits of partnering as posited in various literatures and respondents were requested to choose in terms of relevance among the factors listed as the benefits of partnering depending on their view. Tables 1, 2 and 3 show in rank, the factor that is most beneficial as well as least beneficial in adopting partnering in Nigerian construction industry from the perspectives of clients, contractors and consultants, respectively.

From Table 1, all the factors have high RII rating above 0.60. The respondents (clients) ranked "achieving better buildability" with a very high RII rating of 0.96 as the most beneficial fact in adopting partnering in Nigerian

construction industry while "Enhance value on long term relationship" was the least beneficial factor when ranked according to the respondents however it has a high rating of 0.76.

Tables 2 and 3, show the ranks of the various benefits of adopting partnering in Nigerian construction industry from the perspectives of contractors and consultancy respectively. Oyedele (2013) criticized the Nigerian construction industry stating that it is highly litigious and has high appearance record in Nigerian court. As depicted in Table 2 below, the contractors viewed or ranked the "reduction in the rate of litigation" as the most beneficial factor in adopting partnering in the Nigerian construction industry with a very high RII value of 0.99. However, "enhanced dynamic organizational structure and clear chain of communication" was ranked as the least beneficial factor in adopting partnering in Nigerian construction industry, although it has a high RII value of 0.72. As for the consultants, adopting partnering in the Nigerian construction industry, "better opportunity for innovation and value engineering" was ranked first with a very high RII value of 0.86. Both the consultants and the contractors unanimously viewed "enhanced dynamic organizational structure and clear chain of communication" as the least beneficial factor in adopting partnering in the Nigerian construction industry. However, a low RII value of 0.59 was calculated for "enhanced dynamic organizational structure and clear chain of communication" from the consultants' perspective.

Table 1. *Benefits of Adopting Partnering in Nigerian Construction Industry (Clients' Opinion)*

S/No	Benefits of Partnering	5	4	3	2	1	∑f	∑fx	Mean	RII	Position
1	Achieving better buidability	26	7				33	158	4.8	0.96	1st
2	Developing an environment for a long-team profitability	26	5	2			33	156	4.7	0.94	2nd
3	Better opportunity for innovation and value engineering	20	10	3			33	149	4.5	0.90	3rd
4	Achieving a win- win Situation	17	11	5			33	144	4.4	0.88	4th
5	Enhanced dynamic organizational structure and clear chain of communication	10	23				33	142	4.3	0.86	5th
6	Reduce the rate of Litigation	14	14	3	2		33	139	4.2	0.84	6th
7	Less administrative and legal costs.	10	20		3		33	136	4.1	0.82	7th
8	Eliminating contractual Conflict	17	5	5	6		33	132	4.0	0.80	8th
9	Improved project outcomes in terms of cost, time and quality	21			12		33	129	3.9	0.78	9th
10	Enhance value on long term relationship	3	20	10			33	125	3.8	0.76	10th

Table 2. *Benefits of Adopting Partnering in Nigerian Construction Industry (Contractors' Opinion)*

s/no	Benefits of Partnering	5	4	3	2	1	∑f	∑fx	Mean	RII	Position
1	Reduce the rate of Litigation	56	4				60	296	4.93	0.99	1st
2	Better opportunity for innovation and value engineering	55	3	2			60	293	4.88	0.98	2nd
3	Improved project outcomes in terms of cost, time and quality	50	10				60	290	4.83	0.97	3rd
4	Achieving better buidability	45	15				60	285	4.75	0.95	4th
5	Eliminating contractual Conflict	45	10	5			60	280	4.67	0.93	5th
6	Developing an environment for a long-team profitability	40	15	5			60	275	4.58	0.92	6th
7	Achieving a win- win Situation	35	20	5			60	270	4.5	0.90	7th
8	Less administrative and legal costs.	10	30	15	5		60	225	4.25	0.85	8th
9	Enhance value on long term relationship	15	25	10	5	5	60	220	3.67	0.73	9th
10	Enhanced dynamic organizational structure and clear chain of communication	10	27	13	10		60	217	3.62	0.72	10th

Table 3. *Benefits of Adopting Partnering in Nigerian Construction Industry (Consultants' Opinion)*

S/no	Benefits of Partnering	5	4	3	2	1	∑f	∑fx	Mean	RII	Position
1	Better opportunity for innovation and value engineering	35	31	4	4		74	319	4.3	0.86	1st
2	Reduce the rate of Litigation	61	11	2			74	296	4	0.80	2nd
3	Enhance value on long term relationship		40	29	5		74	220	3.97	0.79	3rd
4	Improved project outcomes in terms of cost, time and quality	53	11	10			74	290	3.92	0.78	4th
5	Achieving better buidability	69	5				74	285	3.85	0.77	5th
6	Eliminating contractual Conflict	20	45	9			74	280	3.78	0.76	6th
7	Developing an environment for a long-team profitability	63	11				74	275	3.72	0.74	7th
8	Achieving a win- win Situation	6	60	8			74	270	3.65	0.73	8th
9	Less administrative and legal costs.	25	33	10	6		74	225	3.04	0.61	9th
10	Enhanced dynamic organizational structure and clear chain of communication	41	30	3			74	217	2.93	0.59	10th

CONCLUSION AND RECOMMENDATIONS

Conclusion

The result of the study indicated that clients, contractors and consultants in the Nigerian construction industry regarded application of partnering as significantly beneficial. This was indicated by a range of calculated RII values of between 0.72 and 0.99. Thus it can be concluded that application of partnering by the construction stakeholders of the Nigerian construction industry will enable all the 10 identified benefits to be achieved. In particular 'Achieving better buildability,' 'Reduction in the rate of litigation', and 'Better opportunity for innovation and value engineering' were identified as the principal benefits that could be obtained by applying partnering in the industry.

Recommendations

The benefits derived from partnering in the construction industry cannot be over emphasized. It is therefore, highly recommended that all stakeholders in the construction industry adopt it in order to reap its benefits. However, adequate skills and knowledge of how best to adopt and implement partnering in the industry is highly necessary.

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