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Preamble

One of the most reputed mediums of exchanging the outcomes of research activities is the academic journal, and it is germane, as scholarship is about the creation and sharing of knowledge.

The reasons for the creation of the Construction and Human Settlements Management Journal (CHSMJ) include:

i. providing a unique record of scholarly activity in Construction and Human Settlements Management while presenting an African perspective to the academic community;

ii. scholarly recognition it brings to the Nelson Mandela University;

iii. creation and sharing of new ideas and knowledge which contributes to the economic and cultural development of the built environment in South Africa, Africa and beyond;

iv. it also supports the goals of Nelson Mandela University by giving national and international recognition, further demonstrating the ability of the university to compete with other research agencies in the production of knowledge while also forming a basis of new collaborations between local, regional, and international researchers, research departments, and institutions.

v. the publication helps close the "knowledge gap" between the developed nations and the often-overlooked ideas, innovations, and discoveries from the African continent.

vi. the enrichment of the research areas of construction and human settlements management, and

vii. the Journal does, through sharing local knowledge and perspectives, make local research more visible throughout Africa and to researchers, students, and scholars globally.

Topics

The Construction and Human Settlements Management Journal, although not limited to, covers the following topics:

Construction project management; Project management; Design and construction management processes; Housing and infrastructure development; Stakeholder management; Project planning and impact assessments; Design and implementation of labour-intensive projects; Procurement management; Management of construction companies; Industry development; Knowledge management in construction; Empowerment of women; Innovation; Human settlement development and management; Real estate development and management; Industry 4.0; Housing; Spatial planning; Project financing; Performance management in construction and projects; Human factors in construction and projects; Health, safety and well-being in construction and projects; Scholarship of Construction and Human Settlements; Current and emerging infrastructure issues in developing countries.

Access

Cover design and picture : Ayo Adeniran

Scientific/Editorial Board

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Editorial

Dear colleagues in the research community. We are delighted to present Volume 2 Issue 1 of the Construction and Human Settlements Management Journal.

In this Issue, Okereke et al. assessed the causes and impact of design and pre-contract delays on construction project delivery. They concluded that the most critical causes of delays at the design and pre-contract stage are incomplete design information coupled with poor communication. These shortcomings inevitably lead to cost and time overruns on projects and much client dissatisfaction which at times leads to abandonment of projects altogether.

Sekinat Abdulkareem used the Structural Equation Modeling approach to identify the critical factors influencing members' satisfaction with housing interventions of cooperative societies. The study concluded that there are available opportunities for cooperative societies to tap into traditional mortgage financing, and that less government interference in cooperative activities, and adequate cooperative funding by members would lead to better satisfaction of cooperative members with cooperative housing interventions.

Jimoh and Oladipupo examined spatial distribution of boreholes in selected residential estates. Their study found that more than 72% of the boreholes in the study area did not meet the standard specified spacing of boreholes. Moreover, the distribution pattern was also clustered and there was no association in the location of the boreholes. They recommended that borehole drilling and location should comply with the expected standard requirement to avoid unintended expensive consequences of random location on aquifer productivity and healthy water abstraction.

Okereke et al. investigated the the benefits and pitfalls of construction risk management. They found that the major benefits of risk management are reduced uncertainty, and heathier bottom lines (with respect to quality, time, cost, and scope). The major pitfalls they found are that the risk management practice is time-consuming, subjective in nature and lacks consistency among the major players in industry. Moreover, it often is undertaken as a once-off activity instead of an ongoing process. They recommend effective process and implementation procedures to reduce the impact of risks in construction projects.

The final paper in this issue by Adegoke et al. investigated the factors influencing women Quantity Surveyors' participation in leadership positions. They examined thirty (30) factors that impact women's aspirations to leadership positions and established that perceptions of subordinates, educational level and leadership style play important roles in pushing women to aspired leadership positions. They recommend that women should equip themselves with as much education and training as they can muster so as to compete favourably in leadership contests of the construction industry.

The papers are available for download or onsite access at https://sbe.mandela.ac.za/Construction-and-Human-Settlements-Management-Jour

With warmest regards,

Winston Shakantu and Ayo Adeniran

Editors

Design and Pre-Contract Delay and Its Impact on Construction Project Delivery in Nigeria

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Abstract

Delay is a phenomenon that impacts construction project baselines. Delays lead to majorly, time and cost overruns and other parameters, for which the construction industry has been highly criticised. While many delays manifest during construction, most of the foundational causes occur from inefficiencies and unknowns at the pre-contract stage. This study assessed the causes and impact of design and pre-contract delays on construction project delivery. A survey research approach was adopted in which a quantitative questionnaire was used to gather data from construction professionals using a purposive sampling technique. With a response rate of 43.75% and a reliability index above 0.80, the gathered data were analysed using frequency, percentage, relative importance index (RII) and Friedman test. The study revealed that the most critical causes of delays at the design and pre-contract stage are; incomplete drawings/ detail design, corrupt practices, Incompetent/inexperienced design/project teams, mistakes and errors in designs, unclear documentation, poor communication among the consultants staff, late design and design documentation, unclear details and design specification, misunderstanding of clients requirements, and poor project feasibility studies. The most critical impacts are time overrun, disputes between parties, cost overruns, poor quality of construction, and abandonments. Construction project stakeholders have a critical role in ensuring that adequate care is taken at the pre-contract stage to avoid causes that could result in delays at the construction stage. It is recommended that the client, as well as the consultant/design teams, ensure that construction project designs/drawings and specifications are completed before construction work on site starts.

Keywords: Construction project, cost overrun, Design delays, Pre-contract delays, Time overruns.

1. Introduction

In the developed and developing nations of the world, the construction industry is the basis for attaining sustainable economic advancement (Eze *et al.,* 2021). The sector contributes significantly to stimulating and catalysing social-economic development in the global economies (Owusu and Aggrey, 2020; Venkatesh and Venkatesan, 2017). The impact of the construction sector on national economies is evident in buildings and infrastructure provisions, employment creation, wealth creation, national income, and gross domestic product (GDP), among others (Nwaki and Eze, 2020). However, despite the industry's critical role in the life of economies, construction projects are known to be confronted with the problem of delays which negatively impact project performance (Sambasivan and Soon, 2007; Jalal and Yousefi, 2017; Ajayi and Chinda, 2022). Delay is a drawback that tends to extend the completion date stated in the contract and agreed upon by the parties to a construction project (Sambasivan and Soon, 2007; Rathod *et al.,* 2020).

Delays in construction projects are a phenomenon that knows no bounds regardless of the industrial level of a country. Sambasivan and Soon (2007) described delays as a global phenomenon in construction. It is a phenomenon that opposes the construction sector's target of achieving the time, cost and quality requirements of construction projects (Ajayi and Chinda, 2022). Chan and Kumaraswamy (1997) posit that a construction project is successful if it is timely completed within budgeted cost and meets required quality standards. Not meeting these targets results in unanticipated consequences for the projects. In developing countries of Africa and beyond, the delay is a basic factor that has denied construction projects from meeting their objectives. Construction projects have failed to meet their planned schedule, cost and quality expectations (Gashahun, 2020). In Pakistan, construction delays are a major problem confronting large scale projects (Haseeb *et al*., 2011). Delays in construction projects are common and affect projects in various ways (Gebrehiwet and Luo, 2017). In the work of Pinamang *et al*. (2018), issues related to construction scheduling were highlighted as the major cause of delays and disruption of work. While for Gamil and Rahman (2018), the most frequently occurring issue in construction is time overruns.

Furthermore, delays in the construction sectors of advanced markets such as the USA, UK, Canada, and Germany, among others, are lesser than what is obtained in the construction markets of developing countries. For example, in Saudi Arabia, only 30% of projects are completed as planned (Assaf and Al-Hejji, 2006); in Nigeria, 70% (i.e. 7 out of 10) of surveyed projects experienced delays (Ibironke *et al*., 2013). Nevertheless, delays are the major reason why the construction industry of Nigeria is highly criticised (Aibinu and Jagboro, 2002). Shehu (2021) posits that the lack of adherence to time management processes due to poor information supply is the major contributor to the delays experienced on construction projects in Nigeria.

A review of extant literature showed many studies outside Nigeria's boundaries. While studies on construction delays in Nigeria have focused on the general causes of delays, effects and mitigation measures (e.g. Aibinu and Odeyinka, 2006; Asa and Kareem, 2016; Abisuga *et al*., 2014; Elinwa and Joshua, 2001; Ebekozien *et al.,* 2015; Ismaila *et al*., 2022), there is the scarcity of study that has focused on the design and pre-contract stage factors responsible for delays in construction projects. In addition, none of these studies highlighted above was carried out in Port Harcourt, the study area of this present study. This is the gap in the literature that this study fills. Also, previous studies in the Nigerian context did not adopt the use of the Friedman test in their analysis. This is among the factors that made this study unique. This study aimed to assess the causes and impact of design and pre-contract delays on project delivery to improve project performance in Nigeria. The specific objectives of this study are; i) to assess the causes of delays at the design and pre-contract stage, ii) to examine the impact of delays on construction projects, and iii) to recommend measures for overcoming design and pre-contract delays in construction projects.

While the impact of delay is higher at the construction stages, most of the causes in this stage emanate from hidden causes at the pre-construction stages. At the construction stage, about 71% of the causes of delays come from the pre-contract stage (Gebrehiwet and Luo, 2017). Unobserved Design errors at the pre-contract stages contribute majorly to delays in the construction phase. Inadequate time and finance, poor coordination, unclear scope of work, and inexperienced designers were identified as the causes of design errors (Shamsudeen and Obaju, 2016). Omissions in the design or contract documents can also result in rework (Enshassi *et al*., 2017). The change orders during construction are caused by insufficient planning and scheduling, design complexity, and consultants' rigidity (Alaryan *et al*., 2014). Delays have an impact at every stage of the construction project. Gebrehiwet and Luo (2017) posit that the impact of delays can be found in the pre-construction, construction, and post-construction stages.

The outcome of this study will assist the design team and other professionals engaged at the inception stage of the construction projects to work smart to avoid the consequences of delays which could be minimised during the pre-contract stages. The client and his consultant will be aware of the causes and impact of delays and work hard to avoid delays for better project performance. The study adds to the existing body of knowledge in construction delays.

2.0 LITERATURE REVIEW

2.1 Causes of Delays at the Design and Pre-Contract Stage

In the Ethiopian construction industry, Gebrehiwet and Luo (2017) reported that the topmost vital causes of delays at the pre-construction stages are; corrupt practices, planning and scheduling ineffectiveness, materials price increases, lack of utilities on-site, poor project feasibility study, late design and design documents, unclear details and design specification, lack of speedy delivery of materials, and mistakes and errors in designs. On large construction projects in Pakistan, incorrect time estimation, quality of materials, obsolete technology, natural disasters, unforeseen site conditions, changes in drawings, incorrect cost estimation, and organisational and regulatory changes are among the causes of delays as reported by Haseeb *et al.* (2011).

In Florida, the United States, Ahmed *et al.* (2003) reported that building permit approvals, changes in drawings, incomplete documents, changes in specification, and changes in law; are among the top causative factors of delays in construction projects. Financial problems by the client, design changes, unforeseen site conditions, inaccurate estimates, and mistakes in design are the major causes of delays in building and industrial construction projects in the Vietnamese construction industry (Le-Hoai *et al*., 2008). Arantes *et al*. (2015) reported that in Portugal, construction project delays are caused mainly by the slow decision-making of the project manager, unrealistic time scale estimates, deficient contract specification, contract award process and bidding type, among others.

Some of the top causes of delays in construction projects in Nepal are; inaccurate time estimates, inaccurate cost estimates, insufficient modern equipment, incompetent project team, and incorrect project planning and scheduling, among others (Sha *et al*., 2017). Other significant causes include poor design and delay in design, incomplete drawings/ detail design and wrong-site investigation. Alfraide (2018) reported that the most critical causes of delays in the Saudi Arabian construction sector are awards of a contract to the lowest bid price, materials price fluctuations, frequent changes in designs, and rework, among others. One of the critical effects of delays in the Ghanaian construction industry is a cost overrun, and the reasons for this are inaccurate cost estimates, unrealistic design, deficiency in the planning of project durations to task, and scope changes (Amoatey *et al*., 2015). Most of these factors emanate from the pre-construction stage. Incomplete drawings and design errors were the major causes of delays in a construction project (Keen, 2010; Kikwasi, 2012; Dosumu and Adenuga, 2013).

Among the causes of delays identified in the study of Gashahun (2020) are; incomplete and undetailed BOQ, poor consultant experience, insufficient site investigation before design, discrepancies/mistakes in design documents, inexperienced design team, delays in design document production, lack of use of modern design software, design complexity, misunderstanding of clients requirements, poor communication between the parties, and insufficient definition of substantial completion. These causes are related to the pre-contract factors of construction delays. In power construction projects in Nigeria, Ismaila *et al.* (2022) reported that the three major causes of delays are corruption and bureaucracy in government, insufficient funding/budget allocation, and inflation or price fluctuation. Table 1 summarises the selected causes of delays during the design and pre-contract stages.

Gebrehiwet and Luo (2017) investigated the different causes of delays at different stages of construction projects in Ethiopia and found that budget overruns, schedule overruns, contract termination, arbitration and litigation are the critical effects of delay on construction projects. A similar report was obtained from the Pakistan construction industry by Haseeb *et al*., (2011), who reported that on large construction projects, the major effects of delays are time overrun, cost overrun, project abandonment, negotiations and court cases and disputes. The critical effect of delays in public housing construction projects in Ghana are; cost overrun, time overrun, litigation, project abandonment by the client, and arbitration (Amoatey *et al*., 2015). In a study over two decades, Aibinu and Jagboro (2001) in Nigeria found that the main six effects of delays on construction projects are time overrun, cost overrun, disputes, arbitration and litigation and litigation complete abandonment. Similar findings were also made by Ibironke *et al.* (2013) and Abisuga *et al*. (2014). In Tanzania, Kikwasi (2012) reported that prolonged delays in a construction project are a potential cause of higher risks and advocated for adequate budgetary provisions, promptly issuing of project information, finalising designs, and sound project management to curtail the associated risks in a delayed project. The effects of delays are time and cost overrun, negative social impact, wastage of resources, arbitration, and disputes, among others. Fashina *et al.* (2020) reported that in Somali land, the three major effects of delays in construction projects are legal action, cost overrun and the complete abandonment of projects.

In Portugal, construction projects experience delays; their major impacts are time and cost overruns and disputes (Arantes *et al*., 2015). In the Sultanate of Oman, the major effects of delays in megaprojects are; project time overrun, extra costs, reduced investor's confidence towards the project, loss of the reputation on construction services, loss of reputation on consulting services, abandonment (termination of the contract) (Oyegoke and Al-Kiyumi, 2017). This is similar to what Samarah *et al.* (2016) reported in the Jordan construction industry. In the Malaysian construction industry, Ramanathan *et al.* (2012) reported that the numbers of construction projects that have recorded delays are on the increase and the most critical, impact is on making projects exceed their planned time and cost budget. In the construction industry of Nepal, similar findings were reported by Sha *et al.* (2017).

Table 1: Selected causes of delays at the design and pre-contract stage

S/n	Pre-contract delays causes	Source(s)
1	Mistakes and error in designs	Le-Hoai *et al*. (2008); Keen (2010); Kikwasi (2012); Dosumu and Adenuga (2013); Gebrehiwet and Luo (2017); Sha *et al*. (2017); Gashahun (2020)
2	Materials price increases/fluctuations	Gebrehiwet and Luo (2017); Alfraide (2018); Ismaila *et al.* (2022)
3	Unclear documentation	Ebekozien *et al.* (2015)
4	Corrupt practices	Gebrehiwet and Luo (2017); Ismaila *et al.* (2022)
5	Late design and design documentation	Gebrehiwet and Luo (2017); Sha *et al.* (2017); Gashahun (2020)
6	Inadequate documentation	Ahmed et al. (2003); Ebekozien *et al.* (2015)
7	Planning and scheduling ineffectiveness	Amoatey *et al*. (2015); Gebrehiwet and Luo (2017); Sha et al. (2017);
8	Inadequate site investigation	Ebekozien *et al*. (2015); Sha *et al*. (2017); Gashahun (2020)
9	Unforeseen site conditions	Le-Hoai *et al.* (2008); Haseeb *et al*. (2011)
10	Incompetent/inexperienced design/project team	Ebekozien *et al.* (2015); Sha *et al.* (2017); Gashahun (2020)
11	Incomplete drawings/detailed design	Keen (2010); Kikwasi (2012); Dosumu and Adenuga (2013); Sha *et al*. (2017);
12	Complex and unrealistic design	Amoatey *et al*. (2015); Gashahun (2020)
13	Unclear details and design specification	Arantes *et al.* (2015); Gebrehiwet and Luo (2017);

14	Pressure to meet an unrealistic deadline	Ebekozien *et al.* (2015)
15	Poor management of design	Ebekozien *et al.* (2015)
16	Poor project feasibility study	Ebekozien *et al*. (2015); Gebrehiwet and Luo (2017);
17	Poor communication among the the consultants staff	Ebekozien *et al*. (2015); Gashahun (2020)
18	Misunderstanding of clients requirements	Gashahun (2020)
19	Lack of design coordination to eliminate design conflict	Ebekozien *et al*. (2015)
20	Lack of constructability reviews on design	Ebekozien *et al*. (2015)
21	Conflicts appear between drawings from different disciplines	Ebekozien *et al.* (2015)
22	Poor or inaccurate fees paid by the client	Ebekozien *et al*. (2015)
23	Slow response/decision-making of the project manager	Arantes *et al*. (2015); Ebekozien *et al*. (2015)
24	Incorrect time estimation	Le-Hoai *et al.* (2008); Haseeb *et al.* (2011); Arantes *et al*. (2015); Sha *et al*. (2017); Gashahun (2020)
25	Quality of materials	Haseeb *et al*. (2011)
26	Use of obsolete equipment and technology	Haseeb *et al*. (2011); Sha *et al.* (2017); Gashahun (2020)
27	Changes in design/drawings	Le-Hoai *et al*. (2008); Haseeb *et al.* (2011); Ahmed *et al.* (2003); Alfraide (2018)
28	Incorrect cost estimation	Le-Hoai *et al*. (2008); Haseeb *et al*. (2011); Amoatey *et al.* (2015); Sha *et al*. (2017)
29	Organisational and regulatory changes	Ahmed *et al.* (2003); Haseeb *et al*. (2011);
30	Incomplete and undetailed BOQ	Gashahun (2020)
31	Changes in specification	Ahmed *et al*. (2003)
32	Building permit approval	Ahmed *et al*. (2003)
33	Contract award process and bidding type	Arantes *et al*. (2015); Alfraide (2018)
34	Insufficient fund/budget allocation	Ismaila *et al.* (2022)
35	Poor consultant experienced	Gashahun (2020)

Shahsavand *et al.* (2018) reported that the most likely source of dispute is the contractual responsibility for delay in the Iranian construction sector. Different techniques have been utilised in the court to demonstrate the critical delay in construction projects. Ajayi and Chinda (2022) reported that enhancing the performance of construction projects, in the long run, would require the use of experienced designers and modern technologies to help curb design errors. Financial resource losses and the urgency to optimize project delivery to improve performance have increased stakeholders' awareness of the challenge of regular time and cost overruns and poor project quality performance (Larsen *et al*., 2016). Table 2 summarises the impact of delays in construction identified in the literature.

3.0 Research methodology

This study sampled experienced construction professionals working in client, consultant, and contractor organisations in Port Harcourt, River State, Nigeria. The Quantitative research questionnaire was adopted to meet the purpose of this study. The questionnaire enables sampling of a large audience at a relatively shorter period and economical cost (Tan, 2008).

Table 2: Impact of construction delays

S/n	Impact of construction delays	Source(s)
1	Time overrun	Sambasivan and Soon (2007); Oyegoke and Al-Kiyumi (2017); Haseeb *et al*. (2011); Arantes *et al*. (2015); Gebrehiwet and Luo (2017); Amoatey *et al*. (2015); Aibinu and Jagboro (2001); Fashina *et al*. (2020); Kikwasi (2012); Ibironke *et al*. (2013); Sha *et al*. (2017); Gashahun (2020); Khattri *et al*. (2016); Samarah *et al*. (2016).
2	Cost overrun	Sambasivan and Soon (2007); Haseeb *et al.* (2011); Arantes *et al*. (2015); Kikwasi (2012); Gebrehiwet and Luo (2017); Amoatey *et al.* (2015); Oyegoke and Al-Kiyumi (2017); Aibinu and Jagboro (2001); Sha *et al*. (2017); Ibironke *et al*. (2013); Gashahun (2020); Khattri *et al.* (2016); Samarah *et al.* (2016).
3	Abandonment	Sambasivan and Soon (2007); Haseeb *et al.* (2011); Arantes *et al.* (2015); Kikwasi (2012); Amoatey *et al.* (2015); Aibinu and Jagboro (2001); Fashina *et al.* (2020); Oyegoke and Al-Kiyumi (2017); Ibironke *et al*. (2013); Sha *et al.* (2017); Khattri *et al*.(2016); Samarah *et al.* (2016).
4	Negotiations	Haseeb *et al.* (2011); Gebrehiwet and Luo (2017); Amoatey *et al.* (2015)
5	Dispute between parties	Sambasivan and Soon (2007);Haseeb *et al.* (2011); Aibinu and Jagboro (2001); Kikwasi (2012); Arantes *et al.* (2015);Fashina *et al* (2020); Ibironke *et al.* (2013);Sha *et al*. (2017);Khattri *et al*.(2016); Samarah *et al.* (2016);
6	Contract termination	Gebrehiwet and Luo (2017); Amoatey *et al.* (2015).
7	Dissatisfaction to all parties	Ramanathan *et al*. (2012)
8	Litigation	Sambasivan and Soon (2007); Amoatey *et al.* (2015); Arantes *et al*. (2015); Kikwasi (2012); Gebrehiwet and Luo (2017);Aibinu and Jagboro (2001);Fashina *et al* (2020); Ibironke *et al.* (2013); Sha *et al.* (2017); Khattri *et al.* (2016); Samarah *et al.* (2016).
9	Arbitration	Sambasivan and Soon (2007); Amoatey *et al.* (2015); Arantes *et al.* (2015); Kikwasi (2012); Gebrehiwet and Luo (2017); Aibinu and Jagboro (2001);Fashina *et al* (2020); Ibironke *et al*. (2013); Sha *et al*. (2017); Khattri *et al*.(2016); Samarah *et al.* (2016).
10	Increased portfolio of "non-performing" projects	Amoatey *et al.* (2015)
11	Difficulties with payment	Amoatey *et al.* (2015)
12	negative social impact	Kikwasi (2012)
13	resources wastages	Kikwasi (2012)
14	lead clients to return the loans	Kikwasi (2012)
15	poor quality of construction	Kikwasi (2012); Gashahun (2020)
16	delay in making a profit for the owner	Kikwasi (2012)
17	bankruptcy	Kikwasi (2012)
18	create stress on contractors	Kikwasi (2012)
19	acceleration losses	Kikwasi (2012)
20	projects blacklisted by the authorities,	Ibironke *et al.* (2013)
21	acquisition of a bad reputation	Ibironke *et al.* (2013);Oyegoke and Al-Kiyumi (2017)

22	Decreased opportunities for future work	Oyegoke and Al-Kiyumi (2017)
23	Reduced investor's confidence in the project	Oyegoke and Al-Kiyumi (2017)

The questionnaire was designed to have three parts; the first part gathered data on the respondents' background information; the second part gathered data on the relative ranking of the design and pre-contract causes of delays, and the third part collected data on the impact of the construction delays. The questionnaire was based on a 5-point response scale in which 5 is the highest rank, and 1 is the lowest rank. The professionals sampled are; i) Architects, ii) Builders, iii) Engineers, and iv) Quantity Surveyors. The Questionnaire was developed from variables derived from an extensive literature review.

The purposive sampling technique was used in administrating the research instrument on the target participants on active construction sites. The purpose of this sampling technique was to meet the study aim and leverage the professionals' experiences. The researchers and some trained research assistants administered the questionnaires to the respondents during a survey period between (November 2021 and February 2022). This was done by hand and via electronic means. The electronic means of questionnaire administration helped reduce the number of hardcopy paper questionnaires used. This was described by Nwaki and Eze (2020) as an eco-friendly means of a survey. Three hundred and twenty questionnaires were administered, out of which 140 completed and useable questionnaire responses were collected and formed the basis for the analyses. This represents an effective response rate of 43.75%. Data analyses used frequency, percentages, relative importance index (RII), and the Friedman test. The Cronbach's alpha test was used to test the reliability of the research instrument; the test gave a Cronbach's alpha coefficient of 0.812 and 0.801 for the assessed variables (See table 3). Thus, the research instrument has a very good reliability index as it meets the threshold suggested (Pallant, 2005). The background information of the respondents was analysed using frequency and percentage. The data on design and pre-contract delays factors and the impact of delays were analysed using RII. The severity level of the assessed factors of delays at the construction stage is shown in Table 4.

Since there is the possibility of having different opinions from the different groups of respondents, the Friedman Test, a non-parametric test, was conducted to determine if a statistically significant difference exists between the means of the four participants groups regarding the ranking of the assessed variables (McLeod, 2019).

This led to the formulation of two hypotheses which are;

H1: There is no significant statistical difference between the perception of the respondents' group regarding the rating of the variables regarding the design and pre-contract delay factors

Table 3 - Reliability Statistics

Variables tested	Cronbach's Alpha	Number of Items
Design and pre-contract delay factors	0.850	35
Impact of delays in construction	0.883	23

Table 4: Cut-off points for the severity of contribution to delays in construction

S/N	Index scale	RII	Severity Level
1	≤ 20%	0.00 - 0.20	Very low (VL)
2	20% - 40%	0.20 - 0.40	low (L)
3	40% - 60%	0.40 - 0.60	Moderate (M)
4	60% - 80%	0.60 - 0.80	High (H)
5	80% - 100%	0.80 - 1.00	Very High (VH)

Sources: Modified from Alfraide (2018)

H2: There is no significant statistical difference between the perceptions of the respondents' group regarding the rating of the variables regarding the Impact of delays in construction

Condition for rejecting or failing to reject the null hypothesis;

i. Reject the null hypothesis if the P-value is less than the 5% significant level

ii. Fail to reject the null hypothesis if the P-value is greater than the 5% significant level.

4.0 Results and discussion

4.1 Respondents' background characteristics

From Table 5, 17.14% of the participants are Architects by profession, 12.14% are Builders, 49.29% are Engineers, and 21.43% are Quantity Surveyors. A total of 20.71% are from client organisations, 36.43% are consulting organisations, and 42.86% are contractors' organisations. These reflect a fair representation of the core built environment experts and major players in the construction industry. For years of experience spent in the industry,15.71% had 1-5 years of experience, 27.14% had 6-10 years, 35.0% had 11-15years, 15.0% had 16-20 years, and 7.14% had 21 years and above. The average years of experience of the participants are 11 – 29 years, which is a considerable period to have gained sufficient experience on the subject of this study. Concerning academic qualifications, HND holders are 6.43%, PGD (12.86%), B.Sc/B.Tech (43.57%), MSc./M.Tech (25.00%) and PhD (2.14%). About 87.14% of the participants are corporate members of the various professional bodies, and only 12.86% are probationer members. This implies that the respondents have the requisite professional experience and are educationally qualified to understand the questionnaires' content and aid the study objective.

4.2 Causes of delays at the design and pre-contract stage

Table 6 shows the result obtained from the analysis of the data gathered on the causes of delays at the design and pre-contract stages. It can be seen that the top ten most critical causes of delays at the design and pre-contract stage are; incomplete drawings/ detail design (RII=0.896; ranked first), corrupt practices (RII=0.879; ranked second), Incompetent/inexperienced design/project team (RII=0.873; ranked third), mistakes and error in designs (RII=0.861; ranked fourth), Unclear documentation (RII=0.861; ranked fourth), Poor communication between the staff of the consultant (RII=0.847; ranked sixth), late design and

Table 5: Background information of Respondents

Variables	Classification	Freq.	%	Cum. %
Profession	Architects	24	17.14%	17.14%
	Builders	17	12.14%	29.29%
	Engineers	69	49.29%	78.57%
	Quantity Surveyors	30	21.43%	100.00%
	TOTAL	**140**	**100.00%**	
Organisation type	Client organisation	29	20.71%	20.71%
	Consultants organisation	51	36.43%	57.14%
	Contractors organisation	60	42.86%	100.00%
	TOTAL	**140**	**57.14%**	
Years of experience	1-5years	22	15.71%	15.71%
	6-10years	38	27.14%	27.14%
	11-15 years	49	35.00%	50.71%
	16-20 years	21	15.00%	65.71%
	21-above	10	7.14%	72.86%
	TOTAL	**140**	**100.00%**	
Academic qualification	HND	23	16.43%	16.43%
	PGD	18	12.86%	29.29%
	BSc/Btech	61	43.57%	72.86%
	M.Sc/M.Tech	35	25.00%	97.86%
	PhD	3	2.14%	100.00%
	TOTAL	**140**	**100.00%**	
Professional status	Corporate member	122	87.14%	87.14%
	Probationer member	18	12.86%	100.00%
	TOTAL	**140**	**100.00%**	

design documents (RII=0.840; ranked seventh), unclear details and design specification (RII=0.837; ranked eighth), misunderstanding of clients requirements (RII=0.831; ranked ninth), and poor project feasibility study (RII=0.830; ranked 10th). While the least critical causes of delays in construction at the design and pre-contract stage are, changes in the specification (RII=0.754; ranked 31st), incomplete and undetailed BOQ (RII=0.733; ranked 32st), slow response/decision making of the project manager (RII=0.730; ranked 33rd), Inadequate site investigation (RII=0.723; ranked 34th), and Pressure to meet an unrealistic deadline (RII=0.720; ranked 35th).

However, regardless of the different ranking of the assessed variables, they are significant contributors to delays in construction. This is based on the maximum RII (0.896), minimum RII (0.720), and averaged RII (0.804) obtained. In addition, the cut-off points for the severity of the factors' contribution to delays in construction (column 5, Table 6) indicate that 20 (57.14%) have a 'very high' severity contribution to delays in construction, and 15 (42.86%) have a 'high' severity contribution to delays in construction. It can be concluded that the severity of the causes of design and pre-contract contribute to delays during construction range from high to very high. This is significant enough for construction projects to suffer the consequences of time overrun, cost overrun, disputes and other negative performance on construction projects.

Major factors found in this section support what has been reported in the extant literature on construction management. (e.g. Sha *et al*., 2017; Keen, 2010; Kikwasi, 2012; Dosumu and Adenuga, 2013; Gebrehiwet and Luo, 2017; Ismaila *et al*. 2022; Gashahun, 2020; Le-Hoai *et al*. 2008;

Ebekozien *et al*. 2015). The pre-contract stage of construction projects is dominated by activities such as the development of project design, writing specifications for the designs, products and materials, preparation of Bills of Quantities and other contract documents, bidding and contractors selection and contract awards among others. At the pre-contract stage, design and documentation, as well as meetings, dominate the critical actions of the parties involved. Therefore, any mistakes, errors, misunderstandings or poor decisions or actions regarding the designs, drawings, specifications, and documentation at this stage, will lead to serious issues during project implementation (construction stage). This is because a good proportion of the issues that are observed in designs, documentation, assumptions, and contracts, among others, during the construction stage were hidden or unseen during the pre-contract stage. At the notice of such defects in design or contract documentation, ongoing activities are halted, or actions slowed down until the defects are corrected. These could lead to delays that could impact the project baselines.

Defects or deficiencies in design/drawings and other contract documents, such as; incomplete drawings/ detail design, mistakes and errors in designs, Unclear documentation, and unclear details and design specification, are major factors at the pre-contract stage that cause construction delays. These factors are well noted in previous studies (Sha *et al.* 2017; Gashahun (2020; Ebekozien *et al*., 2015; Arantes *et al.*, 2015; Kikwasi, 2012; Dosumu and Adenuga, 2013; Gebrehiwet and Luo, 2017). Corruption can kill any viable and vital projects. Cutting corners by any member of the design or project teams at the pre-contract stage could result in serious deficiencies in any of the contract documents. Corrupt practices by the design/consultant team members could lead to delays when discovered during construction. Corruption was found to be one of the critical causes of delays in construction (Gebrehiwet and Luo, 2017; Ismaila et al. (2022). Poor communication is a vital delay factor in construction. Communication issues could lead to errors and late action, especially regarding drawing revision or detailing. Communication can also impact poor project feasibility reports and misunderstanding of client requirements. Communication-related factors were highlighted in the study of Gashahun (2020) as a factor responsible for delays in the early part of projects.

4.3 Friedman Test on the causes of delays at the design and pre-contract stage

The Friedman Test showed that the p-value obtained is less than 0.05 level of significance, indicating a significant statistical difference between the views of the different respondent groups. The mean rank of the variables shows that the architect rated the factors higher than the other participant groups, with the Engineers having the lowest mean rank. The Chi-square value of 17.984 reflects a significant divergence in the participants' opinions. Based on these, the null hypothesis (H1), which states that there is no significant statistical difference between the respondents' perception regarding the rating of the variables regarding the design and pre-contract delay factors, is rejected (see table 7).

With a significant difference observed, it is impracticable to determine the exact groups where the difference lies. To achieve this, the post hoc test was run using Wilcoxon signed-rank tests

(Laerd statistics, 2018). This was achieved by comparing the view of pairs of the groups, and the result is shown in Table 8 below. A Significant statistical difference was obtained between the following pairs; Builders vs Architects (p-value =0.003), Engineers vs Architects (p-value=0.001), Quantity Surveyors vs Architects (p-value=0.033), and Quantity Surveyors vs Engineers (p-value=0.001). With the significant p-value being below 0.05, the null hypothesis (H1) is rejected. While for the Engineers vs Builders and Quantity Surveyors vs Builders, a p-value of 0.107 and 0.058 was obtained, respectively. This shows a non-significant difference in the views of these pairs of groups. Based on this, the study failed to reject the null hypothesis.

Table 6: Causes of delays at the design and pre-contract stage

S/N	Pre-contract delays causes	RII	Rank	Severity level
1	Mistakes and errors in designs	0.861	4	Very High
2	Materials price increases/fluctuation	0.810	15	Very High
3	Unclear documentation	0.861	4	Very High
4	Corrupt practices	0.879	2	Very High
5	Late design and design documentation	0.840	7	Very High
6	Inadequate documentation	0.791	25	High
7	Planning and scheduling ineffectiveness	0.810	15	Very High
8	Inadequate site investigation	0.723	34	High
9	Unforeseen site conditions	0.794	23	High
10	Incompetent/inexperienced design/project team	0.873	3	Very High
11	Incomplete drawings/detailed design	0.896	1	Very High
12	Complex and unrealistic design	0.764	28	High
13	Unclear details and design specification	0.837	8	Very High
14	Pressure to meet an unrealistic deadline	0.720	35	High
15	Poor management of design	0.826	11	Very High
16	poor project feasibility study	0.830	10	Very High
17	Poor communication between the staff of the consultant	0.847	6	Very High
18	Misunderstanding of client's requirements	0.831	9	Very High
19	Lack of design coordination to eliminate design conflict	0.809	17	Very High
20	Lack of constructability reviews on design	0.766	27	High
21	Conflicts appear between drawings from different disciplines	0.759	29	High
22	Poor or inaccurate Fees paid by the client	0.804	18	Very High
23	Slow response/decision-making of the project manager	0.730	33	High
24	Incorrect time estimation	0.797	21	High
25	Quality of materials	0.754	30	High
26	Use of obsolete equipment and technology	0.804	18	Very High
27	Changes in design/drawings	0.794	23	High
28	Incorrect cost estimation	0.803	20	Very High
29	Organisational and regulatory changes	0.814	13	Very High
30	Incomplete and undetailed BOQ	0.733	32	High
31	Changes in specification	0.754	30	High
32	Building permit approval	0.797	21	High

33	Contract award process and bidding type	0.823	12	Very High
34	Insufficient fund/budget allocation	0.791	25	High
35	Poor consultant experienced	0.813	14	Very High

Table 7: Rank and test Statistics causes of delays at the design and pre-contract stage

S/N	Trades group	N	Median	Mean Rank	df	Chi-square	Asymp. Sig.
1	Architects	24	4.3100	3.59	3	17.894	0.000
2	Builders	17	3.8300	2.18			
3	Engineers	69	3.3700	1.82			
4	Quantity Surveyors	30	4.0900	2.41			

Table 8: Wilcoxon Signed Ranks Test Statistics

	Builders vs Architects	Engineers vs Architects	Quantity Surveyors vs Architects	Engineers vs Builders	Quantity Surveyors vs Builders	Quantity Surveyors vs Engineers
Z	-2.959	-3.357	-2.129	-1.610	-1.894	-3.250
Asymp. Sig. (2-tailed)	0.003	0.001	0.033	0.107	0.058	0.001

4.4 Impact of delays in construction projects

Table 9 shows the result obtained from the analysis of the data gathered on the impact of construction delays. It can be seen that the topmost critical impact of construction delays is; time overrun (RII=0.921; ranked first), a dispute between parties (RII=0.907; ranked second), cost overrun (RII=0.873; ranked third), poor quality of construction (RII=0.873; ranked third)), and abandonment (RII=0.857; ranked fifth). On the other hand, the least impact of delays is; the acquisition of a bad reputation (RII=0.780; ranked 19th), negative social impact (RII=0.757; ranked 20th), bankruptcy (RII=0.756; ranked 21st), Litigation (RII=0.741; ranked 22nd), and the lead client to return the loans (RII=0.709; ranked 23rd).

Notwithstanding the relative ranking of the assessed variables, they are all significant impacts of delays in construction. This is premised on the maximum RII of 0.921, minimum RII of 0.709, and an average RII of 0.815. Furthermore, the cut-off points for the severity of the impact of delays in construction (column 5, Table 9) indicate that 13 (56.52%) have a 'very high' severity impact of construction delays, and 10 (43.48%) have a 'high' severity impact of construction delays. It can be concluded that delays have a high to very high impact on construction and construction organisations. This confirms what was reported in extant construction management literature regarding the impact of construction delays (Ajayi and Chinda, 2022; Oyegoke and Al-Kiyumi, 2017; Ramanathan *et al*. 2012; Arantes *et al*. 2015; Sha *et al*. 2017; Ibironke *et al*. 2013; Aibinu and Jagboro, 2001).

When a delay occurs, every activity in that path is put on hold or made to move slowly below the planned rate of progress. This results in a time overrun on the affected work item or activities. Delays of activities become worse when such delays occur on activities on the critical path or without adequate floats. A delay on the critical path will impact the entire project completion date. An unjustified delay usually leads to disputes arising from claims from the contractor or the clients. More monies or expenses are incurred on idle workers, machines and equipment, and wasted materials, leading to cost overruns. The contractors suffer the loss of profits and wastage of productive resources. The client suffers expenses beyond what was planned. Time overrun and budget slippage are the major impact of delays reported in previous studies in Nigeria (e.g. Ibironke *et al.,* 2013; Aibinu and Jagboro, 2001) and other countries (e.g. Amoatey *et al*., 2015; Haseeb *et al.,* 2011; Gebrehiwet and Luo (2017; Fashina *et al.* (2020; Larsen *et al*., 2016).

Other critical fallouts of construction delays found in this study are; disputes, quality problems and project abandonment. When works are not progressing as planned, disputes arise because more monies and time are wasted, and there is no commensurate productivity to show for it. Disputes, if not resolved, could lead to arbitration and litigation. This further leads to more expenses for the parties, thus, adding to the project cost. Time and cost overruns erode clients' monies and project budget, at the extreme, leads to abandonment of the project or ending of the projects (Gebrehiwet and Luo, 2017; Haseeb *et al.,* 2011; Fashina *et al.*, 2020; Oyegoke and Al-Kiyumi, 2017; Larsen *et al*., 2016).

4.5 Friedman Test on the Impact of construction delays

The Friedman Test conducted on the impact of construction delays shows that the p-value obtained is greater than the 0.05 level of significance, indicating no significant statistical difference between the views of the different respondent groups. The mean rank shows a closely related value, except for the architects, which is slightly higher among the groups. The Chi-square value of 6.941 differs slightly from the median values and reflects a no significant divergence in the participants' opinions. Based on these, the null hypothesis (H2), which states that there is no significant statistical difference between the respondents' perceptions regarding the rating of the variables regarding the impact of construction delays, is not rejected (see table 10). There was, however, no need to run a Wilcoxon signed-rank test, as no significant difference was obtained.

Table 9: Impact of construction delays

S/N	Variables	RII	Rank	Severity level
1	Time overrun	0.921	1st	Very High
2	Cost overrun	0.873	3rd	Very High
3	Abandonment	0.857	5th	Very High
4	Negotiations	0.799	14th	High
5	Dispute between parties	0.907	2nd	Very High
6	Contract termination	0.786	16th	High
7	Dissatisfaction with all parties	0.786	16th	High
8	Litigation	0.741	22nd	High
9	Arbitration	0.836	8th	Very High
10	Increased portfolio of “non-performing” projects	0.800	13th	Very High
11	Difficulties with payment	0.853	6th	Very High
12	Negative social impact	0.757	20th	High
13	Resources wastages	0.849	7th	Very High
14	Lead the client to return the loans	0.709	23rd	High
15	Poor quality of construction	0.873	3rd	Very High

16	Delay in making a profit for the owner	0.813	10th	Very High
17	Bankruptcy	0.756	21st	High
18	Create stress on contractors	0.813	10th	Very High
19	Acceleration losses	0.786	16th	High
20	Projects blacklisted by the authorities,	0.836	8th	Very High
21	Acquisition of a bad reputation	0.780	19th	High
22	Decreased opportunities for future work	0.809	12th	Very High
23	Reduced investor's confidence in the project	0.799	14th	High

Table 10: Rank and test Statistics of the Impact of construction delays

S/N	Trades group	N	Median	Mean Rank	df	Chi-square	Asymp. Sig.
1	Architects	24	4.2609	3.00	3	6.941	0.057
2	Builders	17	3.5652	1.88			
3	Engineers	69	4.0435	2.29			
4	Quantity Surveyors	30	4.3478	2.82			

5. CONCLUSION AND RECOMMENDATIONS

This study adopted a survey questionnaire to assess the causes and impact of design and pre-contract delays on construction project delivery. The study sampled construction professionals using the purposive sampling technique in the study area. The analyses led to the vital findings and conclusions made. The study found that the most critical causes of delays at the design and pre-contract stage are; incomplete drawings/ detail design, corrupt practices, incompetent/inexperienced design/project team, mistakes and errors in designs, unclear documentation, poor communication among the consultants staff, late design and design documentation, unclear details and design specification, misunderstanding of clients requirements, and poor project feasibility study. Also, these factors have a 'high to very high' severity contributing to construction project delays. Therefore, it can be concluded that delays have a 'high' to 'very high' impact on construction and construction organisations, with the most critical impacts being; time overrun, disputes between parties, cost overrun, poor quality of construction, and abandonment.

One of the major causative agents of delays in construction projects emanates from the inefficiencies and deficiencies in the contract documents (designs, drawings, specifications, and client requirements, among others). Incomplete drawings and design details incubate many problems that do manifest during construction. This could result from the design consultants being inexperienced or incompetent in the task. Furthermore, not engaging experienced experts could lead to poor feasibility surveys and reports. This is responsible for a lot of failed projects during the implementation phase. Poor communication among the team members of the consultants and misunderstanding of the client's requirements could lead to deficient designs or drawings. This has remained a recurring problem in the construction industry of developing countries like Nigeria. Construction project designs and documentation-related problems are responsible for the greater proportion of the poor performance recorded in construction projects in Nigeria and other developing countries. Communication is central to the problem, as poor information and ideas exchange could lead to mistakes and errors in designs, unclear documentation, unclear specification and details, and not properly interpreting the projects' and clients' needs, among others. Therefore, effective communications management is critical for better project documentation preparation, design implementation, and ultimately better project performance outcomes.

Corrupt practices, which entail following shortcuts, failing to follow due process and what the ethics require, could lead to delays that would become obvious during construction. When this happens, time would be lost, more cost would be incurred, quality would be compromised, and the project could be abandoned at the extreme. Laziness and work overload could lead to a slow or late response to design production, changes and design documentation. Such delays could impact the execution of the critical activity, leading to productivity losses, cost overrun, schedule slippage, dissatisfaction, and even safety issues. The economic implications of delay are high on construction projects. Efforts should be put in place to curtail the factors responsible for this at the design stage so that construction projects could improve performance during the construction stage

Based on the critical findings of this study, the following recommendations that would eliminate or reduce delays and improve project performance outcomes are made;

i. The client, as well as the consultant/design team, should ensure that construction project design/drawings are completed before construction work on-site starts, especially in the traditional procurement system of design, bid and construct contracts.

ii. Adequate measures should be put in place by the project client to ensure that corrupt practices are detected and punished by engaging experts with proven integrity and respect for their professional code of conduct. Construction experts involved in a project's early stages should desist from actions that would jeopardise the project outcome. They should work within the limit of the rules and regulations governing their operations (i.e. ethics of their professions).

iii. An experienced and competent design/project team should be recruited to design and prepare the project documentation. This would improve the design/documents produced at the pre-contract stages.

iv. Mistakes and errors should be avoided as much as possible if projects are to be completed within time, cost and with a good quality specification. Using competent design/project teams is critical to achieving error free drawings/designs.

v. At the pre-contract stage, every document should be clear, simple and written in a good and acceptable communication medium for easy comprehension.

vi. The consultant should implement an effective communication practice among its staff - a clear line or exchanging information, resolving disagreement, among others.

vii. Design and other project documents should be prepared as soon as required. This is to ensure timely checking, given enough time for inputs to be made by all concerned for a better quality design/document.

viii. Production of clear details and design specifications for better and hitch-free construction. A clear specification would help reduce delays and improve project outcomes.

ix. The consultant and other stakeholders should ensure that the requirements of the client are understood prior to construction.

x. Clients must embark on an effective and proper feasibility study of their projects before implementing them. The consultants acting on behalf of the client must ensure that the feasibility study is comprehensive. A feasibility study can reveal weaknesses that require improvement for a successful and better design and subsequent implementation.

This study's outcome could help the key project stakeholders (client, consultants and contractors) to play their role effectively in ensuring that adequate care is taken at the pre-contract stage of a construction project to avoid causes that could result in delays at the construction stage. This study also adds to the existing body of knowledge on the construction delays factor that emanates from the pre-contract stage.

The limitations of this study that could affect the generalisation of its findings are; the sample size, area of the study, sampling techniques and method of analysis adopted. A similar study is proposed in other states or regions in Nigeria or other developing African countries. These will make more studies/ reports available for comparison. Although there is the possibility of having a relationship between the factors assessed, a more advanced analytical technique like exploratory factor analysis could be used to reduce the factors into a more manageable sub-scale.

References

Abisuga A.O, Amusu O.R.O, and Salvador K.A (2014). Construction Delay in Nigeria: A Perception of Indigenous and Multinational Construction Firms. Journal of Emerging Trends in Economics and Management Sciences (JETEMS), 5(3),371-378

Ahmed SM, Azhar S, Kappagntula P, and Gollapudil D (2003). Construction delays: A brief study of the Florida construction industry. In the 39th Annual ASC Conference, Clemson University, Clemson, USA: 257-266.

Aibinu, A. A., and Jagboro, G. O. (2002). The effects of construction delays on project delivery in Nigerian construction industry. International journal of project management, 20(8), 593-599. https://doi.org/10.1016/S0263-7863(02)00028-5

Aibinu, A.A. and Odeyinka, H.A. (2006).Construction Delays and Their Causative Factors in Nigeria. Journal of Construction Engineering and Management, 132(7), 667-677.DOI: 10.1061/_ASCE_0733-9364_2006_132:7_667_

Ajayi, B.O. and Chinda, T. (2022). Impact of Construction Delay-Controlling Parameters on Project Schedule: DEMATEL-System Dynamics Modeling Approach. Frontiers in Built Environment, 8, 1-16. doi: 10.3389/fbuil.2022.799314

Alaryan, A., Emadelbeltagi, E. A., and Dawood, M. (2014). Causes and Effects of Change Orders on Construction Projects in Kuwait. Journal of Engineering Research and Applications, 4 (7), 1–8.

Alfraidi, Y.N. (2018). Risk matrix for delay causes in building construction projects in KSA. International Journal of Advanced and Applied Sciences, 5(6), 93-97

Amade, B., Akpan, E. O. P., Ubani, E. C., & Amaeshi, U. F. (2016). Supply chain management and construction project delivery: Constraints to its application. PM World Journal, V(V), 1-19.

Amoatey, C.T., Ameyaw, Y.A., Adaku, E., and Famiyeh, S. (2015). Analysing delay causes and effects in Ghanaian state housing construction projects. International Journal of Managing Projects in Business, 8(1),198 – 214. http://dx.doi.org/10.1108/IJMPB-04-2014-0035

Arantes, A., da Silva, P. F., and Ferreira, L. M. D. F. (2015). Delays in construction projects - causes and impacts. 2015 International Conference on Industrial Engineering and Systems Management (IESM). doi:10.1109/iesm.2015.7380293

Asa, O. A. and Kareem, A. W. (2016). An Assessment of the Causative Factors and Effects of Delays in Building Construction Projects in Osun State, Nigeria. International Journal of Civil Engineering, Construction and Estate Management,4(3), 49- 64

Assaf , S.A., and Al-Hejji, S.(2006). Causes of delay in large construction projects. International Journal of Project Management, 24(4), 349–357.

Chan, D.W.M., and Kumaraswamy, M.M. (1997). A comparative study of causes of time overruns in Hong Kong construction projects. International Journal of Project Management;15(1), 55–63.

Dosumu, O. S., and Adenuga, O. A. (2013). Causes, effects and remedies of errors in Nigerian construction documents. Organization, Technology and Management in Construction, 5(1), 676-686.

Ebekozien, A., Uwadia, F., and. M. Usman, D.M. (2015). The Impact Of Design Errors And Incomplete Drawings On Construction Project Delivery In Nigeria. Proceedings of The Academic Conference of African Scholar Publications & Research International on Sub-Sahara African Transformation and National Development Vol. 7 No. 1. 8th October 2015 - C.E.S. Lecture Hall, Kaduna Polytechnic, Barnawa Campus, Kaduna, Kaduna State.

Elinwa, A. U., and Joshua, M. (2001). Time-Overrun Factors in Nigerian Construction Industry. Journal of Construction Engineering and Management, 127(5), 419–425. doi:10.1061/(asce)0733-9364(2001)1

Enshassi, A., Sundermeier, M., and Zeiter, M. A. (2017). Factors Contributing to Rework and Their Impact on Construction Projects Performance. International Journal of Sustainable Construction Eng. Technology, 8 (1), 12–33.

Eze,E., Sofolahan, O., Ugulu, R., and Nwankwo, L. (2021).Influence of construction SMEs characteristics on Health and Safety (H&S) deviance normalisation in Abuja, Nigeria. Construction and Human Settlements Management Journal (CHSMJ), 1(1),17-43.

Fashina A. A., Fakunle F.F., and Omar M. A. (2020). A Study on the Effects of Construction Project Delays in Somaliland Construction Industry Journal of Management, Economics, and Industrial Organization,.4(3), 89-102

Gamil, Y., & Rahman, I. A. (2017). Identification of causes and effects of poor communication in construction industry: A theoretical review. Emerging Science Journal, 1(4), 239-

247. https://doi.org/10.28991/ijse-01121

Gashahun, A.D. (2020). Causes and Effects of Delay on African Construction Projects: A State of the Art Review. Civil and Environmental Research, 12(5), 41-53. DOI: 10.7176/CER/12-5-04

Gebrehiwet,T., and Luo,H. (2017). Analysis of Delay Impact on Construction Project Based on RII and Correlation Coefficient: Empirical Study. Procedia Engineering 196 (2017) 366 – 374

Haseeb, M., Xinhai-Lu, A.B., Maloof, D. and Rabbani, W. (2011).Causes and Effects of Delays in Large Construction Projects of Pakistan. Kuwait Chapter of Arabian Journal of Business and Management Review,1(4),18-42.

Ibironke, O. T., Oladinrin, T. O., Adeniyi, O., & Eboreime, I. V. (2013). Analysis of non-excusable delay factors influencing contractors' performance in Lagos State, Nigeria. Journal of Construction in Developing Countries, 18(1), 53.

Ismaila, U., Jung, W., and Park, C.Y.(2022). Delay Causes and Types in Nigerian Power Construction Projects. Energies, 15, 1-16. https://doi.org/10.3390/en15030814

Jalal, M. P., and Yousefi, E. (2017). An Integrated Expert Model for Delay Management in Construction Projects. KICEM Journal of Construction Engineering and Project Management, 7(3), 1–14. doi:10.6106/JCEPM.2017.9.29.001

Keen, B. (2010). The pitfalls of incomplete contract documents. The Revay Report, 29(1),1-6.Available at: https://www.revay.com/wp-content/uploads/2020/10/v29no1en.pdf

Khattri, T., Agarwal, S., Gupta, V., Pandey, M. (2016). Causes and effects of delay in construction project. International Research Journal of Engineering and Technology (IRJET), 03(10), 564-566.

Kikwasi, G.J. (2012). Causes and effects of delays and disruptions in construction projects in Tanzania. Australasian Journal of Construction Economics and Building, 1(2), 52-59,

Laerd statistics (2018). Friedman Test in SPSS Statistics. Available at: https://statistics.laerd.com/spss-tutorials/friedman-test-using-spss-statistics.php

Larsen,J.K., Shen,G.Q., Lindhard, S.M., and Brunoe, T.D. (2016).Factors Affecting Schedule Delay, Cost Overrun, and Quality Level in Public Construction Projects. Journal of Management in Engineering, 32(1), 1 - 10. DOI: 10.1061/(ASCE)ME.1943-5479.0000391.

Le-Hoai L, Dai Lee Y, and Lee JY (2008). Delay and cost overruns in Vietnam large construction projects: A comparison with other selected countries. KSCE Journal of Civil Engineering, 12(6): 367-377.

McLeod, S. (2019). What a p-value tells you about statistical significance. Available at: https://www.simplypsychology.org/p-value.html

Nwaki, W. N., and Eze, C. E. (2020). Lean construction as a panacea for poor construction projects performance. ITEGAM- Journal of Engineering and Technology for Industrial Applications (ITEGAM-JETIA), 6(26), 61-72.https://doi.org/10.5935/jetia.v6i26.723

Nwaki, W.N., and Eze, C.E. (2020). Lean Construction as a Panacea for Poor Construction Projects Performance. Journal of

Engineering and Technology for Industrial Applications, 6(26), 61-72. DOI: https://doi.org/10.5935/jetia.v6i26.723

Owusu, P. K., and Aggrey, D. E. G. (2020). Examining the Effect of Project Delays in the Construction Field, A Case Study of Prime Engineering and Service Ghana Limited. Asian J. Appl. Sci. Technol. 4 (3), 129–144. doi:10.38177/ajast. 2020.4317

Oyegoke, A. S., and Al- Kiyumi, N. (2017). The causes, impacts and mitigations of delay in megaprojects in the Sultanate of Oman. Journal of Financial Management of Property and Construction, 22(3), 286–302. doi:10.1108/jfmpc-11-2016-0052

Pallant, J. (2005). SPSS Survival Manual: A Step By Step Guide to Data Analysis Using SPSS for Windows (Version 12)., (2nd ed.). Allen and Unwin, Crows Nest NSW 2065

Pinamang, P. A., Adu Gyamfi, T., Danso, H., and Ampofo Kwame, J. (2018). Schedule delay analysis of construction projects in Ghana: objectives, importance and effects. Civil and Environmental Research, 10, 25-30.

Ramanathan, C., Narayanan, S. P., and Idrus, A. B. (2012). Construction delays causing risks on time and cost - a critical review. Construction Economics and Building, 12(1), 37-57. https://doi.org/10.5130/AJCEB.v12i1.2330

Rathod, G.G., Yadav, K., and Darshan, A. (2020). Causes of delays in construction industry. International Journal of Scientific Development and Research,5(1),43-45.

Samarah, A., Ghanim A., and Bekr, G.A. (2016). Causes and Effects of Delay in Public Construction Projects in Jordan. American Journal of Engineering Research (AJER), 5(5), 87-94

Sambasivan, M., and Soon, Y.W. (2007). Causes and effects of delays in Malaysian construction industry. International Journal of Project Management, 25 (5), 517–526. doi:10.1016/j.ijproman.2006.11.007

Sha, M.K., Shahi, P.B., Pandit, R., and Pandey, A. (2017). Causes and Effects of Delays in Construction Projects. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 14(2), 52-58.DOI: 10.9790/1684-1402065258.

Shahsavand, P., Marefat, A. and Parchamijalal, M. (2018). Causes of delays in construction industry and comparative delay analysis techniques with SCL protocol. Engineering, Construction and Architectural Management, 25 (4), 497-533. https://doi.org/10.1108/ECAM-10-2016-0220

Shamsudeen,M., and Obaju, N. B. (2016). Effects of Design Errors on Construction Projects. International Journal of Scientific Engineering Research, 7 (2), 1099–1114.

Shehu, S. (2021). A Review of Time Management Factors in Construction Project Delivery. Journal of Project Management and Practice, 1(2), 34-45.

Tan, W. (2008). Practical Research Methods Third Edition (Third Edition ed.). Singapore: Pearson Education.

Venkatesh, P. K., and Venkatesan, V. (2017). Delays in Construction Project: A Review of Causes, Need and Scope for Further Research. Malaysia Construction Research Journal, 23 (1), 89–113.

Structural Equation Modeling for Evaluating Members' Satisfaction with Housing Interventions of Cooperative Societies in Universities, Southwest Nigeria

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Abstract

This paper aims to apply the Structural Equation Modeling approach that identifies the critical factors influencing members' satisfaction with housing interventions in cooperative societies. Data were collected from 463 members of cooperative societies across the six purposively selected Federal Universities in Southwest Nigeria. By using the Partial Least Square Structural Equation Modeling (PLS-SEM) technique, a conceptual model was developed using Smart-PLS version 2.0 M3, and a total of 18 constraints to housing interventions of cooperative societies, which were finalized from the literature and based on factor analysis earlier carried out in the initial research period of this study were categorized into three groups-cooperative governance-related factor, housing construction and economy-related factor, and government interference and funding related factor. In Particular, the research finds the relationships between the three groups and how these relate to cooperative members' satisfaction. The findings of this study revealed that the R2 value of the model scored 0.849, which meant that the three exogenous latent constructs collectively explained 84.9% of the variance in the endogenous construct of cooperative member satisfaction. The Goodness-of-Fit of the model was 0.475. The government interference and funding-related factors were the most important out of the three constructs, which profoundly affected the cooperative members' satisfaction and diminished effective housing interventions in cooperative societies. The study suggests that available opportunities by cooperative societies to tap into traditional mortgage financing, less government interference in cooperative activities and manipulation, and adequate cooperative funding by members would lead to better satisfaction of cooperative members with cooperative housing interventions.

Keywords: *Cooperative Societies, Housing Intervention, Members Satisfaction, University Staff, Structural Equation Modeling*

1. Introduction

Higher education has an important role to play in the development of society, as education not only trains people with good knowledge and expertise but also with good moral and physical qualities, effectively serving the socio-economic development associations of each country (Tri *et al*., 2021).

Governments have made frantic efforts through a commitment of immense resources to ensure the provision of education and tailor their policies towards ensuring it is made accessible to their citizenry's generality. In this context, there has been an estimated 160% increase in tertiary education globally (Sharma, 2012). In Nigeria, university education has expanded rapidly regarding the number of institutions established, new programs introduced, and students admitted to various higher institutions. This has resulted in the employment of an additional workforce for these higher institutions' smooth running (Akinsanya and Adewusi, 2017). As a result of the growth of university education, the focus has shifted away from university staff housing and toward building more academic facilities (Nnametu *et al*., 2015). According to a study performed in Nigeria by Ndukwe *et al*. (2015), aside from the nearly ruined staff quarters in the country's first premier universities, no solid plan has been developed to provide housing for university personnel in both federal and state-owned universities. It is becoming more difficult for governments to afford the cost of university education as the global economy continues to deteriorate (Ajadi, 2010) and providing modern housing has also been found to be capital intensive, which may explain why most universities are not considering the provision of staff quarters where none exist or adding to the existing stock were available (Akinsanya and Adewusi, 2017).

Similarly, the private sector housing interventions implemented in the country as a result of the government's inability to provide direct public housing units (Samuel *et al*. 2015) were profit-driven, which is typically beneficial to high-income earners - those who can afford market-rate housing and also qualify for mortgage loans (Oyalowo *et al*., 2018). As Olotuah and Adedeji (2007) remarked, the situation at Nigerian universities is concerning, as the monthly and annual incomes of workers in higher institutions, as well as the maximum loan available to enable them to live in decent housing, are far from satisfactory compared to the huge salaries earned by other workers in the federal public service.

As University education plays an important role in promoting the socio-economic, political and cultural development of any nation (Woldegiorgis and Doevenspeck, 2013; Ajayi and Ekundayo, 2008), the importance of housing to the university staff cannot be overemphasized because housing has a great impact on the overall well-being of man and his productivity within the society (Jiboye, 2011; Akinyode, 2014). On this basis, many staff in Nigerian universities embraced their cooperative societies as a way of actualizing housing desires. There is a dearth of evidence in the available literature (Adedeji and Olotuah, 2012; Yakub *et al*., 2012; Azeez and Mogaji-Allison, 2017; Oloke *et al*., 2017; Oyalowo *et al.,* 2018) regarding the contributions of cooperative societies to the delivery and provision of urban housing in the setting of Nigeria's higher institutions. It is also evident that authors have identified several variables as determinants of members' satisfaction with the cooperative loans for housing delivery (Oyewole, 2010; Mahmud, 2013; Farouk *et al*., 2014; Oyalowo and Babawale, 2017). Numerous factors also influence cooperative societies' intervention in housing provision, and several authors have made varying proposals for enhancing and overcoming the constraints. (Gbadeyan, 2011; Odum and Ibem, 2011; Adeboyede and Oderinde, 2013; Akinlabi, 2015; Durodola *et al*., 2016; Azeez and Mogaji-Allison, 2017; Oyalowo *et al.*, 2018). Extant literature review shows that little or no research has offered a comprehensive conceptual model explaining how these exogenous latent factors affect cooperative member satisfaction with housing intervention in cooperative societies. This study presents a link between cooperative members' satisfaction and constraints to housing intervention of cooperative societies in six federal universities in Southwest Nigeria using a Partial Least Square Structural Equation Modelling (PLS-SEM) that empirically predicts the most important constructs influencing cooperative members' satisfaction with housing interventions of cooperative societies. This study produced an empirical model that could benefit scholars and cooperatives, aiming to understand the essential aspects influencing members' satisfaction with housing to improve housing delivery interventions.

2.0 Literature Review

2.1 Determinants of Members' Satisfaction with Cooperatives Housing Interventions

Customer satisfaction is a metric used to determine a customer's level of satisfaction with a product, service, or experience. The primary goal of a corporation should be to please its consumers, not to presume to know what the client wants. This is true for industrial firms, retailers and wholesalers, corporations, government agencies, service companies, non-profit organizations, and all organizational subgroups. Given this preliminary, a cooperative society is a user-owner business and a non-profit organization, whose effectiveness in housing intervention can be measured in terms of cooperative members' satisfaction with cooperative activities such as interest on the loan, availability of loan, affordability of loan granted, the transaction cost involved in granting of loan, repayment period of loan granted among others.

Existing studies have showcased the level of members' satisfaction with housing delivery of cooperative societies in Nigeria; for instance, the study of Oyewole (2010) determines cooperators' level of satisfaction with cooperative loans with regards to five attributes of cooperative loans, which are; interest rate, affordability, transaction costs, availability and collateral. The study, using the Cooperator Satisfaction Index (CSI), revealed transaction cost as the only attribute of the cooperative loan that provides the best satisfaction to the cooperators. Farouk *et al.* (2014) assess the impact of Savings and Credit Cooperative Societies (SCCS) as a panacea to providing funds for housing development to workers in the Institute of Agricultural Research (IAR) Ahmadu Bello University, Zaria-Nigeria. The study adopted Cooperators Satisfaction Index (CSI) and revealed that the CSI on each attribute of interest rate, affordability, transaction cost, availability, and collateral for the cooperative loan are greater when compared to National Housing Fund CSI's on each attribute. According to the findings, society can be a viable funding source for government personnel housing projects. In a study conducted among twelve cooperatives in Lagos state, Oyalowo and Babawale (2017) looked at the level of satisfaction with cooperative loans for home construction in relation to five variables: the interest charged, collateral, payback duration, promptness of loan disbursement, and transaction fees. Although the study's customer satisfaction index (CSI) research indicated that members' satisfaction across the five variables was not particularly strong, members were more satisfied with the interest rate than other variables. The study concluded that the quality of housing-related loan services in the cooperative sector is a weakness and might require some intervention to ensure that cooperative members are satisfied with this very important service.

Emanating from the literature, it is evident that several variables have been identified as determinants of members' satisfaction with the cooperative loans for housing delivery. The key variables identified in the literature are interest rate, affordability, availability, transaction cost, collateral, repayment period and adequacy of the loan granted by the cooperative societies for housing delivery (Oyewole, 2010; Farouk *et al.,* 2014; Oyalowo and Babawale, 2017). This present study represents a departure as it presents a link between cooperative members' satisfaction and effective housing interventions in cooperative societies using a Partial Least Square Structural Equation Modelling (PLS-SEM) that empirically predicts the constructs influencing cooperative members' satisfaction in view of enhancing housing intervention of cooperative societies. More importantly, whereas previous research on cooperative societies' housing intervention in higher education has been limited, this study examined cooperatives in a broader geographical context at six federal universities in Nigeria's south-western region, yielding far-reaching and meaningful empirical findings.

3.0 Conceptual model

The Partial Least Square Structural Equation Modeling (PLS-SEM) technique was utilized to determine the essential aspects affecting members' satisfaction with cooperative society housing interventions, and a conceptual model was developed. PLS-SEM is a frequently used multivariate analysis technique for calculating variance-based structural equation models, most notably in the social sciences (Hair *et al*., 2012). This method is nonparametric, implying that no assumptions about the data distribution are required. Additionally, PLS-SEM creates a distribution from the data by utilizing the bootstrapping technique to determine the path coefficient's significance value (Hair *et al*., 2013). It is done via a set of routes that estimate all direct causal paths simultaneously and generate a measure of the model's overall goodness of fit.

By using the PLS-SEM in this study, a model was developed as conceptualized in Figure 1, and a total of 18 constraints to effective housing intervention in cooperative society were finalized from the literature and categorised into three groups based on factor analysis earlier carried out in the initial research period of the study. The three groups are called exogenous latent construct; cooperative governance (CG), housing construction cost and economy (HCE), government interference and funding (GIF), and are measured by their 18 manifest variables as shown in Table 1. The endogenous latent variable - cooperative members' satisfaction (CoopSat) and its three measured items (availability of loan (CoopSat1), loan affordability and low-interest rate (CoopSat2) and flexibility of repayment pattern (CopSat3) are equally shown in Table 1. The conceptual model presents the relationship between the exogenous latent constructs and endogenous latent constructs as exhibited in Figure 1.

The model hypotheses are as follows:

Hypothesis 1 (H_1). There is a significant correlation between cooperative governance and cooperative members' satisfaction.

Hypothesis 2 (H_2). There is a significant correlation between government interference and funding and cooperative members' satisfaction.

Hypothesis 3 (H_3). There is a significant correlation between housing construction costs and economy and cooperative members' satisfaction.

The PLS-SEM was applied to test the model hypotheses on how the constructs in the model relate and which of the constructs significantly impact cooperative members' satisfaction.

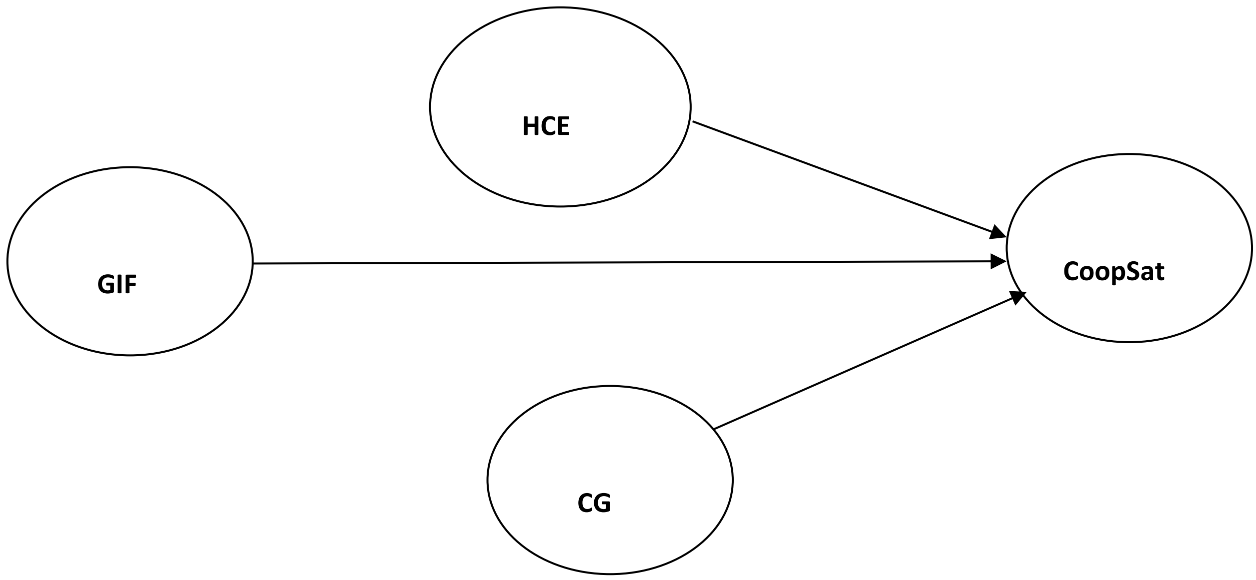

Figure 1: Conceptual Model

Source: Oloke (2015) modified by the researcher

Table 1: Constructs and their respective Measurement Items

S/N	Constructs and Measurement Items	Code	Key References
	Cooperative Governance	**CG**	
1	Unqualified cooperative management committee	CG1	Odera (2012); Umebali *et al*. (2018)
2	Poor management of funds by cooperative officials	CG2	Odera (2012); Umebali *et al*. (2018)
3	Poor accounting and record keeping	CG3	Dayanandan (2013); Babalola (2014); Puri and Walsh (2018)
4	Uncommitted membership	CG4	Odera (2012)
5	Poor loan recovery/high default rate from cooperative members	CG5	Kiarie (2011)
6	Unfavourable lending policy of the cooperatives	CG6	Ozah (2009)
7	Lack of modern business techniques by the cooperative	CG7	Oloke (2015); Kyazee *et al*. (2017)
8	Diversion of housing loans by cooperative members for other purposes	CG8	Sulaiman (2003); Babalola (2014); Akinlabi (2015)
9	Lack of clear policy on cooperative management	CG9	Umebali *et al*. (2018)
	Housing Construction Cost and Economy	**HCE**	
10	High cost of land	HCE1	Odum and Ibem (2011); Alawadi *et al*. (2018); Olanrewaju and Idrus (2020)
11	Poor economic condition	HCE2	Oyediran (2019)
12	Lack of supportive policy from the Government for land acquisition	HCE3	Aluko (2012); Ugonabo and Emoh (2013); Owoeye and Adedeji (2015); Lawal and Adekunle (2018)
13	High cost of housing construction	HCE4	Olotuah (2012); Ugonabo and Emoh (2013); Okwu *et al*. (2017)
14	High cost of building materials for housing construction	HCE5	Akinmoladun and Oluwoye (2007); Enisan and Ogundiran (2013); Oyediran (2019)
15	Inadequate onsite and offsite infrastructure	HCE6	Durodola *et al*. (2016); Ajayi (2017)

	Government Interference and Funding	**GIF**	
16	Lack of opportunities by the cooperative to tap into formal mortgage financing	GIF1	Azeez and Mogaji-Allison (2017)
17	Government interference in Cooperative activities and manipulation	GIF2	Azeez and Mogaji-Allison (2017); Sa'ad (2017)
18	Inadequate Cooperative funding by members	GIF3	Adeboyede and Oderinde (2013); Adeyemo (2014); Farouk *et al*. (2014)
	Cooperative Members Satisfaction	**CoopSat**	
19	Availability of loans	CoopSat1	Oyewole (2010); Mahmud (2013); Farouk *et al*. (2014)
20	Loan affordability	CoopSat2	Oyewole (2010); Mahmud (2013); Farouk *et al*. (2014)
21	Low-interest rate and flexible repayment pattern	CoopSat3	Oyewole (2010); Oyalowo and Babawale (2012). Mahmud (2013); Farouk *et al*. (2014)

4.0 Research Methodology

For this study, a survey research approach was used, which involved the collection of data from cooperative members using a questionnaire. Six cooperative societies were purposively selected across the six federal universities in Southwest Nigeria. The six cooperatives selected are general cooperative societies whose membership is open to all staff of the universities, irrespective of the staff's affiliation, ethnic background or religious ideology. The intent is to generalise the result to other cooperative societies not selected in each federal university for the study. The choice of Southwest Nigeria is based on the fact that -they are richer in cooperative culture compared to other geopolitical zones in Nigeria; the zone also has more universities than other geopolitical zones; all these attributes make it suitable for this study. Members of the selected cooperatives were randomly selected for this study.

The Krejcie and Morgan algorithm was used to determine the sample for the study from a total population of 9738 members of all the selected cooperative organizations. as seen in equation 1:

$$S = \frac{[X^2 * N * P(1-P)]}{[D^2(N-1) + X^2 * P(1-P)]} \quad (1)$$

Where S = sample size, X^2 = table value of chi-square (3.841), N = population, P = the population proportion assumed to be 0.5, since this would provide the maximum sample size, D = the degree of accuracy 0.05 (%).

Given the problem of non-response in most questionnaire-based surveys, the research provided for non-response rate and adopted an 80% estimated response rate (ERS) of the calculated sample size (Willimack *et al*., 2002; Neuman, 2005) to derive the actual sample size. The derivation of the actual sample (*Sa*) is based on the formula in equation 2:

$$Sa = \frac{S*100}{ERS(in\ percentage)} \quad (2)$$

Where S = the initial sample size, ERS = the desired 80% response rate

This procedure yielded a sample of 463, which was proportionately and randomly distributed among members of the selected cooperative societies by the researchers — the questionnaire comprised two sections. The first section consisted of the respondents' personal information, while section two consisted of the final and main part of the questions on a five-point Likert scale ranging from 1- strongly disagree to 5- strongly agree. Section two was categorized into six groups in accordance with the nature of the factor: cooperative governance (CG), housing construction cost and economy (HCE), government interference and funding (GIF) and availability of loan (CoopSat1), loan affordability and low-interest rate (CoopSat2), and flexibility of repayment pattern (CopSat3). The data collected were collated and coded with IBM Statistical Package for Social Sciences (SPSS) version 22 software and a variance-based structural equation modelling (PLS-SEM). The Smart PLS Version 2.0 M3 application was used to evaluate PLS-SEM.

As a response, 435 copies of the questionnaire were received, of which 52 were incomplete and considered inappropriate. Therefore, the analysis used 383 copies of the well-completed questionnaire, which represents 85.67% response rate (see Table 2) and is found sufficient based on Hair *et al*. (2011) rule of thumb for sample size required in PLS-SEM. Table 3 indicates the demographic characteristics of the respondents.

Table 2: Questionnaire administration and valid percentage response

S/N	**Respondents** Cooperative Members	**Population**	**Proportion**	**Initial Sample size**	**Estimated response @ 80%**	***No. of the questionnaire distributed**	**No. of questionnaire returned**	**No of Valid questionnaire**	**Percentage of the valid questionnaire (%)**
1	Coop 1	1700	0.175	65	1.25	81	74	62	76.54
2	Coop 2	1260	0.129	48	1.25	60	58	57	95.00
3	Coop 3	2010	0.206	76	1.25	96	87	61	63.54
4	Coop 4	2033	0.209	77	1.25	97	94	93	95.88
5	Coop 5	1620	0.166	62	1.25	77	72	63	81.82
6	Coop 6	1115	0.114	42	1.25	53	50	47	88.68
	Total	**9738**		**370**		**463**	**435**	**383**	**83.57**

Table 3: Demographic characteristics of the respondents (N= 383)		
Variables	Frequency	Percentage%
Gender		
Male	255	66.6
Female	128	33.4
Total	383	100
Age		
Below 30	21	5.5
30 - 40	134	35
41 - 50	152	39.7
51 – 60	64	16.7
61 – 70	12	3.1
Total	383	100
Educational qualification		
Senior School Cert	10	2.6
NCE and OND	77	20.1
HND/BSc	221	57.7
MSc/PhD	75	19.6
Total	383	100
Length of Membership		
Below 10 year	196	51.20

10 – 19	134	35
20 – 29	43	11.20
30 – 39	9	2.30
40 – 49	1	0.30
Total	383	100

5.0 Partial Least Square Structural Equation Modelling (PLS-SEM) Evaluation

5.1 Evaluation of Measurement Model

The measurement model is evaluated based on its convergent validity and reliability criteria as well as its discriminant validity. Figure 2 depicts the diagrammatic representation of the measured items and constructs of the measurement model. It is important to mention that one of the measured items, "availability of loan" (CoopSat1), did not meet the convergent validity criterion and, as such, was selected for deletion (see Appendix).

5.1.1 Convergent validity and reliability of the measurement

Table 4 presents the results of the convergent validity and reliability of the measurement model. Convergent validity is measured by the factor loadings of the confirmatory factor analysis, and the average variance extracted is the degree to which the measured items or indicators reflect the construct. The factorial loadings of all the measure items are highly loaded and range from 0.606 – 0.993. As the values of the factor loadings exceeded the acceptable threshold value of ≥ 0.500 (Hair *et al*., 2011; Hulland,1999) recommended for this criterion, each measured item accounted for more than 50% variance of the underlying construct. As such, the validity of the criterion is adequately fulfilled.

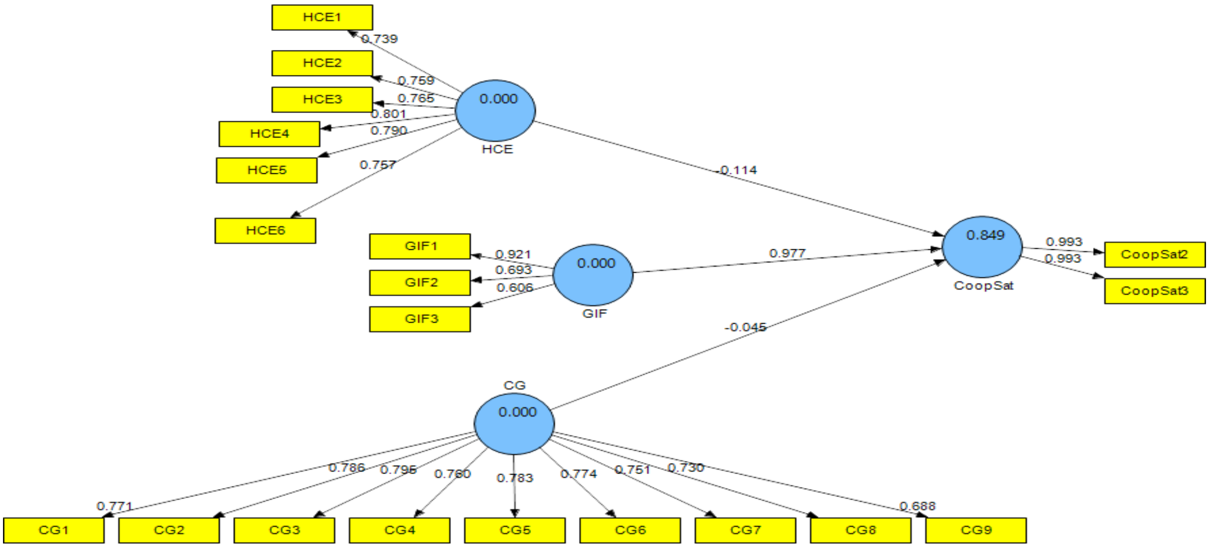

Figure 2: The Measurement Model

Table 4: The Convergent Validity and Reliability of the Measurement Model

Construct	Indicator	Factor loading	AVE	Composite Reliability	Cronbach Alpha
CG			0.578	0.925	0.909
	CG1	0.771			
	CG2	0.786			
	CG3	0.796			
	CG4	0.760			
	CG5	0.783			
	CG6	0.774			
	CG7	0.751			
	CG8	0.730			
	CG9	0.688			
HCE			0.591	0.897	0.864
	HCE1	0.739			
	HCE2	0.759			
	HCE3	0.765			
	HCE4	0.801			
	HCE5	0.790			
	HCE6	0.757			
GIF			0.791	0.765	0.643
	GIF1	0.921			
	GIF2	0.693			
	GIF3	0.606			
CoopSat			0.992	0.986	0.985
	CoopSat1	0.993			
	CoopSat3	0.993			

The second criterion to determine the convergent validity of the measurement model is the average variance extracted (AVE), which also measures the extent to which the construct variance is explained by the measured items selected. As shown in Table 4, the AVE values for CG, HCE, GIF and CoopSat are 0.578, 0.591, 0.791 and 0.992, respectively. These AVE values surpassed the minimum benchmark value of 0.500 (Hair *et al.*, 2017; Fornell and Larcker, 1981) recommended for this criterion. This signified that the constructs satisfied the requirement for convergent validity as more than 50% of each construct variance is due to its measured items.

The result of the reliability criterion for the measurement model is also presented in Table 4 in terms of the composite reliability and Cronbach's alpha values. For composite reliability, a minimum threshold value of 0.700 is acceptable (Hair *et al*., 2017; Ringle *et al*., 2012), while a benchmark of ≥ 0.500 is deemed modest for the Cronbach's alpha value (Hair *et al*., 2017; Bagozzi and Yi, 1998). The reported composite reliability values for CG, HCE, GIF and CoopSat are 0.925, 0.897, 0.765 and 0.986 exceeded 0.700 and therefore satisfied the internal consistency reliability criterion. Similarly, the Cronbach alpha values of 0.909, 0.864, 0.643 and 0.986 for CG, HCE, GIF and CoopSat, which exceeded the threshold, implied that they exhibited satisfactory measurement values with no modification required. Based on these results, the convergent validity and reliability of the measurement model were confirmed as satisfactory.

5.1.2 Discriminant Validity

Discriminant validity for the constructs was evaluated based on their loadings and cross-loadings and the square root of the average variance extracted (AVE) of the measurement model. Table 5 provides the matrix of loadings and cross-loadings for the measured

Table 5: Discriminant Validity (Loadings and cross loadings of the constructs in the measurement model)

Measured items	CG	CoopSat	GIF	HCE
CG1	**0.771**	0.103	0.197	0.417
CG2	**0.786**	0.197	0.316	0.463
CG3	**0.795**	0.213	0.338	0.498
CG4	**0.760**	0.245	0.337	0.444
CG5	**0.783**	0.205	0.330	0.509
CG6	**0.774**	0.162	0.269	0.527
CG7	**0.751**	0.152	0.197	0.555
CG8	**0.730**	0.251	0.336	0.491
CG9	**0.688**	0.241	0.320	0.517
CoopSat2	0.279	**0.993**	0.916	0.263
CoopSat3	0.266	**0.993**	0.895	0.245
GIF1	0.283	0.992	**0.921**	0.267
GIF2	0.354	0.442	**0.693**	0.396
GIF3	0.390	0.374	**0.606**	0.407
HCE1	0.443	0.097	0.212	**0.739**
HCE2	0.468	0.143	0.261	**0.759**
HCE3	0.492	0.200	0.299	**0.765**
HCE4	0.518	0.184	0.324	**0.801**
HCE5	0.528	0.239	0.386	**0.790**
HCE6	0.515	0.239	0.328	**0.757**

Note: The bold values show higher loading on a specific construct

items in the measurement model.

The results showed that loadings (in bold) for a specific construct are higher than the cross-loadings for other constructs. As noted by Hair *et al*. (2012), this implied that all the measured items are representative of their respective constructs. The second criterion for evaluating discriminant validity is that the square root of each AVE must exceed the correlations among other constructs (Hair *et al* ., 2017; Sarstedt *et al*., 2014; Fornell and Larcker, 1981). Table 6 shows the correlation coefficients between the constructs.

Since the value of the square root of the AVE surpassed the correlations between other constructs, this showed the absence of correlations between any of the four constructs. Therefore,
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based on the results, the discriminant validity of the measurement model's requirements was fulfilled, and the structural model can be evaluated.

5.2 Evaluation of Structural Model

The coefficient of determination (R^2) values, Effect size (f^2), the standardised beta coefficients/path coefficients (β value) and the t-statistics values were used in evaluating the Structural Model. Also, the validity and explanatory power of the Structural Model were assessed using the Goodness-of-Fit (GOF) Index and the power analysis test to calculate the adequacy of the sample size. The result of the Structural Model is presented in Figure 3

Table 6: Correlation of Latent Constructs

Construct	CG	CoopSat	GIF	HCE
CG	***0.761***			
CoopSat	0.274207	***0.996***		
GIF	0.402939	0.912051	***0.889***	
HCE	0.650198	0.256264	0.409050	***0.769***

Note: Diagonal values in bold are the square root of AVE

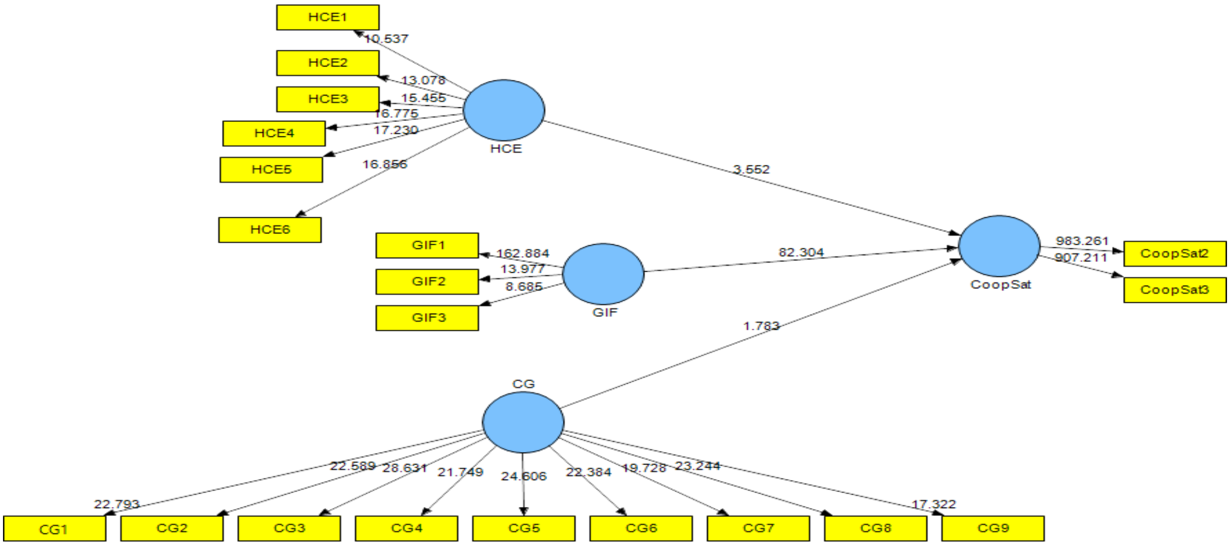

Figure 3: The Structural Model

5.2.1 The Coefficient of Determination (R^2) value

The structural model has a predictive power of 0.849 based on the R^2 value. This shows that the three constructs (CG, GIF and HCE) account for 84.90% of the variance in the endogenous construct of Cooperative Member Satisfaction (CoopSat). Therefore, this R^2 value is considered adequate as it is well above the recommended minimum value of 10% ((Hair *et al*., 2013; Falk and Miller, 1992).

Furthermore, the model was examined for common method bias. The result showed that the R^2 value, which is the predictive power of the structural model on Cooperative Members' Satisfaction, increased marginally by 0.006 (from 0.843 to 0.849) after removing the measured item "Availability of Loans". As the exclusion of this measured item did not result in a significant increase in the R^2 value, it can be concluded that common method bias is not a problem (Tehseen *et al*., 2017).

5.2.2 The Effect Size (f^2)

The effect size (f^2) was employed to determine the practical impact of each construct (CG, GIF and HCE) on the dependent latent construct (CoopSat). Following the approach by Cohen *et al*. (2003), the effect size was determined by:

$$f^2 = \left[\frac{R^2 included - R^2\ excluded}{1 - R^2 included}\right]$$

Where R^2 included and R^2 excluded denoting the R^2 for the Coop Sat construct when the predictor is used or excluded from the structural model. The estimated effect size for the respective construct is reported in Table 7.

Table 7: The Effect Size of the Latent Constructs of the Structural Model

S/N	Construct	R^2 Included	R^2 Excluded	Effect Size(f^2)	Conclusion
1	CG	0.849	0.848	0.006	Small
2	HCE	0.849	0.842	0.046	Small
3	GIF	0.849	0.086	5.565	Large

Note: As outlined in Cohen (1988) effect size(f^2) of 0.03 is small; 0.15 is medium and 0.35 is large

In line with the recommended threshold by Cohen (1988), the effect size(f^2) for Cooperative Governance (CG) and Housing Construction Cost and Economy (HCE) is 0.006 and 0.046, respectively. This portrayed that CG and HCE constructs exhibited a small effect on Cooperative Members' Satisfaction (CoopSat) in the study area. Contrariwise, the Government Interference and Funding (GIF) construct has a large/strong effect on Cooperative Members' Satisfaction (CoopSat).

5.2.3 The Standardised Beta/path Coefficients and t-Statistics of the Structural Model

Finally, Table 8 presents the standardised path coefficients and the t-values of the structural model based on the bootstrapping technique. Utilizing a two-tailed *t*-test criterion with a significance level of 5%, the path coefficient for each hypothesis would be significant if the *t*-value is equal to or greater than 1.96 (Hair *et al*., 2014).

Turning to the results of the path coefficients in table 8, it can be seen that Cooperative Governance have a negative and statistically insignificant effect on Cooperative Members' Satisfaction (β = - 0.046, t = 1.760, p > 0.05). On the other hand, the correlation between Government Interference and Funding and Cooperative Members' Satisfaction was positive and significant (β = 0.997, t = 81.979, p <0.05).

The relationship between Housing Construction costs and Economy and Cooperative Members' Satisfaction was negative but statistically significant (β = -0.114, t = 3.576, p < 0.05). Summarily, hypotheses 2 and 3 were supported while hypothesis 1 was not.
The beta coefficient (β) comparison indicated that Goverment interference and funding (GIF) have the strongest effect on Cooperative Members' Satisfaction. This is the most significant construct (β =0.977) impacting on Cooperative Members' Satisfaction in the study area.

Table 8: Path Coefficient and t-values for the Structural Model

Hypothesis	Path	Std Beta Coefficient(β)	Standard Error	t-Value	Decision
H1	Cooperative governance → cooperative members' satisfaction	- 0.046	0.026	1.760	Not Supported
H2	Government interference and funding → cooperative members' satisfaction	0.977	0.012	81.979**	Supported
H3	Housing construction cost and economy → cooperative members' satisfaction	-0.114	0.032	3.576**	Supported

Note: ** p-value is significant at 0.05

5.3 Model Validation

The validity and explanatory power of the structural model are assessed using the Goodness of Fit Index outlined in Noor *et al*. (2014) as well as utilizing the power analysis test in calculating the adequacy of sample size (Cohen, 1998).

5.3.1 Goodness of Fit Index

The goodness of fit (GoF) index is a measure which determines the overall predictive accuracy of the structural model and is given as the square root of the product of the average variance extracted (AVE) and the R2 of the dependent latent construct (CoopSat). The GoF index is expressed as follows in equation (3):

$$\text{GoF} = \sqrt{AVE.R^2} \qquad (3)$$

$$\text{GoF} = \sqrt{0.559\ X\ \ 0.849}$$

GoF = 0.475

Following the GoF classification adopted by Aftab and Ismail (2014) and Noor *et al.* (2014), where a GoF index of 0.10 is considered small, 0.25 is medium, and 0.36 is deemed large, it can be inferred that the estimated GoF of 0.475 surpassed the cut-off value of a large GoF and therefore implied that the model has a high predictive ability.

5.3.2 Power Analysis

The power analysis (1-β) measures the model parameters' stability in terms of the sample size employed (Chin, 2010). The power analysis for the model was conducted using the G Power 3.1.9.7 software package (Erdfelder *et al*., 2009; Faul *et al.*, 2007). The following input parameters were obtained in generating the power test analysis.

- The sample size of 383.
- The number of predictors equals 3.
- Effect size (f^2) of 5.62 for the endogenous latent variable in the model derived using Cohen *et al.* (2003) equation for determining the effect size $\left[\frac{R^2}{1-R^2}\right]$ and.
- The significant level of the power test was at 5% for a 2-tailed test criterion.

The result of the generated values of the power analysis for different sample sizes is depicted in Figure 4.

The generated values show that the model's power increases as the sample size increases. For instance, with a sample size of 5, the model's predictive power was just 32.30%, while the model's predictive power increased to 100% when the sample size was just 25. As the model employed a sample of 383, this sample is deemed adequate, and the model has good predictive power.

6.0 Conclusion

The key contribution of this study was to empirically reveal the constructs that influence Cooperative Members' Satisfaction with housing interventions of the cooperative societies using the PLS-SEM technique. In addition, the study developed a structural model using the PLS-SEM technique, and Goverment Interference and Funding (GIF) was identified as the most significant construct influencing Cooperative Members’ Satisfaction with housing interventions of the cooperative societies in the study area.

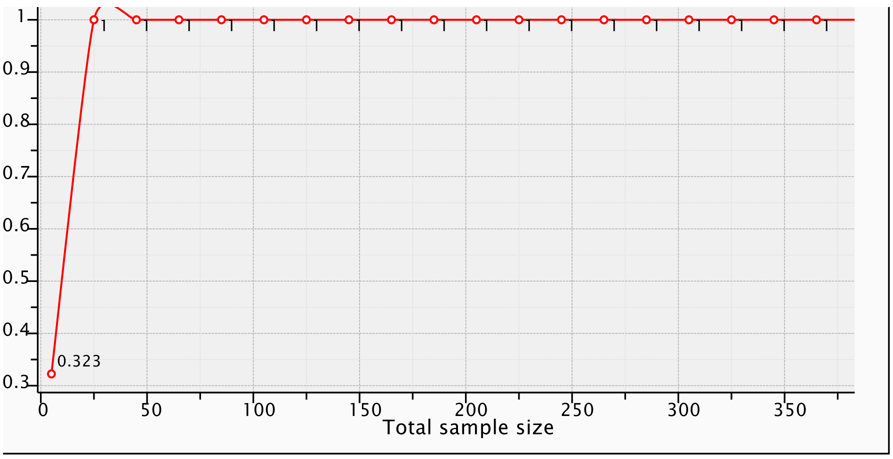

Figure 4: Power Analysis for different sample sizes

Considering the reflective indicators that contributed to the significance level of Government Interference and Funding, it seems that available opportunities by cooperative societies to tap into formal mortgage financing, less government interference in cooperative activities and manipulation, and adequate cooperative funding by members will lead to better satisfaction of cooperative members with cooperative housing interventions.

Acknowledgements

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References

Adeboyejo, A. T., and Oderinde, J. A. (2013). Housing co-operative societies and sustainable housing delivery in Oyo state, Nigeria**.** *International Journal of Co-operative Management, 6*(2), 61-75.

Adedeji, Y. M. D., and Olotuah, A. O. (2012). An evaluation of the accessibility of low-income earners to housing finance in Nigeria. *Journal of Scientific Research, 7*(1), 23-31.

Adeyemo R. (2014). Self-help Farmer Cooperatives: *Management of Natural Cooperation*, (32), 3 – 18

.

Aftab, H. M., and Ismail, L. A. (2014). SEM-PLS analysis of inhibiting factors of cost performance for large construction projects in Malaysia: Perspective of clients and consultants. *The Scientific World Journal,* volume 2014.

Ajadi, T. O. (2010). Private universities in Nigeria – The Challenges ahead. *American Journal of Scientific Research.* Issue 7, 15-24.

Ajayi, O. (2017). Factors affecting housing delivery in Lagos state, Nigeria. *Journal of Sustainable Human Settlement and Housing*, 1(1), 41-54.

Ajayi, I. A., and Ekundayo, H. T. (2008). The deregulation of university education in Nigeria: implications for quality assurance. NAEAP Publications. Lagos, Nigeria.

Akinlabi, A. J. (2015). Informal financial institutions and sustainable housing finance in Southwestern Nigeria. 6th International Trade and Academic Research Conference (ITARC), 9-10 November 2015, UK.

Akinmoladun, O. I. and Oluwoye, J. O. (2007). An assessment of why the problems of housing shortages persist in developing countries: a case study of Lagos Metropolis, Nigeria. *Pakistan Journal of Social Sciences*, 4(4), 589-598.

Akinsanya, G. M., and Adewusi, A. O. (2017). Staff housing needs of Nigerian University: A case of Obafemi Awolowo University, Ile-Ife. IIARD *International Journal of Geography and Environmental Management,* 3(1).

Akinyode, F. B. (2014). Students' satisfaction and perception on rented apartments in Nigeria: Experiment of Lautech Students. *International Journal of Business and Social Research (IJBSR)*. 4(7).

Alawadi, K., Khanal, A. and Almulla, A. (2018). Land, urban form, and politics: a study on Dubai's housing landscape and rental affordability. *Cities*, (81), 115-130.

Aluko, O. (2012). The effects of land use act on sustainable housing provision: The Lagos state experience. *Journal of Sustainable Development*, *5*(1), 114-122.

Azeez, T., and Mogaji-Allison, B. (2017). Constraints of affordable housing through cooperative societies in tertiary institutions in Lagos State, Nigeria. *Journal of Geography and Regional Planning. 10(3), 39-46.*

Babalola, A. (2014). Corporate governance and cooperative societies: A survey of tertiary institutions in Oyo, Nigeria. *Developing Country Studies*, 4(12), 8-17.

Bagozzi Richard, P., and Yi, Y. (1988). On the evaluation of structural equation models. Journal of the Academy of Marketing Science, 16, 74–94.

Chin, W. W. (2010). How to write up and report PLS analyses. In Handbook of partial least squares (pp. 655-690). Springer, Berlin, Heidelberg.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.) Hillsdale, NJ: Erlbaum.

Cohen, P., Cohen, S. G., West., and Aiken, L. S. (2003). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences, Lawrence Erlbaum Associates, Mahwah, NJ, USA, 3rd edition.

Dayanandan, R. (2013). Good governance for better performance of community organizations –Myths and Realities! *Journal of Power, Politics and Governance,* 1(1).

Durodola, O. D., Oloke, O. C., and Opoko, A. P. (2016). Co-operative housing and basic infrastructure provision: A conceptual framework for effective public private partnership. *Journal of Contemporary Issues in Real Estate,* 3(1), 233-241.

Enisan, O. and Ogundiran, A. (2013). Challenges of housing delivery in metropolitan Lagos. *Research on Humanities and Social Sciences*, 3 (20), 1-9.

Erdfelder, E., Faul, F., Buchner, A., and Lang, A. G. (2009). "Statistical power analyses using G∗Power 3.1: tests for correlation and regression analyses," *Behavior Research Methods*, 41(4), 1149–1160.

Falk, R. F., and Miller, N. B. (1992).primer for soft modelling. Akron, OH: University of Akron Press.
Faul, F., Erdfelder, E., Lang, A. G., and Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*, 39(2), 175- 191.

Farouk, B. U. K., David, I. J., and David, O. A. (2014). Savings and credit cooperative societies (SCCs): A panacea to accessing funds for housing development to workers of public institutions in Nigeria. *Journal of Economics and Sustainable Development, 5*(23).

Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* (18), 39-50.

Gbadeyan, R. A. (2011). Private sector's contributions to the development of the Nigerian housing market current research. *Journal of Social Sciences 3(2), 104-113.*

Hair, J. F., Ringle, C. M., and Sarstedt, M. (2011). PLS-SEM: Indeed, a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–151.

Hair, J. F., Ringle, C. M., and Sarstedt, M. (2012). Partial Least Squares: The better approach to Structural Equation Modeling? Editorial. *Long Range Planning*, 45, 312-319.

Hair, J. F., Hult, G.T.M., Ringle, C. M., and Sarstedt, M. (2013). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). Sage, Thousand Oaks.

Hair, J. F., Sarstedt, M., Hopkins, L., and Kuppelwieser, V. G. (2014). "Partial least squares structural equation modelling (PLS-SEM): An emerging tool in business research", *European Business Review,* 26(2), 106 – 121.

Hair J. F., Hollingsworth, C. L., Randolph, A. B., and Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management and Data Systems,* 117(3), 442-458.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: a review of four recent studies. *Strategic Management Journal*, 20(2), 195–204.

International Cooperative Alliance Congress (ICA), (1995). *Review of International Co-operation* 88, (3), 3-4

Jiboye, A. D. (2011). Urbanization challenges and housing delivery in Nigeria. The need for an effective policy framework for sustainable development. *International Review of Social Sciences and Humanities,* 2(1), 176-185.

Kiarie, C. K. (2011). The role of savings and credit cooperative societies in facilitating rural financing in Kenya: A case study of Embu County. An MBA thesis submitted to the Department of Business Administration, University of Nairobi.

Kyazze, L. M., Nkote, I. N., and Wakaisuka-Iingoma, J. (2017). Cooperative governance and social performance of cooperative societies. *International Journal of Developing Societies*, *4*(1), 10-20

Krejcie, R. V., and Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement,* 30, 607-610.

Lawal, A. O., and Adekunle, I. A. (2018). Access to land and the delivery of affordable housing in Nigeria: An assessment of the Federal Housing Authority (FHA) in Abuja, 1991 to 2013. SAGE Open, 8(2), 1-7. https://doi.org/10.1177%2F2158244018777281

Mahmud, S. M. (2013). An Evaluation of the contributions of Cooperative Societies in housing finance to workers of tertiary institutions in Zaria Metropolis. M.sc Dissertation, Department of Business Administration, Ahmadu Bello University Zaria - Nigeria.

Ndukwe, C. N., Loretto, I., and Nwuzor, C. I. (2015). Impact of Nigerian housing policy on university staff service delivery in Ebonyi state: A study of Ebonyi State University (EBSU), Abakaliki and Federal University Ndufu Alike Ikwo (FUNAI). *Journal of Social Development, 5(1).*

Neuman, W. L. (2005). *Social Research Methods* (6th edn). London: Pearson.

Nnametu, J. N., Alaka, I. N., and Okoronkwo, C. (2015). Staff housing: Panacea to academic productivity (Nigerian Institutions). *IOSR Journal of Research & Method in Education (IOSR-JRME),* (5)1 Ver. I, 63-68.

Noor, A. A., Farah, L. A., and Aflah, I. D. (2014). "Determinants of halal purchase intention case in Perlis". *International Journal of Business and Social Research* (IJBRS), 4(5) 118-123.

Odera, O. (2012). Corporate governance problems of savings and credit co-operative societies. *International journal of academic research in business and social Sciences*, (2). University of Queensland, Australia and Masinde Muliro University of Science and Technology.

Odum, C. O., and Ibem, E. O. (2011). Securing urban land for housing among low-income earners in Sub-Saharan Africa: Case study of worker's co-operative society, Enugu, Nigeria. *Journal of Studies and Research in Human Geography,* 5(1), 61 -75.

Okwu, A. T., Ngoepe-Ntsoane, M., Tochukwu, O. R., and Obiwuru, T. C. (2017). Housing and economic growth nexus in Nigeria: Data-based evidence. *Transylvanian Review of Administrative Sciences,* (51), 70-88. DOI:10.24193/tras.51E.5

Oladejo, M. O. (2013). Stakeholders' perception of Cooperative Societies as a micro-credit delivery Channel in the Nigerian Financial Sector Reform Era. *International Review of Management and Business Research, 2(2).*

Olanrewaju, A. L., and Idrus, A. (2020). What is determining affordable housing shortages in the Greater Kuala Lumpur, Malaysia? *Property Management*, 38(1), 52- 81, DOI 10.1108/PM-05-2019-0025

Oloke, O. C. (2015). Performance evaluation of co-operative societies' housing provision in Lagos state, Nigeria. An unpublished PhD thesis submitted to the Department of Estate Management, Covenant University, Ota, Nigeria.

Oloke, O. C., Ayedun, C. C., Oni, A. S., and Opoko, A. P. (2017). Empirical assessment of success rate of co-operative societies' housing provision in Lagos State, Nigeria. *International Journal of Humanities and Social Science,* 7(3).

Olotuah, A. O. (2012). Housing for Low-income Workers in Developing countries: a Nigerian case study. *LAP Lambert Academic Publishing*, GambH and Co.KG, Saarbrucken, Germany.

Owoeye, O. J., and Adedeji, Y. M. D. (2015). Urban land acquisition for sustainable housing delivery in Akure, Nigeria. *SAGE Open*, 1–7. DOI: 10.1177/2158244018777281

Oyalowo, B. A., and Babawale, G. K. (2017). Urban housing supply: Cooperative Societies as the third way. *Unilag Journal of Humanities.* 4(2), 18-37.

Oyalowo, B. A., Nubi, T. G., and Lawanson, T. O. (2018). Housing affordability, government intervention and housing informality: An African dilemma? *Journal of African Real Estate Research*, 3(2), 63-86.

Oyediran, O. S. (2019). Institution and housing development: mirage, magic and miracle of low-cost housing in Nigeria. *Economic and Financial Review* 57(4), 37-68.

Oyewole, M. O. (2010). Housing development finance through cooperative societies: The case of Ogbomoso, Nigeria. *Int. J. Housing Markets Anal*. 3(3), 245-255.

Ozah, B. N. (2009). Problems and prospects of cooperative societies in Nigeria: A case study of farmers‟ cooperative society, Oyi local government, Anambra State, Nigeria. Being an unpublished project work submitted to the school of business studies, Department of business administration, Akwa Ibom State Polytechnic.

Puri, D. L., and Walsh, J. (2018). Impact of good governance on the performance of cooperatives in Nepal. *Management and Marketing*, 16(2), 209-224.

Sa'ad, T. H. (2017). Assessing the factors hindering the effective performance of cooperative societies in Jimeta metropolis, Adamawa state Nigeria. *Journal of Social Science and Public Policy*, 9(1), 146-175.

Ringle, C. M., Sarstedt, M., and Straub, D. W. (2012). Editor's Comments: A Critical Look at the Use of PLS- SEM in" MIS Quarterly". MIS quarterly, iii-xiv.

Samuel, C.O., Manase, D., Lowe, J., and Sommerville, J. (2015). Critical review of Nigeria housing policies delivery (NNHPD) and its implementations. *International Journal of Engineering Research and Technology* (IJERT), 4(9).

Sarstedt, M., Ringle, C. M; Smith, D; Reams, R; Hair, J. F. (2014). Partial Least Squares Structural Equation Modeling (PLS-SEM): A Useful Tool for Family Business Researchers. J. Fam. *Bus. Strategy*. 5, 105–115.

Sharma, Y. (2012). Fast pace of higher education enrolment growth is predicted slow. University world news Issue N: 213, available at

http://www.universityworldnews.com/article.php?story=20120313081727224.

Sulaiman A. (2003). Corporate governance and organizational performance. In: O. Alo Ed) *Issues in Corporate Governance Lagos*, Financial Institutions Training Centre.

Tehseen, S., Ramayah, T., and Sajilam, S. (2017). Testing and controlling for common method variance: A review of available methods. *Journal of Management Science,* 9(2), 142-168.

Tri, N. M., Hoang, P. D., and Dung, N. T. (2021). Impact of the industrial revolution 4.0 on higher education in Vietnam: challenges and opportunities. *Linguistics and Culture Review*, *5*(S3), 1-15. https://doi.org/10.21744/lingcure.v5nS3.1350

Ugonabo, C. U., and Emoh, F. I. (2013). The major challenges to housing development and delivery in Anambra State. *Civil and Environmental Research*, *3*(4), 1-19.

Umebali, E.E., Nwankwo, F., and Usman, A.U. (2018). Performance of cooperative management committee in Kaduna polytechnic, Kaduna. *International Journal of Arts, Languages and Business Studies,* 1(1), 231-243.

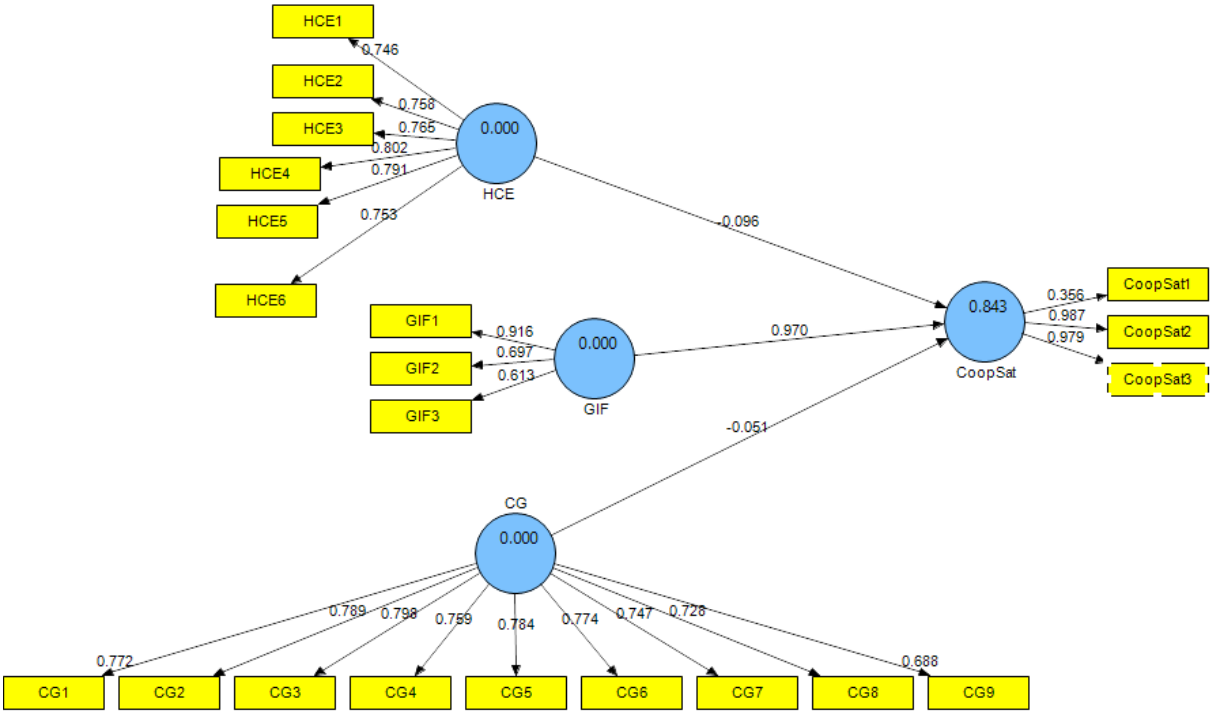
Willimack, D. K., Nichols, E., and Sudman, S. (2002) 'Understanding unit and item non-response in business surveys', in D.A. Dillman, J.L. Eltringe, J.L. Groves and R.J.A. Little (eds), *SurveyNonresponse.* New York: *Wiley Inter science,* 213–27.

Woldegiorgis, E. T., and Doevenspeck, M. (2013). The Changing Role of Higher Education in Africa: "A Historical Reflection" *Higher Education Studies*, 3(6) 35-45.

Yakub, A. A., Salawu, A. O., & Gimba, S. D. (2012). An empirical study of housing delivery via housing cooperatives as a tool towards national development. In: Laryea, S., Agyepong, S.A., Leiringer, R. and Hughes, W. (Eds.). Proceedings of 4th West Africa Built Environment Research (WABER) Conference, 24-26 July. Abuja, Nigeria. pp.1427- 1441

APPENDIX

The Measurement Model prior to deletion of COOPSAT1



Water Access: A Planners Investigation of Borehole Spatial Distribution in Selected Urban Residential Estates in Ibadan North Local Government Area, Ibadan, Oyo State, Nigeria

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Abstract

The study examines the spatial distribution of boreholes in selected residential estates of Ibadan north local government area, Ibadan, Oyo State, Nigeria. The cross-sectional survey research design was adopted for the study while both primary and secondary data were sourced. A multi-stage sampling technique was adopted in which Ibadan north local government was purposely picked out of the 11 local governments that make up the Ibadan metropolis. This was due to the high concentration of residential estates in the area. All the estates within the LGA were identified, and with the help of a global positioning system, the coordinates of all the boreholes and the distances of one borehole from the other were taken. Furthermore, the Nearest Neighbor analysis was used to determine each estate's degree of concentration or distribution. Descriptive statistics (simple percentage) and inferential (Chi-square) were adopted in analyzing the data. In order to arrive at the simple percentage, the percentage error of points that did not meet the required standard was calculated. Then the aggregated percentage of points that did not meet the standard was divided by the total number of estates. The result was validated p-value = >0.05 level of significance. It was revealed that more than 72% of the boreholes in the study area did not meet the standard spacing of the borehole. The distribution pattern was also clustered (NNA = 0.821). In addition, there was no association in the distance between the location of the boreholes. Therefore, compliance with the expected standard requirement in the subsequent locations of boreholes should be enforced.

Keywords: *Residential estates, Boreholes, Spatial distribution, Water, Ibadan.*

1.0 Introduction

There is a growing global challenge in accessing good quality fresh water. Competing interests of agriculture, industry and households and growing human populations continue to place increasing demands on water resources, seriously affecting their quality. Globally, approximately one in three people live in moderate to high water stress areas, and it is estimated that two-thirds of people will live in a water-stressed area by 2025 (UN, 2016). It is estimated that just 12% of the global population consumes 86% of the available water while 1.1 billion people (one-sixth of the world's population) have no access to adequate water supplies. WHO (2004) reported that 75 Litres of water is required daily to protect against household diseases and 50 Litres daily for basic family sanitation.

Bates *et al.* (2008) reported that WHO and UNICEF Joint Monitoring Program estimated that 1.1 billion people worldwide lack access to water resources. They defined access to water as the availability of at least 20 litres of water per person per day from an improved water source within a distance of 1 km. Nigeria is known to be endowed with abundant water resources, but the availability of potable water is a problem in many parts of the country (Onokerhoraye, 1995). Although the Federal Government of Nigeria attempted to develop water infrastructure like dams in the last eight years, these attempts were meant for irrigation purposes, and little attention was paid to water for domestic use.

This leads to an emerging interest in improving safe water access through small-scale water projects at the household (provision of private water boreholes) to reduce the problems posed by the water crisis (Anwuri, Lawrence, Kurotamuno, 2015). However, the share distribution of boreholes as part of infrastructural planning requires a strategic planning approach to avoid over-concentration in a particular location, which eventually affects the primary purpose of meeting the household water demand for which it was intended. This is because the removal of water in its natural state through geo–drilling activities creates disequilibrium in the earth's crust, leading to land subsidence. The multiplicity of borehole water facilities by private individuals and corporate bodies can also undermine the earth's crust's stability, thereby exposing the citizens to potential crustal changes and phenomena that greatly damage this water resource. This is one of the major environmental effects associated with the multiplicity of borehole facilities.

Many scholars have worked on the distributional pattern of boreholes across the city. For instance, Clement *et al.* (2019) worked on spatial distribution and challenges of water infrastructure in Kogi State and found that most boreholes were owned by private individuals and were better managed than those owned by government. Ezezue *et al*. (2017) also worked on the distribution of boreholes in urbanising residential districts and its implications for the planning of the Awka urban area. Findings revealed that the distribution of these boreholes was random, while Okwere *et al*. (2015) also worked on mapping the spatial distribution of water borehole facilities in part of Rivers State. The result revealed that the density of these facilities within the study area reinforces the view that if there is no control measure, the consequence for the urban area will be grave. However, given these contributions to knowledge, there is still a paucity of knowledge on the spatial distribution of boreholes, particularly in the built area. Therefore, the study was designed to investigate the spatial distribution of boreholes in the selected residential estate in the Ibadan North local government area of Oyo State, Nigeria. This is done with the view of proferring solutions to the negative impact of the proliferation of boreholes.

1.1 Study Area

Ibadan-North local government in which Agodi falls is geographically located on Latitudes 70231N and 30331E and Longitude 70281N and 30531E. Ibadan-North is bounded in the north by Akinyele local government, in the East by Lagelu local government and Egbeda local government, in the West by Ibadan-North west local government and in the South by Ibadan-North East local government

(Figure 1). It occupies a total landmass of 145.58 square kilometres—Federal Republic of Nigeria Official Gazette (2007).

The type of rock in any area is an important factor governing the characteristics of the groundwater. Due to their high porosity, permeability and layered nature, sedimentary rocks are invariably good aquifers. On the other hand, basement complex rocks, composed mainly of metamorphic and igneous rock types, are relatively poor aquifers (Ibadan region). Therefore, in the Ibadan area, one expects relatively low groundwater production compared to the south sedimentary rock areas. The study area comprises metamorphic Pre-Cambrian Basement Complex rocks with Gneisses as the predominant rock type. The Basement Complex rocks are generally considered poor aquifers because of their low porosity and permeability (Davis and De Wiest, 1966). Therefore, groundwater availability depends on the depth of the weathered material (overburden) and the presence of joints and fractures in the rock. However, the basement complex nature of the rocks in Ibadan does not completely rule out the possibility of the presence of isolated good and productive aquifers. The factors which account for the presence of good aquifers in a particular location over the basement complex rocks are the thickness of the regolith (weathered layer), the size and density of fractures, fissures and other cracks and the permeability and porosity of the rocks.

Meanwhile, the study area has a high degree of borehole proliferation. Just as housing demand and development are increasing, so is the location of boreholes. This stemmed from a bid to meet the demand for potable water for consumption. Therefore, there is a need to investigate the extent of compliance of these boreholes to the existing planning standard.

2.0 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Continuous Location Models - site generation model

The central concern in location problems is determining site(s) for one or more new facilities with respect to a set of fixed points, often called existing facilities.

Such problems are termed continuous when the underlying space both for facility sites and given points is continuous, i.e. all points under discussion are determined by way of one or more (according to the dimension) variables (coordinates) which may vary continuously. As such, they were appropriately termed "site generation" models by Love-Morris-Wesolowsky (1988); since no a-priori knowledge of particular candidate sites is assumed, the model is conjectural in generating the appropriate ones. This excludes the discrete case, also termed "site selection" models by the same authors, where a given finite set of candidate sites is considered, represented by discrete variables, and also the general network case where the description of a point involves either identification of the node it lies at (discrete) or both identification of the enclosing edge (discrete) and the (continuous) position along this edge.

Although different scholars have used this model in solving different infrastructural challenges, for instance, a study on new warehouse locations for efficient logistical activities by quantifying transportation costs associated with increasing demand, potential alternative locations could be located in the current urban areas or new industrial parks designated by cities. The cities of Fargo, ND, Moorhead, MN, and West Fargo, ND,

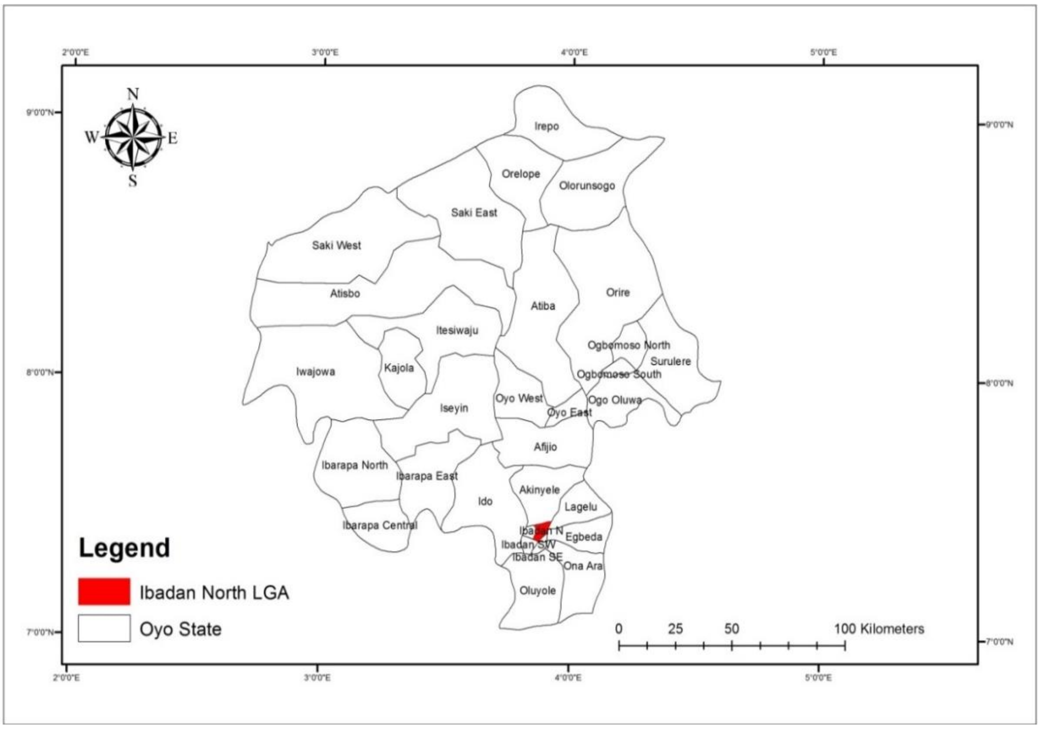

Figure 1: Ibadan North Local Government in the context of Oyo State, Nigeria

are selected as potential candidates for a distribution centre. The model is applicable for the location of borehole facilities as it can identify the node and discrete distribution at an appropriate distance.

2.2 Literature review

Locating improved water supply within reasonable distances to households saves time and increases total water consumption. WHO (2000) considers 200 metres a convenient distance for getting water. Huttly *et al*. (1990) found that improving accessibility by constructing boreholes in villages and towns in Nigeria reduces daily water fetching water time from 360 minutes to 45 minutes.

Khar *et al*. (2010) agreed that the GIS base map, through the application of its features, is very good for analysis of potable water in order to delineate the areas within the metropolis that are served, under-served and unserved by the water cooperation. Ofoegbune *et al*. (2010) used hand-held GPS in collecting data on the geographical location or position as well as elevation of the various facilities of the water corporation including reservoirs, pumping stations and the water distribution pipelines at Abeokuta. However, in their study, a topographic map at a scale of 1:50,000, a water distribution facility map of Abeokuta (1998) on a scale of 1:1250000 and a population of an estimate of about 593,140 people (2005 estimate) as retrieved from the federal office of statistics were used. The spatial analysis was made, and the result produced was a map of the existing water facilities, a map of the metropolis showing utility map networks, a population dot map of the metropolis and the suggested extension elevation map showing digital elevation model of the metropolis with the proposed location of new facilities.

In a study by Awodumi and Akeasa (2017) on the GIS application for assessing the spatial distribution of boreholes and hand-dug wells in Boroboro community, Atiba local government, Oyo state. It was revealed that as the community expanded, the distance to the existing and available boreholes and the hand-dug wells increased.

Furthermore, Ruma and Thomas (2020), in their study on the spatial distribution of public boreholes in Kaduna north area of Kaduna state, realised that 31 functional boreholes were distributed within 23.6 km^2 while 64.9% was deprived of this essential facility. However, despite these reviews, an issue that bothers the spatial distribution of boreholes in selected residential estates of Ibadan north local government area, Ibadan, Oyo State, Nigeria, has not been given adequate attention in the literature. This is the gap the study intends to fill.

3.0 Study Methodology

A cross-sectional survey research design was adopted for the study, while both primary and secondary data were sourced. A multi-stage sampling technique was adopted in which Ibadan North local government was purposively selected out of the 11 local governments that make up the Ibadan metropolis, and this was due to the high concentration of residential estates in the area. All the estates within the LGA were identified, and with the help of a global positioning system, the coordinates of all the boreholes and the distances of one borehole from the other were taken. Furthermore, the Nearest Neighbor analysis was used to determine each estate's degree of concentration or distribution. Descriptive statistics (simple percentage) and inferential (Chi-square) were adopted in analyzing the data. In order to arrive at the simple percentage, the percentage error of points that did not meet the required standard was calculated. Then the aggregated percentage of points that did not meet the standard was divided by the total number of estates. The results were validated p-value = >0.05 level of significance

4.0 Results And Discussions

4.1 Distance between boreholes in conformity with the planning standard

Major issues raised are the distances between the location of one borehole to another per the minimum and maximum standard of 50m to 150m, respectively (Bill *et al*. 2011). Investigation of the surveyed estates revealed that 7 points (10.4%), mainly from Ikolaba, met the minimum distance of 50 meters. In contrast, more than 88.1% of the points had less than 50m distance between them, implying a non-conformity with the minimum distance of 50m (see table 1); in Aerodrome, 16 points (62%) met the minimum distance of 50 meters as against just one point (3.8%) that met the maximum distance of 150m. Meanwhile, 9 (34.6%) out of all the points in the aerodrome met the required standard, despite being a newly planned area (Table 2). In Ashi, only six points (16.2%) met the minimum distance of 50m, with no point meeting the required maximum distance of 150m. However, more than two-thirds (83.8%) did not meet the required planning standard distance (Table 3). For Aare, the investigation revealed that there were just nine points (56.2%) that met the minimum standard of 50m, while 43.75% did not (Table 4); regarding the Oluwokekere area, the investigation revealed in Table 5 shows that no point (100%) met the minimum distance of 50m and the maximum distance of 150m. With respect to Basorun in the study area, five points (7.1%) met the required distance, indicating a high percentage of 92.8 deviations from the required standard (Table 6).

Likewise, in Oluwonla, only one point (11.1%) met the minimum distance of 50 metres, while 88.8% did not (see table 7). More than 72% of the boreholes in the study area did not meet the required minimum distance between the storage interval of separate holes of 50m spacing standard. This result implies that closely located boreholes negatively affect underground water from borehole facilities outside the minimum distance between the storage intervals of separate holes of 50m spacing. This result shows a non-adherence to planning standards which may be attributed to different reasons, such as lack of engagement of the professionals in drilling boreholes who could work to specification and lack of supervision and monitoring during construction by facility planners.

Over time, telecommunication facilities and underground electricity routes can also affect groundwater if boreholes are closely located. This is because the removal of water in its natural state through geo–drilling activities creates disequilibrium in the earth's crust, leading to land subsidence. This is one of the major environmental effects associated with the multiplicity of borehole facilities. Over time as more water is removed from the area, the ground drops and creates a cone. Land subsidence can lead to many problems, including storm drains, sanitary sewers, and structural damage to buildings, which may eventually negatively impact the people. This result agrees with the study carried out by Okwere Anwuri, Lawrence and Kurotamuno (2015) on mapping the spatial distribution of water borehole facilities in part of Rivers State using Geographical Information System (GIS) techniques, in which it was revealed that with the multiplicity of these private water boreholes the risk of possible land subsidence is very high.

4.2 Distributional Pattern of Boreholes in the Study Area

In order to differentiate further on the pattern of distribution of boreholes in the study area, the nearest neighbourhood analysis was conducted. From the results, the observed mean distance between the sampled boreholes was 2936.9512 meters, while the expected mean distance was 1547.9507 meters. In addition, the Nearest Neighbor ratio was 1.897316, with the Z-score estimated as 27.358546 at the P-value of 0. Given these values, the pattern of the sampled boreholes is dispersed throughout the whole local government, having a serious implication for planning; people would have to go a long distance to get water within the local government, thereby not making water resources available when needed (see figure 2). However, an individual within each estate may enjoy the water supply, as the case in the first section of this study deals with the distance between the locations of the borehole. The result negates the findings of Ezezue *et al.* (2017), which centred on the distribution of boreholes in residential layouts and implications for the planning of Awka, Nigeria. It revealed that the analysis of the distribution of boreholes in the two districts shows that they are random, with Okpuno revealing more randomness because of the higher p-value of 0.821 obtained from the distribution analysis in the district. Boreholes within the local government are also explained with the point map showing clustered nature of the borehole in each estate in the study area.

The chi-square contingency table analysis with the corresponding p-values of 0.148, 0.148, 0.460, 0.079, 0.054, and 0.120, the study concluded that there is a low association between the distance of boreholes at Aare, Aerodrome, Ashi, Basorun, Ikolaba, Oluwokekere, and Oluwonla area of Ibadan North LGA.

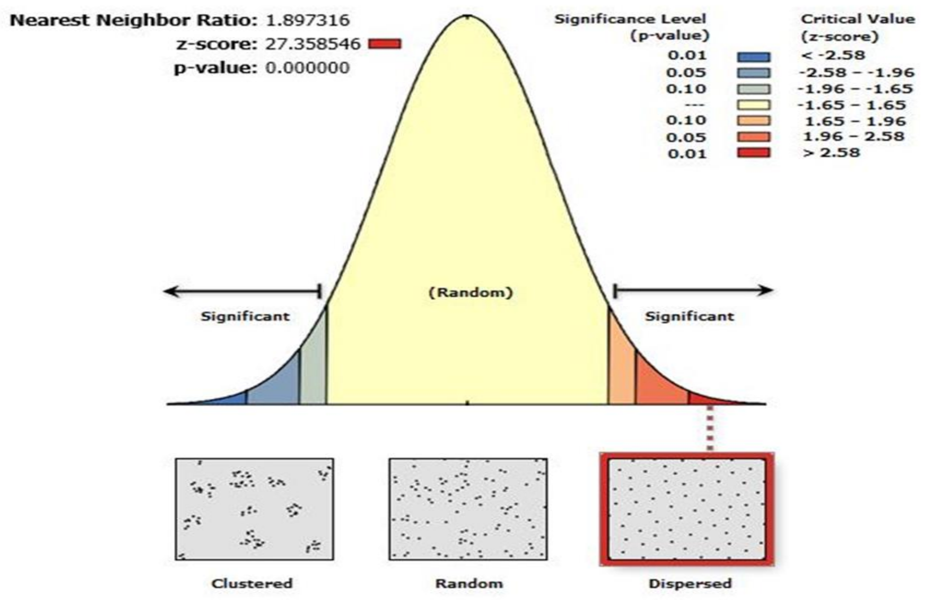

Figure 2: **Nearest Neighbourhood Analysis of Borehole Spatial Distribution**

The Chi-square analysis of the relationship between borehole distance

Aare			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	104.000[a]	90	.148
Likelihood Ratio	62.723	90	.987
Linear-by-Linear Association	13.457	1	.000
N of Valid cases	16		
Aerodrome			
Pearson Chi-Square	104.000[a]	90	.148
Likelihood Ratio	62.723	90	.987
Linear-by-Linear Association	13.457	1	.000
N of Valid cases	16		
Ashi			
Pearson Chi-Square	337.933[a]	336	.460
Likelihood Ratio	153.201	336	1.000
Linear-by-Linear Association	3.151	1	.076
N of Valid cases	37		
Bashorun			
Pearson Chi-Square	743.208[a]	690	.079
Likelihood Ratio	308.609	690	1.000
Linear-by-Linear Association	10.099	1	.001
N of Valid cases	70		
Ikolaba			
Pearson Chi-Square	948.608[a]	880	.054
Likelihood Ratio	334.033	880	1.000
Linear-by-Linear Association	51.931	1	.000

N of Valid cases	67		
Oluwokekere			
Pearson Chi-Square	220.124[a]	209	.285
Likelihood Ratio	111.057	209	1.000
Linear-by-Linear Association	8.960	1	.003
N of Valid cases	67		
Oluwonla			
Pearson Chi-Square	45.000[a]	35	.120
Likelihood Ratio	31.232	35	.651
Linear-by-Linear Association	7.131	1	.008
N of Valid cases	9		

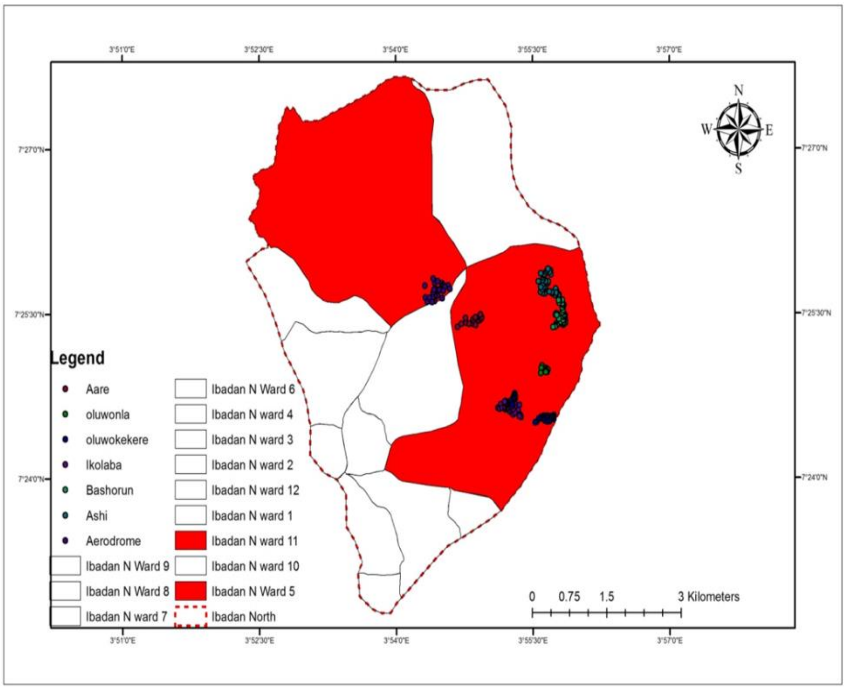

Figure 3.0 shows the location of the borehole within the LGA

5.0 Conclusion and Recommendation

The study concludes that the spatial distribution of boreholes in the study area was dispersed or scattered, having a serious implication for planning and health of the residents in the area, which is cable of leading to land subsidence that could eventually affect buildings in the area. Therefore, the government, through the department of development control in the local planning authority, should guide and enforce the compliance of boreholes to the expected standard requirement in the Study Area and other areas where this is also obtainable.

6.0 References

Anwuri O.O, Hart, L., and Jackson, K. (2015). *Mapping the spatial distribution of water borehole facilities.* FIG Working Week 2015 From the Wisdom of the Ages to the Challenges of the Modern World Sofia, Bulgaria, 17-21 May 2015

Awodumi, O.E. and Akeasa, O.S., 2017. GIS Applications for Assessing Spatial Distribution of Boreholes and Hand Dug Wells in Boroboro Community, Atiba Local Government, Oyo State. *J Remote Sensing & GIS*, *6*(208), p.2.

Bates, B.C., Kundzewicz, Z.W., Wu, S. and Palutikof, J.P., 2008. Climate Change and Water. IPCC Technical Paper IV. Intergovernmental Panel on Climate Change, Geneva.

Cunningham, W.P. and Saigo, B.W., 1999. *Environmental science* (p. 640). McGraw-Hill.

Ezezue, A.M., Ezenwaji, E.E. and Odoanyanwu, N.M., 2017. Distribution of boreholes in residential layouts and implications for planning of Awka, Nigeria. *Mgbakoigba: Journal of African Studies*, *7*(1), pp.156-166.

Falkenmark, M., Lundqvist, J. and Widstrand, C., 1989, November. Macro-scale water scarcity requires micro-scale approaches: Aspects of vulnerability in semi-arid development. In *Natural resources forum* (Vol. 13, No. 4, pp. 258-267). Oxford, UK: Blackwell Publishing Ltd.

Federal Ministry of Water Resources. (2000). National water supply and sanitation policy

Onokerhoraye, A.G., 1995. *Urbanization and environment in Nigeria: Implications for sustainable development*. Benin Social Science Series for Africa.

Ruma, M.M and Thomas, C (2020), Spatial distribution of public borehole in Kaduna North, Kaduna State, *African Journal of Earth and Environmental Sciences*, 7(1), pp. 1

United Nations (2016), *World Water Development Report*

WHO (2004). *Water, sanitation and hygiene links to health.* Retrieved 30/10/2021, from https://www.who.int/water_sanitation_health/publication

Table 1: Distances between Borehole Locations at Ikolaba

S/N	Points	Coordinates for Ikolaba		Actual Distance (M)	Expected distance	
		X	Y		Minimum	Maximum
					50m	150m
1	Point 1 to 2	601520	819298	9.0	X	X
2	Point 2 to 3	601520	819307	9.0	X	X
3	Point 3 to 4	601500	819324	23.0	X	X
4	Point 4 to 5	601483	819344	25.0	X	X
5	Point 5 to 6	601452	819376	15.0	X	X
6	Point 6 to 7	601452	819391	15.0	X	X
7	Point 7 to 8	601441	819402	15.6	X	X
8	Point 8 to 9	601445	819441	39.2	X	X
9	Point 9 to 10	601451	819482	41.4	X	X
10	Point 10 to 11	601465	819524	28.1	X	X
11	Point 11 to 12	601464	819552	28.1	X	X
12	Point 12 to13	601451	819591	21.1	X	X
13	Point 13 to 14	601440	819609	21.1	X	X
14	Point 14 to 15	601475	819685	27.3	X	X
15	Point 15 to 16	601462	819709	27.3	X	X
16	Point 16 to 17	601432	819777	46.2	X	X
17	Point 17 to 18	601415	819820	46.2	X	X
18	Point 18 to 19	601387	819873	57.0	√	X
19	Point 19 to 20	601336	819898	30.4	X	X
20	Point 20 to 21	601350	819925	30.4	X	X
21	Point 21 to 22	601303	819884	35.4	X	X
22	Point 22 to 23	601277	819860	35.4	X	X
23	Point 23 to 24	601244	819830	45.0	X	X
24	Point 24 to 25	601170	819809	23.0	X	X
25	Point 25 to 26	601150	819820	23.0	X	X

26	Point 26 to 27	601209	819895	74.0	√	X
27	Point 27 to 28	601268	819949	74.0	√	X
28	Point 28 to29	601323	820002	75.2	√	X
29	Point 29 to 30	601384	820046	75.2	√	X
30	Point 30 to 31	601453	820083	59.7	√	X
31	Point 31 to 32	601511	820097	59.7	√	X
32	Point 32 to 33	601622	820129	115.5	√	X
33	Point 33 to 34	601401	819267	18.9	X	X
34	Point 34 to 35	601417	819257	18.9	X	X
35	Point 35 to 36	601443	819253	20.6	X	X
36	Point 36 to37	601461	819243	20.6	X	X
37	Point 37 to 38	601504	819243	16.6	X	X
38	Point 38 to 39	601511	819258	16.6	X	X
39	Point 39 to 40	601536	819285	20.6	X	X
40	Point 40 to 41	601555	819301	24.8	X	X
41	Point 41 to 42	601583	819288	27.7	X	X
42	Point 42 to 43	601601	819267	27.6	X	X
43	Point 43 to 44	601613	819241	28.6	X	X
44	Point 44 to 45	601623	819213	29.7	X	X
45	Point 45 to 46	601657	819191	22.2	X	X
46	Point 46 to 47	601675	819178	11.1	X	X
47	Point 47 to 48	601703	819144	7.6	X	X
48	Point 48 to 49	601748	819092	8.0	X	X
49	Point 49 to 50	601723	81914	6.7	X	X
50	Point 50 to 51	601748	819092	3.2	X	X

51	Point 51 to 52	601723	819114	3.5	X	X
52	Point 52 to 53	601748	819092	4.8	X	X
53	Point 53 to 54	601723	819114	7.6	X	X
54	Point 54 to 55	601757	819091	9.1	X	X
55	Point 55 to 56	601706	819151	7.6	X	X
56	Point 56 to 57	601686	819179	11.0	X	X
57	Point 57 to 58	601665	819212	22.5	X	X
58	Point 58 to 59	601663	819246	26.0	X	X
59	Point 59 to 60	601670	819271	26.0	X	X
60	Point 60 to 61	601694	819348	43.9	X	X
61	Point 61 to 62	601703	819391	43.9	X	X
62	Point 62 to 63	601712	819436	45.9	X	X
63	Point 63 to 64	601550	819335	22.0	X	X
64	Point 64 to 65	601533	819321	19.1	X	X
65	Point 65 to 66	601519	819337	21.3	X	X
66	Point 66 to 67	601519	819366	17.5	X	X
67	Point 67 to 68	601503	819359	17.5	X	X

NB: √= within standard; X= Not within the standard

Source: Field survey, 2019.

Table 2: Distances between Borehole Locations at Aerodrome

S/N	Points	Coordinates for Aerodrome X	Y	Actual Distance	Expected distance	
					Minimum	Maximum
					50m	150m
1	Point 1 to 2	600148	821238	35.2	X	X
2	Point 2 to 3	600157	821204	35.2	X	X
3	Point 3 to 4	600239	821348	40.5	X	X
4	Point 4 to 5	600265	821317	37.0	X	X
5	Point 5 to 6	600241	821289	37.0	X	X
6	Point 6 to 7	600221	821253	35.3	X	X

7	Point 7 to 8	600192	821233	35.3	X	X
8	Point 8 to 9	600143	821242	67.1	√	X
9	Point 9 to 10	600146	821141	53.0	√	X
10	Point 10 to 11	600111	821127	53.0	√	X
11	Point 11 to 12	600588	821140	81.0	√	X
12	Point12 to 13	600061	821186	52.0	√	X
13	Point 13 to 14	600081	821233	52.0	√	X
14	Point 14 to 15	600394	821261	67.1	√	X
15	Point 15 to 16	600409	821229	67.1	√	X
16	Point 16 to 17	600398	821252	67.1	√	X
17	Point 17 to 18	600300	821285	47.4		X
18	Point 18 to 19	600264	821221	54.0	√	X
19	Point 19 to 20	600246	821098	108.0	√	X
20	Point 20 to 21	600244	821076	51.0		X
21	Point 21 to 22	600177	821016	197.0	√	√
22	Point 22 to23	600141	821009	85.0	√	X
23	Point 23 to24	600052	821012	81.0	√	X
24	Point 24 to 25	600036	821030	58.1	√	X
25	Point 25 to 26	600015	821006	66.0	√	X
26	Point 26 to 27	600039	821032	51.0	√	X

NB: √= within standard; X= Not within the standard. Source: Field survey, 2019.

Table 3: Distances between Borehole Locations at Ashi

S/N	Points	Coordinates for Ashi		Actual Distance (M)	Expected Distance	
		X	Y		Minimum	Maximum
					50m	150m
1	Point 1 to 2	602606	821155	23.0	X	X
2	Point 2 to 3	602586	821144	23.0	X	X
3	Point 3 to 4	602547	821159	29.4	X	X
4	Point 4 to 5	602556	821211	27.0	X	X
5	Point 5 to 6	602533	821255	50.0	√	
6	Point 6 to 7	602538	821207	30.1	X	X
7	Point 7 to 8	602542	821188	27.0	X	X
8	Point 8 to 9	602467	821177	26.1	X	X
9	Point 9 to 10	602453	821199	26.1	X	X
10	Point 10 to 11	602404	821208	50.0	√	X
11	Point 11 to 12	602349	821217	39.2	X	X
12	Point 12 to 13	602317	821174	40.1	X	X
13	Point 13 to 14	602271	821179	46.3	X	X
14	Point 14 to 15	602228	821203	49.2	X	X
15	Point 15 to16	602330	821251	35.1	X	X
16	Point 16 to 17	602295	821248	27.0	X	X
17	Point17 to 18	602268	821248	27.0	X	X
18	Point 19 to 20	602326	821286	33.2	X	X
19	Point 20 to 21	602293	821290	33.2	X	X
20	Point 21 to 22	602261	821283	42.0	X	X
21	Point 22 to 23	602234	821285	50.2	√	X

22	Point 23 to 24	602381	821353	26.5	X	X
23	Point 24 to 25	602386	821379	26.5	X	X
24	Point 25 to 26	602331	821382	55.1	√	X
25	Point 26 to 27	602279	821404	42.0	X	X
26	Point 27 to 28	602187	821382	95.0	√	X
27	Point 28 to 29	602287	821445	35.0	X	X
28	Point 29 to 30	602305	821475	25.0	X	X
29	Point30 to 31	602289	821503	28.0	X	X
30	Point 31 to 32	602316	821497	25.0	X	X
31	Point32 to 33	602287	821504	56.0	√	X
32	Point 33 to 34	602340	821533	37.0	X	X
33	Point 34 to 35	602384	821543	42.5	X	X
34	Point35 to 36	602435	821562	36.4	X	X
35	Point 36 to 37	602387	821544	36.4	X	X
36	Point 37 to 38	602364	821561	33.1	X	X
37	Point 38 to 39	602380	821590	33.1	X	X

NB: √= within standard; X= Not within standard Source: Field survey, 2019.

Table 4: Distances between the Borehole Locations at Aare

S/N	Points	Coordinates for Aare		Actual Distance (M)	Expected distance	
		X	Y		minimum	Maximum
					50m	150m
1	Point 1 to 2	600555	820597	89.5	√	X
2	Point 2 to 3	600632	820614	89.5	√	X
3	Point 3 to 4	600702	820629	70.0	√	X
4	Point 4 to 5	600730	820635	83.0	√	X
5	Point 5 to 6	600797	820650	70.0	√	X
6	Point 6 to 7	600822	820640	48.0	X	X
7	Point 7to 8	600890	820656	45.2	X	X
8	Point 8 to 9	600915	820657	45.2	X	X
9	Point 9 to 10	600920	820646	53.0	√	X
10	Pont 10 to 11	600939	820696	44.2	X	X
11	Point 11 to 12	600994	820696	44.2	X	X
12	Point 12 to 13	601020	820727	50.0	√	X
13	Point 13 to 14	601036	820734	31.0	X	X
14	Point 14 to 15	601051	820763	31.0	X	X
15	Point 15 to 16	601065	820763	53.3	√	X
16	Point 16 to 17	601090	820789	50.0	√	X

NB: √= within standard; X= Not within standard Source: Field survey, 2019.

Table 5: Distances between Borehole Locations at Oluwokekere

S/N	Points	Coordinates for Oluwokekere		Distance (M)	Expected distance	
					Minimum	Maximum
		X	Y		50m	150m
1	Point 1 to 2	602495	819066	33.2	X	X
2	Point 2 to 3	602658	819098	33.7	X	X
3	Point 3 to 4	602486	819098	24.3	X	X
4	Point 4 to 5	602457	819075	27.5	X	X
5	Point 5 to 6	602462	819102	24.3	X	X
6	Point 6 to 7	602435	819113	29.2	X	X
7	Point 7 to 8	602396	819095	36.8	X	X
8	Point 8 to 9	602370	819121	23.6	X	X
9	Point 9 to 10	602351	819107	23.6	X	X
10	Point 10 to 11	602300	819124	38.3	X	X
11	Point 11 to 12	602411	819032	49.8	X	X
12	Point 12 to 13	602362	819023	47.5	X	X
13	Point 13 to 14	602318	819041	47.5	X	X
14	Point 14 to15	602287	819088	20.2	X	X
15	Point 15 to 16	602276	819071	20.2	X	X
16	Point 16 to 17	602241	819098	28.8	X	X
17	Point 17 to 18	602225	819074	28.8	X	X
18	Point 18 to 19	602192	819071	33.1	X	X
19	Point 19 to 20	602152	819018	29.4	X	X
20	Point 20 to 21	602124	819009	29.4	X	X
21	Point 21 to 22	601708	819499	31.3	X	X
22	Point 22 to23	601699	819469	31.3	X	X
23	Point 23 to 24	601681	819441	20.6	X	X
24	Point 24 to25	601686	819421	20.6	X	X
25	Point 25 to 26	601680	819395	26.7	X	X
26	Point 26 to 27	601657	819357	26.5	X	X
27	Point 27 to 28	601651	819360	35.5	X	X
28	Point 28 to 29	601662	819331	23.1	X	X
29	Point 29 to30	601660	819308	23.1	X	X

NB: √= within standard; X= Not within standard Source: Field survey, 2019.

Table 6: Distances between Borehole Locations at Basorun

S/N	Points	Coordinates of houses in Basorun		Distance (M)	Expected Distance	
					Minimum	Maximum
					50m	150m
1	Point 1 to 2	602790	820391	25.1	X	X
2	Point 2 to 3	602815	820392	25.1	X	X
3	Point 3 to 4	602815	820446	54	X	X
4	Point 4 to 5	602901	820454	10.2	X	X
5	Point 5 to 6	602899	820464	10.2	X	X
6	Point 6 to 7	602895	820485	21.4	X	X
7	Point 7 to 8	602970	820510	66.4	√	X

8	Point 8 to 9	603023	820550	66.4	√	X
9	Point 9 to 10	603083	820790	247.0	√	X
10	Point 10 to 11	603190	820437	121.0	√	X
11	Point 11 to 12	603199	820225	21.3	X	X
12	Point12 to 13	603215	820239	21.3	X	X
13	Point 13 to 14	603240	820261	16.6	X	X
14	Point 14 to 15	603255	820268	16.6	X	X
15	Point 15 to 16	603261	820284	17.1	X	X
16	Point16 to 17	603284	820268	22.0	X	X
17	Point 17 to 18	603304	820259	22.0	X	X
18	Point 18 to19	603332	820259	28.0	X	X
19	Point 19 to 20	603366	820193	47.2	X	X
20	Point 20 to 21	603362	820146	31.2	X	X
21	Point 21 to 22	603338	820126	28.3	X	X
22	Point 22 to 23	603314	820111	28.2	X	X
23	Point 23 to 24	603289	820098	28.2	X	X
24	Point 24 to25	603245	820078	29.4	X	X
25	Point 25 to 26	603228	820054	14.0	X	X
26	Point 26 to 27	603214	820054	9.1	X	X
27	Point 27 to 28	603213	820045	9.1	X	X
28	Point 28 to 29	603171	820002	29.0	X	X
29	Point 29 to 30	603150	819982	29.0	X	X
30	Point 30 to 31	603152	820100	40.0	X	X
31	Point 31 to 32	603161	820139	20.0	X	X
32	Point 32 to 33	603155	820158	5.7	X	X
33	Point 33 to 34	603159	820162	5.7	X	X
34	Point 34 to 35	603143	820181	18.9	X	X
35	Point 35 to 36	603130	820194	18.9	X	X
36	Point 36 to 37	602733	820730	27.0	X	X
37	Point 37 to 38	602733	820703	21.1	X	X
38	Point 38 to 39	602731	820682	21.1	X	X
39	Point 39 to 40	602708	820674	24.4	X	X
40	Point 40 to 41	602680	820680	28.6	X	X
41	Point 41 to 42	602635	820678	25.1	X	X
42	Point 42 to 43	602625	820701	25.1	X	X
43	Point 43 to 44	602659	820718	38.1	X	X
44	Point 44 to 45	602552	820671	26.8	X	X
45	Point 45 to 46	602564	820647	26.8	X	X
46	Point 46 to 47	602527	820640	23.2	X	X
47	Point 47 to 48	602524	820617	18.1	X	X
48	Point 48 to 49	602507	820611	18.1	X	X
49	Point 49 to 50	602728	820790	3.2	X	X
50	Point 50 to 51	602710	820785	16.2	X	X
51	Point 51 to 52	602680	820783	30.1	X	X
52	Point 52 to 53	602725	820791	32.2	X	X
53	Point 53 to 54	602727	820813	22.1	X	X
54	Point 54 to 55	602705	820823	16	X	X
55	Point 55 to 56	602689	820823	16	X	X

56	Point 56 to 57	602692	820859	24.1	X	X
57	Point 57 to 58	602668	820857	24.1	X	X
58	Point 58 to 59	602553	820846	33.2	X	X
59	Point 59 to 60	602530	820822	28.8	X	X
60	Point 60 to 61	602557	820812	28.8	X	X
61	Point 61 to 62	602683	820896	38.1	X	X
62	Point 62 to 63	602671	820941	46.6	X	X
63	Point 63 to 64	602700	820983	19.0	X	X
64	Point 64 to 65	602682	820990	19.0	X	X
65	Point 65 to 66	602670	821010	23.0	X	X
66	Point 66 to 67	602607	821020	45.1	X	X
67	Point 67 to 68	602637	821063	13	X	X
68	Point 68 to 69	602632	821075	13	X	X
69	Point 69 to 70	602610	821065	18.0	X	X
70	Point70 to 71	602592	821066	18.0	X	X

NB: √= within standard; X= Not within standard Source: Field survey, 2019.

Table 7: Distances between Borehole Locations at Oluwonla

S/N	Points	Coordinates for Oluwonla X	Y	Actual Distance (M)	Expected Distance	
					Minimum	Maximum
					50m	150m
1	Point 1 to 2	602344	819919	26.0	X	X
2	Point 2 to 3	602367	819907	19.9	X	X
3	Point 3 to 4	602382	819894	19.9	X	X
4	Point 4 to 5	602362	819857	23.1	X	X
5	Point 5 to 6	602341	819872	13.2	X	X
6	Point 6 to 7	602339	819859	13.2	X	X
7	Point 7 to 8	602262	819963	39.4	X	X
8	Point 8 to 9	602246	819927	39.4	X	X
9	Point 9 to 10	602237	819840	87.5	√	X

NB: √= within standard; X= Not within standard Source: Field survey, 2019.

The benefits and pitfalls of risk management in construction project

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Abstract

Construction projects are laden with different categories of risks and uncertainties which impact construction projects' objectives of time, cost, quality and safety performance. While risk management (RM) practices have evolved in developed countries, developing countries like Nigeria are still lagging due to awareness and knowledge issues. This has denied construction organisations from enjoying the full benefits of RM. The purpose of this study is to determine the benefits and pitfalls of risk management in construction projects in Nigeria. The quantitative survey questionnaire and snowball sampling technique were used to gather data from construction professionals in consulting and contracting organisations within the study area. Frequency, percentage, mean item score (MIS), and Mann–Whitney U-Test were used to analyse the gathered data. It was found that the practice of RM is low, and the major benefits of RM are; more precise estimate (through reduced uncertainty), maximization of the objectives of the projects, maximisation of opportunities in the business environment, Healthier bottom lines (with regards to quality, time and cost, and scope), and minimisation of surprises. Also, the major pitfalls of RM in construction are; effective risks management practice is time-consuming, subjective nature and lack of consistency in assessing risks, making RM a one-off activity instead of an ongoing process, not recognising team members' responsibility for certain specific risks, and risk management practices in construction are 'post mortem'. Effective RM is advocated among construction organisations for better construction project performance.

Keywords: *Uncertainties, Risk management, pitfalls, benefits, construction projects*

1.0 INTRODUCTION

The construction industry globally serves as the bedrock for nations' sustained infrastructure development, economic growth and survival (Eze *et al.,* 2021; Eze *et al*., 2020). In all countries, the industry is the most important and leading job-creating sector (Rad and Yamini, 2017). Notwithstanding the critical role the industry plays in the life of economies, construction projects undertaken in the sector suffer from enormous delays, budget overruns, quality issues, safety issues, claims and disputes, loss of value and dissatisfaction of clients (Bayraktar, 2020). This situation results from the multiple stakeholders, complex nature and dynamic operating environment of the construction market. These create an atmosphere of high risks and uncertainties (Gulam, 2018).

Careful consideration of the risks, such as economic, socio-political, financial, and environmental risks, must be done before investing or engaging in any developmental projects (Renault and Agumba, 2016). These risks are also responsible for the decline of the construction industry's contribution to sustainable economic growth and development (Ygwu *et al*., 2019). Minimising the effects of the high level of uncertainties and risks on construction projects, effective risks management (RM) is needed.

According to Perry and Hayes (1985), risks are uncertain events whose probability of occurring could lead to either a positive or negative outcome on a project. Risks occur across the entire project life cycle (Design, construction and maintenance/operations of the facility), although they occur more at the construction stage (Nnadi, 2016). Similarly, Szymanski (2017) suggests that there are risks associated with various divisions of construction projects, and these divisions are; preliminary design, tender, detailed design, construction works, and financing of the investment. Risks are an inherent aspect of construction activities, and effort should be made to reduce their occurrence and impact on project objectives. RM is, therefore, a key to ensuring that construction projects are delivered within their planned objectives. RM permeate all aspects of construction projects and is inclined toward the success of the projects (Schieg, 2006). Bahamid and Doh (2017) highlighted the main risk management subsets, including risk identification, risk analysis and evaluation, and risk response. Scott (2019) states that RM involves risk identification, risk assessment and prioritization, which is closely followed by a well-articulated, coordinated and efficient deployment of resources to minimise, monitor and control their impact and probability of occurrences of risks. Risks could evolve from project failures, financial turbulence, accidents, legal liabilities, and natural disasters. RM is a vital process in every business and requires a daily effort and five critical processes of effectiveness and efficiency to be achieved in business organisations. These processes are identifying risk, Analysing risk, evaluating the risk, planning risk, and monitoring and reviewing the risk (Reddy, 2016).

RM prepares an organisation to be better prepared for threats, prioritize investment decision, savings in time and cost, better quality performance, maximise opportunities, reduce disputes, improves the strategic business performance, improves the health and, safety and environmental performance of organisations (Scott, 2019; Reddy, 2016). However, RM has pitfalls: it is subjective with no consistency, impacts profitability as excess time is committed to assessing and managing unlikely events, it involves complex calculations, and risk management plans are sometimes difficult to implement. These pitfalls in RM are blamed on the differential knowledge, practices and application of RM methodologies. According to Gulam (2018) and Bahamid and Dohm (2017), the RM concept is still unpopular and has remained a serious and challenging responsibility for construction practitioners. Uncertainties have hampered construction project managers' efforts toward improving project performance because of an ineffective approach to managing risk events.

While quantitative and qualitative techniques of RM have gained significant attention and application in construction industries of developed nations with technical know-how, the construction market of developing countries like Nigeria is generally not very acquainted with risk management analysis (Ogunbayo, 2014a). In the Nigerian construction industry, risk management has been carried out with imitations and ineffectiveness, attributed to a lack of knowledge of the processes and methodologies and project risk events. Furthermore, a reductionist approach has been the predominant approach to RM, which has brought little or no performance improvement in construction projects (Adeleke *et al*., 2015; Adeleke *et al*., 2016). Similarly, a formal approach to risk analysis and management that is important for minimising cost and time risks for enhanced profitability is not usually followed in Nigeria (Windapo *et al.*, 2010; Ojo, 2010). Poor quality of work, schedule overrun, budget overrun, disputes and other issues have remained the order of the day on construction projects executed in Nigeria, which is the consequence of poor risk diagnoses and management (Aibinu and Henry, 2006). Many construction projects are abandoned in Nigeria due to poor attention to risk management which is known to have positive time and cost minimisation effects on projects (Ojo, 2010; Odeyinka *et al*., 2008; Dada and Jagboro, 2007). The construction companies and clients in the sector have not enjoyed the full benefits of RM due to a poor approach to risks and uncertainties (Adeleke *et al.,* 2016).

The review of the extant literature on risks management in construction in the Nigerian context has been centred on risks identification, risk types in construction, level of practice of risks management, risk analysis process, the impact of risks on construction project cost and time (e.g. Ijigah *et al.*, 2013; Sebastian *et al*., 2018; Nnadi, 2016; Adeleke *et al*., 2015; Adeleke *et al*., 2016; Ezeabasili et al., 2021; Ugwu *et al.*, 2019; Ubani *et al*., 2015; Ogunbayo, 2014a,b; Dada and Jagboro, 2007; Ojo, 2010). However, emphasis on risks management benefits and pitfalls has been largely ignored in construction management literature in the Nigerian context. Studies that have explored the benefits, as well as the pitfalls of RM on construction projects, have not been undertaken. In addition, construction RM studies in the south-east of Nigeria are very scanty. Therefore more exploration of this area is needed in Nigeria. It is these gaps that this study is filling. This study aims to assess the benefits and pitfalls of risk management in construction projects in southeast Nigeria. It is the understanding of this study that knowing the benefits of effective risk management in construction will help improve the interest of stakeholders in risk management practices and implementation across the entire value chain of construction projects. The outcome of this study will also help improve the risk performance rating of the construction industry of Nigeria and other developing nations. It will also add to the little existing global knowledge on risk management.

2.0 LITERATURE REVIEW

2.1 Risks Associated With Construction Projects

In the construction environment, many elements of inherent risks exist, such as logistics risk, physical risk, environmental risk, financial risk, political risk, and legal risk, among others. The approach has been to cost these risk items using the contingency sum approach and insurance cover, but this approach has never given the best results in terms of cost and time parameters. Frequently, construction projects that adopt these approaches are either undervalued or over-valued due to higher cost implications before construction contract awards are made (Sebastian *et al.,* 2018). Ogunbayo (2014b) assessed twelve (12) types of risks in the construction industry, and they are; construction risks, financial risks, design risks, technical risks, managerial-related risks, management risks, logistic risks, contractual risks, administrative risks, political risks, physical risks, and disaster risks. Ijigah *et al.* (2013) established that the Nigerian construction industry is exposed to about 53.04% of risks which are responsible for the high rate of failure of construction projects. The study assessed seven (7) risks associated with construction projects, and they are financial risk, management risk, technical risk, environmental risk, legal risk, political risk, and market risk.

Ezeabasili *et al.* (2021) reported that the risk level is higher in the Nigerian construction industry than expected. Moreover, these risks mainly come from the relative impact of risks such as "economic and financial risks, political and governance risks, management and technological risk, cultural and social risks and natural and environmental". Odeyinka *et al.* (2004) assessed pre-contact and post-contract risks in the construction industry and found that design risk, estimating risk, competitive tendering risk, and tender evaluation risk were the pre-contract risks associated with construction projects. Financial risk, political risk, physical risk, contractual risk, logistics risk, legal risk, and environmental risk are the common post-contract risks affecting construction project performance. Similar findings were also reported by Akintoye and MacLeod (1996); Thompson (1992) and Perry and Hayes (1985).

It is established in the literature that RM is poorly practised, and risk analysis is wrongly done. This has been blamed for the continuous poor construction project performance in Nigeria. Therefore, to encourage effective risk analysis and management in Nigeria, there is a need to examine the benefits of effective RM practices and the pitfalls of poor implementation of risk management practices.

2.2 Benefits of Risk Management in Construction

According to Renault and Agumba (2016), RM is associated with identifying, assessing and prioritizing risks through the monitoring, controlling, and application of organisational resources in a coordinated and economical manner; for the reduction of the probability of the occurrence of uncertainties and maximization of the objectives of the projects. Based on the overall weighted average, Ogunbayo (2014a) reported that the most important benefits of RM are; more precise estimate (through reduced uncertainty), reduced duplication of effort (through team awareness of risk control action), improved chances of success, increased confidence in achieving project objectives, reduced surprises, and identification of challenging alternative courses of action. According to Scott (2019), RM ensures that organisations are better prepared for uncertainties and threats, improves investment decisions, maximises opportunities, reduces claims and disputes, improves project objectives with regard to quality, time and cost, and improves the safety consciousness of the project. Renault and Agumba (2016), through a review of RM literature, found that RM leads to many benefits such as improved confidence in actualising the objectives of a project; there is a better chance of project success, minimisation of surprises, helps to identify an alternative course of action, improves the accuracy of estimates, and efforts duplications are reduced. It was also observed that the risk management processes are not restricted to solving problems in advance but to preventing unanticipated events. Envisaging threats on a project is not the only way to reduce losses but also to transfer risks into opportunities that could improve economic profitability and environmental benefits, among other benefits (Renault and Agumba, 2016).

Ezeabasili *et al*. (2021) posit that RM is critical in assisting construction projects to be completed on time and within budget. Other benefits of RM on construction projects are; decision making is more objective ad systematic, loss minimisation and opportunities maximisation, encouraging pro-active responses to uncertainties, improving the understanding of risk identification process, improves management awareness of project outcomes through enhanced communication of project status and progress. Reddy (2016) suggests that RM practises help to identify and assess potential risks of a project, help in responding to minimising uncertain events from occurring, save project cost and time, enhance business strategies, help in maximising new opportunities in the business environment, assist in protecting resources, harvesting of new knowledge through documentation of experiences, improve project performance which helps organisations to reposition in competition, and improves the credit rating of organisations. In addition, RM helps to identify troubled projects, reduces surprises on a project, makes data available for improved quality of the decision-making process, prompts communication of risks information to management using the approved channel, improves budgeting accuracy, makes expectations clearer, risks ownership and responsibility of project teams, integrate risks, issues and changes for better management of a project, encourages pro-activeness other reactiveness over uncertainties, risks information provides lessons learned that improves the risk information database (Axelerate, 2021).

Gabrieyel (2021) posit that the combination of the qualitative and quantitative elements of managing construction risks plays an essential role in successfully delivering construction projects. RM improves operational consistency and efficiency (Marine Agency Insurance, 2021; Gabrieyel, 2021; Michalowicz, 2018). Effective RM enables companies to plan and respond promptly and competently to risks event, thus, saving them time, cost and other physical resources. The employees are allowed to focus on other value-adding activities. The workers' experiences are increased, workflows are diligently planned, and they are better ready to make informed decisions, ensuring that companies' operations progress efficiently (Gabrieyel, 2021). RM and risk analysis help management make better decisions that can change the fortune of a project (Humphreys, 2008). RM increases the project managers' confidence in a project (Michalowicz, 2018; Gabrieyel, 2021). The project manager is aware of the risks associated with his project as well as the budget involved. He also has a clear path for mitigating uncertainties; these improve his confidence as he has already built an invaluable tool for communicating and reporting risks to senior management, the project team, and the client. RM leads to customer satisfaction and healthier bottom lines (Michalowicz, 2018; Marine Agency Insurance, 2021). Improved data security, efficiency, and operations consistency can lead to more client/customer satisfaction. RM improves an organisation's reputation and prevents the rate at which construction equipment, machinery, and materials are damaged (Grange Insurance, 2021).

RM ensures the safety of employees, clients and visitors; this is evident in reducing the number of accidents and hazards. Thus, RM improves workers' safety and well-being (Grange Insurance, 2021). This affects and boosts the employees' morale, productivity and performance. This, in turn, improves construction projects' time, cost and quality performance. RM increases company profit ensures financial stability, and helps reduce the amount paid as a premium for insurance. A well-designed RM plan would reduce the costs of accidents, fines and penalties for non-compliance-related issues, among others. RM also builds trust and minimises liability from legal actions and litigation threats (Gabrieyel, 2021). Gulam (2018) identified five advantages of RM: achievement of objectives, shareholders' reliability, reduction of capital cost, less uncertainty, and creation of value. Table 1 below summarises the selected benefits of RM in the construction industry.

Table 1: Summary of the benefits of Risks management

S/N	Benefits of Risk management	Source(s)
1	Reduction of the probability of the occurrence of uncertainties	Renault and Agumba (2016); Reddy (2016); Gulam (2018); Grange insurance (2021)
2	Maximization of the objectives of the projects	Renault and Agumba (2016);Axelerate (2021);
3	identification of formidable alternative courses of action	Ogunbayo (2014a); Renault and Agumba (2016);
4	More precise estimate (through reduced uncertainty)	Ogunbayo (2014a); Renault and Agumba (2016); Axelerate (2021);
5	Reduced duplication of effort (through team awareness of risk control action)	Ogunbayo (2014a); Renault and Agumba (2016);
6	Improved chances of success	Ogunbayo (2014a); Renault and Agumba (2016);
7	Increased confidence in achieving project objectives	Ogunbayo (2014a); Michalowicz (2018); Gabrieyel (2021);
8	Improves decisions on investments	Scott (2019)
9	Maximises opportunities in the business environment	Scott (2019); Ezeabasili *et al*. (2021);Reddy (2016); Gulam (2018)
10	Reduction of claims and disputes	Scott (2019)
11	Healthier bottom lines (with regards to quality, time and cost, and scope)	Scott (2019); Gulam (2018); Grange insurance (2021); Ezeabasili *et al*. (2021); Reddy (2016); Michalowicz (2018); Marine Agency Insurance (2021);
12	Improves safety consciousness of the project	Scott (2019); Gabrieyel (2021); Grange insurance (2021)
13	Better prepared for uncertainties and threats	Scott (2019); Gulam (2018)
14	Minimisation of surprises	Ogunbayo (2014a); Reddy (2016); Gulam (2018); Axelerate (2021); Grange insurance (2021); Renault and Agumba (2016); Ezeabasili *et al*. (2021)
15	Improves the economic fortune and profitability	Renault and Agumba (2016); Gabrieyel (2021); Grange Insurance (2021)
16	Decisions making are more objective ad systematic	Ezeabasili et al. (2021); Axelerate (2021); Humphreys (2008)
17	Encourage pro-active responses to uncertainties	Ezeabasili *et al*. (2021); Axelerate (2021)
18	Improves the understanding of risks identifications process	Ezeabasili *et al.* (2021);Reddy (2016); Renault and Agumba (2016); Ogunbayo (2014a); Axelerate (2021)
19	Improves management awareness through the communication of project status and progress.	Ezeabasili *et al*. (2021); Axelerate (2021)
20	Improves data security and protection of resources	Reddy (2016); Grange insurance (2021); Gabrieyel (2021)

21	Improves project performance which helps organisations to reposition in competition	Reddy (2016); Gulam (2018)
22	Harvesting of new knowledge through documentation of experiences	Reddy (2016)
23	Rsks information provides lessons learned that improve the risk information database	Axelerate (2021)
24	Better operational consistency and efficiency	Marine Agency Insurance (2021); Gulam (2018); Grange insurance (2021); Gabrieyel (2021); Michalowicz (2018)
25	More customer satisfaction	Michalowicz (2018); Marine Agency Insurance (2021); Grange Insurance (2021)
26	Improves the reputation of an organisation	Grange Insurance (2021); Gulam (2018)

2.3 Pitfalls of Risk Management in Construction

One of the major issues of RM identified by Ezeabasili *et al*., (2021) is the "post mortem" practices in which management is practised in the industry of developed nations. One of the reasons why RM remains ineffective in the construction industry is the lack of the requisite knowledge on the best tools and techniques for carrying out an effective RM (Serpella *et al*., 2014). Some of the disadvantages of risk management highlighted by Scott (2019) include the subjective nature and lack of consistency in assessing risks; too much time is devoted to assessing and managing risks, which diverts resources from other more profitable ventures.

Reddy (2016) identified some drawbacks of the RM process, including complex calculations that are difficult to do without automated tools, unmanaged losses resulting from poor scheduling of risks, and its dependence on external entities' data for managing risks. In addition, there is usually an ambiguity in managing risks. Lukas and Clare (2011) state that in the course of risk management of a project, there are basic mistakes that might affect the organisation and the success of any project undertaken. These mistakes include; Lack of consideration of opportunities, lack of clear definition of causes, events and impact, use of checklists instead of looking for more possible risk events, underestimation of risks impact, the lack of use of 100% probability during the planning of projects, not taking sensitivity of risks in consideration, confusing risks response planning with mitigation, not recognising team members responsibility for certain specific risks, and making RM a one-off activity instead of an on-going process. Table 2 summarises the pitfalls of RM derived from literature.

Table 2: Pitfalls of construction Risks management

S/N	Pitfalls of construction Risks management	Source(s)
1	Risk management practices in construction are 'post mortem'	Ezeabasili *et al*. (2021)
3	Subjective nature and lack of consistency in assessing risks	Scott (2019)
2	Lack of the requisite knowledge on the best tools and techniques	Serpella *et al*. (2014)
4	Effective risks management practice is time-consuming	Scott (2019)
5	Too much time is devoted to assessing and managing risks and this diverts resources from other more profitable ventures	Scott (2019)
6	Ambiguity in managing risks	Reddy (2016)
7	Involves complex calculations that are difficult to do without automated tools	Reddy (2016)
8	Unmanaged losses result from poor scheduling of risks	Reddy (2016)
9	It dependents on external entities	Reddy (2016)
10	Lack of consideration of opportunities	Lukas and Clare (2011)
11	Lack of clear definition of causes, events and impact	Lukas and Clare (2011)
12	Use of checklists and instead of looking for more possible risks events	Lukas and Clare (2011)
13	Underestimation of risks impact	Lukas and Clare (2011)
14	The lack of use of 100% probability during the planning of projects	Lukas and Clare (2011)

15	Not taking sensitivity of risks in considerations	Lukas and Clare (2011)
16	Confusing risks response planning with mitigation	Lukas and Clare (2011)
17	Not recognising team member's responsibility for certain specific risks	Lukas and Clare (2011)
18	Making risk management a one-off activity instead of an ongoing process	Lukas and Clare (2011)

3.0 RESEARCH METHODOLOGY

This study aims to assess the benefits and pitfalls of risk management in construction projects in southeast Nigeria, with Imo state as a case in point. This choice of Imo State is premised on the report of Egwunatum *et al.* (2021) that there are incessant construction project failures and poor construction project performance in the study area. In addition, the government of the day in Imo State have initiated many developmental projects, which have attracted construction professionals and companies alike to Owerri, the state capital of the state. Therefore, a well-structured quantitative questionnaire was adopted to achieve the aim of this study, and data were collected from construction professionals who have the requisite knowledge and experience in risk management of construction projects within the study area. This study followed the approach of related studies (Nnadi, 2016; Adeleke *et al.,* 2016; Ubani *et al*., 2015; Ugwu *et al*., 2019; Ogunbayo, 2014a; Ogunbayo, 2014b; Ijigah *et al*., 2013) in using a survey questionnaire. The sampled professionals (Architects, Builders, Engineers and Quantity Surveyors) were grouped into consultants and contractors. The consultants in most construction projects act on behalf of the client on matters that affect the projects bottom lines. The contractors are also principal actors in ensuring projects are delivered within agreed objectives.

The questionnaire was divided into three sections; the first section gathered data on the respondents' background information. The second section gathered information on the benefits of risk management in construction. The third section gathered information on the drawbacks of risk management in construction. The respondents were asked to rate the assessed variables on the 5-point Likert scale, where 5 represents the highest scale and 1 is the lowest. A detailed literature review obtained the variables used to develop the questionnaire. The study set some criteria for participation and sample selection, and these criteria are; i) the respondents must be knowledgeable and experienced in the subject of this study; ii) they have taken part in RM activities in a construction project, iii) they have spent at least 5 years in practice, and iv) be willing to participate in the survey. This followed the submission of Ogunbayo (2014a), who states that risk analysis requires experienced and knowledgeable professionals to analyse the potential risks and monitor and control project risks from inception to closeout. In addition, the criteria would help ensure that quality and reliable data are collected.

A non-probabilistic snowball sampling technique that relies on referral was adopted in administering the researchers' questionnaire to the participants who met the sampling criteria. There was no special database of construction experts who met the survey criteria; therefore, the sample size could not be determined. After a survey period that lasted for 14 weeks, 128 responses were collected and found useful for the analysis. The collected data were analysed using frequencies, percentages and mean item score (MIS) and Mann–Whitney U-Test. Frequencies and percentages were used to analyse the background information of the respondents. The data gathered on the benefits and pitfalls of Risk management were analysed using MIS. Since the respondents came from different organisational management and had different experience levels, Mann–Whitney U-Test was used to determine if a significant difference exists between the consultants and contractors regarding the ranking of the variables assessed. Spearman rank-order correlation test was used to establish the uniformity in views and the relationship in the strength of the ranking of the consultants and contractors groups. Before these analyses, a reliability test was conducted to determine how reliable and consistent the research instrument was. The reliability test was done using Cronbach's alpha test, and the alpha value obtained was greater than 0.700, as seen in Table 3. The Cronbach's alpha coefficient is greater than 0.70, which is in line with the suggestion of Pallant (2005). The values obtained show that the data are highly reliable and highly consistent. The Entire methodological flow of the study is shown in figure 1.

Table 3 - Reliability evaluation

	Case Processing Summary			Reliability Statistics	
		N	%	Cronbach's Alpha	Number of Items
Cases 1: Benefits of Risk management	Valid	128	100.00	0.764	26
	Excluded[a]	0	0.00		
	Total	128	100.00		
Cases 2:pitfalls of risk management	Valid	128	100.00	0.853	18
	Excluded[a]	0	0.00		
	Total	128	100.00		

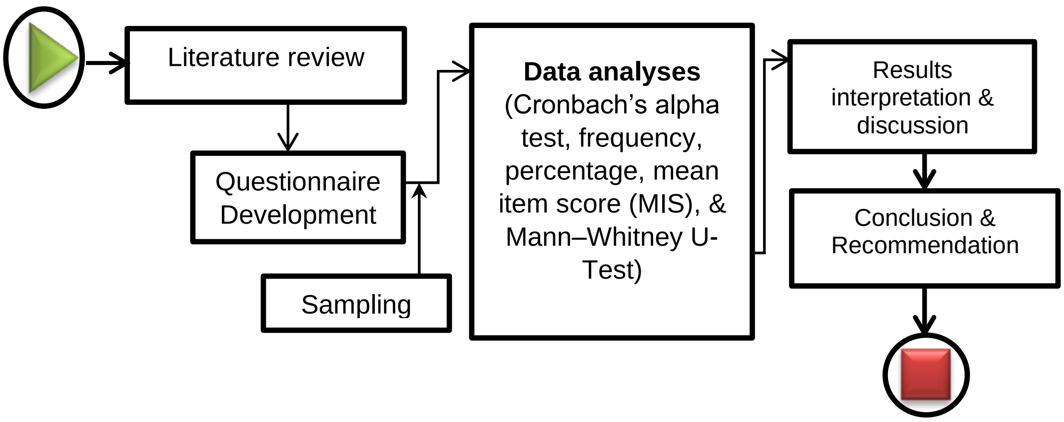

Figure 1: Research methodological flow chart

4.0 RESULTS AND DISCUSSION

4.1 Respondents' background characteristics

Table 4 shows that 36.72% of the respondents work with consultants' organisations, and 63.28% work with contractors' organisations. The professional representations show that Architects are 22.66% of the participants, Builders are 10.16%, Engineers are 39.84%, and Quantity

Surveyors are 27.34%. In addition, 32.03% have 5-10 years working experience, 43.75% have spent 11-15 years, 17.19% have spent 16-20 years, and 7.03% have spent over 20 years in the industry. Furthermore, 7.81% of the respondents have HND as their highest academic qualification, 8.59% have PGD, and 45.31% have B.Sc/B.Tech., 36.72% have MSc./M.Tech., and 1.56% have PhD. The professional status of the respondents shows that 14.06% are fellow members of their various professional bodies, 74.22% are corporate members, and 11.72% are probationer members.

The results in this section showed that the participants are educationally and professionally qualified and have the requisite experience to give reliable information that would aid the subject of this study.

4.2 Level of Risk management practices in construction

From figure 2, the practice of RM in construction ranges between low and moderate. This is evident in the percentage of respondents who indicated the level of practice of RM in their projects. This implies that the RM is not well practised by construction organisations in Nigeria and, by extension, in other developing countries of Africa.

4.3 The benefits of Risk management in construction

Table 5 shows the results of the analysis of the data gathered on the benefits of RM. The top ten (10) benefits of RM, according to the consultants, are; maximisation of opportunities in the business environment (MIS=4.94), Healthier bottom lines (with regards to quality, time and cost, and scope) (MIS=4.79), maximisation of the objectives of the

Table 4: Background information of participants

Category	Classification	Frequency	Per cent
Organisational category	Consultants organisations	47	36.72
	Contractors organisations	81	63.28
	TOTAL	**128**	**100.00**
Profession of respondents	Architect	29	22.66
	Builders	13	10.16
	Engineers	51	39.84
	Quantity Surveyors	35	27.34
	TOTAL	**128**	**100.00**
Years of experience	5 - 10years	41	32.03
	11-15 years	56	43.75
	16-20 years	22	17.19
	Above 20	9	7.03
	TOTAL	**128**	**100.00**
highest Academic Qualification	HND	10	7.81
	PGD	11	8.59
	BSc/Btech	58	45.31
	M.Sc/M.Tech	47	36.72
	PhD	2	1.56
	TOTAL	**128**	**100.00**
Professional membership status	Fellow member	18	14.06
	Corporate member	95	74.22
	Probationer member	15	11.72
	TOTAL	**128**	**100.00**

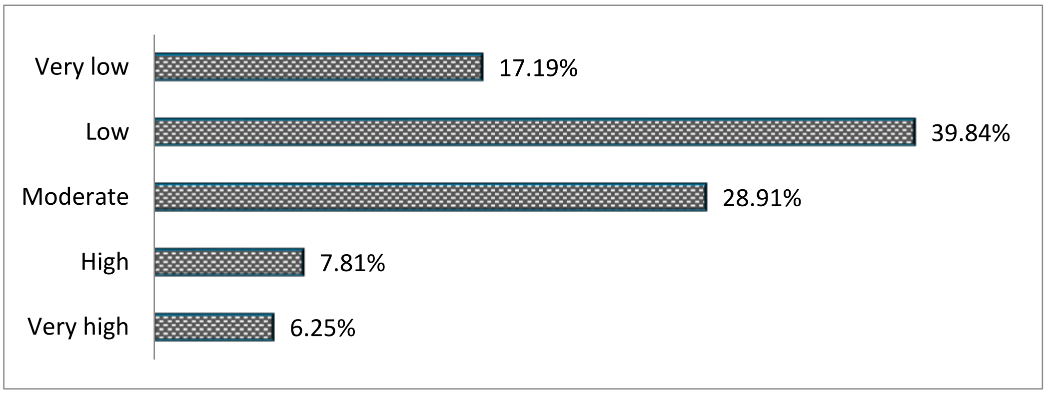

Figure 2: Level of Risk management practices in construction

projects (MIS=4.74), more precise estimates (through reduced uncertainty) (MIS= 4.74), improvement of the reputation of an organisation (MIS=4.72), encouragement of pro-active responses to uncertainties (MIS=4.68), harvesting of new knowledge through documentation of experiences (MIS=4.68), minimisation of surprises (MIS=4.62), improvement of project performance which helps organisations to reposition in competition (MIS=4.62), and reduction of the probability of the occurrence of uncertainties (MIS=4.60). For the contractors, the top ten (10) benefits of RM are; more precise estimate (through reduced uncertainty) (MIS=4.88), maximization of the objectives of the projects (MIS=4.77), minimisation of surprises (MIS=4.75), more customer satisfaction (MIS=4.73), improvement of the reputation of an organisation (MIS=4.69), Healthier bottom lines (with regards to quality, time and cost, and scope) (MIS=4.67), maximisation of opportunities in the business environment, (MIS=4.64), improvement of project performance which helps organisations to reposition in competition (MIS=4.59), better operational consistency and efficiency (MIS=4.59), and improved chances of success (MIS= 4.58).

Overall, the top ten (10) benefits of RM are; more precise estimate (through reduced uncertainty) (MIS=4.83), maximisation of the objectives of the projects (MIS=4.76), maximisation of opportunities in the business environment (MIS=4.75), Healthier bottom lines (with regards to quality, time and cost, and scope) (MIS=4.71), minimisation of surprises (MIS=4.70), improvement of the reputation of an organisation (MIS=4.70), more customer satisfaction (MIS=4.65), encouragement of pro-active responses to uncertainties (MIS=4.61), improvement of project performance which helps organisations to reposition in competition (MIS=4.60) and reduction of the probability of the occurrence of uncertainties (MIS=4.56). However, regardless of the relative ranking of the variables by the respondents, all the variables are important benefits of carrying out risk management in the construction industry of Nigeria. This is premised on the average MIS value of 4.47(89.38%), the maximum MIS of 4.83(96.56%) and the minimum MIS of 4.07 (81.41%).

The findings in the study support what has been reported in extant studies on construction management such as (Renault and Agumba, 2016; Ezeabasili *et al.,* 2021; Ogunbayo, 2014a; Scott, 2019; Michalowicz, 2018; Gabrieyel, 2021). Ezeabasili *et al.*

(2021) reported that the most important benefits of RM are timely completion of projects within the planned budget. The role of RM in meeting project objectives, reducing wastes and losses and opportunities maximisation, and pro-activeness in responding to risk events; was also highlighted. RM put the organisations on alert and not to be surprised by uncertainties. Thus, they are better prepared to handle the occurrence of risks and uncertainties. This was supported by the findings of (Renault and Agumba, 2016; Ogunbayo, 2014a; Scott, 2019).

Mann–Whitney test results in (columns 8 and 9 of Table 5) were meant to determine if any statistical differences exist in the perception of the two groups of respondents. It can be seen that the views of the respondents converged in 24 (92.31%) of the assessed variables. This is because the p-value of these variables is higher than 0.05 significant levels. Furthermore, the ranking patterns of these variables are the same. This implies that no significant statistical difference exists in the perception of the variables by the consultants and contractors group. However, a divergent opinion was observed in the ranking of 2 (7.69%) of the assessed variables, as the significant p-value is lower than 0.05. This, implies a significant statistical difference in the perception of these variables. These variables are; improved management awareness through the communication of project status and progress (MIS= 4.20; Z=-2.023; Sig. =0.043) and harvesting of new knowledge through documentation of experiences (MIS=4.31; Z=-2.625; Sig. =0.009). The different levels of practice of RM in construction by the different organisations could be the reason for this divergent view on these variables.

Table 5: benefits of Risk management in construction

Benefits of Risk management	Overall		Consultants		Contractors		Mann–Whitney	
	MIS	Rank	MIS	Rank	MIS	Rank	Z-Value	Sig.
Reduction of the probability of the occurrence of uncertainties	4.56	10th	4.60	10th	4.54	14th	-1.417	0.156
Maximisation of the objectives of the projects	4.76	2nd	4.74	3rd	4.77	2nd	-0.736	0.462
Identification of formidable alternative courses of action	4.35	17th	4.02	23rd	4.54	14th	-1.791	0.074
More precise estimate (through reduced uncertainty),	4.83	1st	4.74	3rd	4.88	1st	-1.205	0.228
Reduced duplication of effort (through team awareness of risk control action),	4.39	16th	4.55	12th	4.30	22nd	-1.141	0.254
Improved chances of success,	4.34	18th	3.94	24th	4.58	10th	-0.071	0.943
Increased confidence in achieving project objectives,	4.24	22nd	3.91	25th	4.43	17th	-1.625	0.087
Improves decisions on investments	4.48	13th	4.34	21st	4.57	11th	-1.585	0.113
Maximisation of opportunities in the business environment,	4.75	3rd	4.94	1st	4.64	7th	-0.686	0.493
Reduction of claims and disputes,	4.07	26th	4.40	19th	3.88	26th	-0.642	0.521
Healthier bottom lines (with regards to quality, time and cost, and scope)	4.71	4th	4.79	2nd	4.67	6th	-1.590	0.112
Improves safety consciousness of the project.	4.52	12th	4.47	17th	4.56	13th	-0.687	0.492
Better prepared for uncertainties and threats,	4.16	24th	4.55	12th	3.94	25th	-0.290	0.772
Minimisation of surprises,	4.70	5th	4.62	8th	4.75	3rd	-0.744	0.457
Improves the economic fortune and profitability	4.42	15th	4.49	16th	4.38	19th	-0.095	0.924
Decision making is more objective and systematic,	4.48	13th	4.53	14th	4.46	16th	-0.809	0.418

Encourages pro-active responses to uncertainties,	4.61	8th	4.68	6th	4.57	11th	-0.564	0.573
Improves the understanding of risks identifications process,	4.30	21st	4.13	22nd	4.41	18th	-1.392	0.164
Improves management awareness through the communication of project status and progress.	4.20	23rd	4.60	10th	3.96	24th	-2.023	0.043*
Improves data security and protection of resources	4.16	25th	3.85	26th	4.33	20th	-1.354	0.176
Improves project performance which helps organisations to reposition in competition,	4.60	9th	4.62	8th	4.59	8th	-1.035	0.301
Harvesting of new knowledge through documentation of experiences,	4.31	20th	4.68	6th	4.10	23rd	-2.625	0.009*
Risks information provides lessons learned that improves the risk information database	4.33	19th	4.36	20th	4.31	21st	-0.006	0.995
Better operational consistency and efficiency	4.54	11th	4.45	18th	4.59	8th	-0.695	0.487
More customer satisfaction	4.65	7th	4.51	15th	4.73	4th	-1.535	0.125
Improves the reputation of an organisation	4.70	5th	4.72	5th	4.69	5th	-1.049	0.294

*P-value<0.05

4.4 Pitfalls of Risk management

The result of the analysis of the data gathered on the pitfalls of RM is shown in Table 6. From the consultants' point of view, the top five pitfalls of RM in construction are; not recognising team members' responsibility for certain specific risks (MIS=4.87), effective RM is time-consuming (MIS=4.81), making RM a one-off activity instead of an ongoing process (MIS=4.79), subjective nature and lack of consistency in assessing risks (MIS=4.74), and its dependence on external entities (MIS=4.72). On the other hand, the contractors are of the view that the top five pitfalls of RM are; subjective nature and lack of consistency in assessing risks (MIS=4.64), effective RM practice are time-consuming (MIS=4.63), making risk management a one-off activity instead of an ongoing process (MIS=4.53), the lack of use of 100% probability during the planning of projects (MIS=4.51), Risk management practices in construction is ‘post mortem’ (MIS=4.37), and not recognising team members responsibility for certain specific risks (MIS=4.37).

Overall, the top five pitfalls of RM in construction are; effective risks management practice is time-consuming (MIS=4.70), subjective nature and lack of consistency in assessing risks (MIS=4.68), making risk management a one-off activity instead of an ongoing process (MIS=4.63), not recognising team members responsibility for certain specific risks (MIS=4.55), and risk management practices in construction are ‘post mortem’ (MIS=4.45). All the assessed variables are the important pitfalls of RM, and this decision is premised on a maximum MIS of 4.70 (93.91%) and a minimum MIS of 3.95 (78.91%), with an average MIS of 4.34 (86.80%). The findings in this section support what has been reported in the construction management literature (e.g. Ezeabasili *et al*., 2021; Serpella *et al.,* 2014; Lukas and Clare, 2011; Reddy, 2016).

Mann–Whitney test results in (columns 8 and 9 of Table 6) were meant to determine if any statistical differences exist in the perception of the two groups of respondents. It can be seen that the views of the respondents converged in 14 (77.78%) of the assessed variables. The p-value of these variables is higher than 0.05 significant levels.

Furthermore, the ranking patterns of these variables are the same. This implies that no significant statistical difference exists in the perception of the variables by the consultants and contractor groups. However, a divergent opinion was observed in the ranking of 4 (22.22%) of the assessed variables, as the significant p-value is lower than 0.05. This, implies a significant statistical difference in the perception of these variables. These variables are; it dependents on external entities (MIS=4.41; Z=-4.167; Sig.=0.000), Lack of consideration of opportunities (MIS=3.95; Z=-2.105; Sig.=0.035), underestimation of risks impact (MIS=4.03; Z=-3.449; Sig.=0.001), and not recognising team members responsibility for certain specific risks (MIS=4.63; Z=-3.306; Sig.=0.001). The different experiences of the sampled professionals in the different organisations could be the reason for this divergent view on these variables.

Table 6: Pitfalls of Risk management

Pitfalls of Risk management	Overall		Consultants		Contractors		Mann–Whitney	
	MIS	Rank	MIS	Rank	MIS	Rank	Z-Value	Sig.
Risk management practices in construction are 'post mortem'	4.45	5th	4.60	6th	4.37	5th	-2.000	0.052
Subjective nature and lack of consistency in assessing risks	4.68	2nd	4.74	4th	4.64	1st	-0.109	0.913
Lack of the requisite knowledge on the best tools and techniques	4.23	12th	4.06	16th	4.32	9th	-1.248	0.212
Effective risks management practice is time-consuming	4.70	1st	4.81	2nd	4.63	2nd	-0.975	0.330
Too much time is devoted to assessing and managing risks, and this diverts resources from other more profitable ventures	4.22	14th	4.60	6th	4.00	16th	-0.730	0.465
Ambiguity in managing risks	4.20	15th	3.94	17th	4.36	7th	-0.014	0.989
Involves complex calculations that are difficult to do without automated tools	4.10	16th	3.83	18th	4.26	11th	-1.974	0.050
Unmanaged losses result from poor scheduling of risks	4.33	10th	4.34	13th	4.32	9th	-0.184	0.854
It dependents on external entities	4.41	6th	4.72	5th	4.23	13th	-4.167	0.000*
Lack of consideration of opportunities	3.95	18th	4.40	12th	3.68	18th	-2.105	0.035*
Lack of clear definition of causes, events and impact	4.23	12th	4.19	14th	4.25	12th	-1.233	0.215
Use of checklists and instead of looking for more possible risks events	4.39	7th	4.47	11th	4.35	8th	-1.702	0.089
Underestimation of risks impact	4.03	17th	4.55	8th	3.73	17th	-3.449	0.001*
The lack of use of 100% probability during the planning of projects	4.39	7th	4.19	14th	4.51	4th	-0.925	0.355
Not taking sensitivity of risks in considerations	4.30	11th	4.55	8th	4.15	15th	-1.644	0.100
Confusing risks response planning with mitigation	4.34	9th	4.53	10th	4.22	14th	-1.888	0.059
Not recognising team members' responsibility for certain specific risks	4.55	4th	4.87	1st	4.37	5th	-3.306	0.001*
Making risk management a one-off activity instead of an ongoing process	4.63	3rd	4.79	3rd	4.53	3rd	-1.000	0.317

*P-value<0.05

5.0 Conclusion and Recommendations

This study aimed to determine the benefits and pitfalls of risk management in construction projects in southeast Nigeria, focusing on Imo State. The survey questionnaire was administered to construction professionals in consulting and contracting organisations using snowball sampling techniques to aid data collection. Conclusions were drawn based on the critical findings of this study.

The study found that even though the practice of RM is low, construction experts still recognise its usefulness. The top benefits of Risk management in construction are; more precise estimate (through reduced uncertainty), maximisation of the objectives of the projects, maximisation of opportunities in the business environment, Healthier bottom lines (with regards to quality, time and cost, and scope), minimisation of surprises, improvement of the reputation of an organisation, more customer satisfaction, encouragement of pro-active responses to uncertainties, improvement of project performance which helps organisations to reposition in competition, and reduction of the probability of the occurrence of uncertainties. Also, the major pitfalls of RM in construction are; effective risk management practice is time-consuming; subjective nature and lack of consistency in assessing risks; making risk management a one-off activity instead of an ongoing process; and not recognising team members' responsibility for certain specific risks; and risk management practices in construction are 'post mortem'.

Construction organisations should practise effective RM, and every construction industry expert should know the risks. This would ensure that the full benefits of RM are enjoyed in the execution of construction projects and the running of construction companies. This is critical for effective delivery and meeting of project objectives. The pitfalls should be overcome or avoided through education, training, or workshops on RM. This should be organised by the various professional bodies to ensure that their members, regardless of status, gain adequate knowledge of the various tools and techniques for effective risk analysis and assessment.

This study may have been carried out in Nigeria, but the outcome is useful in other developing countries of Africa with similar construction environments. Construction project managers and other management staff of construction companies should see RM as critical to the success of construction projects, especially through meeting baseline targets, reducing waste and improving safety performance records. Reducing surprises, improving organisational reputation, and competitive advantage should be the focus of project managers, in addition to having eyes on the project baselines. The enormous benefits of RM reported in this study should serve as a pointer to the need to take RM very seriously during construction projects. This study shouldl be useful to project managers, construction organisations, Quantity Surveyors, and estimators in the built environment in their quest to build up accuracy and fair estimates of work items. RM ensures all the risk elements are priced and captured in construction works' estimates. This study should also add to the existing body of knowledge on Risk management in developing countries. The sample size, sampling techniques, analysis method, and geographical location of this study limits this study. Therefore consideration of these limitations should be made when generalising the findings of this study. On this premise, a similar study is advocated in other states or regions of Nigeria or other developing nations of Africa and beyond. A case study is recommended where empirical data could be obtained on the actual cost, time and quality benefits of risk management could be ascertained.

REFERENCES

Adeleke, A.Q., Bahaudin,A.Y., and Kamaruddeen, A. M. (2015). Level Of Risk Management Practice In Nigeria Construction Industry- From A Knowledge Based Approach. Journal of Management, Marketing and Logistics – (JMML), 2(1), 12-23. DOI: 10.17261/Pressacademia.2015111601

Adeleke, A.Q., Nasidi, Y., and Bamgbade, J.A. (2016). Assessing the Extent of Effective Construction Risk Management in Nigerian Construction Companies. Journal of Advanced Research in Business and Management Studies, 3(1), 1-10

Aibinu, A. A., and Henry, A.O. (2006). Construction delays and their causative factors in Nigeria. Journal of construction engineering and management 132, no. 7 (2006): 667-677.

Akintoye, A. S., and MacLeod, M. J. (1997). Risk analysis and management in construction. International Journal of Project Management, 15(1), 31-8.

Axelerate (2021). 10 Benefits of Project Risk Management. https://www.axelerate.com/post/10-benefits-of-project-risk-management

Bahamid, R.A., and Doh, S.I. (2017). A review of risk management process in construction projects of developing countries. IOP Conf. Series: Materials Science and Engineering 271 (2017) 012042. doi:10.1088/1757-899X/271/1/012042

Bayraktar, O.Y. (2020). Risk management in construction sector. World Journal of Advanced Research and Reviews, 08 (02), 237–243

Dada, J. O. and Jagboro, G. O. (2007). On an evaluation of the impact of risk on project cost overrun in the Nigerian construction industry, Journal of Financial Management of Property and Construction, 12 (1), 37-44.

Egwunatum, S.I., Anumudu, A.C., Eze, E.C., and Awodele, I.A. (2021).Total Quality Management (TQM) Implementation in the Nigerian Construction Industry. Engineering, Construction and Architectural Management (ECAM). DOI 10.1108/ECAM-08-2020-0639

Eze,C.E., Awodele, I. A., Adegboyega, A. A., Onyeagam, O.P. and Guto, J.A. (2020). Assessment of the Triggers of Inefficient Materials Management Practices by Construction SMEs in Nigeria. International Journal of Real Estate Studies(INTREST), 14(1), 38-56

Eze,E., Sofolahan, O., Ugulu, R., and Nwankwo, L. (2021). Influence of construction SMEs characteristics on Health and Safety (H&S) deviance normalisation in Abuja, Nigeria. Construction and Human Settlements Management Journal (CHSMJ), 1(1),17-43.

Ezeabasili, A.C.C., Dim, N. U. , Ezeabasili, C.A.C., and Obiefuna, J. J. (2021). The Identification of Risks and its Criticality in the Nigerian Construction Industry. International Journal of Engineering and Management Research, 11(1),58-62.https://doi.org/10.31033/ijemr.11.1.9.

Gabrieyel, J. (2021). 7 Key Elements of a Construction Risk Management Plan: Manage Your Project Risks. Available at: https://www.jonasconstruction.com/blog/construction-risk-management-plan/

Grange Insurance (2021). The importance of construction risk management. Available at: https://www.grangeinsurance.com/tips/construction-risk-management

Gulam, M. U.D.R. (2018). Risk Management in Construction Projects. The International Journal of Engineering and Science (IJES),7(12),56-62.DOI: 10.9790/1813-0712015662

Humphreys, K.K. (2008). project risk management - advantages and pitfalls. Available at: http://www.icoste.org/ICMJ%20Papers/Humphreys-Slovenia.pdf

Ijigah, E.A., Jimoh, R.A., Bilau, A.A., and Agbo, A.E. (2013). Assessment of Risk Management Practices in Nigerian Construction Industry: Toward Establishing Risk Management Index. International Journal of Pure and Applied Sciences and Technology,16 (2), 20-31

Lukas, J. A. and Clare, R. (2011). Top 10 mistakes made in managing project risks. Paper presented at PMI® Global Congress 2011—North America, Dallas, TX. Newtown Square, PA: Project Management Institute. Available at: https://www.pmi.org/learning/library/mistakes-made-managing-project-risks-6239

Marine Agency Insurance (2021). Reasons Why Every Company Is in Need of a Risk Management Plan. Available at: https://marineagency.com/reasons-why-every-company-should-implement-a-risk-management-plan/

Michalowicz, M. (2018). 5 Hidden Benefits of Risk Management Planning. Available at: https://www.americanexpress.com/en-us/business/trends-and-insights/articles/5-hidden-benefits-of-risk-management-planning/

Nnadi, E.O.E. (2016). Risk Management; Key to Successful Project Delivery in Nigeria. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 13(3), 21-26.DOI: 10.9790/1684-1303032126.

Odeyinka, H.A., Lowa, J.G., and Kaka, A. (2008). On an evaluation of risks factors impacting construction cash flow forecast, Journal of Financial Management of Property and Construction, 13 (1), 5-17.

Odeyinka, H.A., Oladapo, A.A., and Dada, J.O. (2004). An Assessment of Risk in Construction in the Nigerian Construction Industry.Available at: https://www.researchgate.net/publication/249643925_An_Assessment_of_Risk_in_Construction_in_the_Nigerian_Construction_Industry

Ogunbayo, O.M. (2014a). Assessment of Risk Analysis Processes In the Nigerian Construction Industry: Contractors' and Project Managers' Views. International Journal of Advancements in Research & Technology, 3(11), 36-42.

Ogunbayo, O.M. (2014b). An Assessment of Types of Risks in the Nigerian Construction Industry: Project Managers' and Contractors' Perspectives. International Journal of Scientific & Engineering Research, 5(11),1105-1111

Ojo, G.K. (2010). On an assessment of the construction site risk-related factors, The 40th Annual General Meeting/ Conference of the Nigeria Institute of Building(NIOB), Asaba, Delta State, July 7-11.

Pallant, J. (2005). SPSS Survival Manual: A Step By Step Guide to Data Analysis Using SPSS for Windows (Version 12)., (2nd ed.). Allen and Unwin, Crows Nest NSW 2065

Perry, J. G., and Hayes, R. W. (1985). Risk and its management in construction projects. Proceedings of the Institution of Civil Engineers, 78(3), 499-521.

Rad, K.M., and Yamini, O.A. (2017). The Importance and Use of Risk Management in Various Stages of Construction Projects Life Cycle (PLC). Modern Applied Science, 11(1), 48-54. doi:10.5539/mas.v11n1p48

Reddy, C. (2016). What is Risk Management: Advantages and Disadvantages. Available at:https://content.wisestep.com/advantage-disadvantage-risk-management/

Renault, B.Y., and Agumba, J.N. (2016). Risk management in the construction industry: a new literature review. MATEC Web of Conferences, 66, 00008 (2016). DOI: 10.1051/matecconf/20166

Schieg, M. (2006). Risk Management In Construction Project Management. Journal of Business Economics and Management, VII (2), 77–83

Scott, R. (2019). Risk Management: Objectives, Advantages And Disadvantages. Available at: http://processnews.blogspot.com/2019/06/risk-management-objectives-advantages-and-disadvantages.html

Sebastian, O .U., Francis, O. O., and Charity, E. D . U. (2018). A Review of Application of Risk Management Techniques in Costing and Evaluating Construction Work Projects in Nigeria: A Mathematical Analysis Approach. Current Investigations in Agriculture and Current Research, 5(4), 689-696. DOI: 10.32474/CIACR.2018.05.000216.

Serpella, A.F., Ferrada, X., Howard,R., and Rubio, (2014). Risk management in construction projects: a knowledge-based Approach. Procedia - Social and Behavioral Sciences, 119 (2014), 653 – 662

Szymanski, P. (2017). Risk management in construction projects. Procedia Engineering, 208 (2017) 174–182.

Thompson, J. A. (1992). A Guide to Project Risk Analysis and Assessment: Implications for Project Clients and Project Managers. An ESRC Project Report. Engineering Construction Risk.

Ubani, E. C., Amade, B., Okorocha, K.A., and Agwu, F. O. (2015). Project Risk Management Issues in the Nigerian Construction Industry. International Journal of Engineering and Technical Research (IJETR), 3(1), 217-232.

Ugwu, M. C., Osunsanmi, T.O., and Aigbavboa, C.O. (2019). Evaluation of Risk Management Practice in the Nigeria Construction Industry. Conference on Modular and Offsite construction, May 21-24, Banff, AA, Canada.

Windapo, A.O., Omeife, C., and Wahap, L. A. (2010). On stakeholders perception of key risks in oil and gas construction projects, 40th Annual General Meeting/Conference of the Nigeria Institute of Building (NIOB), Asaba, Delta State, July 7-11.

Factors influencing women's participation in leadership positions in the Nigerian construction industry- Women Quantity Surveyors scenario

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Abstract

Leadership is very important to a construction organisation, just like any other organisation. Men are leaders by default; hence women are not generally encouraged to participate in leadership. This paper examines factors influencing women Quantity Surveyors' (QSs) participation in leadership positions in the Nigerian Construction Industry and proposes ways to encourage more women to take up leadership positions. This study used a questionnaire survey to collect information purposively from women QSs in leadership positions and their subordinates. Three hundred and thirty nine (339) questionnaires were administered to Quantity Surveying Firms in Lagos and Abuja. A total of 211 questionnaires, making 62.2% were returned and analysed. Mean scores, mean, Man Whitney U-Test, and factor analysis were used to tatitistically analyse the results. The results show that that the perception of subordinates, educational status and leadership styles are the factors that most influence women-Quantity Surveyors' (QSs) participation in leadership positions. These factors were ranked 1st, 2nd and 3rd overall with mean scores of 3.79, 3.78 and 3.76, respectively. Furthermore, the Man Whitney U-Test results showed that educational status, an expectation of seeing women displaying a high level of energy and support from subordinates and peers, ranked first to third in the leaders' opinions. In contrast, perception of the subordinates' leadership styles and work-family issues ranked first to third in the subordinates' opinions. The factor analysis results showed seven components with a total variance of 73.254%. The components are a stereotypic factor, social factor, tribe/religion-factor, family issue-factor, subordinates-factors and physical fitness. Stereotypic-factor had ten items with the highest total variance of 39.250%. Therefore the paper recommends, among others, that traditional beliefs and age-long barriers against women in leadership positions should be discouraged; likewise, subordinates and peers should give maximum support to women QSs in leadership positions. Also, women QSs should enhance their leadership status with the necessary educational and leadership training.

KEYWORDS: *Women, leadership, Quantity Surveyors, factors*.

1.0 Introduction.

Leadership is critical to any organisation. Good leadership is essential for an organisation to achieve its goal and improve productivity. Leadership is the art of influencing others to achieve desired results (Robin and Coulter, 2010). Leadership involves making sound and difficult decisions, creating and articulating a clear vision and establishing achievable goals. Leadership is the heartbeat of

any organisation to achieve its goals (Fatokun *et al*., 2010).
Meanwhile, bad leadership does not lead to leaders' failure alone but negatively affects the organisation, specifically the construction industry (Boullouta, 2012). Negative effects include time and cost overrun in project delivery, problems with the human relationship between owners' workers and subordinates, abandonment, and poor-quality jobs. It has been argued that gender diversity can be a source of competitive advantage to reduce some of these negative effects on the construction industry (CI) through maximum participation of women in the CI and leadership (Jimoh *et al*., 2016). Furthermore, the study of leadership is inconclusive without mentioning "gender". The word gender literarily should mean both males and females, but culturally and socially, males are leaders by default (Adegoke *et al*., 2022; Maryam *et al*., 2021). However, Eswaran (2019) argued that equal opportunity should be accorded to both males and females to enhance their leadership horizons. The situation is not all that different in the CI, where it was almost believed that the industry is mostly meant for men and this is evident in the population of males the organisations compared with women (Ares-Molina *et al.,* 2019). It is therefore imperative to examine the factors influencing the participation of women in leadership positions in the construction industry with reference to quantity surveying.

Women leadership is defined as the possibility of women being a leader (Lathi, 2013). It is also viewed as feminine characteristics enhancing the performance of an organisation (Warkula, 2018). Leadership is the backbone of every organisation (Adegoke *et al*., 2022); furthermore, Ayangade *et al*. (2018) emphasised that leadership is necessary where groups of people work for a common goal, hence the need for leadership in the construction organisations. Ayangade *et al*. (2018) further stressed that leadership is a process of influencing others. On the other hand, the construction organisation comprises groups of people who must be influenced toward achieving the set goals. Group of people such as professionals, contractors, site workers, manufacturers of construction materials, etc., all these groups are working towards the goal of delivering construction projects enhancing the value of the environment with infrastructure. However, evidence from the literature indicates that women are few in the leadership positions of the CI, which is of enormous benefit to the growth and development of a nation (Adogbo *et al*., 2015; CITB, 2016, Jimoh *et al*., 2018). In addition, the significance of construction organisations as a tool for nation development was further stressed by Thurairajah *et al*. (2016). Construction organisations and their products contribute positively to the national economy and a nation's development (Aretoulis, 2018). Construction organisations in the context of this paper are classified into construction firms, consultancy firms, product services, construction sites and client organisations; all were not, in a few measures contributing to the nation's development. Also, Quantity surveying firms specifically referenced under discussion in this paper fall under consultancy in the construction industry. Likewise, the client organisations, which can be regarded as tertiary institutions, ministries, and local governments, are also contributors; however, women are few in all these sections of the construction organisations. The COs are assumed to be male-dominated, and leadership is the male norm, the presence of women in the organisations is seen as contradicting the norm, therefore, leading to minimal females in the management as established in much literature (Ayman and Korabik, 2010; CITB, 2016; Lombardi, 2017; Warnakula, 2018; Ares-Molina *et al*. 2019; Hamadah, 2021) to mention a few.

Furthermore, women are marginalised within the organisation and in the organisational hierarchy, which is slanted toward one direction (Shamungam *et al*. 2006). Labour Force Survey Spring (ONS, 2013) reinforced that there are more women in health and social workers than in construction. Women tend to be more concentrated in health, social work, and education than men, while 90% of men were found in construction work. It was further stressed that about 60% of women are in the leadership position of health care provider services; 40-59% in insurance; 20-39% in food services; industrial manufacturing, while less than 20% were recorded for COs and 1/4 in higher education (Maki, 2015). When gender is considered, physical strength is typically the only gender difference the COs recognise (Wangle, 2009). This could be attributed to why more men are found in the organisations, especially on construction sites. Also, the bias of the leadership theory of great man possibly contributed to this. The theory of the great man, where leadership is acclaimed as men's property, imagines leadership as physical power, strength and authority (Klenke, 96; Warnakula, 2018). These scenarios gave the conclusion that men dominated COs. In addition, women were discovered to be an added advantage to organisations that operate as leaders. For instance, the study of Boatman *et al*. (2011) established that the involvement of women at the senior level in an organisation makes an organisation perform better. This assertion also buttressed that women in the leadership of any organisation assist in contributing new ideas because women are innovative and affirmed that women should be seen beyond gender but as one of the business strategies that enhance business (Moodley, 2012; Wittenberg - Cox and Maitland, 2012; Yang and Wang, 2013).

Women engineers are segregated not only horizontally-mainly engaged in civil, production and safety, agricultural, forestry, livestock, electronics, and chemical engineering but also vertically, not managing to reach the top of hierarchies (Marques, 2010; Tadim, 2011; Fernando *et al*., 2014). A survey from the United States of America indicated that at that time, more women were graduating from high school, but the effect of this on the representation of women in the management and leadership positions was contradicting (Hamadah, 2021). Women were also discovered to constitute half of the workforce; however, less than 10% were in executive positions of the organisations. The possibility of complementing men is obvious, but there have been barriers to women getting to the top as leaders in an organisation. In recent times, the barrier of the glass ceiling was established; in professional culture and the workplace (Marques, 2010); other times, the barriers are unconscious bias that women cannot lead where men are, and those women cannot succeed as leaders, where men are, ought to take up the responsibilities of leadership (Kolb, 2013).

2.0 Statement of Research Problem

Leadership is needed in the construction industry (CI), which is expected to be assumed by males or females. However, there have been records of underrepresentation of women in the leadership of the CI (Shamungam *et al*., 2006; Othman and Jaafar, 2013; CITB, 2016) and neglect in the research of leadership by women (Warnakula 2018; Adegoke *et al.*, 2022). However, the study of Hamadah (2021) established that women are not doing badly in education, medicine, and politics in Saudi Arabia but are still not well represented in leadership. Therefore, it is imperative to examine factors influencing participation of women leadership, that is, the factors enhancing or limiting women's leadership. This journal paper empirically reflects on the women's leadership in the CI and factors influencing women's participation in leadership positions in the construction industry to increase their participation in the leadership as proposed in the Hampton-Alexander Review (2016).

3.0. Factors Influencing Women's Participation in Leadership

Few researchers have concentrated on women's inability to obtain executive positions (Kirsch, 2017). The arguments in the literature showed some supporting factors and some against women aspiring to leadership positions. For instance, the study by Warnakula (2018) discovered that personal/psychological barriers, traditional roles, selection hiring promotion procedures, structural/systemic organisation, glass ceiling barriers, socio-economic and cultural barriers are factors constituting barriers to women leadership; cultural and religious issues (Al- Sudahir, 2017; Hamadah (2021). among which are the perception of subordinates, lack of role models, women own attitudes. These are further discussed below.

3.1 Perception of subordinates

Some subordinates perceived that women could not be effective in leadership hence the low representation of women in the leadership positions. Some subordinates also do not see women as leaders who can exercise authority, while some male colleagues of women in leadership may not want to take responsibility to avoid relationship problems and discriminatory attitudes (Lombard, 2017). Stereotypical masculine behaviour believes that men's nature (masculine) is needed for effective leadership and that because not all women can display masculinity may be an additional reason why subordinates, especially males, may not want to cooperate with women in leadership. The stereotypic factor is the general perception that further contributed to the low representation of women in leadership positions (Hodges, 2017). So, it is assumed that masculine behaviour is necessary for a woman to perform effectively as a leader. However, the multi-tasking nature of women as household managers, taking care of children and pursuing private careers gave them a unique advantage in leadership roles over men. Salahuddin (2015) corroborated the multi-tasking responsibilities and caring of women as girls, wives and mothers.

3.2 Lack of Role Model

It is suggested that women cannot see a clear role model in the industry. Integrity and openness to change as leadership qualities could make a difference in encouraging more women in the leadership of the construction industry (CIOB, 2013). In addition to role models in the industry, mentoring was also established as a helpful instrument to encourage women into leadership positions and advance their career progression (Heiskanen, 2013). Mentoring should probably be more productive if women are strictly involved in mentoring women. Lack of role models hinders women from aspiring for leadership positions (Makinsey, 2009; GitalPael and Buitin, 2013), and there have not been enough good women role models, according to Ely *et al*. (2011). This is due to the opinions of Elmuti *et al*. (2009) that women are more emotional and not as skilled at problem-solving and probably because of the risk of sexual harassment. However, this might not be supported generally; though women are more emotional, they are skilled at problem-solving because of their multiple-tasking role and moral standard.

3.3. Women's Attitudes

The study of Talouselämä (2013) noted that women's attitudes were established as a factor that can influence women negatively in the position of leadership. Some women lack confidence (Robinson and Stuberrud, 2011) and self-will to aspire to leadership positions. At times the fear of failure suppresses women's aspiration to leadership; sometimes, it may be the inability to take risks. However, this assertion is not only identified with women alone, as some men will not want to be a leader either. Some women may not want to go through the rigours of becoming leaders which is why a few women are in leadership positions. At times, it may be due to self-under-rating of skill, lack of confidence, fear of failure, self-doubt (Teague, 2015), lack of faith in their abilities, or the traditional norm of seeing men as leaders by default. This norm can discourage women to aspire to become leaders as they would not want society to see them as irresponsible. The attitudes can also be positive when some women are determined to become leaders, as self-determination propels women into leadership positions (Maryam *et al*. 2022)

3.4 Building Network

Building networks can enhance women's opportunities to leadership positions (Ely *et al*., 2011; Lussier and Achua, 2013). Women are affirmed to be good in interpersonal relationships; therefore, they are expected to build relationships and know people that matter. Network building has been confirmed to be a carrier booster that can help widen influence, power and recognition. Networking is highly important for any leader, but even more so for women. Networking allows people to share experiences and knowledge and even support each other. There are both female and male-based networks and "mixed" networks. Often, having a diverse network of women and men is seen as more beneficial as it brings more different perspectives (Teague, 2015). Goethals and Hoyt (2017) buttressed the fact that there are organisations that provide the opportunity to enhance leadership skills, and it is imperative for females anticipating leadership roles to network with such that promote leadership skills.

3.5 Discrimination

Sex discrimination and other discriminating practices like the glass ceiling, glass door, stereotyping and prejudice make many women lose their drive and morale for leadership. The glass ceiling is where women are hindered from progressing beyond a certain level due to gender discrimination. On the other hand, glass door prevents women from getting an appointment in an organisation so as to prevent them from becoming leaders (Salahuddin, 2015). Lathi (2013) likewise affirmed that stereotyping hinders change and reduces women's chances of becoming leaders. Leadership style is another factor influencing women into leadership positions.

3.6 Leadership style

Leadership style is a behaviour associated with a leader. Men leaders are task-oriented, while women are socially constructed as leaders (Lathi, 2013). In a circumstance where the main priority of an organisation is to achieve the task at hand, this may not allow women to become leaders and vice versa. Women becoming leaders may at times be influenced by good organisational governance and management practices (Sandberg, 2013). Good governance and organisational management practices reflected in the selection of leaders should be by competence and merit, not traditional norms. Some organisations encourage gender diversity in the composition of their organisational leadership because of global demands and logicality and not because they are willing to do so. It was also established that women's personalities are not different (Kirsch, 2018), whereas all women cannot be the same, a specific personality attached to an individual makes her unique. Some women who reject the traditional roles of women as only caregivers and gatherers of fruits have to break the shell to assume leadership roles as men their counterparts.

3.7 Stereotyping

The study of Lathi (2013) affirmed that stereotyping is a major barrier to women's advancement in their chosen carrier. The study states that stereotyping drag changes slowly, affecting the traditional norm that restricts women from aspiring to leadership positions. Other studies like Sandberg (2013) bolstered the traditional belief that women work less than men, earn less and have less demand in higher positions. This traditional belief has, in one way or the other, become a societal belief which greatly influences both the organisations and individual behaviours, especially women. Societal factors are indirect factors which influence both organisational and individual behaviour. Society sets standards, expectations and customs for organisations and individuals, thus affecting women's leadership. Societal factors are the knottiest issue and time-consuming element to change. The traditional gender roles likewise slow down women's career progression.

3.8 Education

Education may influence women into positions of leadership. Getting the right academic qualifications that match the pursuit of higher positions is very important (Kallio, 2013). Intellectual and technical skills in the construction industry can enhance women's leadership positions. Several studies favour women (DeFrank-Cole *et al*., 2014; Diehl, 2015; Gallant, 2014), and attest to that women attain academic education more than men. Litigations and abandonment of construction projects are rampant in the construction organisations, and the root course majorly is monetary issues between the participants, especially contractors and the clients. The role quantity surveyors play in the finance and construction process makes them expert witnesses in arbitration. Therefore, women in quantity surveying professions should, in addition to academic knowledge, acquire knowledge on the ability to solve problems, work in groups and have the skills in interpersonal relations.

Lathi (2013) reported that women's high education level in Finland had been described as the "engine of the silent revolution". The study further stressed that employers need workers with intellectual skills, willingness to learn, and analytical thinking skills. However, to fulfil the employment opportunities in the construction organisations of this study area, women should also meet the admission criteria that the organisations require. The higher the education level, the more opportunities to get a job, thus increasing the number of women in the organisations. Therefore, it is expected of women to organise them and be at the top of every job specification and various skills that employers require to acquire knowledge that is needed by the construction organisations generally and the quantity surveying profession. This will increase the number of women in organisations equivalent to men and accord them opportunities to hold higher leadership positions.

3.9 Business Culture /Organisational Culture

Business culture may influence women emerging as leaders of any organisation. The expectations, beliefs, and values that the leader practices are known as business or organisational culture. The leader's core values affect employees' attitudes, operations, and the organisation's general nature and culture (Lussier and Achua, 2013). The study stressed further that culture could be feminine or masculine, individualistic or collectivistic or low or high-performing cultures. There are many variations in the cultures of organisations that reflect the core value of the leaders and the operations. Construction organisations comprised of construction firms, consultancy firms, construction materials product services, academia and client representatives can be small, large, local, or global and operate in different ways, which may be called culture. The construction organisations currently and generally are male-dominated, but organisational culture may change. The change in the organisation results from new trends, changes in the business world, global competitiveness, or a change of leader. Hence the need for clamouring for women in the leadership positions of the construction organisations to change the original culture of male dominance and leadership positions.

The organisation's culture was reported to have a strong effect on the organisation's performance and people. According to the Corporate Gender Gap Report (CGGR) (2010), masculine/patriarchal corporate culture is the main barrier for women in senior management in Finland. The study also discovered that many Finnish companies still preferred men's way of leading and performance. The same opinions of Finish companies still hold in this research study area, which discourages women aspiring for leadership positions. Also, Elmuti *et al*. (2009) also opined that organisational barriers known as organisational-level factors can also affect the employment and promotion of men and women in the organisations.

Furthermore, there are other peculiarities of the construction industry apart from being male-dominated. These characteristics and environments displayed by the industry placed women at a disadvantage from their male counterparts. Such characteristics include working long hours throughout the week, including weekends, changing work locations due to available construction sites at hand and travelling from time to time

(Mariska *et al*. 2017). Though compliance with all these customs by women may threaten their families, noncompliance can negatively impact promotion prospects and job security. The expectation is that the construction industry will treat women's family life in conjunction with work. However, unfortunately, they are treating them separately, hindering women from advancing in their professional careers as professionals in the industry and making many women lose interest in managerial positions. In contrast, Finland was the number one country regarding flexible working hours, yet other countries with fewer opportunities for flexible working hours perform better when it comes to women's managerial positions (Grant Thornton International Report, 2015). Therefore, it can be deduced that flexible working hours do not always help women move to managerial and leadership positions.

3.10. Cronyism

Cronyism negatively influences women aspiring to leadership positions in any organisation (Heiskanen, 2013). Cronyism was described as favouritism resulting from a relationship that exists either as friends orally but, in this case, as men. This can be linked to a situation between men in Finland where masculinity in leadership is still preferred over feminists in leadership (Lathi, 2013). In summary, aside from the factors that positively or negatively influence women to aspire to leadership positions in an organisation discussed so far, the employers of labour, customers and clients in the construction context are more interested in cost minimisations, profit maximisation, quality products and services, provision of a new market, avoidance, or reduction of litigation to the barest minimum, among others. However, some studies have found that women are good at interpersonal relations and team building; therefore, there is a need to have more women in leadership positions to meet the demands of employers, customers and clients. In addition, women possess social skills, are good at social interaction and informal communication, accept differences, are multi-skilled and excel in team spirit (English and Hay, 2015). A sense of isolation is another reason for high defections, with women having almost no chance of meeting other women working in the industry and lacking the support they need.

4.0. Research Method

This paper focused on the factors influencing the participation of women in a leadership positions in the construction industry with a specific reference to women quantity surveyors. In this context, this paper aims to examine the literature relating to the factors that can encourage or discourage the participation of women in leadership positions within the construction sector. The contents of the questionnaire were related to the factors influencing the participation of women in leadership in the construction industry. Data for this study were collected through a structured questionnaire survey administered to Women Quantity Surveyors (WQS) and their subordinates in Quantity Surveying Firms (QSFs) in Lagos and Abuja. The research is limited to Lagos State and Abuja because the majority of QSFs are concentrated in the two locations because 75% of the QS firms were reportedly located or having their head offices in Lagos State. In addition, the structure of QSFs in these two locations is more elitist, comprehensive and well organised. The questionnaires were distributed personally and with the help of an assistant researcher who happened to be a graduate of the quantity surveying profession engaged during this research. Two types of Questionnaires were distributed, Type A for the leaders and Type B for the subordinates.

The leaders for Type A in this paper are women quantity surveyors in the leadership positions in this category: Owners of quantity surveying firms, chief executives, principal partners; senior partners; senior quantity surveyors or quantity surveyors who have occupied the position of construction managers; project managers; site supervisors; fellows of NIQS and professors. Type B was administered to subordinates; both males and females who are also quantity surveyors (Registered or Not registered) who have been working under the categorised women quantity surveyors' leadership for nothing less than five years. The questions were asked on a 5-point Likert scale, with five being the highest of the ratings while one is the lowest. Purposive sampling was used to select the QSFs based on firms with female QSs in leadership positions. Also, purposive and convenience sampling methods were employed in distributing the questionnaires to both women QS in leadership positions and the subordinates who are qualified and willing to be included in the survey. Out of 178 active QSFs (QSRBN, 2020), 94 in Lagos and 84 in Abuja, 63 and 50 QSFs, in Lagos and Abuja, respectively, qualified to be included in the survey making a total of 113 QSFs (See details in Table 1). Therefore, 113 type A questionnaires were distributed, that is, one questionnaire to each firm, but 77 were returned filled, which is 68%. It is expected that two numbers of type B questionnaires should be distributed to each of the firms accounting for a total number of 226 questionnaires, but 134 were returned filled, 59% (See details in Table 1). Therefore, a total of 339 questionnaires (Type A & Type B) were distributed for this study and a total of 211 were returned filled and used in this study which is a 62% rate of return. The details of the rate of responses and total responses are shown in Tables 1 and 2, respectively

Table 1: Rate of Responses

Location	No of QSFs	Leaders			Subordinates		
		No. of qualified QSFs/ Distributed	No Returned	%	No Distributed	No Returned	%
Lagos	94	63	48	76	126	83	66
Abuja	84	50	29	58	100	51	51
Total	178	113	77	68	226	134	59

Table 2: Total Responses

Respondents	Lagos	Abuja	Total
Leaders	48	29	77
Subordinates	83	51	134
Total	131	80	211

5.0 Reliability Analysis

A reliability test was conducted for the scales using Cronbach's alpha. Table 4 shows the results of KMO and Bartlett's to determine the data's adequacy and suitability prior to carrying out factor analysis via principal components analysis extraction method (varimax rotations). KMO test indicates that the data is adequate for factor analysis, being 0.854, while Bartlett's Test of sphericity is also significant (0.000), indicating that the data is suitable. Based on those mentioned earlier, the data upon which factor analysis was carried out in this study is not only adequate but also suitable.

6.0 Data Analysis

The data were presented in tables and analysed through Statistical Package for Social Sciences (SPSS) version 26.0 using the mean score, standard deviations, Manny-Whitney U test and factor analysis.

6.1 Results and Discussion

The results from the data analysis, as presented in Table 3, revealed that perception of subordinates, educational status and leadership style ranked first to third as the factors that most influence the participation of women in leadership positions. The mean, standard deviation and p-significant values were (3.79, 0.96, 0.666), (3.78, 1.02, 0.015) and (3.76, 1.009, 0.703) respectively. The perception of subordinates ranked first because of the premonition that leadership does not come to play without the subordinates; leadership exists where there is a "group(s)" in the same 'ship' with a common goal or aim. Also, the result is in tandem with the view of Lombardi (2017), where the attitudes or perceptions of the subordinates were noted as one of the factors that can boost or reduce women's participation in leadership. A situation where women are accepted as leaders by their subordinates or male colleagues will encourage women to develop an interest in leadership. It was also discovered that educational status is also one of the factors that can assist in increasing the number of women in leadership; education is a silent revolution (Kallio, 2013) and a booster to leadership positions. There is a positive testimony in the literature on the issue of education and women, where it was established that women are not doing badly in education (Harmdah, 2021). Women were established not to be doing badly in education, social services and government; therefore, this is an added advantage for women to play leadership roles (Maden, 2011).

On the other hand, weight, height and tribe ranked least of the factors that influence participation of women in leadership, the weight having ranked 30th position (2.87, 0.98, 0. 967). This indicates that body weights, height and tribe of women do not influence whether to participate in leadership or not. The results of the Mann-Whitney likewise show the opinions of the leaders and the subordinates where in the opinions of the leaders' educational status, an expectation of seeing women displaying a high level of energy and level of support and cooperation from peers and subordinates ranked first to third as the most influential factors in the participation of women in the leadership positions.

In contrast, in the opinions of the subordinates, perceptions of subordinates, leadership styles, and work-family issues ranked first to third positions. The common line here in the results from both leaders and subordinates is that subordinates are very significant in the leadership; one of the boosters for leadership is the acceptability of the leaders by the subordinates. For women to anticipate and participate in leadership, the support of their subordinates cannot be overlooked, as likewise argued in the study of Maryam *et al*. (2021). Hence, these results agree that women in leadership need collective support from subordinates and others to enhance their leadership positions. The expectation to see women displaying a high energy level is borrowed from the great man theory, where men are seen as leaders by default, as established in the studies of Klenke (1996) and Warnakula (2018).

In contrast, this assertion is biased as leadership is not all about physical energy but the ability to lead to achieve the organisational goal without injuring subordinates' development simultaneously, as opined by Fatokun *et al*. (2010). Furthermore, the leadership style leaders employ at times will determine the amount of cooperation from the subordinates and the rate of leadership success. Therefore, women should encourage leadership styles that will promote and balance the interest of the organisation, leaders' vision, and subordinates' interests.

Table 3: Factors Influencing Women's Participation in leadership Positions

CODE	FACTORS	OM	STD	OR	Leaders		Subordinates		P-Sig
					ML (x)	RL	MS (y)	RS	
F1	Perception of subordinates	3.79	0.96	1	3.84	4	3.75	1	0.666
F2	Educational status	3.78	1.02	2	4.03	1	3.65	4	*0.015
F3	Leadership styles	3.76	1.00	3	3.83	5	3.74	2	0.703
F4	Work family issues	3.73	0.85	4	3.82	6	3.68	3	0.361
F5	Level of supports and cooperation from peers and subordinates	3.64	0.90	5	3.89	3	3.49	10	*0.003
F6	Expectation to see women displaying high level of energy	3.62	0.95	6	3.91	2	3.46	12	*0.001
F7	Traditional gender stereotype	3.59	1.01	7	3.70	8	3.54	6	0.327
F8	Global perspectives	3.58	0.93	8	3.59	14	3.57	5	0.966
F9	Organisational context	3.55	0.85	9	3.62	12	3.51	8	0.443
F10	Attitudes of women in leadership positions/lack of confidence	3.54	1.07	10	3.56	15	3.54	7	0.791
F11	Cronyisms/Favouritism	3.52	0.93	11	3.62	13	3.46	11	0.287
F12	Psychological attack safety, fear of being exposed to physical and emotional attack	3.51	1.00	12	3.64	11	3.43	16	0.098
F13	Economic status	3.50	0 .90	13	3.49	19	3.51	9	0.833
F14	Societal factors	3.49	0.92	14	3.66	9	3.41	17	0.084
F15	Culture barrier	3.49	0.94	15	3.81	7	3.31	19	*0.000

F16	Fear of failure	3.48	0.97	16	3.51	16	3.46	13	0.481
F17	Network building	3.46	0.96	17	3.49	18	3.45	14	0.960
F18	Contractual agreement	3.41	0.96	18	3.36	24	3.43	15	0.435
F19	Glass ceiling	3.38	1.05	19	3.40	22	3.37	18	0.892
F20	Ego	3.38	0.95	20	3.51	17	3.31	21	0.101
F21	Feelings/emotions	3.37	1.04	21	3.42	20	3.35	20	0.447
F22	Promotion of feminist policy and agenda	3.36	0.96	22	3.65	10	3.21	24	*0.002
F23	Frustration and exhaustion	3.29	1.07	23	3.29	25	3.29	22	0.891
F24	Religion	3.23	1.10	24	3.40	21	3.13	26	0.077
F25	Policy of tokenism	3.21	1.03	25	3.21	26	3.24	23	0.823
F26	Lack of female role model	3.17	1.06	26	3.10	27	3.20	25	0.610
F27	Gender	3.16	1.10	27	3.36	23	3.04	28	0.059
F28	Tribe	3.01	1.16	28	3.09	28	2.96	29	0.488
F29	Height	3.00	1.02	29	2.87	29	3.08	27	0.137
F30	Weight	2.87	0.98	30	2.84	30	2.89	30	0.967

***Significant < 0.05, OM = Overall Mean, OR= Overall Rank, ML = Mean leader, RL= Rank Leader, MS = Mean subordinates, RS= Rank Subordinates,**

6.2. The Results of Factor Analysis on the Factors Influencing the Participation of Women in Leadership Positions

Table 5 depicts the Rotated Component Matrix for factors influencing QS women's leadership. The table accounts for factor loadings of thirty (30) variables from different literature factored into seven (7) components by deploying the Principal Component Analysis extraction method. While adopting Varimax with Kaiser Normalization as the rotation method, the absolute value/cut-off point of 0.50 was adopted to suppress variables with small coefficients leaving fewer variables for further statistical analysis. The seven components account for 73.254% total variance explained (Ref to Appendixes 1 and 2).

Table 5: Factor Analysis of Leadership of Women QS

Variable	C1	C2	C3	C4	C5	C6	C7
1. Stereotypic- Related							
Lack of female role model	0.626						
Policy of tokenism	0.736						
Contractual agreement	0.635						
Ego	0.523						
Promotion of feminist policy and agenda	0.547						
Expectation to see women displaying a high level of energy	0.501						
Global perspectives	0.524						
Feelings/emotions	0.679						
Frustration and exhaustion	0.738						
Glass ceiling	0.697						
2. Social Related							
Psychological attack		0.742					
Attitudes of women		0.578					
Societal factors		0.781					

Organisational context		0.843					
Economic status		0.683					
3.Tribe/Religion- Related							
Gender			0.845				
Tribe			0.787				
Religion			0.773				
4.Tradition/Culture Related							
Culture barrier				0.554			
Traditional gender stereotype				0.814			
Level of support and cooperation from peers and subordinates				0.609			
5. Family Issue							
Fear of failure					0.524		
Work-family issues					0.757		
Cronyisms/Favouritism					0.628		
6.Subordinate-Related							
Educational status						0.767	
Perception of subordinates						0.616	
Leadership styles						0.572	
7. Physical Appearance							
Weight							0.817
Heght							0.837
Eigen value	**11.775**	**2.792**	**1.968**	**1.585**	**1.414**	**1.323**	**1.120**
% of total variance	**39.250**	**9.307**	**6.561**	**5.283**	**4.712**	**4.409**	**3.733**
Total variance explained	**73.254**						
Kaiser- Meyer-Olkin Measure of sampling adequacy	**0.854**						
Bartlett's Test of sphericity:	**4958.618;**						
	Df = 435; P < 000						

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Normalisation.
a. Rotation converged in 7 iterations.

Component 1 – Stereotypic/Glass Ceilings-Related

Table 5 shows the factor loadings of eleven variables factored into four components with the extraction method deploying Principal Component Analysis. The first component had ten highly correlated variables. The factors are Lack of female role models (0.626), Policy of tokenism (0.736), Contractual agreement (0.635), Ego (0.523), Promotion of feminist policy and agenda (0.547), Expectation to see women displaying a high level of energy (0.501), Global perspectives (0.524), Feelings/emotions (0.679), Frustration and exhaustion (0.738) and Glass ceiling (0.697). The figures in parenthesis represent the respective factor loadings. This cluster accounted for 39.250% of the variance in rotation sums of square loadings with an Eigenvalue of 11.775, as shown in Table 5. The component is referred to as Stereotypic-Related factors.

Component 2 – Social-Related

The second component comprises four-factor loadings that are highly correlated, which include fear of psychological attack (0.742), attitudes toward women (0.578), societal factors (0.781), organisational context (0.843) and economic status (0.683). This cluster accounted for 9.307% of the variance in rotation sums of square loadings with an Eigen value of 2.792, as shown in Table 5. The component is tagged Social-Related factors.

Component 3 – Tribe/Religion-Related

The third component comprises three highly correlated factor loadings which include gender, tribe and religion, with the corresponding variances of (0.845), (0.787) and (0.773), respectively, within the cluster. The cluster has a 6.561% variance, and the Eigen value is 1.968. The component is identified as Tribe/Religion-Related.

Component 4 – Tradition/Culture - Related

The fourth component comprises three-factor loadings that are highly correlated, which include culture barrier (0.554), Traditional gender stereotype (0.814) and level of support from peers and subordinates (0.609). This cluster accounted for 5.283% of the variance in rotation sums of square loadings with Eigen value of 1.585 as shown in Table 5. Therefore, the component is referred to as Tradition/Culture-Related.

Component 5 – Work Family/Cronyism- Related

The fifth component had four fairly correlated variables, which include Network building (0.483), Work-family issues (0.524), fear of failure (0.757) and Cronyisms/Favouritisms (0.628). This cluster accounted for 4.712% of the variance in rotation sums of square loadings with an Eigen value of 1.414. The component is tagged Work Family/ Cronyism.

Component 6– Educational/Subordinates- Related

The third component comprises three highly correlated factor loadings which include educational status, perception of subordinates and leadership style with the corresponding factor loadings of (0.767), (0.616) and (0.572), respectively, within the cluster. The cluster has a variance of 4.409%, and the Eigen value is 1.323. The component is identified as Educational/Subordinates- Related.

Component 7– Physical Fitness related

The last component comprises only two factors loading, which include weight (0.817) and height/tallness (0.837) with the corresponding variance of 3.733 with an Eigen value of 1.120 in the cluster. The component is named Physical Fitness related.

Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.775	39.250	39.250	5.062	16.873	16.873
2	2.792	9.307	48.557	4.276	14.254	31.127
3	1.968	6.561	55.118	3.002	10.008	41.135
4	1.585	5.283	60.401	2.854	9.513	50.648
5	1.414	4.712	65.113	2.596	8.653	59.301
6	1.323	4.409	69.521	2.107	7.024	66.325
7	1.120	3.733	73.254	2.079	6.929	73.254
8	0.987	3.290	76.543			
9	0.797	2.656	79.199			
10	.760	2.534	81.734			
11	.661	2.202	83.936			
12	.527	1.756	85.692			
13	.484	1.612	87.305			
14	.467	1.556	88.860			
15	.395	1.318	90.178			

16	.369	1.231	91.409			
17	.332	1.106	92.515			
18	.289	.965	93.480			
19	.263	.878	94.357			
20	.249	.831	95.188			
21	.241	.805	95.993			
22	.219	.731	96.723			
23	.193	.644	97.367			
24	.169	.562	97.929			
25	.147	.492	98.421			
26	.130	.434	98.855			
27	.114	.379	99.234			
28	.083	.277	99.511			
29	.082	.274	99.784			
30	.065	.216	100.000			

Extraction Method: Principal Component Analysis.

7.0. Discussion on Factor Analysis

The cluster of factors coined as stereotypic factors/glass ceiling accounted for 39.250% of all the factors influencing women into leadership positions. The ten factors under this are which are highly correlated, are a lack of female role models, a policy of tokenism, contractual agreement, ego, promotion of feminist policy and agenda, the expectation to see women displaying high level of energy, global perspectives, feelings/emotions, frustration and exhaustion and a glass ceiling. The stereotypic factor has been a critical factor that has been affecting women in getting to leadership positions, and this result is in agreement with the studies of Sandberg (2013) and Warnakula (2018) that men assumed most of the leadership positions based on the barriers of women are subjected by the leadership of men such as the glass ceiling that women face in getting to leadership positions. Also, social-related cluster factors are the second factor in the results of FA, accounting for 9.307%. The components are fear of Psychological attack, Attitudes toward women, Societal factors, Organisational context and Economic status. Women have been been playing social roles congruity, which in a way has been hindrance to getting to leadership positions as established in the studies of Salahuddin (2015) and Kaiser and Wallace (2016). Religion and culture are other factors influencing womens aspiration to leadership positions. Culture and religious background are not supportive of women aspiring to leadership positions at times; some religious and cultural beliefs do not provide women with a favourable atmosphere to aspire to leadership positions (Lussier and Achua, 2013)

8.0. Conclusion and Recommendations

This paper concluded that the research instrument was adequate and reliable, with a KMO of 0.854. Perception of subordinates, educational status, leadership styles, level of support and cooperation from peers and subordinates, an expectation of seeing women displaying a high level of energy, and work-family issues have a high influence on the participation of women in leadership positions. Other factors of influence are cultural barriers and the promotion of feminist policy. In contrast, weight, height and tribe had little influence on the participation of women quantity surveyors in leadership positions. In addition, the 30 factors examined also devolved into 7 components with a total variance of 73.254. Stereotypical–related components had ten items with the highest % total variance of 39.250. The ten items are a lack of female role models, a policy of tokenism, contractual agreement, ego, promotion of feminist policy and agenda, an expectation to see women displaying a high energy level, global perspectives, feelings/emotions, frustration and exhaustion and glass ceiling. Therefore, the paper recommends that subordinates and peers give maximum support to women QSs in leadership positions. In addition, women QSs should enhance their leadership status with the necessary education and training; there should be a shift from the orientation that expects women in leadership positions to display a high level of energy as men; leadership is not about physical energy but the power of positive influence. Also, women should adopt a suitable leadership style and allow for transformation and mentoring of subordinates to become good leaders. Cultural barriers and work-family issues should give women ways to attain their full potential.

8.0 REFERENCES

Adegoke, B. F., Aje, I. O. and Oke, A. E. (2022). Leadership potentials of women in the Nigerian construction- A literature visit. *UniOsun journal of engineering & environmental sciences*. 4 (1) 122 – 130. Doi:10.36108/2202.40.0121.

Adogbo, K.J., Ibrahim, A. D. and Ibrahim, Y.M. (2015). Developing a framework for attracting and retaining women in construction practice *Journal of Construction in Developing Countries,* 20 (1), 99–115.

Al-Sudairy, H. (2017). *Modern woman in the Kingdom of Saudi Arabia: Rights, challenges and achievements*. Newcastle-upon-Tyne: Cambridge Scholars Publishing.

Arenas-Molina, M.T., Rodriguez, J. M. and Dominguez, N. (2015). Leadership in construction: A case study with a gender perspectives. doi. 1. 107764/ndlc161.1.

Aretoulis, G. N. (2018). Gender-based perception of successful construction of project managers' attributes. *Social sciences* MPDI.

Ayangade, J. A., Aina, O. O., Omojola, S. O. and Odubanjo, M. (2017). Leadership styles selected construction managers in Nigeria. *British Journal of Environmental*. 5 (4) 1-10.

Ayman, R. and Korabik. K. (2010). Leadership: Why gender and culture matter. *American* Psychologist. 65. 157-161.

Boatman, J., Wellins, R. S. and Stephanie Niel, M. A. (2011). Global leadership forecast 2011.

Boulouta, I. (2012). Hidden connections: The link between board gender diversity and corporate social performance. *Journal of Business Ethics*.3 (9). 110-121.

Construction Industry Training Board (2016). *Construction industry 2002-2007 Dorset economic impact future prospects skills issues.* http://: www.constructionskills.net.

Construction Industry Training Board (CITB, 2013). *Construction skills: Annual reports and accounts*http://www. documents.citb.co.gov.uk/document/hc0809/hc03/0326/0326.pdf

Corporate Gender Gap Report (CGGR) (2010). *World economic forum*. https://docs.google.com/viewer?url=http%3A%2F%2Fwww3.weforum.org%2Fdocs%2F WEF. Gender gap corporate report

DeFrank-Cole, L., Latimer, M., Reed, M., & Wheatly, M. (2014). The women's leadership initiative: One university's attempt to empower females on campus. *Journal of Leadership, Accountability and Ethics,* 11(1) 50-63.

Diehl, A. B. (2014). Making meaning of barriers and adversity: Experiences of women leaders in higher education. *Advancing Women in Leadership,* 34, 54-63.

Elmuti, D., Jia, H. & Davis, H. H. (2009). Challenges women face in leadership positions and organisational effectiveness: An investigation *Journal of Leadership Education.8,* (*2*).

Ely, R. J., Ibarra, H. and Kolb, D. (2011). Taking Gender into Account: Theory and Design for Women's Leadership Development Programs. *Insead -Working Paper,* 10 (3).

English, J. and Hay, P. (2015). Black South African women in construction: Cues for success, *Journal of Engineering, Design and Technology*, 13 (1)144 – 164.

Eswaran, V. (2019) The business case for diversity in the workplace is now overwhelming. World Economic Forum. Retrieved from. https://www.weforum.org/agenda/2019/04/business-case-for-diversity-in-the-workplace.

Fatokun, J. O., Salaam, M. O. and Ajegbomogun, F. O. (2010). The influence of style on the performance of subordinates in Nigerian Libraries, *Library Philosophy and Practice*, 7(1) 75- 79.

Fernando, N. G., Amaratunga, D. and Haigh, R. (2014) The career advancement of the professional women in the UK construction industry, Journal of engineering, design and technology, 12(1) 53–70.

Gallant, A. (2014). Symbolic interactions and the development of women leaders education *Gender, Work & Organisation,* 21(3) 203-216. doi:10.1111/gwao.12030

Gita Patel, F. C. A. and Buiting, S. (2013). Gender differences in leadership style and the impact within corporate boards. Commonwealth security.

Goethals, G. R. and Hoyt, C. I. (2017). Women and leadership: History, theories and case study Great Barringyon, MA: Berkshire Publishing GroupLLC.

Grant Thornton International Report. (2015). *Women in business: The path to leadership*. Available: http://www.gt.co.za/news/2015/08/women-in-business-the-path-to-leadership/.

Hampton, P. & Alexander, H. (2016). *Hampton-Alexander Review*. Available from: https://ftsewomenleaders.com/wp-content/uploads/2016/11/Hampton-Alexander-2016.pdf.

Harmdah, A. A. (2021). Exploring employed women's perceptions of leadership in the light leadership program in Saudi Arabia. *Journal of educational & social research* 11 (2). E-ISSN2240 - 0524.

Heiskanen, M. (2013). Hankalatämmät.Talouslehti, 26.4.2013nro 17.

Hodges, J. (2017). Cracking the walls of leadership: Women in Saudi Arabia. Gender management,32, 34-46.
Jimoh, R. A., Oyewobi, L.O. Adamu, A,N & Bajere, P. A. (2016). Women professionals' participation in the Nigerian construction industry: finding voice for the voiceless**.** *Organisation, Technology and Management in Construction*.8, 1429–1436.

Kallio, H. (2013). Naisetottavatmiehiäkiinnikeskijohdossa.Aamulehti, 14.5.2013

Kirsch, A. (2018). The gender composition of corporate boards: A review and research agenda. *The leadership quarterly.* 29 (2) 346 – 364.

Klenke, K. (1996). *Women and leadership- a contextual perspective*. New York: Springer Publishing Company Inc.

Lathi, E. (2013). Women and leadership: Factors that influence women's career success female leaders' reflections on their career development and leadership. A B.Sc Thesis in International Business Submitted to Lathi University of Applied Sciences.

Lombardi, M. R. (2017). Women engineering in construction: The feminisation possible and gender discrimination. 47 (163) 122- 145.

Lussier R. N. & Achua C. F. (2014).A leadership theory: Application and development.5th Edition. United States: South-Western, Cengage Learning.

Madden, M. (2011). Gender stereotypes of leaders: Do they influence leadership in higher education? Wagadu*: A Journal of Transnational Women's & Gender Studies*, 9. 55-88.

Maki, L. A. (2015). A Grounded Theory of Women's Leadership Experiences in Higher Education: Navigating from the Director Level. All Theses, Dissertations, and Other Capstone Projects. 397.https://cornerstone.lib.mnsu.edu/etds/397.

Mariska, D., Andi, A. and Alifen, R. S. (2017). Women's career and factors influencing construction. *EACEF - The 1st international conference of European Asian civil engineering forum* conference paper delivered at Pentra Christian University, Surabaya.

Marques, R. S. B.(2010). Engenharia e ambiente rural: o gênero na agronomia. In: Seminário T. E G., 3 Goiânia *Anais* Goiânia: UFG.

Maryam, S. Idris, M and Abdul Ghaffar (2021). Strategy to overcome leadership barriers. A case study of women principals Inkhyber-Pakhtunichws. *Multiculture Education* 7 (10) 171-171*.* doi: 105281/Zenedo.5555371

McKinsey and Company (2010). *Moving women to the top: McKinsey Global* McKinsey Quarterly.
Modley, M. S. (2012). An Investigation of the role of women in the South African Constr uction industry. M.Tech. Thesis. Faculty of engineering. The University of Johannesburg. South Africa.

Office for National Statistics. (ONS) (2013). Labour market statistics. Office for national statistics.

htpp://www.ons,gov.uk/ons/dcp/17177833818.

Othman, N. L. and Jaafar, M. (2013). Personal competency of selected women construction project managers in Malaysia", *Journal of Engineering, Design and Technology,* 11 (3), 276-287.

Palmu-Joronen, A. L. (2009). Nokian vuodet. Mitä johtamisesta voi oppia. Jyväskylä: Atena Robin, S. P. and Coulter, M. K. (2010).*Management*. 10thEdition, Pearson Education. Prentice-Hall.

Robinson, S. and Stubberud, H. A. (2011).Gender Differences in Entrepreneurs' PerceivedProblems, Profit and Plans. *International Journal of Entrepreneurship, 15*, 25-44.

Salahuddin, N. N. B. (2015). A study of women's careers in construction. A B.Sc Thesis in Civil Engineering and Earth Resources Submitted to the University of Malaysia Pahang.

Sandberg, S. (2013). Lean in: Woman, work and the will to lead. Alfred A. Knopf.

Shamugam, M, Amaratunga, R. D. G. and Haigh, R.P. (2006). Women in construction: A study on leadership. Research institute of built and homes environment University of Salford

Tadim, M. C. F. (2011). *A construção de identidade profissional das mulheres engenheiras mecânicas:* um estudo de caso com egressas do CEFET-MG. 2011. Dissertação (Mestrado em Administração) – Faculdade Novos Horizontes, Belo Horizonte, 2011.

Talouselämä. (2013). Naisjohtajien määrä putoaa Suomessa taas - "ensimmäinen kerta neljään vuoteen Available in http://www.talouselama.fi/uutiset/naisjohtajien+maara+putoaa+suomessa+taas++ensimmainen+kerta+neljaan+vuoteen/a2173610

Teague, L. J. (2015). Higher education plays a critical role in society: More women leaders can make a difference. Forum on Public Policy Online, 2015 (2) http://forumonpublicpolicy.com/

Thurairajah, N., Amaratunga, R. D. G. & Haigh, R. (2010) *Study on women leadership in construction organisations*. *In* Boyd, D (Ed) *Procs 23rd Annual ARCOM Conference*, Belfast, UK, Association of Researchers in Construction Management. 367-376.

Wangle, A. M. (2009). Perception of traits of women in construction. A Thesis Presented to the Graduate School of the University of Florida in partial fulfilment of the Requirements for the Degree of Master of Science in Building Construction.

Warnakula, U. S. (2018). Leadership: Gender bias and barriers. *International Journal of Advancement Research and Technology* 7 (7) 209 -216. ISSN 2278 - 7763.

Wittenberg-Cox, A. (2012). Three diversity: Best practices that hurt women. *Harvard Network*Retrievedfromhttp://blogs.hbr.org/cs/2012/11/three_diversity_bestpractices.ht ml.

Yang, Y. & Wang, J. (2013). Competencies Required by Female Leaders in University libraries- The library of the University of Gävle. Second cycle, Final assignment for Master Degree in Business Administration.

Appendix 1
Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
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5	1.414	4.712	65.113	2.596	8.653	59.301
6	1.323	4.409	69.521	2.107	7.024	66.325
7	1.120	3.733	73.254	2.079	6.929	73.254
8	0.987	3.290	76.543			
9	0.797	2.656	79.199			
10	.760	2.534	81.734			
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Extraction Method: Principal Component Analysis.