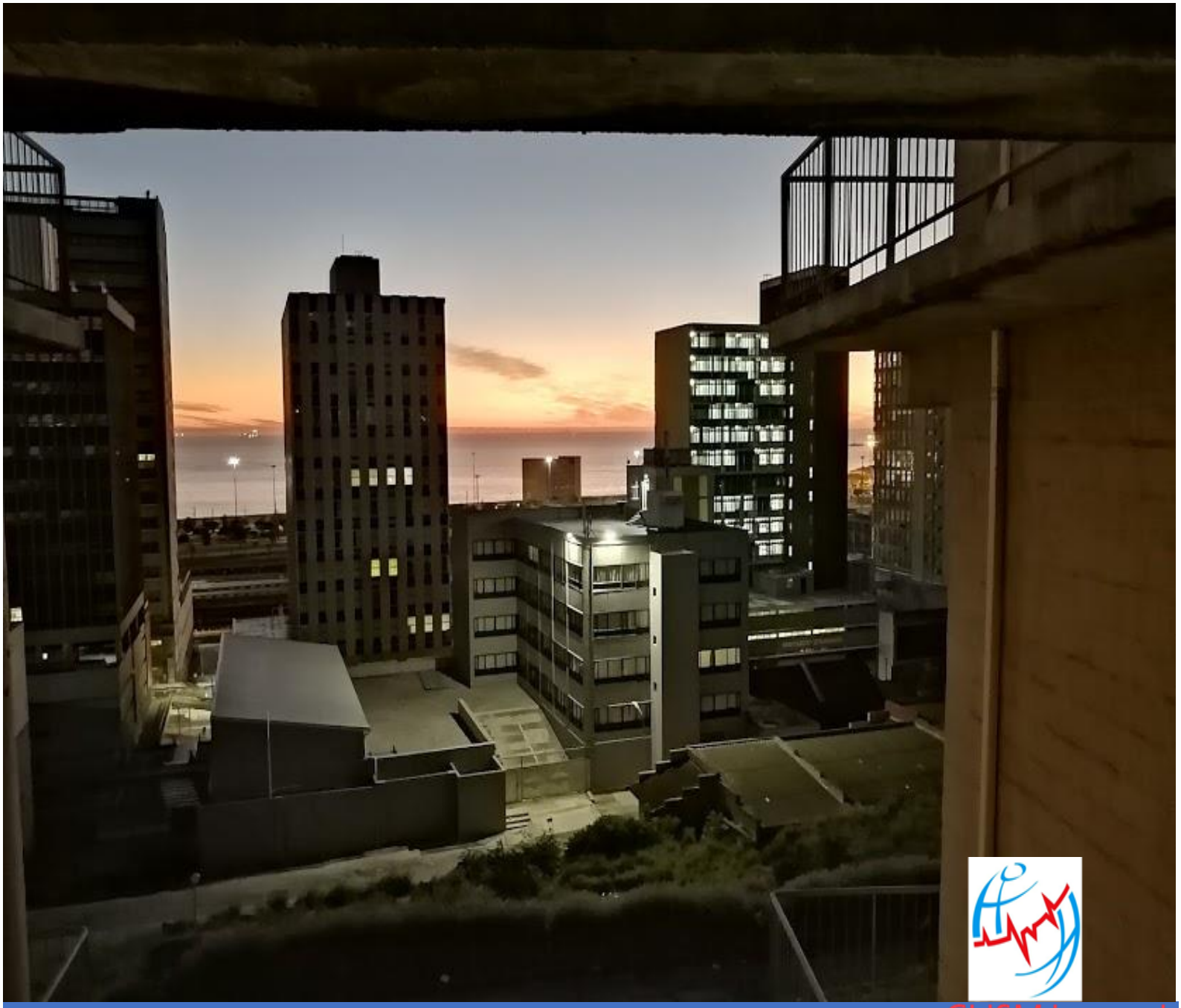

CHSMJournal

Construction and Human Settlements Management Journal

Maiden edition Volume 1 Issue 1 2021

ISSN 978-1-928472-28-5

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 new and unique record of scholarly activity in Construction and Human Settlements Management Journal while presenting an African perspective to the academic community;

ii. scholarly recognition it will bring to the Nelson Mandela University;

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

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

v. the publication will help to 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 will, through the sharing of local knowledge and perspective, make local research more visible throughout Africa and to researchers, students, and scholars globally.

Topics

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

Construction project management; Project management; Design and construction management processes; Housing and infrastructure development; Stakeholder management; Project planning and project 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; Current and emerging infrastructure issues in developing countries.

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ISSN 978-1-928472-28-5
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EDITORIAL

Dear academic and research community colleagues and friends.

We are pleased to announce the publication of our inaugural issue of the Construction Management and Human Settlements Journal. The CMHS journal is hosted by the Department of Construction Management at Nelson Mandela University.

We have five papers in this inaugural issue. Olowa *et al.,* **Appraisal of planning, monitoring, and controlling tools and techniques on time schedule performance of construction projects in Nigeria,** investigates how professionals adapt the use of project management tools and techniques of planning, monitoring and control (PM&C) to manage schedule performance for positive project outcomes. Eze *et al.,* in **Influence of construction SMES characteristics on Health and Safety (H&S) deviance normalisation in Abuja, Nigeria,** lament on poor health and safety performance of construction SMEs, with seemingly, unending high injury and fatality rates. They that this state of H&S affairs is attributed to the SME characteristics hich in turn impact heavily on construction firms, workers, the projects being executed and the client's satisfaction level. The paper proposes a range of interventions to

improve health and safety performance of SMEs in that part of the world. The third paper in this issue by Shittu *et al*., **Involvement of Community-Based Associations towards Sustainable Settlement Infrastructure in Ilorin, Nigeria,** appraised the involvement of Community-Based Organisations in the provision of infrastructural facilities in Mandate Housing Estate. The paper identified infrastructural facilities and their associated challenges in the Mandate estates and suggest range interventions that could deployed by the community-based organisation to improve sustainability of their community and neighbourhood. Meanwhile, Maauf and colleagues from Salford in **Factors Affecting Materials Management on Libyan Construction Sites** identify and analyse the factors affecting materials management in Libya. They developed a framework for materials management on Libyan construction sites. The paper posits that materials management is impacted by the contractors' experience and skills, factors related to management of materials on the site (receiving, storing, handling and tracking), and site supervision. The fifth paper in this issue, by Ogunbajo *and colleagues from FUTs Minna and Akure,* **The influence of proximate neighbourhood facilities on residential property vacancy periods in Minna, Nigeria** investigates the extent to which neighbourhood facilities and amenities determine the vacancy periods of residential properties in that part of the world. They lament on inadequacy of ancillary facilities, as well as the poor management of existing ones. They posit that major challenges associated with neighbourhood facilities/amenities result from increased urban growth and density, as well as the inability to effectively manage existing infrastructure. The paper argues that the ability of amenities to accommodate growth depends on the ability of the urban area to provide new ones and manage and improve the condition of the existing amenities.

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

Appraisal of planning, monitoring, and controlling tools and techniques on time schedule performance of construction projects in Nigeria.

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Abstract

The need for Project Management tools in developing countries is ever increasing in the face of modern project complexities and clients' expectations. This study investigates how professionals adapt the use of project management tools and techniques of planning, monitoring and control (PM&C) within the context of Nigerian construction industry to manage schedule performance for positive project outcome. A cross-sectional research design was adopted, and a survey was conducted among 122 construction professionals for this investigation. Analysis of the data collected was achieved by using IBM SPSS Statistics (Version 26) predictive analytic software. Findings reveal four and three top contemporary tools/techniques used in engineering and building projects for both planning and monitoring respectively, and their impact on schedule performance of construction projects. While there was a significant positive correlation between tools and techniques used for planning and monitoring with schedule performance, the study did not find a correlation between the control tools/techniques with schedule performance. It was recommended that construction managers could use these findings as checklist for good practice and to improve schedule performance while mitigating construction time overrun.

Keywords: Schedule performance, time overrun, project management, time control, construction management.

1. Introduction

The management of time for large projects is usually quite complicated and therefore challenging for many construction clients and contractors. Depending on how time overrun risks are shared, financial risks and commercial viability in construction can span between two extremes for both clients and contractors; it could either be very profitable and other times it may be the albatross if proper planning, monitoring, and controlling are neglected (Alshanbari, 2010). Construction managers' ability to predict likely problems, plan, monitor and control them have great influence on both construction project's success and profitability. Consequently, avoiding construction related problems on site is linked to the amount of planning carried out prior to the commencement of the project as well as the interrelated activities of construction activities during execution (Ncwadi *et al*., 2005).

The complexity and interconnectedness of construction activities is usually a bane for optimal and efficient planning, monitoring and control process (Sharifi *et al.,*

2007). The challenges associated with optimal and efficient control are diverse and are not minimized simply because a similar project has been executed in the past. Some of the challenges may include regional or global restriction of movement of both men and materials, political instability, occupational accidents, change in weather conditions, level of supervision, level of workmanship, availability of material, storage facility, wastages including rework and damages, etc. Appropriately documenting and managing the different activities during a construction is indeed demanding (Stanitsas *et al.,* 2021). These complexities have had their toll on Nigerian construction industry. As a developing country with huge investments in construction projects, the growing rate of delays in project delivery has been identified by some researchers as a major problem facing the Nigerian construction industry is (Aibinu et al., 2002). Past studies have also shown (Ogunlana *et al.*, 2006; Haron *et al.*, 2018) that most clients are dissatisfied with the outcome of construction projects, especially because their project expectations in terms of time are usually not met. The absence of a well-established effective system for PM&C projects' time schedule has caused failures of many construction projects in the construction industry. In acknowledging this conundrum and as part of an effort to address it, the Nigerian Bureau of Public Procurement (BPE) recently advertised for the re-evaluation and re-designing of the extant tendering template for procuring construction contracts in Nigeria (Nigeria Federal Ministry of Culture and Information, 2020).

Project outcomes are generally viewed and described in terms of unit cost, construction speed, delivery speed, cost growth, schedule growth, and several quality measures (Idoro, 2012b). Several authors like Chen (1998) and Ling *et al.*, (2008) have added their opinions to this list. User expectation, participants' satisfaction, environmental performance, health and safety, and commercial value are additional criteria suggested by Chen (1998). Additionally, Ling *et al.*, (2008) suggest that owners' satisfaction and owners' administrative burden should also be measures of project outcomes. However, to achieve the desired project outcome, Idoro (2012) contends that effective and efficient planning, monitoring, and controlling (PM&C) must be ensured before and during the construction phases of projects. Faniran *et al*., (1998) argue that the main "*objective of project planning is to complete a project within a fixed time, at a previously estimated cost and to a specified standard of quality*". This assertion implies that the effectiveness of project planning is measured by the project outcome (Parchami *et al*., 2015). Authors like Ling *et al.*, (2008) and Xiao *et al*., (2003) also regard project outcome as the basis of evaluating the effectiveness of project planning.

PM&C is increasingly becoming an important issue in project success outcome. Tsiga *et al*., (2016) claim that planning is a key activity required for a successful construction project outcome by all stakeholders. Likewise,

monitoring and control are very important management functions to ensure that planned project objectives are fully achieved (Idoro, 2012a). The relationship between PM&C is described succinctly by Abbasi *et al.,* (2000). According to Abbasi *et al*., planning defines the strategies, tactics, and methods for achieving project objectives, while monitoring and control provide the required checks and balances for ensuring that the plans and overall project objectives are achieved.

Evidences from both literature and personal experience show that clients and professionals in the Nigerian construction industry engage bespoke strategies, tactics and methods in many PM&C activities involving local projects. Bernardes *et al.,* (2002) argue that the performance of construction projects depends largely on their control structures as well as their production planning. Researchers have shown that efficient, timely and responsive PM&C activities in managing construction projects should mitigate negative project outcomes. In a study, Koskela (1992) identifies and attributes major construction project failures to inefficient or deficient planning and slow response or lack of flexibility to adjust to changes in project environment. Abbasi & Al-Mharmah (2000) argue that PM&C tools and techniques in developing countries are not prominent in project management as obtained in developed countries. They claimed that the use of these tools and techniques usually reflect the social, economic, and political values upheld by the stakeholders (ibid).

Despite the many studies on project PM&C management, the problem of time overrun persists in the Nigerian construction industry (Aibinu *et al*., 2002). Coupled with the fact that most literature on this matter are dated and not solely focused on in depth evaluation of project success vis a vis construction time schedule performance, it has also been argued that previous studies have focused on causes of time overrun and factors militating against effective control of projects by construction managers in charge (Olawale *et al.*, 2010). It is against this backdrop that this study is inspired to investigate the relationship between PM&C and project time schedule performance.

The first stage of this study is designed to provide answers to the following research questions using the quantitative research design methodology, viz: (1) What are the planning, monitoring and control tools and techniques used on Nigerian construction projects to mitigate negative project outcomes? (2) How frequently do Nigerian construction stakeholders use the planning, monitoring and control techniques on construction projects to avert negative project outcomes? In addition, it is hypothesized that planning, monitoring and control techniques and tools used in the Nigerian construction industry do not have any significant effect on cost performance of construction projects.

The purpose of this study is therefore to assess the importance of project management tools for PM&C construction time schedule among construction stakeholders within the Nigerian construction

industry. The next section of this paper describes the research methodology followed by the findings of the study. Thereafter, the findings are discussed in the discussion section before conclusions are made in the last section.

2. Research Methodology

This study was approached through the realist ontology and objectivist epistemological philosophical lens which assumes that the PM&C tools and techniques exist and their implementation (or lack of it) directly bears on the construction contracts duration without further consideration to other extraneous factors. This world view also suggests that all we can know of causation are the observable regularities in associations of events, and which rejected any reference to unobservable entities and mechanisms (King *et al.,* 2010). Using quantitative method, a survey research design was adopted to provide answers to the research questions and hypothesis of this study. The study survey was conducted within three cosmopolitan cities, representing three geo-political zones in Nigeria to have a balanced view across the nation. These cities (Lagos, Federal Capital Territory and Kano states) were selected because of their commercial relevance and prominence in construction activities. Apart from the respondents from consultancy outfits and the state ministries associated with construction activities in each state (e.g., Ministry of works, Ministry of Housing) the contracting organizations where respondents were sampled are those that were registered with each states' tenders board. The research instrument was prepared and administered to professionals working at different levels within contracting, consulting, and client organizations in a way that the study can get adequate information relating to the effect of planning, monitoring and control on project time schedule performance in the construction industry. The structured questionnaire was developed to collect data through a non-probability purposive sampling (both via online google form and personal contact) from managing directors, managing partners/senior partners, project managers, head of department and other key personnel involved in the construction process that were best suited to offer project specific information required for this study. Thus, eligibility criteria required individuals to come from states earlier mentioned, should have received a formal education and be a member of any of the professional associations in the architectural, engineering and construction (AEC) sector. Purposive sampling permitted sampling for this study due to the absence of a reliable sampling frame in the study population. Data for the study was processed and analysed using the IBM SPSS Statistics (Version 26) predictive analytic software. Descriptive statistics (such as frequency, percentages, relative important index (RII)); and inferential statistics like regression and one-way analysis of variance (ANOVA) were used as tools in summarizing the findings. The levels of significance of identified factors

were determined by the magnitude of their mean scores, with the greatest mean representing the most significant factor.

3. Findings

122 copies of research questionnaires were sent out to the respondents, but 81 were returned. The returned copies were examined to address issues relating to inconsistencies, omissions, completeness, and errors. Out of the returned questionnaires 76 were deemed usable, representing a 69% response rate, for this analysis.

3.1 General characteristics of the respondents

The survey on academic qualification of the respondents shows that all the respondents attended a formal education setting, which confirms their eligibility for providing the required data for this study (Table 1). The table also indicated that more than half (61.8%) are HND/BSc/BTech holders, 21.1% master's degree holders, 13.2% have obtained PGD certificates, 2.6% are OND graduates and minority few (1.3) have bagged their doctorate degree (PhD).

Table 1: Summary of demographics.

Characteristics	Number of observations	Characteristics	Number of observations
Professional affiliation		**Membership status**	
NIA	8 (10.7%)	Student	5 (6.7%)
NIOB	8 (10.7%)	Probationer	5 (6.7%)
NSE	31(41.3%)	Graduate	24 (32%)
NIQS	28 (37.3%)	Corporate	41(54.7%)
Academic qualification		**Working experience**	
OND	2 (2.6%)	1-10	47 (61.8%)
HND/BSc/BTech	47 (61.8%)	11-20	17 (22.4%)
PGD	10 (13.2%)	21-30	12 (15.8%)
Master's degree	16 (21.1%)	**Position in organization**	
PhD	1 (1.3%)	Chief executive officer	44 (57.9%)
Professional background		Managing director	3 (3.9%)
Architecture	9 (12%)	Project manager	21 (27.6%)
Quantity surveying	28 (37.3%)	Partner/assoc. partner	4 (5.3%)
Building	8 (10.7%)	Others	4 (5.3%)
Civil engineering	22 (29.3%)	**Type of organization**	
Mechanical engineering	3 (4%)	Consulting	9 (11.8%)

Others	6 (6.7%)	Private client organization	5 (6.6%)
Staff strength		Public client organization	58 (76.3%)
Less than 50 workers	18 (26.5%)	Others	4 (5.3%)
51-100	22 (32.4%)		
101-300	5 (7.4%)		
Above 300	23 (33.8%)		

The categories of professional respondents are: Quantity surveyors (37.3%), Civil engineers (29.3%), Architects (12%), Builders (10%), Mechanical engineers (4%) and 6.7% was from other professionals like estate surveyors, structural engineers, and town planners (Table 1). All the respondents (construction professionals) are affiliated with the respective professional bodies; 41.3% are affiliated with Nigerian Society of Engineers (NSE), 37.3% with the Nigerian Institute of Quantity Surveyors (NIQS), and both the Nigerian Institute of Architects (NIA) and Nigerian Institute of Building (NIOB have an equal percentage of 10.7% of the affiliated respondents. On membership status, most (54.7%) are corporate members, 32% are graduate members and 6.7% are student members and probationers. 61.8% of the total respondents have a working experience of less than 10 years, 22.4% have working experience of within 11-20 years and 15.8% have been working for 21-39 years in the construction industry. Responses were mostly from the top officials of the organizations. Hence, with the high percentage of corporate membership and many years of experience of the respondents, their opinions about the organizations' performance and the various planning, monitoring and control techniques used by their organizations would be eligible for this study. While 57.9% of the respondents were chief executive officers of their firms, 27.6% are project managers, 5.3% are associate partners, and 5.3% have other positions like chief engineers, chief quantity surveyors and human resource manager. A very high percentage of the respondents (76.3%) are from public client organizations. Respondents from consulting firms represent 11.8% of the sample population, while about 6.6% of the respondents were primarily from private client organizations.

3.2 Planning, monitoring, and controlling techniques.

One of the objectives of this research is to investigate how frequently PM&C techniques are used and to identify their impact on construction projects duration. This section examines the frequency of use of the various PM&C techniques and their associated mean scores with the aid of relative importance index (RII).

3.2.1 Use of planning tools/technique.

The relative importance index (RII) of the planning tools and techniques (PTT) was analysed, ranked, and presented in Figure 1. A critical look at the figure shows that the respondents make use of all the planning techniques with a RII value of 0.95 to 0.55. However architectural drawing as a form of planning tool is always used by the respondents for the design of buildings/engineering projects. This probably explicates the imperativeness of design is an important construction process. Other forms of planning tools frequently used by the respondents are bills of quantities, structural drawing, and mechanical/electrical drawing. This was confirmed by the relatively high mean score shown in Figure 1.

Other planning tools with relatively low RII such as value analysis/engineering report, subcontractors list, milestone date programming technique and life cycle cost seem not to be popular among the respondents. This suggests that construction managers/planners rarely use these tools/techniques in planning their project execution and delivery.

3.2.2 Use of monitoring tools/technique.

The ranking of the types and how frequently the various monitoring tools/techniques are used is represented in radar Figure 2. The closer the ranking is to the centre of the radar, the highly it is ranked by the respondents. The figure reveals that majority of the respondents frequently use progress report as the primary means of construction project monitoring. This is subsequently followed by site coordination meeting, site instruction book, health and safety checklist, request for information, critical path network, project tracker, line of balance, Gantt chart, change order log and risk log.

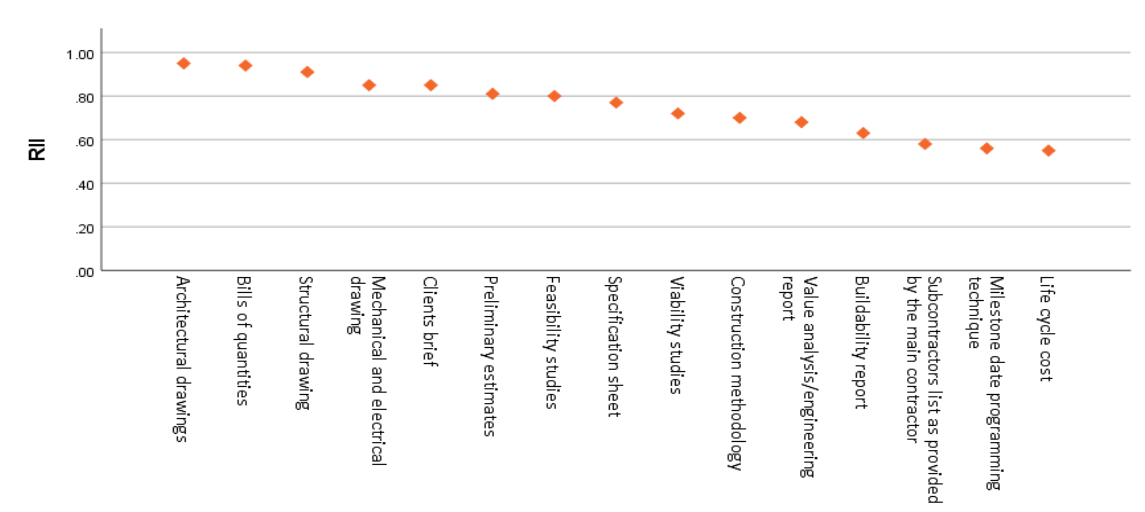

Figure 1: Use of planning tools/techniques

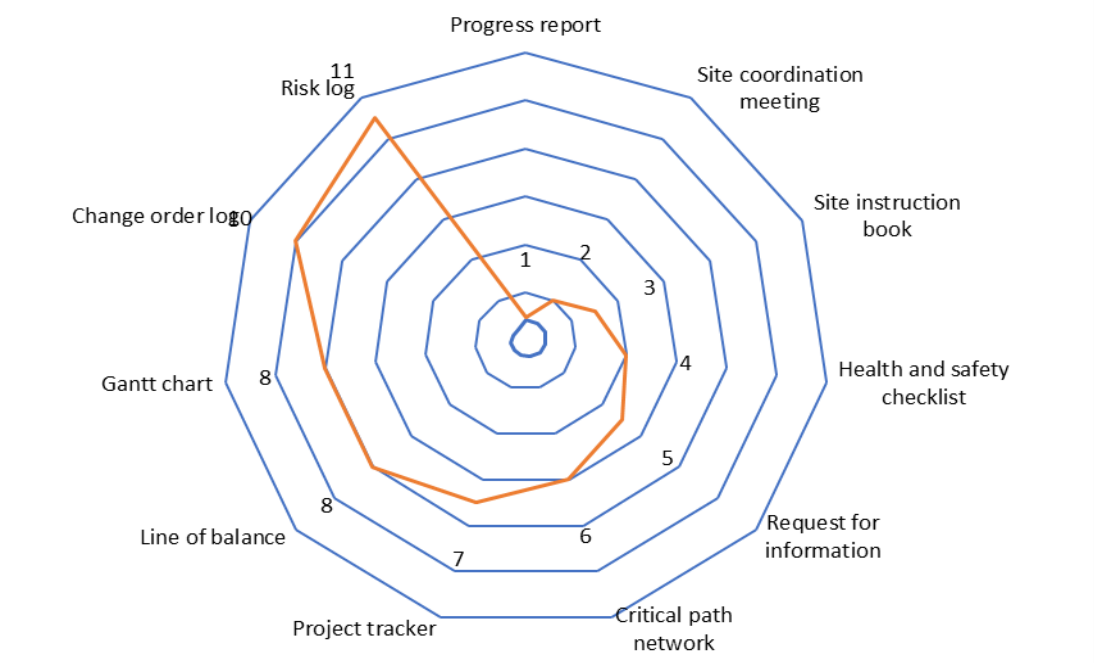

Figure 2: Use of monitoring tools/techniques.

It is suggestive that the respondents' preference for techniques like progress report, site instruction book and site coordinating meetings are means of ensuring timely completion or schedule performance amongst other project objectives. In contrast, the use of line of balance, Gantt chart, change order log and risk log are not popular monitoring collection probably because the respondents might not be familiar with their usage. It may be argued that the dominance of respondents from government-related agency in this survey might also have influenced these observations.

3.2.3 Time control.

Table 2 shows that six techniques (progress report, line of balance, Gantt chart, project tracker, site coordination meeting and milestone date programming technique) are mostly used for time control. A closer look reveals that many of the tools under monitoring techniques are logically prevalent for general time and schedule control.

Table 2: Techniques used for time control.

Techniques	Percentage (%)	Rank
Progress report	55.3	1
Line of balance	49.3	2
Gantt chart	48.6	3
Project tracker	46.7	4
Site coordination meeting	45.2	5
Milestone date programming technique	44.4	6
Change order log	33.8	7

Health and safety checklist	31.6	8
Risk log	30.1	9
Buildability report	26.0	10
Site instruction book	25.3	11
Request for information	24.3	12
Feasibility studies	22.7	13
Construction methodology	22.7	14
Subcontractors list as provided by the main contractor	18.3	15
Value analysis/engineering report	16.4	16
Preliminary estimates	14.5	17
Actual versus forecast reconciliation	13.5	18
Interim valuation	12.7	19
Earned value analysis	11.4	20
Viability studies	9.5	21
Profit and loss on each valuation dates	7.0	22
Financial reporting	6.8	23
Financial statement	5.6	24
Specification sheet	5.5	25
Architectural drawing	4.0	26
Bills of quantities	3.9	27
Clients brief	2.7	28
Structural drawing	2.7	28
Mechanical and electrical drawing	2.7	28

It is worthy to also note that change order log, health and safety checklist, risk log, buildability report, site instruction book, request for information, feasibility studies, construction methodology and subcontractors list as provided by the main contractors are sometimes used by the respondents for time control. Also worthy of note is financial statement, specification sheet, architectural drawing, and bills of quantities, clients' briefs, structural drawing, and mechanical/electrical drawing which are rarely used by the construction professionals for time control.

3.3 Impact of planning on time schedule performance

A bivariate regression was conducted to examine how well planning tools/techniques (PTT) could predict schedule performance (SP). A scatterplot showed that the relationship between PTT was negative and linear and did not reveal any bivariate outliers. The correlation between PTT and SP was statistically significant, r (67) = .30, $p < .05$. The regression equation for predicting the SP from PTT was $\hat{y} = 164.74 - 2.05x$. The r^2 for this equation was .087; that is, 8.7% of the variance in SP was predictable from level of PTT. The bootstrapped 95% confidence interval for the slope to

predict SP from PTT range from -3.77 to -.44: thus, for each one unit of increase of PTT, time overrun decreases by about 0.4 to 3.8 points (Table3)

bootstrapped 95% confidence interval for the slope to predict SP from MTT range from -5.02 to -1.88: thus, for each one unit of increase of MTT, time overrun decreases by about 1.88 to 5.02 points (*Table 4*).

Table 3: Regression Analysis of effect of planning on schedule performance

Model	B	Std. Error	T stat	F	R	R^2	Adjusted R^2	p-value	Lower 95%	Upper 95%
Constant	164.735	46.136	3.571	*NA	*NA	*NA	*NA	.001	72.646	256.823
PTT	-2.054	.811	-2.533	6.416	.296	.087	.074	.014	-3.673	-.436

*NA = Not applicable

3.4 Impact of monitoring on time schedule performance

A second bivariate regression was carried out to examine how well monitoring tools/techniques (MTT) could predict schedule performance (SP). A scatterplot showed that the relationship between MTT was negative and linear and did not reveal any bivariate outliers. The correlation between MTT and SP was statistically significant, r (62) = .50, $p < .05$. The regression equation for predicting the SP from MTT was $\hat{y} = 178.21 - 3.45x$. The r^2 for this equation was .238; that is, 23.8% of the variance in SP was predictable from level of MTT. The

3.5 Impact of control on time schedule performance

A bivariate regression was also performed to examine how well controlling tools/techniques (CTT) could predict schedule performance (SP). A scatterplot showed that the relationship between CTT was negative and linear after the bivariate outliers have been removed. The correlation between CTT and SP was not statistically significant, r (71) = .04, p > .05 (Table 5)

Table 4: Regression Analysis of impact of monitoring on schedule performance

Model	B	Std. Error	T stat	F	R	R^2	Adjusted R^2	p-value	Lower 95%	Upper 95%
Constant	178.206	31.485	5.660	*NA	*NA	*NA	*NA	.001	115.269	241.143
PTT	-3.449	.785	-4.395	19.315	.487	.087	.238	.000	-5.017	-1.880

*NA = Not applicable

Table 5: Regression Analysis of effect of control on schedule performance

Model	B	Std. Error	T stat	F	R	R^2	Adjusted R^2	p-value	Lower 95%	Upper 95%
Constant	107.953	40.646	2.656	*NA	*NA	*NA	*NA	.010	26.908	188.998
PTT	-2.813	1.756	-1.602	19.315	.187	.035	.021	.114	-6.314	.689

*NA = Not applicable

4 Discussion of findings

Planning in construction projects provides the baseline by which any future monitoring and/or control is achieved (Olawale *et al.,* 2010). To keep construction projects on track and delivered within anticipated duration, this study identifies contract drawings (architectural, structural, and service drawings), bills of quantities and client's brief as the three most frequently used planning tools employed by construction professionals and practitioners in the Nigerian construction contracts. Although this finding is at variance with the findings of some previous studies such as Olawale *et al.,* (2010) and Ncwadi *et al*., (2005), this study however included additional key metrics unlike the previous studies which probably is responsible for the disparity in the findings. For instance, Olawale *et al*., concluded in their study that the most frequently used planning technique by indigenous contractors in Nigerian construction industry is Bar chart. Similarly, Ncwadi *et al*., also argued that bar chart was the predominantly used planning technique by local contractors in Nigeria. Nevertheless, and in both cases, contract drawings and client's brief as planning tools were not part of the metrics considered in their studies as part of planning techniques toolbox; in managing time of construction projects in Nigeria. Abbasi *et al.* (2000) lamented on lack of modern tools in time management of construction projects and proposed that for resources to be efficiently used toward optimal productivity, then available tools for planning must be harnessed and deployed. Apparently, based on the reports of both Ibrahim *et al*., (2014) and Ogunde *et al.* (2013), construction stakeholders have probably focused and depended only on the use of Bar chart to manage construction contracts duration in order not to extend beyond planned programme. This notion is amplified by Memon *et al.*, (2006) who remarked that "*Bar charts or Gantt charts are a powerful communication tool and are extremely useful visual, and graphical medium in construction scheduling*"; and are also the more common types of techniques for construction scheduling followed by "*activity on the arrow, precedence network and line of balance"*. Nevertheless, this study has shown that an equal attention should also be given to the evolution or changes in the client's brief and their translation into the contract documents (especially the designs and bills of quantities) as the construction project matures. This consideration is important most especially as planning has been considered an ongoing and the most rewarding process in a construction project execution (Abbasi *et*

al., 2000). According to Bon-Gang (2018), drawings and specifications belong to the client, consultant, and design team-related factors, such that if given adequate attention, could be the most important determinants of project schedule performance.

When it comes to monitoring and schedule performance, which is a logical offshoot of planning, this study shows that Progress report and Site coordination meeting are the prevalent tools used in construction projects to have a predictable and favourable project schedule outcome. There is a perceived preference for these tools when compared with Gantt chart as a monitoring tool among the study population. This is a divergence from the assertions of both Ibrahim *et al.,* (2014) and Memon *et al.*, (2006) that Gantt chart has become one of the very few monitoring techniques adopted for construction activities. Limited knowledge and understanding of construction managers have been ascribed to low use of complex and modern tools for monitoring project schedules (Dziekoński, 2017). Given the ease of deployment of site meetings/reports it becomes explicable why they trump the use of Gantt charts in this study. Furthermore, Aljohani (2019) argued that project success is perception-based depending on whose view is sought. The author claimed that what is considered a failed project by a stakeholder could be viewed differently by another even when they are in the same project team. The Aljohani's scenario might have played out among the participants in this study resulting in both progress report and site coordination meeting as the most important monitoring tools for managing project duration. Notwithstanding Aljohani's argument, this study in alignment with findings of other authors like Idoro (2012b) has demonstrated and emphasized the importance of site meetings and visits in ensuring timely completion of construction projects in Nigeria.

This study is not without its limitations and the results should be interpreted with caution for the reasons mentioned hereafter. Although effort was made to get a representative sample for the whole country, the eventual number of samples analysed may be small for generalizability of the findings. Further studies to cover more zones and practitioners is therefore necessary in the future to validate the findings in this study. Also, this study focused on eliciting information from professionals only whereas, there might be other practitioners who may also have as much information as the professionals that were not sampled. There is also a limitation in directionality due to the cross-sectional design and correlational nature of the study.

5 Conclusion

This study set out to investigate the impact of planning, monitoring and control on construction project outcome in Nigeria with respect to schedule performance. A cross-sectional research design among construction professionals has been used to provide useful information on tools and techniques that are prevalent for schedule performance in practice in Nigeria. Issues such as the

scale of application of project planning, monitoring and control tools/techniques and their significance in schedule performance were highlighted. The top four documents frequently used in practice for planning in the execution of buildings/engineering projects to achieve positive schedule performance were revealed as architectural, structural, mechanical, and electrical drawings. Likewise, the top three most frequently used monitoring tools/techniques in construction projects that were identified in this study are progress report, site co-ordination meetings and site instruction book are considered as the. Other monitoring tools/techniques also identified as essential for controlling purposes include progress report, line of balance, Gantt chart, project tracker, site coordination meeting and milestone date programming technique. The study also clearly shows that there is a correlation between the use of planning and monitoring techniques on construction projects and project schedule performance whereas controlling tools/techniques do not have impact on schedule performance of construction projects.

This study has implications both in theory and practice. Apart from adding to the corpus of knowledge on project PM&C domain, it also reveals the dynamism of practice and the contemporary areas of planning and control that Nigerian construction managers should pay adequate attention to for positive project outcome in terms of effective schedule performance. This suggests that the application of some or all the top PM&C tools/techniques identified in this study, for managing construction projects, will mitigate the odds of suffering time overrun on the projects and invariably improve schedule performances. Therefore, it is recommended that during construction process, design consultants should ensure the production of detailed design and give attention to the use of detailed architectural, structural, and service drawings, all in a bid to reduce variations and additional work which may affect time and cost performance of such projects. The lead consultants on the project should encourage periodic site co-ordination meetings for prompt progress review of the contract and settle alignment issues which may require the attention of the consultants. While this may seem obvious to the experienced construction managers and practitioners it is important to state that it would be handy to the novice or less experienced construction managers trying to find their feet in the construction industry. Furthermore, the study is considered the first attempt to probe critically into time performance of construction projects and developing comprehensive solutions for managing same.

At present, several questions remain unanswered and on which further study may be required, one of which the lack of understanding of the rationale behind the choice of the tools and techniques is adopted by sampled population in this study. A further qualitative study might be able to elucidate and throw some light into this issue. The other issue would also be to understand if the divergence between the

previous findings and this study is because of limited knowledge of the construction managers or whether the managers are moving towards more sophisticated modes of construction project planning, monitoring and control that is not captured within the scope of this study. Apart from all these, a much larger issue is to find out about the depth of training and competence of each construction professional in the area of PM&C and suggest the most suitable professional to manage this process; and to find out how the environmental and project specific factors interact to affect choice of PM&C tools and techniques. Furthermore, the perception of respondents from only three states in Nigeria was used to investigate the effect of PM&C tools/ techniques on project schedule outcomes in this study. Future research could consider comparing more states and multiple countries. A comparative evaluation could also be between construction management techniques in construction projects under public and private sector contracts.

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Influence of construction SMES characteristics on Health and Safety (H&S) deviance normalisation in Abuja, Nigeria.

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ABSTRACT
The intolerably high and frequent injuries and fatalities in the construction industry have made it remain one of the most dangerous and hazardous industry to work in. The poor health and safety performance of the Construction SMEs is attributed to their characteristics; which have contributed to the normalisation of H&S deviances. This study examined the contribution of the characteristics of Construction SMEs to the prevalence of health and safety deviance normalisation in the construction industry. The effects of H&S deviance normalisation were also examined. The well-structure structured questionnaire was used to gather data from the SMEs using the snowball sampling technique. The collected data were analysed using frequencies, percentages, mean analytics, and Mann-Whitney U test. It was found that the characteristics of the SMEs that contribute most to H&S deviance normalisation in the construction industry are; poor budgetary allocation for safety implementation, financial insecurity, constant project management and leadership changes, seeing adherence to H&S as an impediment to productivity, and lack of clear cut difference between management and operations. The major effect of H&S deviance normalisation in the construction industry are; disruption of work progress, project execution delay, extra cost for medical expenses, death of workers, and extra cost to rebuild damaged work. It was concluded that the level of health and safety implementation and performance of the construction SMEs is poor, and this is caused by the characteristics of the SMEs. The Mann Whitney U tests showed a slightly differences in the perception of the SMEs in some of the assessed variables. This study will assist managers/owners of the SMEs and the industry regulators and other stakeholders in making decisions that will change the functioning, management and operations of the SMEs and the H&S related practices and performances in the construction industry. The study recommended that interventions such as partnering, and government support will improve the health and safety performance of the Construction SMEs.

Keywords: *Health and safety; deviance normalisation; construction project; construction industry; construction SMEs; Nigeria*

1. Introduction

The construction industry in both the developed and developing countries is the foundation for sustainable economic growth and development. Eze *et al.* (2020) described it as the prime mover for the survival of the economies of nations globally. Despite the economic and developmental importance of the industry, it has remained the most dangerous and hazardous industry (Jaselskis *et a*l., 2006; Abas *et al*., 2020; Sunindijo, 2015), when compared to the other industries. This is due to its intolerably high and frequent injuries, fatality rates and accidents records (Cheng *et al.*, 2012; Abas *et al.,* 2020). Also, because of the high level of fragmentation and risk potentials of its activities; craftsmen exposure to accidents is about 50% greater than what is experienced in other industries, and above the average of the national fatality record (Charles *et al*., 2007). A similar submission was made by Endroyo *et al*. (2016) who reported that safety performance is still low, and the accident rate is still high in the construction industry. The dynamic nature of construction work and its inherently high risk are the reasons why the construction industry is considered the highest in accident rates the world over (Yiu and Chan, 2016). SMEs have a wider spread and coverage and contribute to the poor H&S performance of experience in the construction industry.

The dominance of the construction industry by construction micro, small and medium organisations, has been attributed to the continuous poor health and safety performance of the industry. In Europe, it was reported that about 82% of workplace injuries occurred in small organisations (EU-OSHA, 2014). Wang *et al*. (2018) reported that in small enterprises, the management of occupational health and safety (OH&S) is comparatively poor, and it is one of the dangerous problems threatening SMEs in China and globally. In addition, the government is under a heavy burden in terms of OH&S policies and safety regulations, because of the numerical strength of the SMEs (Wang *et al*., 2018). Large organisations are known to have a more organised and formal health and safety (H&S) management system, thus, takes H&S issues very seriously than the SMEs with less organised H&S management practices (Wang *et al.,* 2018; Sunindijo, 2015; Kheni *et al*., 2010). Construction SMEs are usually found wanting in health and safety-related issues in the construction industry which could be attributed to the complex nature of health and safety system. Furthermore, in developing countries, the industry is underdeveloped and dominated by unstructured SMEs; thus, abuse of health and safety measures are not unanticipated. It is common for construction organisations to undermine health and safety management practices (Shabangu, 2017; Orji *et al*., 2016). The frequent disregard for H&S management by construction organisations has resulted in a lot of health issues and accidents (Laryea and Mensah, 2010; Aghimien *et al*., 2018).

The findings of Mollo *et al*. (2020) in South Africa, suggested that the poor implementation of the safety

management system (SMS) on construction sites led to errors and violation which have become the norm. According to Perlman *et al*. (2014), errors and violations have a direct connection with accidents on construction sites; as they are the major causal factors of injuries and fatalities. While errors are not deliberate, they emanate from deviation from the normal path through inappropriate act or behaviour (HSE, 2019; Reason, 2016). Violation is deliberate acts that have been reinforced and made a norm in the workplace (HSE, 2019). Bell and Healey (2006) attributed the frequent neglect of health and safety to deviance normalisation. In the same vein, Randy (2017) observed that the absence of discipline and respect for safety practices, prioritisation of productivity above safety; are the major supporter of health and safety deviance normalisation. Health and safety deviance normalisation is the conscious repetition of an unsafe and risky activity that has not resulted in injuries in the short term; thus, the deviant conducts are accepted as normal or standard (Jennings, 2016). The deviant behaviours are allowed to continue by entities in the organisation as normal even though the acts are not in line with the basic safety rule of the organisation or industry (Randy, 2017). The continuous and deliberate indulgence in unsafe acts by craftsmen/artisans and tolerance of these unsafe acts by management and supervisory team; as a result of having been successful in delivering tasks and not falling victim to injuries and fatality is known as health and safety deviance normalisation. Health and safety deviances are allowed to subsist without causation or correction until it becomes a norm because there has not been fatality in the short run. Deviance normalisation impedes the full-scale implementation and practices of effective occupational health and safety in construction organisations. Health and safety is the responsibility of every stakeholder, but employees and management are guilty of flouting them. Jennings (2016) submitted that the acceptance of risks that were not acceptable originally could happen to a worker, a team or an organisation. It, therefore, implies that deviance normalisation is the main reason why unsafe act and warning signs are ignored before an accident occurs. The results of health and safety deviance normalisation are injuries and fatalities with consequences such as suspension of work, incapacitation of employees, disruption of work, loss of lives, loss of jobs, cost and time overruns, rework and waste, and disputes, among other contractual problems.

Like other developing countries of the world, the Nigerian construction industry is dominated by over 78% indigenous small and medium-sized firms (Tunji-Olayeni *et al*., 2016). These firms are predisposed to several forces both from their external and internal environments. According to Kheni *et al*. (2010), SMEs have little control over the external environment under which they operate; thus, are unlikely to give satisfactory attention to H&S because of the need to survive. The influence of these forces is more on the SMEs because of their characteristics and management style which

make them suffer higher H&S deviance practices when compared to the large and mostly foreign multi-national construction organisations. According to Ozmec *et al*. (2014), health and safety studies in the construction industry focused more on large organisations. Enormous studies on health and safety risks in construction have emanated from developed economies than developing countries (Kheni *et al*., 2010). Legg *et al.* (2015) also submitted that only a few studies exist on H&S studies among SMEs. Deviance normalisation hampers efficient health and safety management practices, and this is worsened as a result of the inherent characteristics and operations of the SMEs. Based on this information, this study examines the contribution of the characteristics of Construction SMEs to the prevalence of health and safety deviance normalisation in the construction industry. This study aims to determine the characteristics of SMEs that influence the prevalence of health and safety deviance normalisation in the construction industry of Nigeria, with a view to determining the impact of H&S deviance normalisation in the construction industry. The working objectives of this study are: 1) to determine the characteristics of SMEs that contribute most to health and safety deviance normalisation on construction projects, and 2) to determine the impact of health and safety deviances normalisation in the industry.

This study will help in the attainment of the social dimension of sustainability as submitted by (Aghimien *et al.,* 2019). It was submitted that health and safety-related issues are among the major constituents of the social dimension of sustainable project delivery (Aghimien *et al.,* 2019). Thus, the outcome will complement the environmental and economic aspects of sustainable construction. This will impact positively SMEs overall performance and improvement in construction projects delivery and workers well-being. Knowing the characteristics that contribute most to H&S deviance normalisation and the implications of the H&S deviant behaviours will help the managers of the SMEs and the industry regulators in making decisions that will change the functioning, management and operations of the SMEs in the construction industry.

2. LITERATURE REVIEW

2.1 Construction Small and Medium Enterprises (SMEs)

The definitions of small and medium enterprises (SMEs) in extant literature are dependent on the concerned country's level of development. However, common features in the definition of SMEs have been related to turnover, asset and the number of employees. In countries like UK, USA, and Canada, the features are a mixture of employment rate and turnover. SMEs are those organisations with an annual balance sheet total and turnover of not more than €43 million and €50 million respectively, and an employees' population of not more than 250 people (European Commission, 2015). The SMEs in Nigeria was defined by National Bureau of Statistics (2019)

and SMEDAN/NBS MSME Survey (2013) as those organisations with employees' population of at least 10 people and not more than 200 people, with Assets (land and buildings excluded) of more than ₦ 5million and not more than ₦ 500milion.

These SMEs are the backbone of Nigeria's economy and the major agent that drives economic growth, flexibility and vitality (Agwu and Emeti, 2014). SMEs have been projected to be the agent that will bring about the much-needed industrialisation of the Nigerian economy. Thus, Mahmoud (2005) posit that the step towards a diversified and vibrant Nigerian economy is through the development of SMEs. Lawal *et al*. (2014) confirm that the continuous use of SMEs to fast-track economic growth in both developing and developed countries has been advocated by development experts. In South Africa, construction SMEs accounts for about 19% of GDP, 17.7 in Mexico, 5% in Nigerian and 8% in Ghana (Usman *et a*l., 2014).

The construction industry globally is dominated by SMEs. SMEs constitutes 99.9% of all construction contracting businesses in the UK, and in the EU, it is 99% (European Commission, 2015; Lu, 2018). Manu *et al*. (2018) reported that in Malaysia, SMEs makes up a substantial percentage of micro-business construction organizations. Also, 90% of construction firms are SMEs as reported by (CIDB, 2018). The Nigerian construction industry is dominated by 78% small and medium-sized firms that are indigenously owned (Tunji-Olayeni *et al*., 2016). Globally, stakeholders in the construction industry are greatly concerned about the poor health and safety performance of SMEs. Even the government are bothered about the safety regulations and policies of the SMEs because of their population (Wang *et al.,* 2018), and isolated nature and geographical dispersion.

2.2 CSMEs Characteristics and Health and Safety Deviance Normalisation

Despite the contribution of the SMEs to economic growth and development, they suffer from health and safety performance issues as confirmed by (Masi *et al*., 2014). This was attributed to the limited physical, economic and organisational resources. As a consequence, they experience poor conditions of occupational health and safety when compared to large firms. The resource, physical and economic limitations could be the reason why the SMEs frequently undermine health and safety practices (Ying *et al.,* 2015). According to EU-OSHA (2014), in the EU, small firms contribute 67% to employment which cut-across all the industrial sectors but are responsible for 82% of health and safety fatalities. The level of health and safety issues on construction projects undertaken by SMEs is very high, and the nature and features of the SMEs could be blamed for this, due to the normalisation of H&S deviances behaviours. Financial problem is one of the features that have affected the investment in H&S management by SMEs. Fatai (2011) submitted that more than 80% of SMEs are muffled due to poor

financing and associated problems. Oduntan (2014) confirms that the management and scale of operations of SMEs are adversely affected because of financial problems. This implies that financial constraints impede the commitment of the managers of the SMEs to proper planning and H&S management. Therefore, implementing sustainable H&S management practices becomes a major problem as a result of poor finance (Jaroenroy and Chompunth, 2019; Belayutham and Ibrahim, 2019). Lingard (2013) also highlighted that most SMEs faces cash flow problems and this hampers good health and safety practices. In small organisations, there is a lack of financial security, the budget allocated for safety implementation is grossly inadequate, uses less formalised safety measures and engage temporary safety personnel (Stiles et al., 2012). These have influenced the normalisation of health and safety deviances in SMEs. Another thing is the perception of the employees and management regarding investment in H&S. For example, Zahoor *et al.* (2015) and Mohamed *et al.* (2009) reported that most SMEs consider investment in H&S as a liability and employees are of the view that it impedes workflow rate.

Resources limitations, non-centralised representation, heterogeneous nature, geographical dispersion, poor market share, and organisational issues of the SMEs encourage inefficient safety practices (Wang *et al*., 2018; Legg *et al.,* 2015). The inability of the SMEs to separate company management and other operations (Hasle *et al.,* 2012), thus, H&S management functions are integrated into other operations of the firms. Agwu and Emeti (2014) reported that in SMEs, there is a fusion of ownership and management. In additions, SMEs have a simple management structure where the owner is the sole manager; this impacts the decision regarding safety management. Furthermore, in SMEs, there is inefficiency in the overall management of their businesses and a lack of proper record-keeping and documentation (Agwu and Emeti, 2014). This implies the absence of historic data on H&S performances for planning purposes, and in pricing health and safety in the preliminaries section during tendering. Also, the absence of a well-articulated in-house occupational health and safety policy and system documentation, poor H&S knowledge of regulations and codes of practice, and improper evaluation of H&S risks; could influence H&S deviance normalisation by the construction SMEs (Legg *et al*., 2015 Adegboyega *et al*., 2021).

The poor and irregular performance on health and safety by the SMEs is blamed on a frequent change in site leadership (Loosemore and Andonakis, 2007). Occupational H&S methods of the SMEs are less formal; this is because they are used majorly as sub-contractors in a large project and main contractors in small ones (Belayutham and Ibrahim, 2019). Small projects do not require a comprehensive safety programme. Sunindijo (2015) posits that large projects usually handled by large organisations require detailed and robust H&S management; which the SMEs cannot provide. In SMEs, the

owners-managers are also the safety manager of the company. With the level of engagement and management responsibilities of the owner, OH&S management suffers and are rendered ineffective with a lot of losses. This, therefore, makes H&S management unattractive and unprofitable for the owners of the SMEs (Wang *et al.,* 2018). This excess load carried by the Owners of the SMEs leads to negligence, thus, H&S deviances are inevitably normalised.

SMEs engage domestic, seasonally and relatively less qualified workers. In these organisations, the effectiveness of health and safety training and education is limited because there is no sense of job security (Wang *et al*., 2018). Loosemore and Andonakis (2007) assert that because the CSMEs functions more as trade sub-contractors on large projects, they tend to use temporary skilled and unskilled labour forces. It was confirmed by Kolo (2015) that a greater percentage of construction workers are temporary staff. The temporary nature of construction projects and the characteristics of engaging temporary workers do not encourage the level of commitment that is needed by Health and safety on the construction site. Aside from the use of temporary workers, labour nomadism of the workers also affects H&S practices. Workers that are experienced and knowledgeable about the company's health and safety practices and policies, constantly change employers or migrate to another job in another location. Thus, retaining them becomes even more difficult because of the financial status of the SMEs and their perception about investment in H&S. Casualisation of workers employment contribute to H&S deviance normalisation; and makes it impracticable to keep workers for a longer period (Belayutham and Ibrahim, 2019).

Wang *et al.* (2018) posit that the higher accident and injury rate is one of the safety management characteristics of SMEs. This is due to the non-functional, ineffective and insufficient safety management coupled with their numerical strength in the industry. The absence of awareness of safety and resource limitation impedes the execution of safety policies and laws. Also, SMEs do not engage safety professionals in executing and improving H&S practices. These safety characteristics of the SMEs contribute to the prevalence of H&S deviance normalisation. As a consequence, unsafe production activities are treated as a normal situation (Wang *et al.,* 2018). Table 1 below is a summary of the identified SMEs characteristics influencing H&S deviance normalisation among construction SMEs.

Table 1: SMEs characteristics influencing H&S Deviance Normalisation

S/N	Variables	Source(s)
1	Constant project management and leadership changes	Loosemore and Andonakis (2007)
2	Financial insecurity	Fatai (2011); Oduntan (2014); Jaroenroy and Chompunth (2019); Belayutham and Ibrahim (2019); Lingard (2013).
3	Cash flow and payment issues	Lingard (2013)
4	Lack of clear cut different between management and operations	Hasle *et al. (*2012), Agwu and Emeti (2014)
5	Heterogeneous nature of SMEs	Wang *et al. (*2018); Legg *et al. (*2015)
6	Non-centralised representation	Wang *et al. (*2018); Legg *et al. (*2015)
7	Geographical spread (dispersion)	Wang *et al. (*2018); Legg *et al. (*2015)
8	Organisational issues	Wang *et al. (*2018); Legg *et al. (*2015)
9	Limited market spread (share)	Wang *et al. (*2018); Legg *et al. (*2015)
10	Insufficient access to external supports sources	Legg *et al.* (2015)
11	High level of resources limitations	Wang *et al. (*2018); Legg *et al.(*2015)
12	Lack of proper documentation/record keeping	Agwu and Emeti (2014); Legg *et al*. (2015)
13	Poor knowledge of health and safety risks evaluation	Legg *et al*. (2015); Adegboyega *et al*.(2021)
14	Poor knowledge of health and safety acts, regulations and code of practices.	Adegboyega *et al*.(2021); Wang *et al*. (2018); Legg *et al*. (2015)
15	Use part-time or temporary staff or labour force	Stiles *et al.,* (2012); Loosemore and Andonakis (2007); Kolo (2015)
16	Poor bargaining power and under-pricing of H&S	Ying *et al*. (2015)
17	Casualization of workers	Belayutham and Ibrahim (2019)
18	Safety measures are not formalised	Stiles *et al*. (2012)
19	Poor budgetary allocation for safety implementation	Stiles *et al. (*2012); Smallwood (2004)
20	Management Perception of investment in HS as liability	Zahoor *et al.* (2015); Mohamed *et al*. (2009)
21	Seeing adherence to HS as impediment to productivity	Zahoor *et al.* (2015); Mohamed *et al*. (2009)

2.3 Effect of H&S deviance normalisation in construction

The consequences of failed occupational health and safety in the construction industry, and especially among the SMEs are accidents, injuries and related property destruction to workers and their employers (Wang *et al.,* 2018). Wang *et al.* (2018) further submitted that the threat of occupational health and safety concerns in China and other countries of the world, impact both the society and the government.

The impact of H&S deviance normalisation on construction projects is substantial. Construction projects experience economic and financial losses and expense. The consequence of safety breakdown is accidents which

could lead to destruction to plant and equipment, injury to already completed work, loss of productivity in terms of work time, the extra cost to rebuild damaged work, loss of workers morale, disruption of work progress (Manase *et al.,* 2004). Accidents resulting from H&S deviance normalisation cause the construction organisations to experience loss of reputation and confidence by clients/customers, extra cost/fines for legal issues (Manase *et al.,* 2004). Arunkumar and Gunasekaran (2018) found that the effects of the accidents caused by OH&S deviance normalisation in the construction industry are extra cost for medical expenses, project execution delay, loss of productivity, loss of trust in firms, and the cost involved in new employees training. According to Kolo (2015), contractors suffer from financial losses in the form of cost of treating the injured, cost of litigation in case of claims, high cost of the premium for the insurance policy, liquidated and ascertained damages for delayed compensation to clients.

Delay in project execution, contractors' losses of confidence reposed on them by the client, bodily injury for employees, loss of income and revenue, death of workers, psychological problems as a result of their experiences, damages to equipment, materials and tools. Kadiri *et al*. (2014) found that the major consequence of H&S deviance normalisation is a loss of project time during the execution stage.

A lot of SMEs often do not consider H&S as vital during tendering, this have led to the non-inclusion of H&S budget and strategies in tenders. The non-inclusion of H&S measures in tenders according to Smallwood (2004), has led to the loss of bids by contractors in most cases. To ensure that SMEs inculcate H&S in their daily operations, Smallwood *et al.* (2018) advocated for a second- or third-party certification in health and safety (H&S). Table 2 below is a summary of the identified effects of H&S deviance normalisation in the construction industry.

Table 2: Effect of H&S deviance normalisation in construction

S/N	Variables	Source(s)
1	Lead to destruction to plant, tools, equipment and materials	Kadiri *et al*. (2014); Manase *et al.(*2004)
2	Damage to already completed work	Manase *et al.(*2004)
3	Extra cost to rebuild damaged work	Manase *et al.(*2004)
4	Loss of workers morale	Manase *et al.(*2004)
5	Disruption of work progress	Manase *et al.(*2004); Kadiri *et al*. (2014)
6	Loss of reputation and confidence by clients/customers	Kadiri *et al*. (2014); Manase *et al.(*2004)
7	Extra cost for medical expenses	Kolo (2015); Arunkumar and Gunasekaran (2018)
8	Project execution delay	Kadiri *et al*. (2014); Arunkumar and Gunasekaran (2018)

9	Loss of productivity	Arunkumar and Gunasekaran (2018); Manase *et al.(*2004)
10	Loss of trust in firms	Arunkumar and Gunasekaran (2018)
11	Cost involved in new employees training	Arunkumar and Gunasekaran (2018)
12	Cost of litigation in case of claims	Kolo (2015); Manase *et al.(*2004)
13	High cost of premium for insurance policy	Kolo (2015)
14	Liquidated and ascertained damages for delay compensation to clients	Kolo (2015)
15	Bodily injury to employees	Kadiri *et al*. (2014); Wang *et al. (*2018); Manase *et al.(*2004)
16	Loss of income and revenue	Kadiri *et al*. (2014); Manase *et al.(*2004)
17	Death of workers	Kadiri *et al*. (2014); Wang *et al. (*2018)

3. RESEARCH METHODOLOGY

The purpose of this study is to examine the contribution of the characteristics of Construction SMEs to the prevalence of health and safety deviance normalisation in the construction industry. The geographical area of this study is Abuja, Nigeria and the respondents were owners/managers, project managers, contract managers, H&S managers, and senior supervisors and other construction professionals occupying positions of responsibility, which understands the running of the company, know about occupational health and safety and are, involved in on-going construction projects. Abuja is the administrative headquarters of Nigeria with a lot of completed and ongoing building and other infrastructure developmental projects. Construction professionals, craftsmen, artisans and other construction-based trades are naturally attracted by job opportunities provided by the construction projects. Also, construction SMEs lags in health and safety performance, although, the form majority of the construction organisations in the industry (Sunindijo, 2015; Eze *et al*., 2020), thus, are suitable for this study. It follows that an improvement in the health and safety performance of the construction SMEs is an improvement in the health and safety performance of the construction industry since they dominate in terms of population.

Following a detailed literature review, 21 characteristics of the construction SMEs that contribute to the prevalence of health and safety deviance normalisation, and 17 effects of health and safety deviance normalisation were identified. Based on this and other background information, the questionnaire was developed. The questionnaire was used in the collection of data from the target respondents in the organisations that have been in existence for at least 5years. The participants were expected to have participated in the delivery of at least two construction projects. The idea behind these criteria is to reduce response bias and obtained quality data. The questionnaire was used because it saves survey time and covers a wider area (Tan, 2011). The

adopted questionnaire used a 5-point Likert scale in which 1 is the lowest and 5 the highest, the respondents were asked to rate the assessed variables according to their perceived contribution and importance to H&S deviance normalisation.

The population of construction SMEs and the sample size for the study was impracticable to be established because there is no database for CSMEs which have been in existence for at least 5 years and have delivered at least two projects. It is based on these, that a snowball sampling technique was adopted in the administration of the questionnaire. Snowball sampling was used to conveniently reach the target respondents and their organisations that met the study's sample set criteria. The snowball sampling according to Naderifer *et al.* (2017) is a convenient sampling technique that relies on referrals to reach difficult to access respondents with certain characteristics. This sampling technique has the potential to increase the sample response rate and minimise survey time and cost (Atkinson and Flint, 2001; Ramsey *et al.*, 2016; Naderifar et al., 2017). It was observed that the sampled SMEs engage between 2 to 5 professional employees in addition to the owners/managers. At least 2 people were sampled in each of the organisations visited and this was based on referrals by already sampled participants.

After a sampling period of 3months, 63 of the CSMEs were successfully sampled with a total of 156 sampled participants. The level of participation is high because of the method employed in the delivery of the research instrument. The study used both hand-to-hand delivery by trained research assistants and electronic means such as Google forms in the administration of the questionnaire. The analysis was based on the 156 responses received.

The gathered data were analysed using descriptive statistical tools such as frequency, percentage and mean score and standard deviations. The data garnered on the background information of the respondents were analysed using frequencies and percentages. Data gathered on the characteristics of the construction SMEs that contribute to the prevalence of health and safety deviance normalisation and the effects of health and safety deviance normalisation were analysed using the mean score and standard deviation (SD). The ranking of the variables was done using the combined values of the mean and standard deviation (SD). The mean score is the most frequently used descriptive analyses tool, it is easy to interpret when used for ranking and identifying more important variables. It is also used by scholars in built environment schools and beyond, and professional researchers in the construction industry. Where there is a tie in the mean score of two variables, the variable with the lower SD is ranked first as submitted by (Field, 2005). It was submitted that the variable with the smallest SD should be ranked first where the mean score of two

or more variables are the same. The standard error of the mean was used to establish whether the function determining the chosen sample population parameter is precise. Field (2005) supported this submission through its findings. It was found that the sample means is similar to the population means, when the standard error is small. In the words of Ilola (2018), the standard error reveals the level of accuracy of the mean of the given sample of a population compared to the true population mean. Higher standard error values imply that the mean is imprecise and not the representation of the true population mean. The samples chosen concerning population are adequate when the standard error is closer to 0.

Shapiro-Wilk test was used to determine the normality distribution (assumption) of the gathered data since the sample size is 156, which is far less than 2000. This is in line with the suggestion of Ghasem and Zahediasl (2012). It was suggested that the Shapiro-Wilk test should be used where the sample size is less than 2000. The p-value obtained for the variables were zero (that is, less than 0.05). The data, thus, failed normality assumption and were declared non-parametric. Since the gathered data are non-parametric, the difference in the perception of the participants in the small and medium organisations was determined using the Mann-Whitney U Test. There is the likelihood of a difference existing between the rating patterns of the participants in small and medium organisations. The Mann-Whitney U Test will help reveal this difference, especially in the variables where the views differ significantly, and in the proportion of the variables in which the rating pattern is similar. The reliability of the research instrument is very high as shown in Table 3; this is based on the Cronbach's alpha values of 0.868 and 0.922 obtained for the variables tested. For a good internal consistency, Kasim *et al*. (2019) suggested a Cronbach's alpha value range of 0.8-0.90.

Table 3 Reliability analysis

	case processing summary			reliability statistics	
		N	%	Cronbach's Alpha	Nr. of items
CSMEs characteristics that contribute to H&S deviance normalisation	Valid	156	100.00	0.868	21
	Excluded[a]	0	0.00		
	Total	156	100.00		
Effects of health and safety deviance normalisation	Valid	156	100.00	0.922	17
	Excluded[a]	0	0.00		
	Total	156	100.00		

a. Listwise deletion based on all variables in the procedure.

4.0 RESULTS AND DISCUSSION

4.1 Respondents background information

From Table 4, 52.56% of the respondents work with small organisations and 47.44% work with medium organisations. The results of the respondents' position/responsibility revealed that 27.56% are owners/managers of the organisations, 19.87% are project managers, 15.38% are contract managers, 16.03% are safety managers, and 21.15% are senior supervisors. This shows that only very few SMEs recognise the role of safety experts. Based on academic qualification, those with BSc./Btech. are more with 40.38%, followed by those with higher national diploma (33.97%), and then Masters degree holders (23.72%) and lastly, PhD holder were just 1.92% of the sampled population. This, however, showed that the participants have formal education, thus, can give reliable information that will aid the study.

Furthermore, the year of experience of the respondents revealed that 44.23% of the respondents have spent about 5-10 years in the industry, followed by 32.69% that have spent 11-15years, then 15.38% who have spent 16-20years and 7.69% have spent over 21years in the industry. The median class is 11-15years, meaning that the respondents are experienced enough to give an insight into the subject of the study. Regarding the number of projects executed, 39.10% have taken part in 2-5projects, 32.05% have taken part in 6-9projects, 21.15% have been involved in 10-13projects and 7.69% have executed over 14 projects. These reflect the quality of experiences gained in the industry.

Generally, the participants from the small and medium organisations were fairly represented. The number of projects executed, years spent in the industry, and coupled with their academic qualification and responsibility is an indication that the respondents possess the requisite knowledge and experiences for meeting the purpose of this study.

Table 4: Respondents background information

Variables	classification	freq.	per cent
Organisational type of respondents	Small (10 to 49 employees)	82	52.56
	Medium (50 to 199 employees)	74	47.44
	Total	**156**	**100.00**
Position/responsibility	owners/managers	43	27.56
	project managers	31	19.87
	contract managers	24	15.38
	Safety managers	25	16.03
	Senior Supervisors	33	21.15
	Total	**156**	**100.00**
Academic qualification	Higher National Diploma	53	33.97
	BSc/Btech	63	40.38
	Masters degree	37	23.72
	Doctorate	3	1.92
	Total	**156**	**100.00**
Years of experience	5-10years	69	44.23
	11-15 years	51	32.69
	16-20 years	24	15.38
	21-above	12	7.69
	Total	**156**	**100.00**
Number of projects executed	2-5 projects	61	39.10
	6- 9 projects	50	32.05
	10-13 projects	33	21.15
	14 projects and above	12	7.69
	Total	**156**	**100.00**

4.2 Level of H&S implementation and H&S deviance Normalisation in CSMEs

As shown in Table 5, the respondents were also required to rate the level of H&S implementation on construction project site by their organisations. It can be seen that the overall H&S implementation ranges between very low to average; with a combined response of 82.69%. This result means that the occupational health and safety performance of SMEs is poor. H&S practices appear to be consciously ignored, thus, leading to high injuries and fatalities recorded on construction sites where small and medium organisations are engaged. The poor H&S implementation further means that construction works are delivered under an unsafe environment where deviances in H&S have been normalised. However, the medium sized construction organisations have a better H&S performance record compared to the small organisations. The combined implementation level of H&S for 'high and very high' responses is 8.21% (21.62-13.41%) higher than that obtainable in the small organisations

Regarding the level of agreement that construction SMEs characteristics contribute to health and safety deviance normalisation in the construction industry, the overall responses showed that 35.90% of the respondents strongly agree,

24.36% of the participants very strongly agree and 21.79% moderately agree. Based on these results, it can be concluded that the characteristic of the SMEs impacts the health and safety implementation and performance on construction projects. It, therefore, follows that the poor health and safety performance of the SMEs are caused largely by their characteristics. This further means that deviances in H&S practices are inherent in their characteristics and the deviances behaviours have been made a 'new normal'. There is however a slightly difference in perception of the two organisations as 34.94% of the participants from the small organisations opined that the characteristics of SMEs contribute to H&S deviance normalisation than the participants from the medium organisations. The 34.94% was obtained from the difference in the combined responses that indicated 'strongly agreed and very strongly agreed' in both small and medium organisations.

4.3 CSMEs Characteristics that Contribute to H&S Deviance Normalisation

From the results in Table 6, the top five construction SMEs characteristics that contribute most to H&S deviance normalisation in the construction industry are; poor budgetary allocation for safety implementation (mean=4.30, S.D=1.0861), financial insecurity (mean=4.24, S.D= 0.8121), constant project management and leadership changes (mean=4.15, S.D=1.1517), seeing adherence to H&S as impediment to productivity (mean=4.13, S.D=1.0205), and lack of clear cut different between management and operations (mean=4.12, S.D=0.9459).

Table 5: Level of H&S implementation and H&S deviance normalisation in CSMEs

		Small		Medium		Overall	
Variables	**Classification**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
What is the level of H&S implementation in your organisation?	Very high	3	3.66	5	6.76	8	5.13
	High	8	9.76	11	14.86	19	12.18
	Average	18	21.95	14	18.92	32	20.51
	Low	26	31.71	21	28.38	47	30.13
	Very low	27	32.93	23	31.08	50	32.05
	Total	**82**	**100.00**	**74**	**100.00**	**156**	**100.00**
What is your level of agreement that construction SMEs characteristics contribute to health and safety deviance normalisation in the construction industry?	Very strongly agree	31	37.80	7	9.46	38	24.36
	Strongly agree	32	39.02	24	32.43	56	35.90
	moderately agree	12	14.63	22	29.73	34	21.79
	Disagree	4	4.88	12	16.22	16	10.26
	Very strongly disagree	3	3.66	9	12.16	12	7.69
	Total	**82**	**100.00**	**74**	**100.00**	**156**	**100.00**

While, the least five characteristics of the CSMEs that contribute to H&S deviance normalisation are; limited market spread (share) (mean=3.40, S.D=1.3183), lack of proper documentation/record keeping (mean=3.35, S.D=1.2631), geographical spread (dispersion) (mean=3.33, S.D=1.4248), Heterogeneous nature (mean=3.26, S.D=1.3252), and non-centralised representation (mean=3.17, S.D=1.3576).

These results support the submissions of (Jaroenroy and Chompunth, 2019; Belayutham and Ibrahim, 2019; Zahoor *et al*., 2015; Oduntan, 2014; Lingard, 2013; Stiles *et al*., 2012). Stiles *et al*. (2012) reported that small organisations are characterised by a lack of financial security, the insufficient budget allocated for safety implementation is grossly inadequate, uses less formalised safety measures and engage temporary safety personnel. The wrong perception of the owners of the SMEs and their employees were found to be one of the reasons for H&S deviance behaviours. This was reported by Zahoor et al. (2015), it was submitted that SMEs considers investment in H&S as a liability and employees are of the view that adhering to H&S policies impedes work rate. Financial insecurity and cash flow problems characterise the functioning of the SMEs and hinder the commitment of their managers from proper H&S planning and management (Oduntan, 2014; Lingard, 2013; Jaroenroy and Chompunth, 2019; Belayutham and Ibrahim, 2019). Poor finance and associated problems are among the reasons 80% of SMEs fails (Fatai, 2011). The fusion of ownership, management and other operations (Agwu and Emeti, 2014; Hasle *et al.,* 2012), are among the characteristics of the SMEs that contribute to poor H&S practices. Another characteristic of the SMEs that contribute to H&S deviance normalisation is the frequent change of site management and leadership (Loosemore and Andonakis, 2007). The constant change of site management means that knowledge will be lost since there is no proper record-keeping by the SMEs (Agwu and Emeti, 2014).

The overall average mean of the assessed variables is 3.80, and this is higher than the 3.5 that (Osunsanmi *et al*., 2020) consider important. Concerning the highest Likert scale point of 5, the 3.80 average mean score is equivalent to 75.93%; and this is a high value. This implies that all the variables contribute greatly to continuous accidents and injuries in the construction industry. They, therefore, have a high level of contribution to the prevalence of normalisation of health and safety deviance. Furthermore, the impact on the poor health and safety performance of the SMEs in the construction industry. In addition, the standard error of the variables further show that the chosen sample is adequate, compare to the true population mean. This is premised on the fact that the standard error is small and closer to zero (Field, 2005; Ilola, 2018).

The Mann-Whitney U Test was further used to reveal where the

difference occurs in the views of the small and medium organisations in terms of individual variables, and the proportion of the variables in which the rating pattern is similar. The test result shows that there no statistically significant difference in the perception of 18 (85.71%) of the variables. Thus, the rating pattern of these 18 variables is similar. This further means that the participants view in the two organisational categories converge in 85.71% of the variables assessed. This decision is premised on the significant p-value obtained for the variables which are higher than 0.05. A divergent view was, however, observed in 3(14.29%) of the assessed variables, because the p-values obtained are less than 0.05. Thus, it can be said that there is a significant statistical difference in the perception of respondents in these variables. These variables with their Z and P-value scores as shown in (column 6 & 7 of Table 6) are; high level of resources limitations (Z=-3.416, Sig=0.001), casualization of workers (Z=-3.134, Sig. =0.002), and Poor budgetary allocation for safety implementation (Z=-3.648, Sig. = 0.000). This divergent view in the rating pattern of these 3 variables could be as a result of 1) the participant different understanding of what constitute resources, 2) the varying degree of use of casual workers in the organisations, and 3) how serious safety is taken in the organisations.

Table 6 CSMEs characteristics that contribute to H&S deviance normalisation

SMEs Characteristics	Mean	S. D	S. EM	Rank	Mann-Whitney	
					Z	Sig.
Constant project management and leadership changes	4.15	1.1517	0.0922	3rd	-1.229	0.219
Financial insecurity	4.24	0.8121	0.0650	2nd	-0.105	0.916
Cash flow and payment issues	3.81	1.1461	0.0918	12th	-0.912	0.362
Lack of clear cut difference between management and operations	4.12	0.9459	0.0757	5th	-0.505	0.613
Heterogeneous nature of SMEs	3.26	1.3252	0.1061	20th	-0.198	0.843
Non-centralised representation	3.17	1.3576	0.1087	21st	-0.621	0.535
Geographical spread (dispersion)	3.33	1.4248	0.1141	19th	-0.491	0.623
Organisational issues	3.67	1.2708	0.1018	16th	-1.759	0.079
Limited market spread (share)	3.40	1.3183	0.1055	17th	-0.142	0.887
Insufficient access to external supports sources	3.76	1.2081	0.0967	13th	-0.534	0.593
High level of resources limitations	3.84	1.2623	0.1011	11th	-3.416	0.001*
Lack of proper documentation/record keeping	3.35	1.2631	0.1011	18th	-0.893	0.372
Poor knowledge of health and safety risks evaluation	3.95	1.1060	0.0886	7th	-0.417	0.677
Poor knowledge of health and safety acts, regulations and code of practices.	3.76	1.2081	0.0967	13th	-0.534	0.593
Use part-time or temporary staff or labour force	3.91	1.1988	0.0960	8th	-0.884	0.377
Casualization of workers	3.70	1.1096	0.0888	15th	-3.134	0.002*
Poor bargaining power and under-pricing of H&S	3.88	1.0737	0.0860	10th	-1.003	0.316
Safety measures are not formalised	3.89	1.1672	0.0935	9th	-1.961	0.051
Poor budgetary allocation for safety implementation	4.30	1.0861	0.0870	1st	-3.648	0.000*
Management Perception of investment in H&S as liability	4.11	1.1278	0.0903	6th	-1.406	0.160
Seeing adherence to H&S as an impediment to productivity	4.13	1.0205	0.0817	4th	-1.945	0.052

*Sig. = p-value <0.05; S.D = standard deviation; S.EM= standard error mean

Regardless of the divergent views, the variables do have an important impact in contributing to health and safety deviance normalisation in the industry. This is evident in their mean score which is higher than 3.5.

4.4 Effects of Health and Safety Deviance Normalisation

From the results in Table 7, the top five effect of H&S deviance normalisation in the construction industry are; disruption of work progress (mean=4.41, S.D= 0.8181), project execution delay (mean=4.37, S.D= 0.7806), extra cost for medical expenses (mean=4.33, S.D=0.7199), death of workers (mean =4.29, S.D =0.7468), and extra cost to rebuild damaged work (mean=4.27, S.D=0.7304). While, the least impact of health and safety deviance normalisation in the construction industry are; liquidated and ascertained damages for delay compensation to clients (mean=3.89, S.D=1.2106), lead to destruction to plant, tools, equipment and materials (mean=3.81, S.D=1.0765), and loss of trust in firms (mean=3.61, S.D=1.3892). The results support findings in the extant literature and corroborate studies of (Arunkumar and Gunasekaran, 2018; Kolo, 2015; Kadiri *et al*., 2014; Manase *et al*., 2004).

Arunkumar and Gunasekaran (2018) reported that extra cost for medical expenses, project execution delay, loss of productivity, loss of trust in firms, and cost involved in new employees training were the major effects of the injuries and fatalities caused by OH&S deviance normalisation in the construction industry. Loss of project execution time, bodily injuries and death of workers were also reported by Kadiri *et al*. (2014) to be among the major effects of H&S deviance normalisation. Among the consequences of H&S deviance normalisation in the long run posited by Manase *et al*.(2004) are; the extra cost to rebuild damaged work and disruption of work progress. According to Kolo (2015), a contractor suffers from financial losses in the form of the cost of treating the injured and cost of various other claims.

The seemingly unending high injury and fatality rates in the construction industry, impact heavily on construction firms, workers, the projects being executed and the client's satisfaction level. Unsafe deviance behaviours that have been made the 'new normal in the execution of construction projects, is a disaster waiting to happen. Success in previous deviance behaviours does not mean that fatality will not result in succeeding tasks. Apart from the effect on the health of the workers, organisations, projects, equipment and tools, and the relationship with clients, deviance normalisation could also lead to poor quality work, rework, wastage, among other issues.

The overall average mean of the assessed variables is 4.12, and this is higher than the 3.5 that Osunsanmi *et al*. (2020) consider as important. Concerning the highest Likert scale point of 5, the 4.12 average mean score is equivalent to 82.50%; and this is a very high value. This implies that all the variables are affected by H&S deviance normalisation in the construction industry. The long-term consequences of H&S deviance

normalisation are accidents and injuries in the construction industry. The occurrences of injuries and fatalities have negatively on organisations, projects, workers and clients. In addition, the standard error means of the variables further show that the chosen sample is adequate to compare to the true population mean. This is premised on the fact that the standard error is small and closer to zero (Field, 2005; Ilola, 2018).

Furthermore, the Mann-Whitney U Test carried out shows that the rating pattern of 13 variables is similar. This implies that the participants in the small and medium organisations have a convergence view in 76.47% of the assessed variables. The significant p-value for the variables is greater than 0.05. Thus, it was concluded that there no statistically significant difference in the perception of 13 (76.47%) of the variables. A significant statistical difference was however obtained in the perception of respondents in 4 (23.53%) of the variables. These variables have their p-values to be less than 0.050. This implies a divergent view among the participants in small and medium organisations.

The four variables and their respective Z and p-value scores displayed in (column 6 & 7 of Table 7) are; loss of workers morale (Z=-3.331, Sig. =0.001), loss of reputation and confidence by clients/customers (Z=-4.697, Sig. =0.000), extra cost for medical expenses (Z=-3.096, Sig. =0.002), and loss of trust in firms (Z=-2.193, Sig. = 0.028).

Table 7 Effect of H&S deviance normalisation

Effect of H&S deviance normalisation	Mean	S.D	S.EM	Rank	Mann-Whitney	
					Z	Sig.
Lead to destruction to plant, tools, equipment and materials	3.81	1.0765	0.0862	16th	-0.678	0.434
Damage to already completed work	4.06	0.9245	0.0740	11th	-0.933	0.336
Extra cost to rebuild damaged work	4.27	0.7304	0.0585	5th	-1.847	0.067
Loss of workers morale	4.01	1.0984	0.0879	13th	-3.331	0.001*
Disruption of work progress	4.41	0.8181	0.0655	1st	-1.365	0.172
Loss of reputation and confidence by clients/customers	3.96	1.1492	0.0920	14th	-4.697	0.000*
The extra cost for medical expenses	4.33	0.7199	0.0576	3rd	-3.096	0.002*
Project execution delay	4.37	0.7806	0.0625	2nd	-1.516	0.129
Loss of productivity	4.26	1.1688	0.0936	6th	-1.321	0.206
Loss of trust in firms	3.61	1.3892	0.1112	17th	-2.193	0.028*
The cost involved in new employees training	4.17	1.2119	0.0970	10th	-0.68	0.497
Cost of litigation in case of claims	4.23	1.0463	0.0838	8th	-1.851	0.064
The high cost of the premium for an insurance policy	4.21	1.0142	0.0812	9th	-1.131	0.291
Liquidated and ascertained damages for delayed compensation to clients	3.89	1.2106	0.0969	15th	-0.808	0.419
Bodily injury to employees	4.24	0.8220	0.0576	7th	-1.062	0.289
Loss of income and revenue	4.01	1.1749	0.0941	12th	-1.640	0.111
Death of workers	4.29	0.7468	0.0576	4th	-0.761	0.441

*Sig. = p-value <0.05; S.D = standard deviation; S.EM= standard error mean

This difference in the rating style of these 4 variables could be as a result of 1) the varying level of motivational packages adopted in the organisations, 2) differences in clients' loyalty to the organisation, 3) temporary staffs do not have medical insurance, and 4) owners-managers and clients have a personal relationship that is not affected by H&S performance. Regardless of the divergent views, H&S deviance normalisation has a very high impact on these variables, this decision is based on the mean scores of the variables that are greater than 3.5.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the contribution of the characteristics of Construction SMEs to the prevalence of health and safety deviance normalisation in the construction industry. It also assessed the effect of H&S deviance normalisation in the construction industry. It utilised a quantitative research questionnaire and snowball sampling techniques in gathering data from owners/managers of construction SMEs and other senior management staff of the organisations.

The study concludes that CSMEs level of health and safety implementation and performance is poor and this is caused by the characteristics of the SMEs. Furthermore, the prevalence of health and safety deviance normalisation is inherent in the characteristic of SMEs. The characteristics of the SMEs that contribute most to H&S deviance normalisation in the construction industry are; poor budgetary allocation for safety implementation, financial insecurity, constant project management and leadership changes, seeing adherence to H&S as an impediment to productivity, and lack of clear cut difference between management and operations. Also, disruption of work progress, project execution delay, extra cost for medical expenses, death of workers, and extra cost to rebuild damaged work, were the most important effect of H&S deviance normalisation in the construction industry.

Based on the findings, this study recommends that; improving the health and safety performance of the Construction SMEs involves interventions. Partnership with H&S professional firms is one of the intervention strategies that the SMEs could leverage to improve their H&S performance. The provision of financial securities by the government to increase their financial and other resources capacities of SMEs is also critical. Partnering and financial support might encourage SMEs to adopt more innovative safety monitoring and management using technology. The use of the H&S management plan as a vital pre-qualification criterion for the subcontracts will serve as an incentive for taking safety seriously and a trigger for the provision of an adequate budget for H&S planning and implementation. Adequate management and leadership support are needed to make health and safety culture an integral part of the functioning of the organisations. A sound organisational health and safety culture will ensure the refocusing of management on adequate safety over

productivity. Sustainable H&S training and induction programmes for new employees on construction projects should be put in place by construction organisations. This will increase workers consciousness of the consequences of H&S deviance. Awareness and safety implementation campaigns in the construction industry and particularly among construction SMEs which makes up the bulk of the construction firms in the industry is important. This will allay the fear and misconception they hold regarding investment in Health and safety.

The uniqueness of the study lies in the sampling of owners/managers of the SMEs and other responsible key senior staffs. This study adds to the existing body of knowledge on health and safety practices in the construction industry. The study would be useful to managers/owners of the SMEs and the industry regulators and other stakeholders in making decisions that will change the functioning, management and operations of the SMEs and the H&S related practices and performances in the construction industry. Care must be taken in generalising the findings of this study, as it is limited by geographical boundary and sample size. Thus, a further similar study is proposed so that more characteristics could be assessed. This study could take place in other state or country or region to enable findings to be compared. The role of collaboration on health and safety performance could be investigated. A study that will explore how collaboration could be used to improve the health and safety performance of the SMEs can be embarked upon. In this era of industry 4.0, the health and safety of the workplace can be improved and made sustainable using ICT.

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Involvement of Community-Based Associations towards Sustainable Settlement Infrastructure in Ilorin, Nigeria

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Abstract
To reduce the national housing deficit in Nigeria, numerous government housing estates were constructed and allocated for people to reside. Government housing estates in Nigeria are now characterized by gross discomfort due poor state of the infrastructures. This study appraised the involvement of Community-Based Organisation in the provision of infrastructural facilities in Mandate Housing Estate, Ilorin, Kwara State. Questionnaires were administered to officials of the Kwara State Housing Corporation and committee members of the Community-Based Organisations in the estate. Findings reveal that communal involvement led to the provision of culverts, parking facility, walkway, and streetlight while the utilities and services provided by associations also include electric pole, electric transformers, waste disposal, deep-well, borehole, and security. The involvement strategies in community development projects by the associations include resource mobilization, special levy, physical participation, and payment of the regular levy. In contrast, factors influencing residents' participation in community projects include affordability to pay, the influence of neighbours and households, and the suitability of projects. Among the recommendations made for improved infrastructural facilities through community-based organisation are upgrading of amenities in the housing schemes, the connection of the schemes to public water mains, spatial control and review of developmental plan in the estates and housing schemes.

Keywords: Community-Based Associations; Infrastructure Facilities; Community Projects; Community Involvement and Participation; Urban Estate.

1. Background of the Study

Globally, infrastructural facilities have been a primary concern of urban residents and, most importantly, in developing countries as the pace of urbanization and population explosion are fast exceeding the available infrastructure. The issues of urban infrastructural facilities, especially in residential areas in cities and communities, have been of great interest to many researchers and scholars in recent times. Authors (Moteff and Parfomak 2004; Kim 2006; Abegunde, 2009) have explained urban infrastructure and its associated issues

at different times with varying scopes. Agbola and Adegoke (2011) described infrastructure as a systematic framework which underpins a community's ability to fulfil its mission of providing a base for its citizens to be productive, and to nurture social equity. Infrastructural facilities remain necessary ingredients not only for socio-economic production but also for conducive living in various communities of human settlements (housing estates and schemes inclusive) around the world. By this, infrastructure is essential facilities, services, and installations (electric power, ports, roads, water supplies, public transportation, telecommunications, and schools) needed for the functioning of a community or society (Moteff and Parfomak 2004; Kim 2006).

Jimoh *et al.* (2016) classified infrastructural facilities into three which are physical infrastructure (roads, water, electrification, storage, and processing facilities), social infrastructure (health, educational, community centre, and fire and security services) and institutional infrastructure (financial institutions and agricultural research infrastructure). The physical infrastructures and, by extension, social infrastructure is of utmost importance to human dwellings and communities. Hence, it is based on the availability, extent of adequacy, and functioning of these infrastructural facilities that housing estates are more livable and satisfactory to residents with the vigor of experiencing a sense of livelihood in such community.

The provision of adequate housing with accompanying infrastructure for the teeming urban population remained one of the most complex challenges confronting many cities in developing countries (Baraje 2014). As urban areas in developing countries continue to witness rapidly growing population and urbanisation, there are indications that despite the vital role infrastructure plays in the physical and socio-economic development of individuals and communities, the frantic efforts made in addressing the situation have not achieved the desired results.

Bello-Schünemann and Porter (2017) opines that the provision of necessary infrastructural facilities has not kept pace with the rapidly growing urban population in Nigeria. The study reported that Nigeria's basic physical infrastructure deficit severely compromises the country's prospects for economic growth and human development. Therefore, community members generally form themselves into groups to participate in development projects for their overall wellbeing. This is as a result of the realization of the fact that contemporary governments can no longer single-handedly meet most of these community infrastructures and non-infrastructure needs (Toyobo and Muili 2008). Such community groups that adopt self–governing techniques for collective action on infrastructural facilities towards bridging infrastructural deficit in their community and make provision for a growing population are regarded as community-based organisations in which Landlord Associations belong.

The dismal performance of government in meeting the socio-economic quests of citizens has been identified as one of the reasons behind the proliferation of Community Based-Organizations (CBOs) (Abegunde, 2009). Hence, the emergence of Community-Based Associations such as the Landlord Associations is equally occasioned by inadequate provision of infrastructural facilities within a particular community by respective governments coupled with the need to bridge such infrastructural deficiency. Like other CBOs, Landlord Associations are in the vanguard of providing and maintaining some services which are exclusive functions of the Local Government within which their community domiciles aside from financing and executing other physical development projects based on their financial capabilities.

With the government in most of the countries, especially in developing countries like Nigeria, partially withdrawing from urban infrastructural provision and maintenance, most notably in residential neighbourhoods, community-based organizations are filling gaps created by such withdrawal. Hence, collective mobilization of resources in project initiation, design, implementation, and funding influenced the type of infrastructure projects the community-based organisations have been able to undertake, most notably in urban centres (Ibem, 2009).

Ilorin, the capital of Kwara state, has also been experiencing a high rate of urbanization and population growth with government embarking on housing programmes to accommodate such. Like other residential dwellings, residents in government housing schemes are left to seek alternative means to meet their infrastructural deficiency and requirements to have a habitable residence with necessary infrastructural facilities. It is on this basis that this study is examining the involvement of Community-Based Organisations in the provision of infrastructural facilities in Ilorin, Kwara State using Mandate Housing Estate as a reference. This study is meant to fill the identified gap in existing knowledge as well as to open a new vista on urban infrastructure, most notably in residential estates. The question that guides this study is:

i. What is the infrastructure condition of the residential estate?
ii. What is the role of community-based organisations in infrastructure provision?

2. Situating the Study within the Sustainable Settlement Infrastructure Discourse

With urban service delivery being on the decline, and local, state, or national service and infrastructure delivery authorities been overwhelmed by challenges in providing essential public services (Popoola and Magidimisha, 2018), various community-based organisation are thereby formed to provide the needed succour (Popoola and Magidimisha, 2019, 2020) in infrastructure and service delivery. The importance of Community Based Organisations has, over the years, been documented by numerous scholars (Mequanent, 1998;

Rothman, 2005; Popoola and Magidimisha, 2020).Prompting the roles of community (public and private) in the form of grassroots groups, community-based organizations, self-help groups, base level organizations and community-based organisations remains fundamental to the functioning and provision of infrastructure (Popoola and Magidmisha, 2020:305). Buttressing this, community infrastructure needs the active involvement of the people residing in the neighbourhoods (Rothman, 2005:7). The argument of the author was that effective community infrastructure must be in partnership with neighbourhood residents who seek to transform and improve the areas that they call home. As iterated by Mequanent (1998), coordinated community development has been perceived as a proactive strategy for the survival and development of rural people and space.

However, there is usually a need to intensify efforts on other areas left untouched or not thoroughly touched by scholars. Sincerely acknowledging the contributions of community-based organizations such as Landlord Associations and Estate Residents' Associations remained a better approach towards encouraging them to do more in their community. Hence, this study is necessary to boost the morale of such association by encouraging them to complement government efforts through pooling their resources together towards improving their state of infrastructural facilities in their territory.

The maintenance of urban centres, most especially communities of residences, is fast overwhelming the capacity of city government. It is, therefore, reasonable to embark on this study now for consistent urban maintenance and management using community-based organisations as crucial instruments in urban governance and settlement sustainability. There could be consistent urban decay and deterioration due to the neglect of crucial infrastructure or inadequate urban infrastructure to serve the residents, as a result, the functions of the community-based organisation can be documented and appropriately cater to by the government using the instrument of law to integrate them as a veritable partner in the infrastructural provision, maintenance, and management, most especially in urban centres.

Therefore, this study is significant as the government cannot singlehandedly provide infrastructure at the required rate, especially in various communities of residence. Since the provision of infrastructural facilities needs vast infusions of capital to ensure adequacy for the teeming populace, integrating community-based organisations is mostly required now. Hence, there is a need to shift from the traditional supply orientation of infrastructure policy, which tends to overemphasize public sector provision and excessive political involvement in decisions about investment and pricing to other viable opportunities provided by community-based organisations. Since many of several previous studies on

infrastructural facilities provision have revolved around infrastructural policy, private sector participation, management thrusts, public-private partnership, and environmental education among others, it is time to extensively exploit the nature, extent, and involvement of community-based organisation which had hitherto been neglected in the provision and maintenance of infrastructural facilities in residential estates.

The scope of this study is restricted to infrastructural facilities provided in Mandate Estates, Ilorin with prime emphasis on the Landlord/Residents' Associations in the estate as a typical example of a Community Based Organisation. Therefore, both Mandate Housing Estate I and Mandate Housing Estate II shall be the geographical coverage of this chapter.

3. Conceptualizing the study

This study is based on the Community Action Model. The model, as illustrated by Abegunde (2009), originated from the theory of Paulo Freire, a Brazilian educationist who, through his concern for the oppressed, argued that disparity between poor and prosperous residents could be bridged through self-determination from those in the low socio-economic class (Hennessey *et al.*, 2005). Awakening of people's conscience to have self-confidence assist in attaining the desired goal collectively (Freire, 2007), and the enlightenment of mind can be achieved through education, which empowers the poor to strive towards a common goal and confront the oppressors collectively.

When this is achieved, the poor can easily develop their community to catch up with the affluent class. Abegunde (2009) states that the community action model involves participatory action research approaches and is an asset based as it builds on the strengths of a community to create changes from within. The model intends to create changes by building community capacity, working in collaboration with communities, and providing a framework for residents to acquire skills and resources necessary to assess their socio-economic conditions. After that, the community can plan, implement, and evaluate actions designed to improve those conditions.

The five underlying assumptions of community action model are:

i. It identifies inequality in the distribution of regional resources.
ii. It believes that inequality can be bridged through the awakening of mind and self-confidence.
iii. It focuses on changing an individual's lifestyle and behaviour.
iv. It mobilizes community members and agencies to eliminate undesired conditions.
v. It places the onus on the individual and does not challenge the social structures that shape residents' choices and decisions.

By this, the community action model in infrastructure delivery is designed to increase the capacity of communities and organizations to address the social and economic determinants

that will positively influence their community. Therefore, community-based organization is seen to fulfilling aspirations and yearnings of her members/residents as well as recognizing Community-Based Organisations as vehicles towards economic development in lagging regions. Slaymaker *et al.* (2005) identified that empowerment, building organisational capacity, improving efficiency, effectiveness and sustainability, and strengthening local government is a synopsis of CBO approach. This is imperative as CBO activity is both focused at improving service, enhancing infrastructure access, and engaging the capacity of the community for improved liveability. Towards enhancing health disparity, Hennessey-Lavery *et al.* (2005) in Figure 1 identified five steps to community action model.

The model was based on capacity building and community organizing strategies and is designed to make issues relevant to the community (Hennessey-Lavery *et al.,* 2005). This was why Montero (2009:150) iterates that communities are part of that space, and as is often said, the voice of the people creating, transforming, preserving, and influencing them, should be heard. Hence, it provides a forum for individuals to collectively contribute towards the progress of the community to catch up with prosperous regions in another part of the world. This model is suitable for Mandate Housing Estates, the study area of this research due to infrastructural neglect being witnessed by the residents from the government. As a result, the coming together of

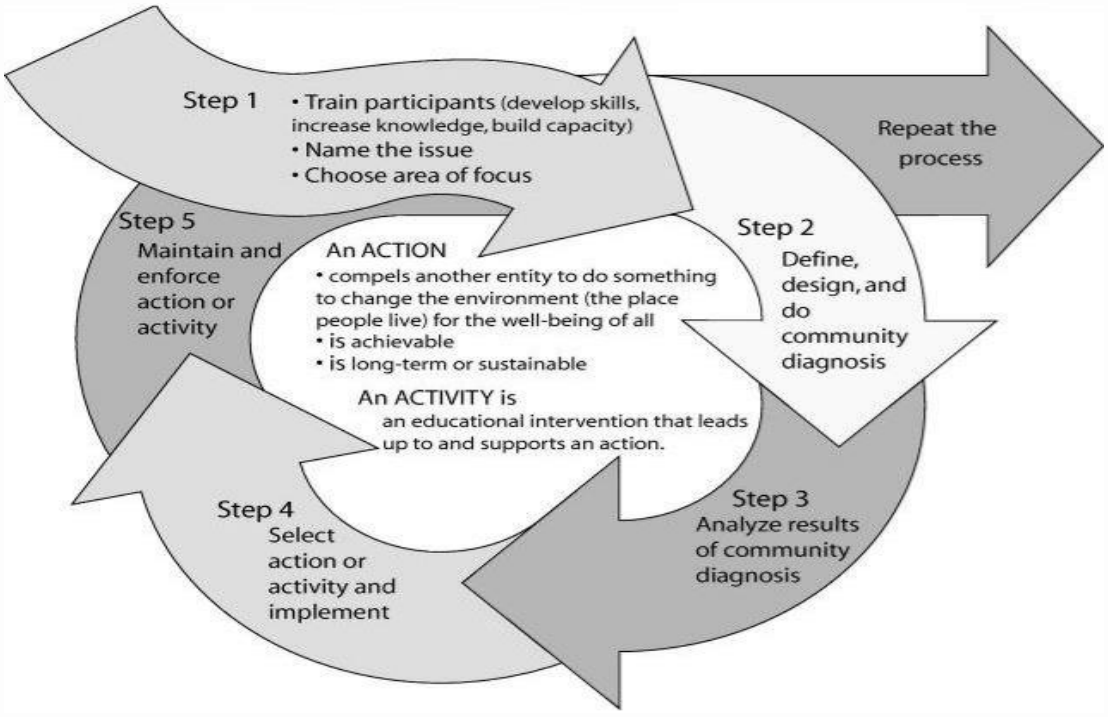

Figure 1. The 5 steps of the community action model process

Source: Hennessey-Lavery *et al.* (2005)

residents/landlords in the estates towards shaping and improving their infrastructural deficit connote the principles of the community action model.

4. Study setting, methods, and materials

Ilorin, located on latitude $8^{0}30^{'}$N and longitude $4^{0}32^{'}$E, is the capital city of Kwara State is the gateway between the Northern and Southern region of Nigeria. The city is a transitional zone between the open savannah belt of which it is an integral part to the North and forest area to the South and is bounded in the North by Niger state, in the East by Ekiti/Osun States and in the South by Oyo State (Figures 2 and 3).

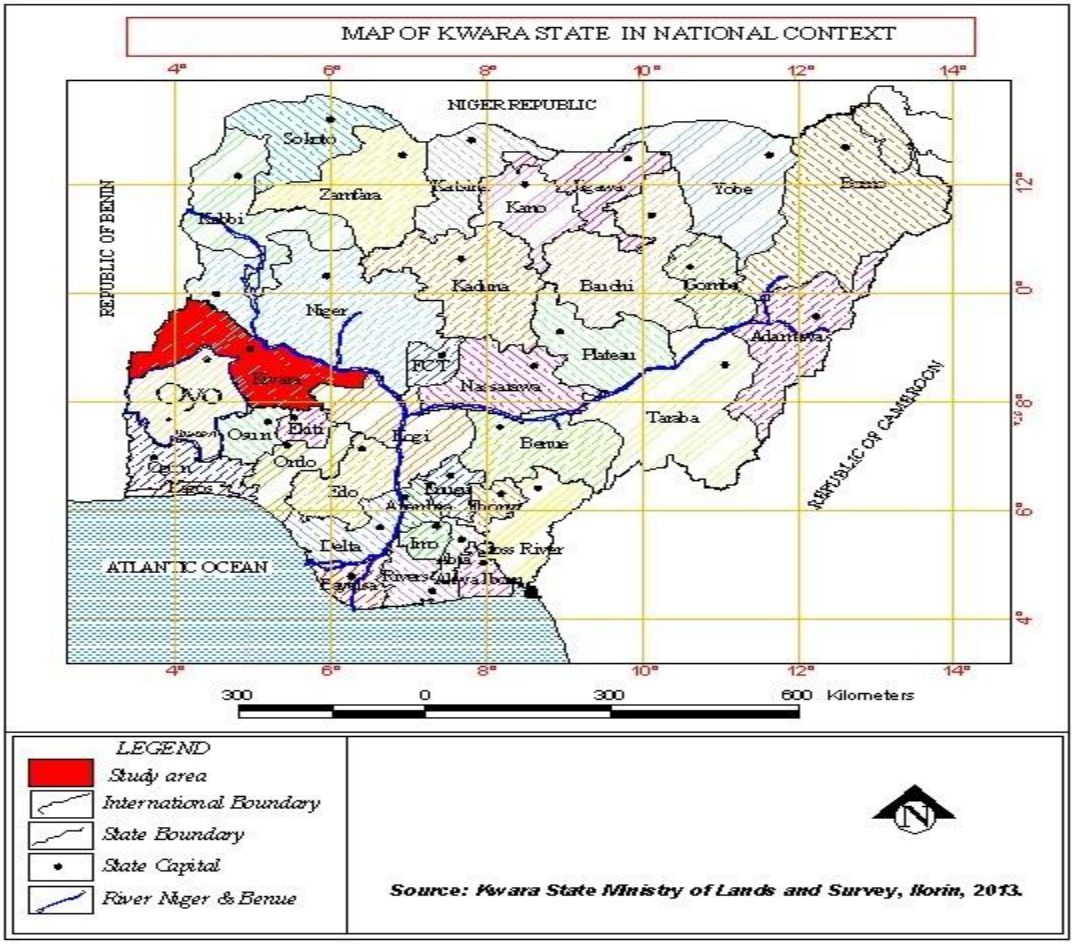

Figure 2. Kwara State within the context of Nigeria

Source: Kwara State Ministry of Lands and Survey (2013)

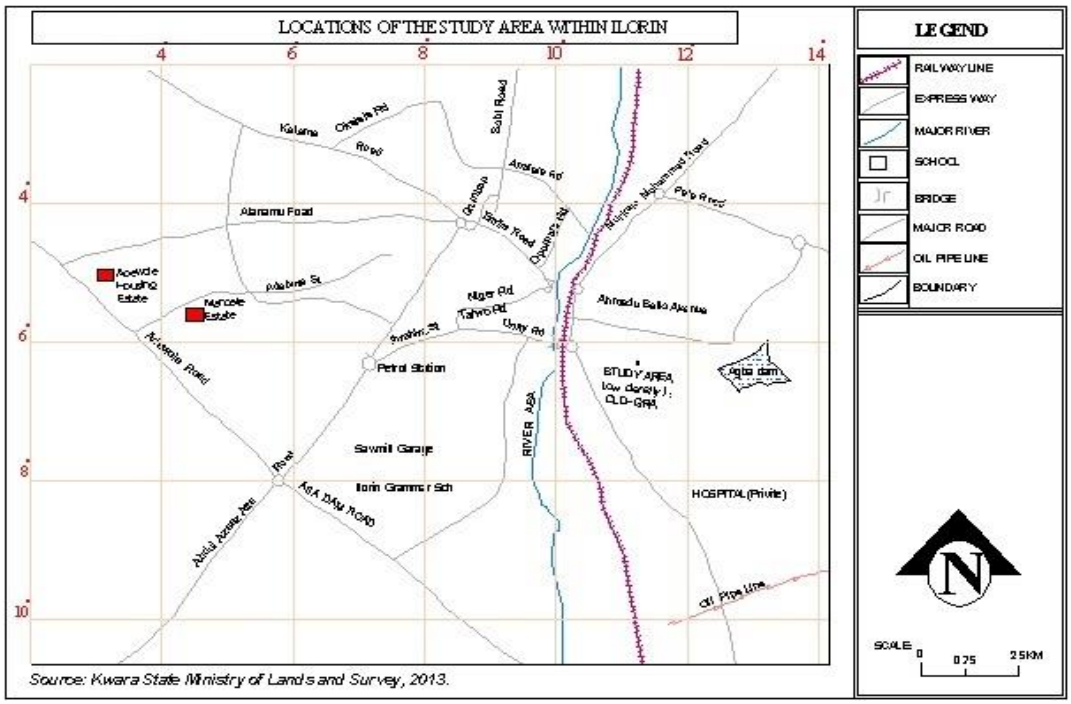

Figure 3. Map of Mandate Housing Estate, Ilorin

Source: Kwara State Ministry of Lands and Survey (2013)

The growth of Ilorin can be viewed from administrative periods, and this denotes that the town has evolved through the process of traditional urbanization, which took place in certain parts of West Africa before the establishment of colonial rule. Post-colonial experience shows the development of the city northward owing to the location of the Kwara State Polytechnic along Jebba road. The growth can also be said to radiate and spread outwards from the indigenous area. The outward growth account for the increasing number of commercial and economic industries such as the International Tobacco Company, Coca-Cola Bottling Company, Dangote Flour Mills, and Tuyil Pharmaceutical company.

The city after Offa (a significant town in the state) is the largest in Kwara State. Historically, the colonial administration put the population of the city at about 36,343 in 1911, while by 1921, the population has highly increased, and the socio-economic functions are predominantly rural (Baraje, 2009 and 2014). The 1991 population census put the figure at 572,198, while the 2006 census results, the most recent National Population and Housing Census put the population of Ilorin to be 777,667 (FGN 2007).

Information required for this study work was obtained through primary and secondary sources.

i. Primary Sources: This source included information obtained directly from residents or members of the Landlord/Residents' Association in the study area. A structured questionnaire

administered to residents or landlords in the study area was the primary data capturing tool. The questionnaire was also administered to officers of Kwara State Housing Corporation towards ascertaining the government's efforts towards the provision of infrastructural facilities and maintenance in the estates. A purposive and accidental sampling technique was employed. In this regard, data was collected on varying variables about the objectives of the study and after the preliminary assessment of infrastructural facilities in Mandate Housing Estates and the government's agency responsible for the estates. The step involved in primary sources of data capture for this study includes the followings:

a. Physical enumeration of infrastructure: This included the undertaking of inventory and enumerations of infrastructure in the estates and subsequent evaluation of their quantity concerning the population of housing residents as well as the extent of such infrastructure satisfying the demands of residents (quality).
b. Classification of infrastructure: The available infrastructures in the estates were classified based on ownership. This categorization was in two forms (government and community-based organisation provision). It is on this basis that various types of facilities, their level of completion, and present conditions were ascertained.

ii. Secondary Sources: These shall include consultation of published and unpublished materials like journals, magazines, newspapers, academic publications, and other online materials. The main emphasis of this consultation is to provide a theoretical background for the research and to obtain a comprehensive perspective of infrastructural facilities and Community-Based Organisations across the globe.

Structured questionnaire administration was the research instrument used in this study. The sample frame for this study is the residents of the housing estates, Community Based Organisations in the estates and Kwara State Housing Corporation. With the preliminary study in the estate, and as documented by KWHC (2010) and Baraje (2014), there are 315 housing units in the Mandate Housing scheme. Therefore, the sampling frame for the Estates was the housing population of the study area, while the inventory of available Community-Based Organisations in the Estates shall be carried out to obtain their accurate number. To have a fair representation of the housing population in the study area, 60% (210) of the housing units were sampled randomly. The justification for the sample size target of 60% was derived from the validity that 60% response rate is reliable for the study (Johnson and Wislar, 2012; Popoola et al., 2020).

Thus, the study targeted the 60% of the population as the targeted sample. The random selection took into consideration distance to access road. In each sampled unit, an adult in each of the residential units was selected for administration of questionnaire and further statistical analysis through a systematic random sampling technique. This method was possible since all buildings in Mandate estates are already occupied. The data collected through the questionnaire shall be collated and analysed using both descriptive and inferential analytical techniques based on the category of data collected. Descriptively, frequency tables, charts and plates shall be employed in the presentation of the results of the analysed data. Also, the use of Likert's scale shall form part of descriptive analysis to measure performance and satisfaction rate of respondents on the involvement of their Community Based Associations on infrastructural facilities. The hypothesis that the extent of involvement of residents in the project projects execution by Community Based Association is (or not) dependent on the socio-economic characteristics of the members of the Association shall be determined inferentially using regression analysis. It is based on the above descriptive and inferential methods that useable inferences and conclusions shall be made.

5. Study Findings and Discussions

5.0 Infrastructure Provision and Satisfaction in the Housing Estates

This section focuses on the infrastructural facilities in the sampled Mandate Housing Estates I and II in Ilorin, Kwara State. It presents the results of data analysis on various kinds of infrastructural facilities (which is categorized into physical facilities and utilities and services) provided in the estate by government and community-based organisation. The quality and quantity of the facilities and satisfaction rates are also examined.

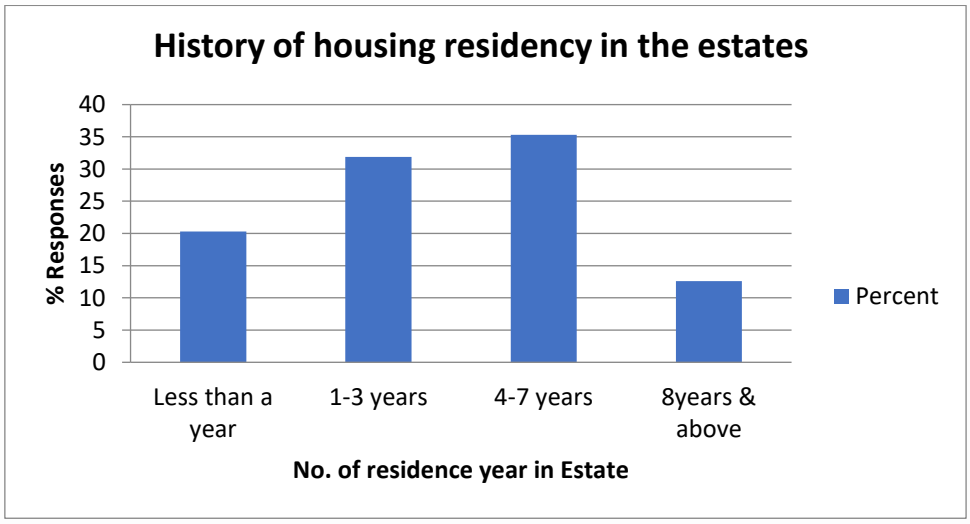

Figure 4. History of housing residency in the Estates

Source: Authors' Field Survey

The analysis, as presented in Figure 4, shows that 20.3% have been staying in the estate for less than a year, 40.1% between 1-3 years, 35.3% have for 4-7 years while the remaining 12.6% have been residing in the estate for over eight years. This shows that a vast majority of residents are not new in the estate and have a long period of staying and have been accustomed to the nature of infrastructural provision in the estate. Hence, their views can be relied on as a true reflection of infrastructural facilities in the estates. From the sample, with the use of design criteria, the types of buildings occupied by respondents are bungalow (43.5%), semi-detached (26.1%), detached (17.4%), and flats/block of flats (13.0%) housing typology, respectively. Based on the researchers' experiences and Popoola et al. (2018), it is observed that the types of housing design in the estates are typical of middle-income people in the society, which is characterised by no rooming apartment in the estates.

In the findings, Table 2 shows the Relative Index Mean (RIM) of residents' ranking of physical infrastructure provided by the government in the housing estates. The infrastructure was ranked on 5 points Liker's scale in which the gradation of the values in ascending order consists of Not Provided (NP=1), Deplorable (D=2), Fair (F=3), Good (G=4) and very good (VG=5), while the mean index value (MIV) of the analysis is estimated to be 3.0815. From the analysis, it was observed that the parking facility was rated first (4.000) by the respondents, and this is closely followed by health facility (3.961) while access road and local streets are concomitantly rated third (3.1836). The children's playground was ranked fourth with an index value of 3.019, while culvert provision was fifth (3.000), and provision of walkway ranked lowest with relative index mean of 1.6087.

The respondents' ranking of utilities and services provided by the government in the estates is also presented in Table 2 with the use of relative index mean (RIM). The utilities and services are equally rated on 5 points Liker's scale and the gradation of the values in ascending order consist of Not Provided (NP=1), Deplorable (D=2), Fair (F=3), Good (G=4) and Very Good (VG=5), while the mean index value (MIV) of the analysis is estimated to be 3.711.From the analysis, it was observed that borehole, electric poles, deep-well, electric transformers, security, and waste bin have a relative index value of 4.000, which is higher than the average mean value of 3.711. Also, the postal agency ranked second with an index value of 3.981 and is followed by sewerage (3.961), while pipe-borne water and waste disposal ranked fourth (3.000), and the streetlight was ranked least with relative index mean of 2.884. Sewerage (3.961), while pipe-borne water and waste disposal ranked fourth (3.000), and the streetlight was ranked least with relative index mean of 2.884.
Exploring the roles of the community-based organisation shows the Relative Index Mean (RIM) of residents' ranking of physical infrastructure provided in the estates. The

infrastructure was rated on 5 points Likert's scale in which the gradation of the values in ascending order consists of Not Provided (NP=1), Deplorable (D=2), Fair (F=3), Good (G=4) and very good (VG=5), while the Mean Index Value (MIV) of the analysis is estimated to be 2.863. From the analysis, it was observed that culverts and parking facilities have the highest index value of 4.000, which is more than the mean index value (2.863) and are ranked first accordingly. These were followed by a parking facility (3.981), which was ranked second, while the walkway (3.000) was rated third and drainage provision ranked fourth. The streetlight with an index value of 1.981 and health center (1.018) was ranked fifth and sixth, respectively, showing their fewer considerations by the CBOs in the study area.

The 5-points Likert scale analysis reveals sewerage ranked first with an index value of 4.971 and followed by both electric pole and electric transformers, which have a value of 4.000 each. The waste disposal was ranked third with an index value of 3.990, while deep-well ranked fourth (3.961) and borehole fifth (3.942) in the analysis. Also, postal agency and security posts/services were ranked sixth and seventh by respondents with an index value of 2.981 and 2.961, respectively.

The culvert and parking facility ranked second with a relative index value of 2.000 while children playing ground and health centre are ranked third with a relative index value of 1.000, signifying the vast extent of residents' dissatisfactions with the four facilities in the estates. It can be inferred that culvert, parking facility, children playing ground, and health facilities need more attention for their improvement or provision to cater for the needs of residents in the estate. However, pipe-borne water, borehole, deep-well, security, postal agency, waste disposal, and sewerage have a relative index value of 1.000 each, which is far below the mean index value. Hence, it can be deduced from this analysis that the attention of stakeholders is strongly needed in

making available and functional utilities and services such as pipe-borne water, borehole, deep-well, security, postal agency, waste disposal and sewerage in the estate. It is observed that residents are satisfied with the quality of access road, drainage, and walkway in the estate as these physical infrastructures have a relative index value of 3.000, which is more than the average mean index value of all variables considered.

5.1 Infrastructural functionality and community engagement in its provision

This section of this study looks at the strategies used by CBOs in the study area in infrastructure and utility services and provisions. The functionality of the physical infrastructure was also examined. The analysis (Table 3) presents the ranking of the operational function of infrastructures and utilities in the estate. The gradation of the values of Likert scale in ascending order are indifference (I=1), deplorable (D=2), moderate (M=3), satisfactory (S=4) and very satisfactory (VS=5) with the Mean Index Value (MIV) of the analysis estimated to be 2.25 for

physical facilities and 1.636 for utilities respectively. The results of the analysis showed that only playground and health centre have relative index values of 3.000 exceeding the meaning index value of the analysis, while both culvert and parking facility has values of 2.000 each respectively; and access road, local street, drainage, and walkway have values of 1.000 accordingly denoting the extent of their poor functional conditions. This shows the dismal performance of physical facilities in the estates as their operational efficiency is far below the average standard.

For utilities and services, the results showed that the streetlights, electric poles, and electric transformers in the estate are in excellent functional conditions as they have relative index values of 3.000, respectively. In contrast, only the playground and health centre have relative index values of 3.000 exceeding the meaning index value of the analysis, while the waste bin is ranked second with an index value of 2.000 denoting its ready availability in the estate. However, pipe-borne water, security, waste disposal, deep-well, postal agency, and sewerage have relative index values of 1.000, which is far below the mean index value of the analysis. Based on this analysis and aside from individual borehole drilled by residents, pipe-borne water, security, waste disposal, deep-well, postal agency, and sewerage are either nonexistence or grossly dysfunctional in the estate as they could not meet the daily needs of residents. Like the physical facilities, the analysis shows that the dismal performance of critical utilities and services in the estates as their operational efficiency is far below the average expected standard.

From the responses gathered, it was observed that affordability to pay by residents has a most significant influence on their participation in community projects as its relative index value (3.000) far exceeds that of the average mean index value of the analysis. From the study, However, infrastructural gap (1.203), prudence of the executives (1.000) and transparency of the executives (1.000) are ranked fifth and sixth respectively denoting their less prominence among the respondents in the study area as each relative index value is far below the general mean index value of the analysis.

To further narrate the roles of community-based organisation in infrastructure provision in the estate, the study hypothesized that infrastructural challenges in their estate do not condition the extent of involvement of residents in the projects' execution by Community Based Organisation. The test of the hypothesis was done using linear regression (Table 4).

Table 2: Ranking of physical facilities, utilities and facilities provided by the government and CBO.

Physical facilities, utilities and facilities provided by the government										*Physical facilities, utilities and facilities provided by the CBO*									
Facilities	NP	DP	F	G	VG	TWV	RIM	MIV	R_K	**Facilities**	NP	D	F	G	VG	TWV	RIM	MIV	R_K
Access road	0	18	483	108	50	659	3.1		3	Drainage	0	406	0	0	20	426	2.0		4
Local street	0	36	429	128	60	659	3.1		3	Streetlight	4	406	0	0	0	410	1.9		5
Drainage	9	220	117	132	80	558	2.6	**3.0**	6	Walkway	0	0	621	0	0	621	3.0		3
Walkway	161	0	36	136	0	333	1.6		7	Playground	0	0	0	828	0	828	4.0	**2.8**	1
Playground	0	0	609	16	0	625	3.0		4	Health centre	205	0	6	0	0	211	1.0		6
Health	0	8	594	40	0	642	3.9		2	Culvert	0	0	0	828	0	828	4.0		1
Culvert	0	0	62	0	0	621	3.0		5	Parking facility	0	4	0	820	0	824	3.9		2
Parking facility	0	0	0	828	0	828	4.0		1										
Utilities & Services																			
Streetlights	2	52	525	8	10	597	2.8		5										
Pipe borne water	0	0	621	0	0	621	3.0		4										
Borehole	0	0	0	828	0	828	4.0		1	Borehole	0	0	0	816	0	816	3.9		5
Electric poles	0	0	0	828	0	828	4.0		1	Electric pole	0	0	0	828	0	828	4.0		2
Deep-well	0	0	0	828	0	828	4.0		1	Deep-well	0	8	0	812	0	820	3.9		4
Electric transformer	0	0	621	0	0	621	4.0	**3.7**	1	Electric transformer	0	0	0	828	0	828	4.0		2
Security	0	0	621	0	0	621	4.0		1	Security	4	0	609	0	0	613	2.9	**3.5**	7
Postal agency	0	0	12	872	0	824	3.9		2	Postal agency	0	8	609	0	0	617	2.9		6
Waste disposal	0	0	621	0	0	621	3.0		4	Waste disposal	0	0	6	820	0	826	3.9		3
Sewerage	0	8	0	812	0	820	3.9		3	Sewerage	0	4	0	0	1025	1029	4.9		1
Waste bins	0	0	0	828	0	828	4.0		1	Waste bins	0	0	211	0	0	211	1.0		8

Source: Authors' Field Survey

Table 3: Ranking of operational function physical facilities and utilities in the Estate.

Facilities	I	D	M	S	VS	TWV	RIM	MIV	R_K
Access road	0	0	621	0	0	621	3.000		1
Local street	0	0	621	0	0	621	3.000		1
Drainage	0	0	621	0	0	621	3.000		1
Walkway	0	0	621	0	0	621	3.000	**2.25**	1
Playground	207	0	0	0	0	207	1.000		3
Health	207	0	0	0	0	207	1.000		3
Culvert	0	414	0	0	0	414	2.000		2
Parking facility	0	414	0	0	0	414	2.000		2
Utilities and Services	I	D	M	S	VS	TWV	RIM	MIV	R_K
Streetlights	0	0	621	0	0	621	3.000		1
Pipe borne water	207	0	0	0	0	207	1.000		3
Borehole	207	0	0	0	0	207	1.000		3
Electric poles	0	0	621	0	0	621	3.000		1
Deep-well	207	0	0	0	0	207	1.000	**1.636**	3
Electric transformer	0	0	621	0	0	621	3.000		1
Security	207	0	0	0	0	207	1.000		3
Postal agency	207	0	0	0	0	207	1.000		3
Waste disposal	207	0	0	0	0	207	1.000		3
Sewerage	207	0	0	0	0	207	1.000		3
Waste bins	0	414	0	0	0	414	2.000		2

Source: Authors' Field Survey

Table 4: Model summary

Model	R	R Square	Adjusted R square	Std. Error of the estimate
1	0.859	0.746	0.738	0.65307

Source: Authors' Field Survey

The independent variables used in testing the hypothesis are factors influencing project participation, which consists of estate rules, neighbours, infrastructural gap, willingness, affordability of levy, household/family, prudency of executives, transparency of executives, the suitability of projects and government supports. In contrast, the dependent variable is the nature of the infrastructure problem in the estates. The results show that there is a positive correlation between the factors influencing participation in projects and nature of infrastructure problem in the estates which is determined by the correlation coefficient, r to be 0.859 denoting a very strong positive correlation and that r2of0.738 denotes the extension of contributions of the mentioned factors to the decision.

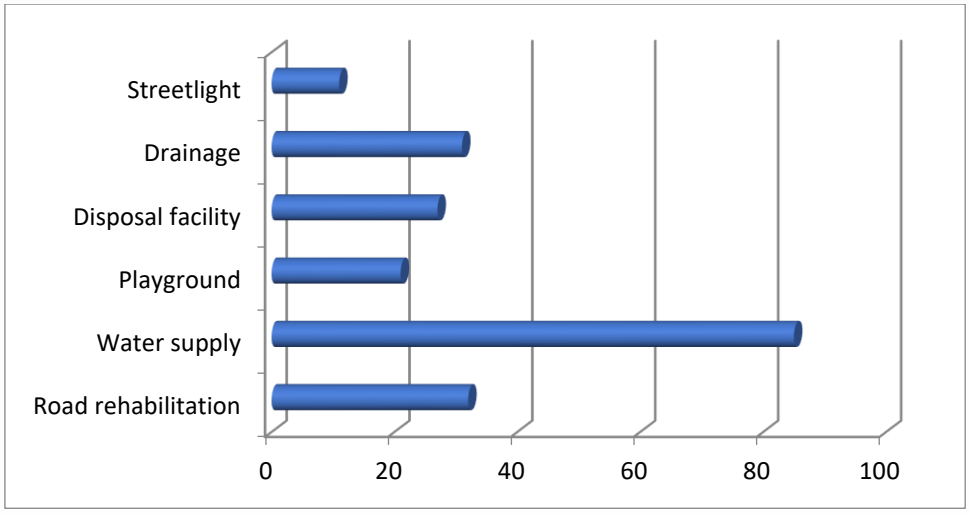

Figure 5. Residents' suggestion for improved conditions of the Estate

Source: Authors' Field Survey

5.2 Limitations and proffered solutions to Estate liveability

From the sampled residents, 52.2% identified water supply as pressing issues confronting the residents, while 22.2% complained of deplorable access roads in the estates. Also, irregular electricity supply to the estates accounted for 2.4% of the responses received, while 1.9% of respondents identified insufficient playground as challenges being faced, and 6.3% complained of blocked drains in the study area. Also, 3.9% identified the lack of firefighting services at proximity to the estates, while the remaining10.6% complained of open dumping of refuse in the estates. It can be inferred from this study that water supply ranked topmost among the challenges identified by residents in the estates.

The suggestions made by residents for improved liveability of the estates as presented in Figure 5 included the advocacy for the rehabilitation of roads in the estates, connecting the estates to public water mains, improvement of existing playgrounds, provisions of disposal facility, improvement in drainage to allow for smooth flow of water during the rainy season and improving the estate streetlight for better illumination in the evening and improved residents' security and safety at night.

6. Discussions of Findings

6.1 Estate and Infrastructure Condition and Liveability

Housing as a combination of the tangible and intangible assets that support wellbeing can also be said to encompasses the immediate environment, sanitation, drainage, recreational facilities and all other economic and social activities that make life worthwhile" (Olejado, 2003). As argued by Popoola *et al.* (2015b), housing goes beyond the materials used in its construction but a collection of facilities that makes the designed building efficient, functional and livable by human all and individual human standards. While the overall importance of complimentary infrastructures such

as good road network, portable water supply system, drainage system, over emphasized, their significance of provision, which is to enhance housing satisfaction and values, as well as promote the social and economic life of the people in that built environment is essential in this study (Ihuah *et al*., 2014).

The study questioned the infrastructure condition in residential estates and the roles of CBOs in infrastructure provision. Based on the study, it was reported by the estate residents that the facilities provided were not standard quality when visually compared to other estates government and CBO provisions based on observations. The analysis assessed satisfaction on various issues such as quality and quantity of infrastructure as well as their operational performance as accounted for by residents. Although, studies (Lawal, 2002; Kadiri Kabir, 2004) have argued that the Federal Housing Authority of Nigeria have concentrated their energies mainly on the provision of numbers of housing units without giving adequate attention to adequate infrastructure provisions to these developed housing estate units. This determines the satisfaction level of residents in certain areas, as residents become choosy as to areas to reside due to lack and inadequate infrastructures in some places. The inadequate infrastructures provision problems are not just typical to a particular reason rather its cut across several reasons (Ayodele and Alabi, 2011), and is assumed to be creating a diminishing impact on the value of properties located close and within the housing estates (Ihuah *et al*., 2014).

playground, education, and health facility adequate provision cannot be

The analysis revealed that residents are not satisfied with physical infrastructures such as a playground, culvert, drainage, and walkway provided by the government in the estates and utilities and services such as pipe-borne water, waste disposal, and streetlight in the estate. The relevance of good playground condition is important to environmental planning (Jafari *et al*., 2011). In addition, indiscriminate dumping of refuse due to poor waste collection and management (Popoola *et al.*, 2015a) which future results in the blocking of drainage and subsequently flood (Wahab and Ojolowo, 2018) is argued to be a peculiar experience in Nigeria. The roles of neighbourhood attributes according to Aluko (2011) was not just critical to liveability but asset valuation. In the study, neighbourhood and locational waste management and recreation facilities were critical to the value for liveability and 'homing'. The dissatisfaction of the sample resident in this study was alluded in the understanding that neighbourhood recreation facilities often form a basis and determinant for housing choice among residents in Nigeria. In Ilesanmi (2012), the quality of life and perception of housing was expressed to be dependent on safety, services, environmental cleanliness, and the availability of parks and recreational areas in a location. Why the number of such facilities available can be essential to wellbeing (Aluko, 2011), the experience in the sample estate

speaks to improved maintenance,

Figure 6. Open dumping of refuse and waste products in the study area

Source: Authors' Field Survey

availability, and accessibility. The observation analysis shows poor maintenance of the park in the neighbourhood as it is often now used for a communal waste disposal and collection spot. This according to (234) often limits the perception of quality of life.

Some of the reasons for dissatisfaction with the utilities include the seasonality of the borehole point, isolation, and locking of the borehole, poor quality of construction materials, and shallow depth and size of the culverts. In an open-ended question set and informal interviews with some of the stakeholders in the estate, an interviewee reported that "*... the committee is made of unqualified personnel with no formal experience in built-environment, project management, quantity surveying or material purchases...* he argued that *"...this accounted for the failed conditions of the projects as the materials and processes were amateur driven..."*

The interviewee was further queried, and he mentioned that when the sizes of the culvert constructed by both the government and association are not within the set standards, coupled with indiscriminate waste disposal within the estate, the drainage channel is expected to be blocked by debris and waste materials (Figure 6). This he mentioned usually distorts the free flow of rain runoff during the rainy season in the estate, and this limits the sustainability and durability of the road system. Studies (Toyobo and Muili 2008; Olujimi and Bello 2009) have investigated the effects of infrastructural facilities on the built environment setting and the roles of community-based organisation in the provision of quality infrastructure for sustainable livelihood.

This evidence aligns to the view by Waziri et al. (2013) there exist a general low level of satisfaction in private housing estates in Abuja. It was buttressed that why structural satisfaction can be said to be average, residents are reported to be more dissatisfied with neighbourhood and environment facilities. It was recorded that the dissatisfaction is mainly from playground and poor health facility condition in the neighbourhood. The poor state and condition of this same complimentary facilities (drainage culverts, parking facility, health centre, children playground, pipe-borne water, borehole, deep-well, security, postal agency, waste disposal and sewerage and street lighting) in the sampled estate forms the basis for the expressed mental perception to quality of life and livability. Aligning with the need for street lighting to improve security of life and neighbourhood walkability, Babalola et al. (2020) has argued for a need for improved maintenance and security in estates as critical to housing quality and satisfaction.

6.2 Role of CBOs in Infrastructure Provision

Towards achieving sustainable residential infrastructure, Popoola and Magidimisha (20) have reported that the government remains incapacitated towards achieving infrastructure inclusion for all settlements. Their study recognises the roles played by international donors, community dwellers and CBOs in achieving community infrastructure sustainability. This study therefore recognises that CBOs are critical to uplifting infrastructure condition of communities.

In promoting improved standardized infrastructure, the study authors identified eight involvement strategies used in a community development project in the order of its efficacy and effectiveness as resource mobilization, special levy, the participation of residents, and payment of the regular levy. However, project levy and material donations are ranked sixth, signifying its less effectiveness as a strategy for the involvement of residents in community development projects in the estate. It can be inferred from this analysis that resource mobilization, special levy (specific project defined monetary contribution), physical participation, and regular level (usually for monthly or years based on stipulated bylaws) are significant strategies used in the realization of community development projects in the estates. The authors revealed that members of the CBO through community mobilization calls for levy for projects such as the spontaneous repair of the electricity transformer or regular monthly levy as security or sanitation charges. Ibem (2009) has written about the collective engagement of communities in infrastructure provision through CBOs. The role of internally generated funds through levies, donations and resource/material donations were identified to be essential to communal project planning and implementation. We identify that collective estate individual engagement promotes sense of ownership of infrastructure in the estate.

Empirical evidence through informal discussion reveals that why monetary levy (monthly, quarterly, or yearly depending on project type and timeline) can be rigid based on estate association rules and regulation, resource and material provisions is often subjected to free will donations, 'political actoring and manipulation' through indirect vote solicitation or campaigning, government project resource support, and philanthropic activities of individuals or groups. It was further recognised that the allocation of funds within the community-based organization is subjected to collective decision-making, voting or skilled and semi-skilled advice by members or non-members. Such estate CBOs often subject the project executions and planning to sub-committees (such as water, sanitation, road, and security committees) that give monthly, or project times reports to the CBO house during general meetings.

The study accidental evidence during data collection reveals that community members can sometimes be involved in project through physical participations. Example of projects that calls for participation includes community sanitation (through house-based clearing of dirt and debris from culvert and drainage), and physical presence in the supervision of electrical transformer repairs or installations. The study established that labour intensive approach of physical involvement is often subjected to the youths that represents each household and sometime contracted out to unskilled labour. This experience establishes the failure of the top-down approach to community infrastructure delivery (Okeke-Ogbuafor, 2016). The authors therefore reinstate the effectiveness of traditional and grassroot community-based organization in promotion infrastructure sustainability for their immediate communities. The perception that this collective 'infrastructure communism' promote inclusiveness and ownership.

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Despite the identified strategies, factors that influence participation in projects include estate rules/regulations, neighbour's choice, infrastructural gaps, willingness, affordability of levy, household disposition, prudency of the executives or project committee, transparency of the executives, suitability of projects and government supports. Despite the self-reliance that is associated with CBO projects execution (Wahab, 1996), evidence as further presented in Popoola and Magidimisha (2020) reports that developmental associations can be subjected to corrupt practices and project price inflations. The issue of accountability and transparency remains a major limitation to successful project participation and implementation in Nigeria. The authors identified that why household levy might create various financial shocks and demands on various households (speaking of affordability), issues relating poor accounting and auditing when records of the committee or any CBO is requested.

Wahab and Adetunji (2015) have reported that poor accounting of stewardship remains a major conflict generator among CBOs. As such, no matter the panning efficacy, responsive

accounting remains a limitation to collective involvement in project management and execution in Estate projects. For example, Wahab and Adetunji (2015) reported that there were occasional complaints on misappropriation and embezzlement of funds, inflation of cost of project, poor accountability and lack of transparency against project committee. This in most cases results into conflict, project abandoning and loss or decline in neighbour will to contribute or being a part of a project, which eventually results into dearth, poor maintenance, or lack of infrastructure in such community.

7. Conclusion and recommendations

As urbanisation and industrialization are taking place, large numbers of people continue to move to urban centres, seeking better means of livelihood and secured place of abode. However, governments at federal and state levels in the country are making frantic efforts on housing provision towards reducing to the barest minimum, the national housing deficits. It is on this basis that numerous government housing estates were constructed and allocated for people to reside across the country in which the Kwara State is not an exception.

Based on this reality, Baraje (2014), states that infrastructural facilities in government housing estates are not only inadequate but also not satisfactory to residents quantitatively and qualitatively. Hence, the persistent intervention and involvement of community-based organisations in improving the situation by making the estates more habitable and liveable for the members of the associations who are also residents of the estates through provisions, management, and maintenance of lacking and inadequate infrastructural facilities. Living in government housing estates is now characterized by gross inadequate infrastructural facilities in which community-based organisations are playing leading roles to improve the situation. Consequently, the situation is the same in the study area, where respondents identified various infrastructure deficiencies as the reason for dissatisfaction where they reside.

Having identified infrastructural facilities and their associated challenges in the estates as well as various mechanisms of interventions deployed by the community-based organisation, the study propose the following recommendations.

i. Upgrading and improved maintenance of amenities in the housing schemes: The habitability of the housing schemes must be urgently improved through the upgrading of amenities, facilities, and services available in them. With this, there is an urgent need to upgrade and repair deplorable access roads in the scheme, while drainage provision and maintenance should be embarked upon. Also, the populations of residence in the schemes justify the location of fire substation at a conspicuous location in the schemes to minimize the loss in the

event of an emergency and other forms of disasters.

ii. Connection of the schemes to public water mains: The importance of water to the liveability of housing schemes is enormous. It is surprising that in this century, modern housing schemes still rely on individual and community deep-well and boreholes. Hence, the connection of the housing schemes and especially the Mandate housing estate to public water mains should be intensified and executed in the shortest possible time.

iii. Spatial control in the estates: The indiscriminate change in land uses, and land conversion in government housing estates need to be addressed urgently. This is necessary to prevent government housing estates from degenerating to slums in the shortest possible time. With this, change in use and use conversion must be approved and certified appropriately by the Town planning Unit of the Kwara State Housing Corporation. Also, noise pollution arising from the conversion of building and change in land use to religion uses shall be greatly controlled.

iv. Improved accountability is recognised to be essential in encouraging neigbours continued involvement in infrastructure provision.

v. Review the development plan of the schemes: There is a need to review the development plan of the studied housing schemes urgently. This is necessary to integrate and incorporate the missing land uses, including children's playground in the schemes. With this review, the provision would be made for service industries, shopping, and waste disposal facilities to enhance the aesthetic quality of the schemes as well as the enhancing the greenery of the scheme; and

vi. Enhancement of the liveability of the estates: The liveability of the estates has to be improved through increased synergy and collective efforts by the government, community-based organisation, and residents. This shall not only improve ease of livings but also make the estates more habitable and liveable through mechanisms that guarantee wellbeing and satisfaction to all.

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Factors Affecting Materials Management on Libyan Construction Sites

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Abstract

Materials management is crucial in construction projects in developing countries. It contributes very important role to the achievement of the project on time and, as such, affects the overall economy of any country. Inappropriate materials management results in cost and time overruns that delay the overall project. Recently, in Libya it considers one of the main key factors of delay in construction projects, involving poor handling of materials and Waste Materials. The aim of this paper is to identify and analyse the factors affecting and develop a framework for materials management on Libyan construction sites. A survey questionnaire was distributed to professionals on construction projects: owners, contractors, site supervisors, consultants, engineers, and suppliers. The questionnaire comprised four sections of pre-defined factors: human, management, technology, and political and civil war issues. The Statistical Package for the Social Sciences (SPSS) was employed, and the factors were analysed. The most significant factors identified affecting materials management were: the contractors' experience and skills, factors related in materials on the site (receiving, storing, handling and tracking), and site supervision.

Keywords: *construction projects, lean construction, materials management, supply chain management, Libya.*

1. Introduction

Construction projects play a significant role in the Libyan economy, creating and retaining jobs and wealth for the country. They represent an important business that contributes 5.2% of the national Gross Domestic Product (GDP) (Omran *et al*., 2012). However, construction projects in Libya face several problems that prevent achievement of their goals, including materials, labour, machinery and the market. An important factor that adversely affects the performance of construction projects is the inappropriate handling of materials during site activities (Yap *et al*., 2017). There are major issues which affect materials management activities such as constraints on storage areas, site logistics with regards to materials handling and distribution, and also ordering and delivery of materials to the construction site.

Previous research has highlighted materials management issues such as inappropriate storage (Ahmed, 2017), the requirement for large storage capacity. (Agapiou *et al*., 1998), transportation difficulties and inappropriate materials delivery (Tedla, 2018). Other issues include manual processes and non-compliance with specifications (Dey, 2001), late delivery (Aibinu & Odeyinka, 2006), and shortage of materials (AL Fakhri, 2017). On the other hand, Solaimani *et al*., 2020) identified that lean construction is a useful technology to manage and improve the construction process, and

therefore deliver the needs of the customer. This study critically reviews the role of materials management on site to reduce the delay in building projects in the Libyan construction sector.

According to the Libya General Council for Planning (GCP) (2002), construction projects began under trying circumstances and then entered into a process of evolution after oil was discovered in 1951. Construction projects were dependent on oil income. Over the last four decades, the public construction sector in Libya has improved, becoming an important business that contributes 5.2% of the gross domestic product (GDP). Nagab (2007) pointed out that, given the availability of raw materials, Libya has the largest cement factories in North Africa, located in Derna in the east of the country, as well as factories in Tripoli, Benghazi and Sabha, and an iron and steel factory in Misrata. On the other hand, Salah and Bloomer (2013) highlighted that sources of construction and building materials in Libya are cement, reinforced steel, blocks and finishing materials. This means that materials management must be applied to deliver materials to site projects on time, because its primary objective in construction projects is to reduce time (Handfield *et al*., 2005).

Murali and Yau (2007) agreed and added that any delay will increase cost, reducing the feasibility of the project and failing to contribute to the development of society. Libyan researchers have conducted several studies on delays in construction over recent years, although mostly without recommending the need for materials management (Shebob *et al.,* 2012). The exception is Mustafa (2009), who identified that most delays are related to materials management because it has an essential role in saving time and reducing costs while retaining quality.

There are several approaches materials management, including proper planning of materials logistics and Just-In-Time (JIT) concepts to resolve the problems of space constraints, and the implementation of Information and Communication Technologies (ICT) such as barcoding for automatic tracking of materials. However, there are few positive examples of the successful use of these tools to improve materials management on construction sites. Therefore, the objectives of this paper are to:

- Explore the current level of awareness of materials management among Libyan construction professionals.

- Assess the potential factors affecting materials management on construction sites.

- Outline and rank the expected factors hindering successful construction materials management in Libya.

This paper conducted to identify the level of awareness of materials management and the critical factors affecting Libyan construction sites and is the first of its kind. It provides a critical overview of the implementation of materials management in Libya, through its originality and the consideration of specific factors contributing to the body of knowledge. This study will provide Libyan professionals in the construction sector, such as owners, consultants and contractors, with a clear view of materials management. It contributes to an understanding of materials management on Libyan construction sites.

2. Literature Review

Fundamentally, management of construction materials is related to arranging, formulating plans, acquiring information and material, stockpiling and ensuring the flow of material. It guarantees that the correct materials are in the correct place, in the quantities required. Wild, (2017) showed that the structure of material management requires organizing procedures to take into account co-ordination and supervision of the supply chain of materials, with a specific end goal of utilizing the assets in a judicious manner and keeping expenditure down to the bare minimum. According to Mogalli and Hussein (2017) this must be implemented in design and planning procedures, the arrangement of resources and ensuring sufficient warehousing, supervision of the use of materials, and ultimately bearing the material costs. All these efforts are interdependent. Doleeb (2016) defined the process of managing materials as sequential procedures to arrange the avalability of the necessary material and equipment at the opportune moment in the place where it is needed. It is performed to minimise the cost of the production process and to control the supply of materials effectively .ensuring that the right materials are available on the construction site at the right time and at the lowest cost (Safa, 2014). The criterion of successfully completing any construction project is always incumbent on the management of materials in an efficacious manner. To ensure that materials management results in improvement of the construction project and control of the site, it should be linmked to specific roles in order to provide materials at the right time and reduce the waste of materials, for example, by the use of supply chain management and lean construction. Koskela (2000) identified that supply chain management (SCM) has four roles in construction sites in Finland: 1. feasible action to improve construction supply chains; 2. improve supply chains; 3. transfer activities from the site to the supply chain; and 4. integrate the site and the supply chain. Patil and Pataskar (2013) and Gulghane and Khandve (2015) agreed that fluctuation of costs of such material, concerning the completion of the projects, could amount to any extent between 20-70% of the complete construction project expenditure and on occasions, this could exceed the general cost ceiling of 70 %. Sustainable management of material generally yields several advantages. Many authors identified the importance of material management. (See Table1).

Table1. Importance of materials management

Authors	The importance of materials management
Hannure and Kulkarni (2014)	Materials management is a scientific technique concerned with preparing, organising and control of the flow of materials from their initial purchase to the end.
Safa (2014)	Materials management is the process, which links supplies and organisations in order to obtain a standard of service ensuring that the right materials are available on the construction site at the right time and at the lowest cost.

Abdulbagei *et al.* (2012)	Materials management is essential to manage productivity and cost efficiency because these contribute the major portion of expenses in construction projects. Moreover, it can reduce total project costs and complete the project on time by controlling procurement, carrying value.
Kasim (2010)	Proper management of construction material could be defined as the methodical procedure of formulation of plans, acquisition and preservation and transportation of such materials which could be necessary for construction purposes.
Doleeb (2016)	Materials management is a sequential procedure to arrange the availability of the necessary material and equipment at the opportune moment to the place where it is necessitated.
Mogalli & Hussein (2017)	The structure of materials management is necessary to be actualised to design and planning procedures, arrangement of resources and making sure of the qualitative warehousing and preservation, supervision of the utilisation of materials, and ultimately bearing the material costs.
Salah and Bloomer (2014)	The associated factors material management are; inventory management, store operations, handling of purchased materials and transportation of the finalised products and components.
Omran (2014)	Proper material management improves labour productivity. For instance, work time can become unproductive or idle time due to the lack or shortage of equipment and tools in the right place at the right time.

Source: Authors compilation

2.1 Importance of materials management

This paper investigated the need for material management, the conclusions of several authors are reported below:

Adita and Sabihuddin (2013**)** conducted a "Study of material management techniques on construction projects" and showed that planning and material take off, vendor evaluation and selection, purchasing, expenditure, shipping, material receiving, warehousing and inventory, and material distribution are the most important functions in the construction industry. They conducted a survey of the industry, determining various formats for materials management, tracking systems and software technology developed for the management of construction materials. They recommended that the total cost of material may be 52% of total costs; so, it is important for the contractor to consider timely availability of material as contributing to successful completion of the project. Materials management is thus a key to successful project management. Kabede *et al.* (2018) assessed the problems of construction materials management in residential projects, addressing current practices to identify issues and apply always better control (ABC) analysis and S-Curve analysis. However, there is a problem in introducing new technologies such as RFID, ICT and bar coding for material tracking and management. Therefore, the researcher recommends further study in this area. Caldas (2014) stated

that the programme of comprehensive materials management contributes to reducing cost, improving productivity, and better-quality and more predictable project outcomes. The author concluded that although the role of materials management is expanding in the early phases of capital project planning, IT systems continue to improve real-time coordination and course correction. The study recommended that materials management should influence IT system selection and integration during project planning, and training programmes should be integrated to improve the use of materials management IT systems.

Mishra (2018) presents a possible solution for managing material delivery problems in construction projects: a shipment tracking-based approach for inventory transparency and proactive timely material availability. The study recommends the Last Planner framework (Ballard, 2000) to shape workflow, address materials needs and improve relationships between among team members. The study found two challenges to material flow management with the Last Planner methodology that had not previously been addressed in detail. First, the Last Planner needs to have access to comprehensive information on the materials available for individual project tasks; and second, the materials should be reliably available at the project site. Previous studies showed that there are factors related to contractors, and other consultants, owners and materials as follows:

2.1.1 Factors related to contractors

It is the responsibility of the contractor to provide materials, labour and services for the construction project, in addition to hiring sub-contractors to implement all or parts of the work on the construction site. Hughes (2015) stressed that the contractor has the greatest responsibility of all the parties involved to complete the undertaking on time. On the other hand, Shabbar *et al.* (2017) stated that time schedule overruns and excessive costs are the responsibility of contractors. As a general rule, contracting is a complex and often difficult venture. Leung (2014) and Salloom *et al.* (2017) agree on the necessity of maintaining a strategic distance from any overruns, be it costs or time; the contractors have to regularly shoulder complete liability for the outcomes of the performances the sub-contractors and other workforce personnel.

Fundamentally, the process through which the contractor manages to perform specific responsibilities indicates the actual nature of the work (Shi & Arditi, 2001). Walker (2015) adds that the ability of the contractor to complete the task according the agreed timetable chiefly relies upon two aspects: accessibility of assets (consolidating cash, labour, materials, hardware and mechanical apparatus); and efficient administrative capability. There are two sources of labour: the sub-contractors and from direct recruitment. If the sub-contractor's insufficient workforce contributes to delays in the agreed time schedule, then both the project and property owners and the primary contractor have to resolve this issue. However, Mpofu *et al.* (2017) in a study in the United Arab Emirates (UAE) recommended that many different variables may result in schedule overruns, categorized as construction materials, machinery, labour force management and

performance management.

2.1.2 Factors related to consultants

Consultants lead the process of planning and designing the project and also contribute to cost control and estimation of resource structure necessities as well as quality control mechanisms. In some circumstances, postponement resulting from the consultants might occur during the design selection and approval phase, the reception of construction blueprints, accepting plan endorsements from contractors or client, and in evaluating the best management methodology. Postponement may result from relative lack of experience of qualifications of the consultancy staff, faulty communication channels, and failure to co-ordinate the multitude of processes and personnel (Shebob, 2012). According to Omran and Ibrahim (2018), inspections required by the consultants could slow down the entire undertaking. Accordingly, the contractors must resolve these problems from multiple angles. The consultants may fail to meet expectations, resulting in assigning the work to other practices. Effective supervision and management of the operations on the construction site are important for timely project completion.

2.1.3 Factors related to owners

One of the most significant decisions in this respect is the length of the agreement and the owners need to focus on resolving this first. Many owners prefer quick completion of the work. Careful deliberation must be given to the terms of the agreements, and the owner must be in a position to hand over the site to the contractor. The owner's leadership in different issues may determine the pace of the of the undertaking. According to Allen and Iano (2019), the obligations and duties of the clients and owners, as key players, are onerous; it is usually necessary to introduce other professional assistance regarding the project ventures. First-hand management groups and units are available to provide the entire range of skill sets, as central administrators to deal with management control (Mohammadi *et al.,* 2018). Mohammadi *et al.* (2018) stressed the interdependence between the owners and the working personnel; this relationship must create trust between these two groups of stakeholders. The owners must take an interest in all aspects of the venture, but without interfering with the working procedures of the contractor.

2.1.4 Factors related to materials

According to Myers (2016), construction materials are basic to any construction undertaking and indicate the actual extent of expenses for the business owner. From the point of view of the contractor, obtaining and transporting materials is crucial at the various phases of the undertaking (Ibrahim, 2015). The inability to deliver the right materials and to store them safely may result in postponements and time overruns, as may theft or deterioration. According to Odeh and Bataineh (2002), the consistent provision of materials is an essential obligation of the contractor on-site. Koushkiet *et al.* (2005) opined that this is another key viewpoint with respect to material costs. Rising material costs may prevent the owner from procuring

more, particularly in large-scale building ventures. Deciding whether to postpone purchase until the price falls is critical. Infrastructural shortcomings may also result in delay in the supply of materials. In short, securing there are many reasons why the delivery of new materials may be delayed (Wiguna & Scott, 2005).

2.2 Supply Chain Management (SCM)

Supply chain management is a tool used to describe the relationship between companies which convert a series of required materials or services into the final product for the customer (Koskela, 2000). Christopher (1992, p.26) identified the supply chain as a "network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer". In construction projects, Subramani and Tamizhanban (2016) suggest that the main contractor, designer, surveyor and subcontractor are all part of a supply chain (see Figure 1).

Within the chain, each company has a client to provide services; however, incorporated supply chain management aims to work wholly in the interests of the project client (Construction Excellence, 2004).

There is a relationship between the main contractor's position, and the activities and errands leading to the preparation of the SCM in construction on site, including clients and the design team. Activities and errands in the delivery of construction suppliers, sub-contractors, and professional contractors in relation to the main contractor also need consideration (Saad *et al.,* 1999; Akintoye *et al.,* 2000; Kaschola, 2000). This means that there is a relationship between the delay of construction projects and the supply chain. Moreover, the process of reducing the real cost and removing waste from projects is one of the benefits of the supply chain in construction. Vrijhoef and Koskela (2000) have identified four roles of the supply chain management (SCM) in construction (see figure 2).

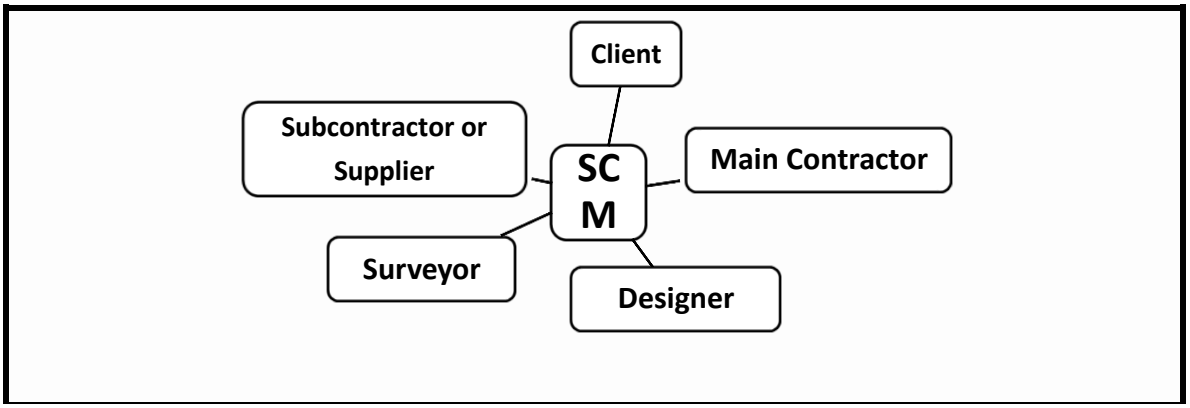

Figure.1 Five Parts of Supply Chain Management in Construction (Subramani and Tamizhanban, 2016).

Role 1: Improving the interface between site activities and the supply chain.

In the field of construction logistics, the supply chain management (SCM) has the clearest roles related to co-operation between suppliers and contractors in order to improve materials. (Asplundh and Danielson, 1991; Wegelius - Lehtonen and Pahkala, 1998, cited in Koskela 2000). However, traditional treatment of construction and handling of materials has concentrated on site activities. On the other hand, (Salah, 2014) highlighted that the weak connection between suppliers and contractors is a key problem in Libya and leads to non-delivery of materials at the specified time.

Role 2: Improving the supply chain.

This is the main aim for the development of particular supply chains, such as prefabricated concrete elements or elevators (Koskela, 2000; Laitinen, 1993). It necessitates analysis of cost and time to identify specific improvement for the development of a supply chain, and when the supply chain is developed, a comparison should be made between transportation and production costs in order to achieve global improvement because productivity and supply chain performance may decrease when changing site ability conditions (Al-hajj. 2011)

Role 3: Transferring activities from the site to the supply chain.

Oyedele *et al.* (2013) conducted a study in the UK and pointed out in order to provide JIT production in the construction there is the need for supply chain management. Therefore, the focus should be on redesigning the supply chain by transferring onsite activities to off site.

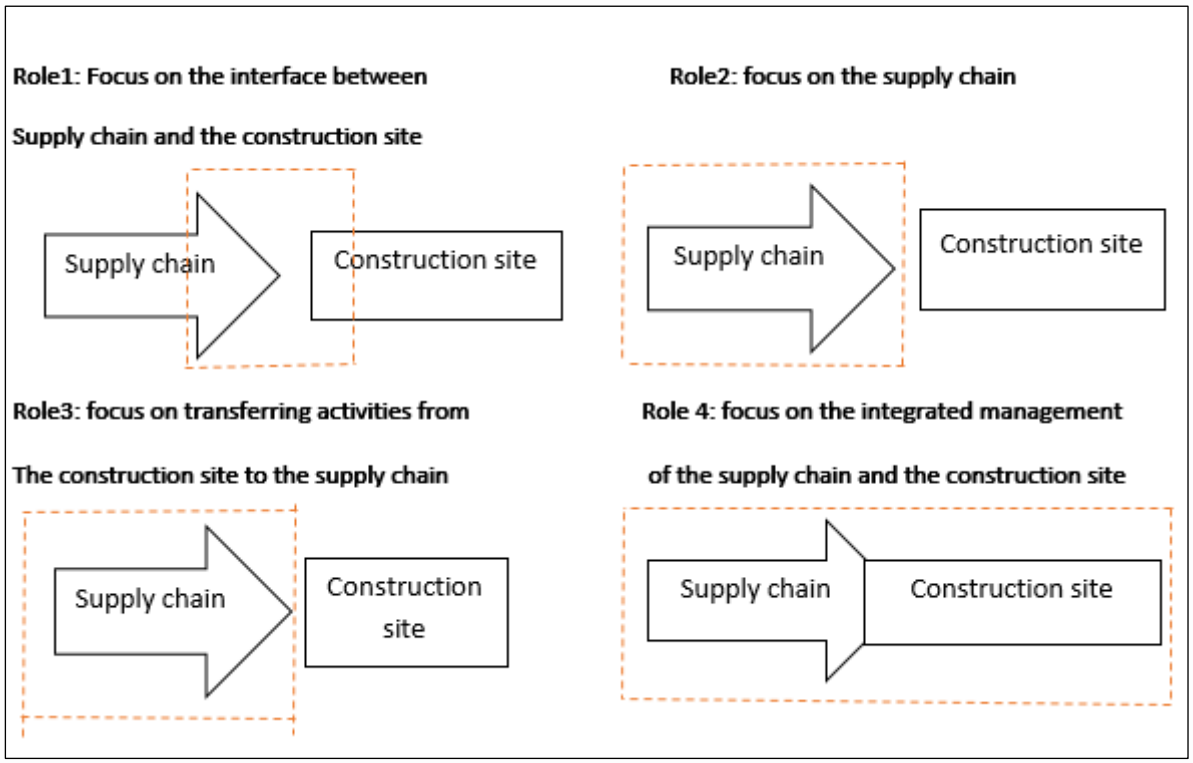

Figure2. Four Roles of Supply Chain Management (SCM) in Construction. Source: Vrijhoef and Koskela (2000: 7)

Industrialisation materials, especially prefabrication, can be observed as a structural means for eliminating on-site activities from the total production chain (Warszaswki, 1990). Thus, the earlier, and still actual initiatives towards industrialisation of construction must also be seen as a form of SCM concentrating on the design of the supply chain (Sarja, 1998).

Role 4: Integration of site and supply chain.

Van Randen (1990) presented a number of suggestions for management of a supply chain such as open building to enable users to defer decisions regarding the interior of the building. The idea is to structure the site work as successive realisations of autonomous sequences (this resembles group technology as developed in manufacturing). On the other hand, (Koskela, 2000) explaining the relationship between supply chain and lean construction and stated that lean construction improves the downstream of supply chain onsite projects; moreover, open building aims to optimise the quality of the built environment, by improving the relationship between the customer and the building industry. Meanwhile, the aim of Lean Construction is to optimise building and construction. Both of them have the benefit of improving supply chain onsite projects**.**

On the other hand, Saad and Jones (1999) recommended the need to improve SCM downstream because it is the weaker link in construction. Erik *et al*. (2010) conducted a study to improve the supply chain in construction and concluded that in order to improve downstream, there is a need to apply lean thinking to construction. This means improving activity on the construction site by defining units of production, and using tools such as visual control of processes. Design teams work exclusively on one design from beginning to end, supporting sub-contractors in developing tools for improving processes (Kaschola, 2000; Lean Construction – Construction Excellence, 2004).

2.3 Lean Construction

Hoop and Spearman (1996) identified that lean construction aims to achieve the objective of the project and meet customer requirements using fewer resources. Koskela *et al.* (2002) identified it is a system to minimise waste of materials, time and effort to generate the maximum possible amount of value. Womack and Jones (2003) defined lean construction as a philosophy that depends on the notion of lean manufacturing, concerning control and improving the construction process to meet the customer's needs on time.

Howell (2001) stated that the construction sector is often described as one with many problems including lack of efficiency. and recommended using the lean construction concept as a solution. Murman *et al.* (2002) added that the principles of lean construction include waste minimisation. Lean construction concepts have recently received attention as a modern way to improve performance and labour productivity (Abdel-Razek et al., 2007; Koskela, 1992; Lean Construction - Construction Excellence 2004). Abdelhamid and Salem (2005) presented five principles of lean production in the construction sector: "1. reduce variability; 2. reduce cycle times; 3. minimise the number of steps, parts and linkages; 4. focus control on the complete process; and 5- balance flow improvement with conversion improvement, benchmarking,

increased output flexibility and improved process transparency".

3. Research methodology

This research is a quantitative study using a questionnaire survey to provide an overview of the current skills in materials management of Libyan construction personnel, and the potential benefits from materials management techniques for Libya. This research method was chosen because of its ability to gather a wide range of views from individuals, to cover a large number of respondents, to have a better generalizability of the results, and for its cost-effectiveness (Shang & Sui Pheng, 2014a; Sarhan *et al*., 2017; Tezel *et al.,* 2018). In addition, this technique fits in with the quantitative approach that enables the statistical testing of the data to obtain meaningful interpretations that provide a better understanding of the survey topic (Abawi, 2008). The Research design followed in this study can be seen in Figure 3.

Before producing the final version of the questionnaire, ten leading academics in the Libyan construction field were invited to evaluate the first draft to ensure the relevance of the questionnaire and to examine the suitability of the extracted factors in the Libyan context. They recommended reformulating some of the questions for more clarity. The revised questionnaire was then distributed online in English and Arabic. The survey consists of four units: respondent's position and experience; S materials management factors; a section designed to collect general information about construction operations on-site; and finally, communication and technology.

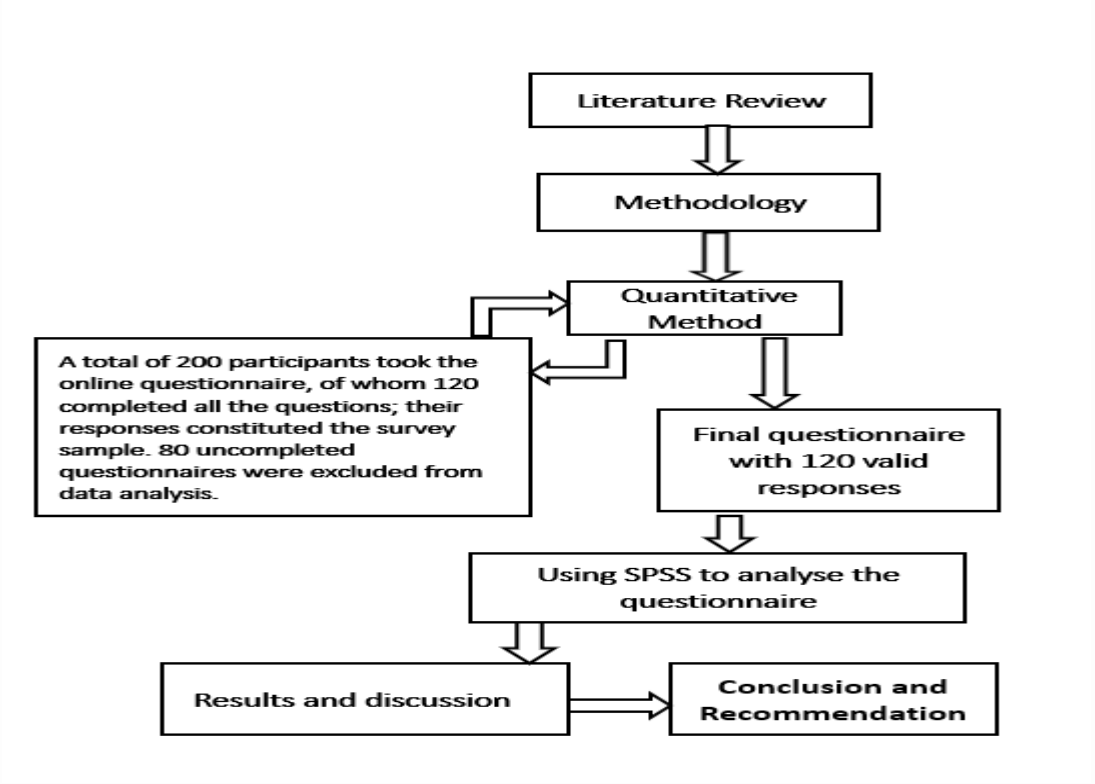

Figure3: Research design

The researcher used SPSS to analyse the questionnaire and used factors analysis. The main aim of using factor analysis (Maximum likelihood) in this study is to identify the important factors related to the perceptions of the construction stakeholders. Factor analysis can be used to explore the data for patterns, to confirm the initial hypotheses and/or to reduce the numerous variables to a more manageable number (Pallant, 2011). Factor analysis is usually applied to a large set of variables; it involves identifying the common and unique sets of variances called factors or components. It allows the researcher to condense the information into a manageable number of related variables prior to using them for conducting other analyses such as multiple regression or multivariate analysis of variance. Additionally, it helps the researcher to determine the number of latent variables of a set of items, and to define the substantive meaning of variables that account for the variations among a large number of items in a questionnaire (Field, 2013).

Maximum Likelihood Factor Analysis is a common technique used to estimate the factor loading (Crisci, 2011). MacCallum etal., (1999) stated that the simple size impacts the factors analysis solutions and offers useful information. They believe that the simple size should be at least 100.

In this study, the varimax rotation is used as it provides better interpretation, leading to more interpretable factors as it allows a smaller number of variables to load highly on each factor. The varimax method of rotation is the most appropriate technique to use because it produces results which are easy to interpret (Pallant, 2011). Following rotation, factor loadings should be more transparent to the researcher. According to Field (2009), factor loading of the variables >0.3 is considered significant, factor loading variables >0.4 are very important, and a factor loading variable >0.5 is considered very significant.

Table 2 Exploratory factor analysis results

	Extraction Method : Maximum Likelihood Rotation Method: Varimax					
No		**Factors**			**Factors Identifications**	
	Variables	**1**	**2**	**3**		
1	Managing materials waste	.821			Activity of material management	
2	The purchasing of the materials	.768				
3	Improving logistic management	.702				
4	Ensuring that the materials are provided on the construction site	.698				
5	Controllig the quality of material	.618				
6	Project manager experience	.588				
7	Transport services	.576				
8	Tracking	.522				
9	Handling material handling	.416				
10	Factors related to the owner	.361				
11	Avability of labour		.740			

12	Training		.725		Internal factors	
13	Healthy and safety		.705			
14	The expertise of subcontractor		.698			
15	Experience of contractor		.642			
16	Knowledge and skills related to the people		.623			
17	Engineers experience		.617			
18	Material delivery		.547			
19	Material cost		.469			
20	Poorsite management and supervision		.317			
21	Poor stores			.562	Externail factors	
22	Effect of using technology			.529		
23	Improper project planning and scheduling		.	. 501		
24	Inappropriate construction methods			.486		
25	Changes in materials prices			.458		
26	Weater factor			.422		
27	Political and environment factors			.418		
28	Desinger impact			.415		
		Total variance explained				
		Kaiser-Meyer-Olkin Measure of Sampling Adequacy				

4. Results and discussion

As mentioned above, this study utilised maximum likelihood estimation as a method to determine how many variables the construction stakeholders consider, and which items belong together because the collected usable sample data was (N=120) and this study used parametric tests.

This result presents the most components of the material management activities which the construction stakeholders consider. The purpose of the rating scales in the questionnaire was to focus on the common components of the material management process. According to the study's findings, three latent variables were identified from the material management process: activities of material management, internal factors, and external factors. The respondents rated material management high in terms of 28 components, but very low (negative) in the six variables identified above, (which are dropped out): supplier effect, supervising site, financial, improvement of the storage site, and using advanced technologies BIM.

Factor one is labelled, "activity of material management" and it includes 10 variables. This factor is based on the managing material waste with the highest loading (.821). The other variables which are included in the material management process are related to the purchasing of the materials, logistic management, controlling the quality of material, transport services, tracking, handling, and project management experience. These attributes are essential for improving material management.

that impact their productivity, training, health and safety, Factor two, the internal factor has 10 attributes. The data showed that most respondents are concerned with factors knowledge and skills, contractor, and subcontractor experience. The respondents expressed a strong interest in joining a

training course that improves their skills and knowledge.

Factor three, the external factor has 8 attributes. This factor has low loading compared to the other factors (activities of materials management and internal factor), Those with the highest loading are poor stores (.562), followed by those using technology (.529), This factor is of great significance to the construction industry because good project managers used technology to improve the material management process. The improper project planning and political situation can threaten material management improvement. These factors are important for the Libyan construction stakeholders because they improve the material management process.

5 Conclusions

This study provides a critical overview of the factors that affect materials management in Libya through its originality and the consideration of specific factors contributing to the body of knowledge. The paper introduced the questionnaire analysis to identify the most important attributes the majority of the construction Libyan companies are concerned with. The result presents the most important components of material management: managing material waste, waste materials, logistic management, controlling material quality, transport services, tracking, handling, project management experience, productivity training, health and safety, knowledge and skills and contractors and subcontractors' experiences.

In assessing the current level of materials management among Libyan construction professionals, the results showed that several factors require greater recognition (see table2); for example, fewer than half the respondents considered the role of consultant as necessary, although two-thirds recognised the contribution of contractors.

The Libyan construction professionals do recognise the role of materials management in meeting deadlines and delivers the project on time. However, communicating the benefits of materials management, especially those related to the reduction of time and cost, should be encouraged through conferences and seminars, while researchers should be aware of the current lack of studies related to materials management. This research will help construction companies and researchers in the Libyan construction sector to focus on the significant issues necessary concerning people-related barriers such as lack of knowledge about materials management, labour productivity and supply chain management. This study investigates factors affecting materials management

6. Recommendation

This study endeavours to improve the material management process by minimising cost and time overruns in construction projects.

Developing the construction material management process is not an easy task. Therefore, active collaboration and cooperation among all construction project stakeholders need to be undertaken to define issues and to implement strategies and plans. The cooperation will help them to succeed in the process of improving their work, overcoming many challenges.

The Libyan construction authority should make efforts to promote technology use in their work, to reduce time and cost. Training and educational courses can be implemented to include all the construction

staff. Increasing awareness can help the sector to avoid any delay and to achieve the project aim.

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The influence of proximate neighbourhood facilities on residential property vacancy periods in Minna, Nigeria.

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Abstract

This study sought to provide evidence on the contributory effect of neighbourhood amenities on vacancy periods for residential buildings in Minna. The research population comprised 9,008 rented residential buildings in thirteen (13) selected areas in Minna Metropolis, while a total of 1,129 housing units were sampled following the Kothari (2004) formula for sample size selection and further adopting ± 10% precision (margin of error), and 90% confidence level. Stratified and random sampling techniques were adopted in order to ensure an unbiased selection of the sample from the population. The data used were generated through two sets of questionnaires which were administered to the household heads of rented dwelling units that fell within the sample group, and the managers of the sampled houses. Questionnaire which was well completed represented an overall 77% response rate were used for analysis. Data analysis involved the use of inferential statistics to address specific objectives of the study. Precisely, collated data were analysed using the optimally scaled categorical regression analysis (CATREG). Nine amenities were found to sustain residential buildings in the study area, which accounted for 32% variance in the vacancy period of tenement buildings and one-bedroom apartments; and 34% & 51% variance respectively in the vacancy period of two and three-bedroom bungalows respectively in the study area. Among other findings, the study revealed that closer distances of shopping centres and health care centres to tenement buildings significantly increased the period of vacancy. Whereas, out of all the amenities measured, only refuse dumps significantly increased the vacancy period of two-bedroom bungalows. Having established the varying degrees of impacts of neighbourhood amenities on the vacancy periods of house types in the study area, it is evident that policy makers need to ensure the equitable allocation of the amenities in question across space.

Key words: *Amenities, neighbourhood, residence, void period*

1. Introduction

Minna, capital of Niger State has experienced rapid urbanization and expansion over the years. The direct implication of this is an increased need for residential accommodation which further necessitated

an increase in housing supply. Recent observations have revealed that massive residential property developments continue to spring up in various parts of the study area. Unfortunately, a number of these residential properties are left unoccupied and suffer longer vacancy periods despite the rising need for residential accommodation. Vacancy period is simply the period between tenancies when buildings are unoccupied. A vacancy period occurs when a property is vacant, unoccupied or without legitimate tenant thereby receiving no rental income.

The notion of vacancy period of residential properties had been a subject of discourse in many academic and professional circles, for example (Remoy 2010, Oladokun 2011, Gabriel and Nothaft 2011 & Akalemeaku and Egbenta 2013. Residential accommodation constitutes a basic necessity to man. Thus, investment in residential properties is considered a major and highly profitable form of investment as it seeks to address the growing housing demand of man. This rising demand for residential accommodation has led to residential property development being considered a major investment in Nigeria. In essence, it has given rise to an increase in the supply of residential buildings/ housing units by both individuals and corporate bodies to cater to the rising need for accommodation. According to Ansah (2012), housing units' development is considered as one of the most important subsectors of the real estate industry. Since the increasing demand for housing units in urban centres have continued to attract the development interests of real estate developers, it is imperative that appropriate measures are taken to ensure that invested capital is profitably recouped. However, a major determinant of the timely recoupment of invested capital is the minimisation or totally eliminating the development's vacancy period (Ogunbajo, 2018).

In recent times, several residential dwelling units across urban areas have suffered longer vacancy periods despite the rising need for residential accommodation. However, research has also shown that the efficiency of any urban area depends largely on the provision of efficient amenities and services (Babarinde 1998). The provision of urban infrastructure in any urban setting has tremendous multi-dimensional impacts on the people and overall property values are well documented (Kiel & Boyle 2001; Adebayo 2006; Zietz, Zeitz & Sirmans 2008, Olujimi & Bello 2009; Ducombe & Yinger, 2010; Boucq & Stratec, 2011; and Cellmer, Senetra & Szczepanska, 2012). With the rapid urbanisation of many Nigerian cities, good quality urban amenities have become increasingly important,

Recent observations have revealed that massive residential property developments continue to spring up in various parts of the study area, with or without a corresponding growth in basic amenities. Neighbourhood facilities in Minna appear to be unevenly distributed across the city, and are at varying distances to dwelling units; while several residential

properties are left unoccupied and suffer longer vacancy periods despite the rising need for residential accommodation. Landlords and real estate investors are sometimes faced with the challenge of replacing tenants within the shortest possible time, without a detailed understanding of the unique factors that determine these delays (Ogunbajo 2018).

The extent to which neighbourhood facilities and amenities determine the vacancy periods of residential properties lacks significant contributions from literature, thus, this research performed a study of the Minna residential property market to determine the primary drivers of vacancy periods with particular emphasis on the availability and proximity to urban facilities and amenities. The research employed different analytical tools to provide evidence on the extent to which neighbourhood facilities contribute to determining vacancy periods or otherwise. It assessed the vacancy periods of tenanted dwellings across the study area, identified neighbourhood facilities sustaining these residential properties, as well as their proximities to the identified facilities. This research addressed the question about the extent to which the duration of vacancy of residential properties in the study area can be explained by differences in availability and proximity to infrastructural facilities. The study is significant in providing empirical evidence on the extent to which the duration of vacancy is influenced positively and/or negatively by the identified facilities. It will aid investors to make more informed decisions on residential property investment with adequate knowledge of the influence of various infrastructural facilities within the various neighbourhoods.

2. LITERATURE REVIEW

2.1 Provision and access to Neighbourhood facilities in Urban centres

Residential buildings and its supporting externalities have become part and parcel of human existence and it is a prerequisite for the development of any urban economy. The provision of amenities such as good roads, electricity, water, telecommunications, sewage and drainages are basic requirements that determine the socio-economic well-being of an area (Anofojie, Adeleye and Kadiri, 2014). Ujoh and Kwaghsende (2014) observed that the provision of adequate amenities and facilities is becoming increasingly difficult due to rapid population growth. However, much concern is increasingly being expressed over the pattern of distribution of amenities and facilities. As observed by Atser and Akpan (2009), the inequality in facilities' distribution is a cause for concern particularly in developing countries where there are problems of personal mobility. While Otegbulu and Adewunmi (2009) described the presence or absence of these amenities as the major difference between a slum and a non-slum area, Saed *et al* (2015), explained that the lack of urban amenities is a good catalyst for squatter

formation and worsening housing conditions in urban districts.

With the rapid urbanisation of many Nigerian cities and parts of other developing countries, good quality urban amenities have become increasingly important. It is pertinent to note that the need to consider end-user priorities in the provision of these amenities /facilities is also important. Due to the unique nature of different geographical areas, as well as end-user preferences, certain infrastructure is highly demanded in certain areas as opposed to other areas. According to the Central Statistics Office, India (2012), measuring the performance of amenities /facilities is required for decision making in order to improve the availability and capacity of these amenities/facilities. In this regard, Otegbulu (2014) examined the implication of infrastructure condition to urban neighbourhood sustainability and how a demand-driven approach can enhance willingness to pay for service improvement in Lagos. The research sampled 1040 households in 8 metropolitan local government areas and elicited information on households' preferences and demand for urban ancillary facilities including willingness to pay and averting expenditure. Findings from the study indicated that different areas of the city have preferences for different ancillary facilities both in specific types and service option, and that demand-driven provision will enhance willingness to pay, and also has implication on neighbourhood sustainability. The study however placed emphases on the condition of the infrastructure clearly excluding the idea of relative proximities of individual households to the infrastructure.

One of the persistent problems facing Nigerian cities in the past decades is the inadequacy of ancillary facilities, as well as the management of existing ones (Ogu, 2005). It is widely accepted that major challenges associated with neighbourhood facilities/amenities result from increased urban growth and density, as well as the inability to effectively manage existing infrastructure. The ability of these amenities to accommodate growth depends on the ability of the urban area to manage and improve the condition of the existing amenities.

2.2 Occurrence of vacancy periods in buildings

A vacant property, which can also be referred to as a void property is one which is unoccupied because it does not have a tenant in occupation (Akalemeaku and Egbenta 2013). As described by Nam, Han and Lee (2016), a vacant house is one that has been unoccupied for an extended period of time. In many developed and developing nations, the prevalence of vacant residential properties has been a course of concern due to its many implications on investment returns and the national economy (Duke 2012). Generally, vacancy periods are inevitable. It however becomes worrisome when the period is elongated. Some consequences of vacant buildings according to Akalemeaku and Egbenta (2013) are loss of rental income to the investor,

loss of professional fees to the property manager, as well as illegal occupation and vandalization of the buildings. A Over the years, studies have attributed vacancy period to several factors. For example, Remoy (2010) established a significant correlation between the amount of facilities in a location and structural vacancy in Amsterdam. The study assessed the travel time from buildings to the nearest highway among others, ,and revealed that vacancy decreased with a farther distance to the highway. Akelemeaku and Igbenta (2013) attributed vacancy/void in commercial properties in Enugu, Nigeria to inadequate infrastructure, high rents, and poor finishing of buildings. Nam, Han and Lee (2016) established a positive correlation between vacant houses (on one hand) and excess supply of houses, and population size (on the other hand). While the above researches recognizes urban infrastructure and amenities as major determinants of vacancy periods, the true relationship and interconnection between proximity to neighbourhood amenities and vacancy periods in Minna, as well as the benefits to government and the society has not been fully addressed and well documented. In the course of this research, a study of existing literature has shown that there has been no documented study to determine the influence of proximate amenities on vacancy period in Minna.

3. Methodology

Residential property markets have received considerable attention worldwide, which may be attributed to the special role of shelter to man. For this study, Minna is chosen because it is the capital of the largest Northern state in Nigeria in terms of land mass (National Population Commission, 2006; Niger State Government, 2011), and also due to the rapid urbanisation and expansion of the town.

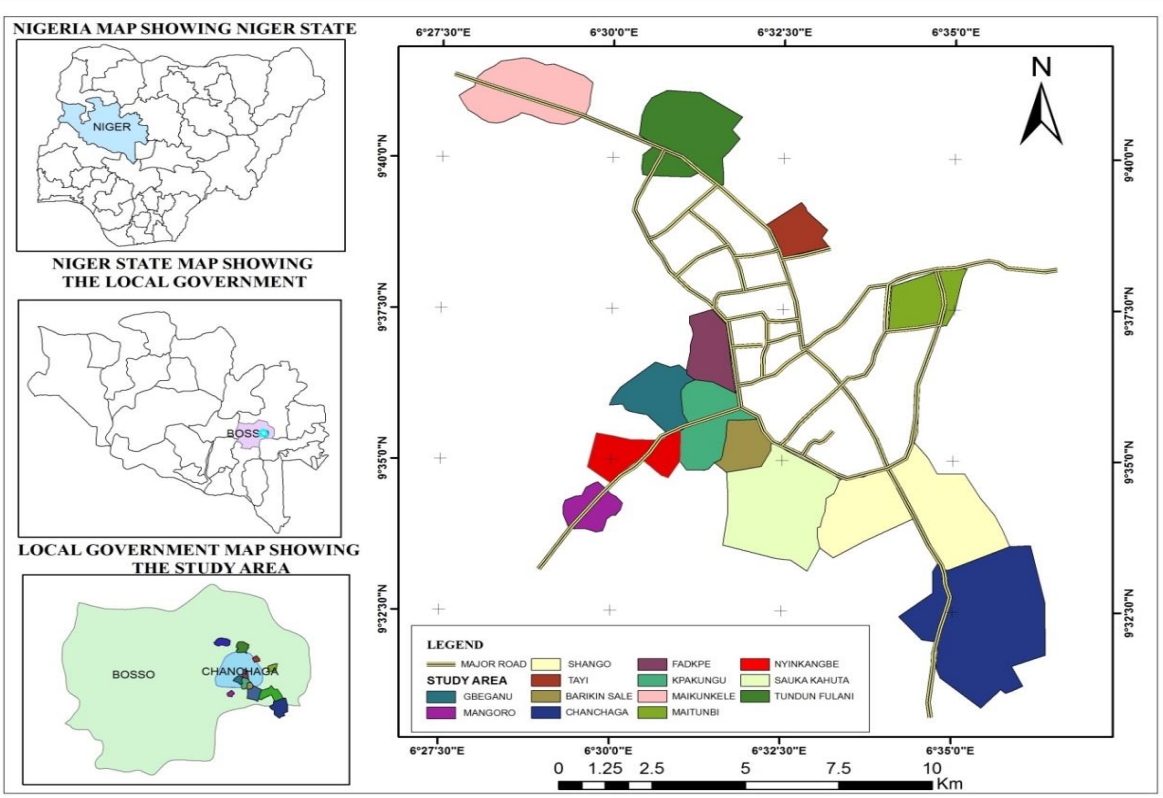

Figure 1: Map of the study area

Source: Department of Remote Sensing and GIS, Federal University of Technology, Akure (2016)

The population for the study constituted residential dwellings that fell into void at any time between January 2014 and December 2018 (5 years),and spread across thirteen (13) residential neighbourhoods in Minna, where rapid residential developments have been observed over the years. A total of 1,129 housing units were sampled following the Kothari (2004) formula for sample size selection and further adopting + 10% precision (margin of error), and 90% confidence level. Four major house types fell into this category. These were Tenements (473), single room apartments (349), two-bedroom bungalows (163) and three-bedroom bungalows (144). The sampled neighbourhoods are: Barkin-Saleh, Maikunkele, Chanchaga, Kpakungu, Maitumbi, Gbaganu, Nyikangbe, Shango, Sauka-kahuta, Tayi village, Tudun-fulani, Fadikpe, and Gidan-mangoro. Neighbourhood facilities identified in the study area which were used in the study were educational institutions/schools, shopping centres, health care centres, recreational facilities, access roads, sewage disposal sites / refuse dumps, security, electricity, and water supply. The choice of these neighbourhood facilities was based on evidence from the literature.

The data used were generated through two sets of questionnaires. The first set was administered on the household

heads of rented dwelling units that fell within the sample group, and focused on the availability and access to amenities, while the second set was administered on the managers of the sampled houses, which constituted estate surveyors, non-professional estate agents, and landlords (as the case may be) in the study area. The second set of questionnaire basically elicited data on vacancy / void related issues. A total of 1129 housing units were sampled, and Fifteen (15) Field Assistants who were trained, assisted in questionnaire administration and retrieval. Duly completed questionnaire were collated and subsequently used for analysis. To avoid the introduction of additional error by imputing missing data, only completed questionnaire without missing values were used. This is in line with Isreal (2003), which explained that imputing missing data could give rise to errors in data analysis. The well completed questionnaires represented an overall 77% response rate.

The research implemented the mixed methods research design. Data analysis involved the use of inferential statistics to address specific objectives of the study. Precisely, collated data were analysed using the optimally scaled categorical regression analysis (CATREG). This analytical tool was adopted due to the nature of the data which also entailed a dependent variable measured on ratio scale (vacancy / void period in months), an independent variable measured on ratio scale, and another eight independent variables measured on ordinal scales. Categorical regression mirrors the conventional multiple regression, except that categorical regression can also accommodate ordinal and nominal variables (Moss, 2016). Typically, the CATREG quantifies categorical variables so that the quantifications reflect characteristics of the original categories (Statistics Solutions, 2016).

The proximity of dwelling units to amenities / facilities was measured using ordinal variables on a three-point scale, viz: far, fairly close, and very close. This scale of measurement was derived in accordance with the duration or time taken (in minutes) by an average adult to walk from his/her dwelling unit to the nearest of each of the facilities / amenities under consideration. This was arrived at based on the consensus opinions of respondents in the course of the pilot study. Respondents described a walking distance of 1 – 15 minutes to any of the amenities as acceptable. They were however not willing to walk more than 30 minutes to access any of the facilities, thus, this research categorized a walking distance of 1 – 15 minutes as very close, 16 – 30 minutes denoted fairly close, while a walking distance of more than 30 minutes was categorised as far. This is similar to the recommendation of the Leeds unitary development plan (2006) which described the local accessibility standard to an amenity site as equivalent to 10 minutes- walk time (based on the consensus opinion of respondents). Neighbourhood security was measured using data obtained from police stations in the study area. The figures denote

the average number of reported crime cases per month in each of the sampled areas. Peculiar crime cases taken into consideration were burglary, robbery/theft, and hooliganism / street fighting, while the quality of electricity was measured in terms of the number of hours of supply per day from the public mains.

The impacts of these facilities/ amenities on the void periods of residential buildings in the study area was established by regressing proximities and availability of the sampled amenities (independent variables) against void periods (the dependent variable) using the optimally scaled categorical regression analysis (CATREG). In this research, void periods are related to the neighbourhood facilities/amenities in the study area. Thus, a functional equation designed to capture the relationship between void period and neighbourhood facilities/amenities takes the form:

$$VOP = f(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where VOP = Void period
The independent variables are as follows:
X =>
X_1 = Shopping centres
X_2 = Educational institutions
X_3 = Health care centers
X_4 = Recreational facilities
X_5 = Major access roads
X_6 = Refuse disposal sites
X_7 = Security/ Crime rate
X_8 = Electricity supply
X_9 = Water supply

Substituting the *x* parameters into equation (1), the equation is simplified as:

$$\varphi_{r\,(VOP)} = \beta_1 \varphi_{j(SHOP)} + \beta_1 \varphi_{j(EDUC)} + \beta_1 \varphi_{j(HEALTH)} + \beta_1 \varphi_{j(RECRE)} + \beta_1 \varphi_{j(ROAD)} + \beta_1 \varphi_{j(REFUSE)} + \beta_1 \varphi_{j(SECURE)} + \beta_1 \varphi_{j(ELECT)} + \beta_1 \varphi_{j(WATER)} + e \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Prior to using collated data to justify the duration of void period of residential buildings, a number of tests and checks were carried out on the data set in order to ensure that the eventual results are meaningful and interpretable. Typically, regression analysis is very sensitive to outliers, thus the first step in the analysis involved the removal /exclusion of outliers from the data. There was also the need to establish whether multicollinearity existed in each of the data sets. This is because multicollinearity had been reported to undermine regression analysis and the subsequent conclusions from such analysis (Starkweather & Herrington, 2016). Multicollinearity was tested for by computing the Tolerance values and Variance Inflation Factors for each of the independent variables. Results showed that the tolerance value for each of the independent variables exceeded 0.10. It therefore implied that there was no multicollinearity in the data sets. Further evidence is given in the Variance Inflation Factors (VIFs) which were quite satisfactory since they are well below the cut off of 10. Having satisfied all the assumptions underlying the use of categorical regression (i.e., excluded outliers, ensured linearity and

homoscedacity, and also satisfied the 'no multicollinearity' rule), the regression analysis was conveniently carried out on the data and results of the analysis are best described as accurate and findings are meaningful.

For the purpose of this research, void period is the period between tenancies when buildings are unoccupied. Educational institutions refer to government owned to primary, secondary and tertiary institutions. Shopping centres refer to multi-tenanted commercial complexes (including blocks of six or more shops on a single floor or on more than one floor); water supply referred to public/government provided boreholes, while Health care centres referred to government owned general hospitals, and primary health care centres.

4. Findings and Discussion

4.1 The significant impacts of Neighbourhood facilities / Amenities on the vacancy periods of residential buildings.

The impacts of neighbourhood amenities/facilities on the vacancy periods of each of the four house types were analysed using the optimally scaled categorical regression analysis. These are presented in Table 1

The model summary in table 1 showed R^2 values of 0.317, 0.318, 0.34, and 0.51 for tenements, one-bedroom apartments, two-bedroom bungalows, and three-bedroom bungalows respectively. These indicated that the regression models explained about 32% of the total variation in the vacancy period of tenement buildings and one-bedroom apartments in the study area, and also 34% and 51% of the total variation in the vacancy periods of two and three-bedroom bungalows respectively. In other words, only 32%, variance in the vacancy period of tenement buildings and one bedroom apartments in the study area is predictable from the facilities under consideration, while 34% and 51% variance in the vacancy period of two and three-bedroom bungalows respectively is predictable from these facilities.

:

Table 1: Model Summary (Standardised data)

House Type	Multiple R	R Square	Adjusted R Square
Tenement	0.563	0.317	0.299
One bedroom apartments	0.564	0.318	0.285
Two bedroom bungalows	0.583	0.34	0.282
Three bedroom bungalows	0.714	0.51	0.49

Data Analysis, 2019

Other factors which were unaccounted for in the model can be said to be responsible for the remaining 68% , 68%, 66% and 49% for the four house types respectively. These factors relates to the accommodation and size of the dwelling unit, the condition of the physical building components of the house, age of the building, number of toilets, rental values, demand for particular house types, and individual preferences/choices of particular neighbourhoods. Generally, the $\mathbf{R^2}$ (coefficient of determination) indicates the proportion of variance in the dependent variable that can be explained by the independent variables.

The multiple correlation coefficients (Multiple *R = 0.563, 0.564, 0.583. and 0.714*) in Table 1 further indicated a fairly good predictability of vacancy periods from the identified facilities/ amenities (for tenements, one-bedroom apartments, and two-bedroom bungalows), and a very good predictability (for three-bedroom bungalows) of the vacancy periods from the identified facilities/amenities. The Multiple *R* is a measure of the strength of the association between the dependent variable and the independent variables. It measures how well the vacancy periods of the four sampled house types can be predicted based on the availability and proximity of the subject buildings to facilities. It indicates the strength of the association between the vacancy periods and these facilities. Typically, a multiple correlation coefficient measures how well a dependent variable can be predicted from independent variables. According to Pallant (2011), the closer R is to 1, the stronger the linear association is.

The *F* ratios in table 2 tested whether the overall regression models are good fits for the data. The table showed that neighbourhood facilities (ie, the independent variables) significantly predicted the vacancy periods for the four sampled house types in the study area (the dependent variable in this case). As shown in the table 2, F (12, 460) = 17.804 for tenement buildings, F (16, 332) = 9.683 for one-bedroom apartments, F (13, 149) = 5.904 for two-bedroom bungalows and (12, 131) = 11.360 for three-bedroom bungalows. The p-values in all the four cases were 0.000 which were less than the alpha level (i.e. $p < 0.05$), thus an indication that the regressions were good fits for the data.

Table 2: ANOVA test for the significance of neighbourhood facilities on the void period of residential buildings.

	Sum of Squares	df	Mean Square	F	Sig.
Tenement Buildings					
Regression	150.012	12	12.501	17.804	0.000
Residual	322.988	460	0.702		
Total	473	472			
One bedroom apartments					
Regression	111.043	16	6.94	9.683	0.000
Residual	237.957	332	0.717		
Total	349	348			
Two bedroom Bungalows					
Regression	55.417	13	4.263	5.904	0.000
Residual	107.583	149	0.722		
Total	163	162			
Three bedroom Bungalows					
Regression	73.433	12	6.119	11.36	0.000
Residual	70.567	131	0.539		
Total	144	143			

Data Analysis, 2019

The standardised beta coefficients which enabled comparison of the contribution of each independent variable to be made are presented in tables 3, 4, 5 and 6. The standardised beta coefficients compared the strength of the effect of each neighbourhood facility to the vacancy periods of each of the four house types. 'Standardised' means that the values for each of the different variables have been converted to the same scale so that they can be compared. The higher the absolute value of the beta coefficient, the stronger the effect. These analyses for each of the four sampled house types are presented as follows:

4.1.1 The impacts of Neighbourhood facilities on the vacancy period of Tenement buildings

This is further analysed in Table 3:

Table 3: Beta Coefficients of the independent variables

	Standardised Coefficients				
		Bootstrap (1000) Estimate of Std.			
	Beta	Error	Df	F	Sig.
Shopping complexes	.165	.038	2	18.401	.000
Educational Institutions	-.140	.041	2	11.504	.000
Health care Centers	.095	.047	1	4.133	.043
Recreation Centers	-.024	.055	1	.193	.661
Major Roads	-.229	.041	1	31.361	.000
Refuse Dumps	.063	.045	1	1.968	.161
Security of the Neighbourhood	-.152	.042	1	13.119	.000
Electricity supply	-.262	.042	1	38.884	.000
Sources of Water supply	-.202	.041	2	24.436	.000

Data Analysis, 2019

Figures in the last column of table 3 (known as the p-values) tell whether the respective independent variables make a significant contribution to the dependent variable. Variables whose p-values are less than 0.05 implied that the variables are making a significant unique contribution to the vacancy period of tenement buildings in the study area. Analysis in table 3 showed that the proximity of dwelling units to shopping centres, educational institutions, health care centres, and major roads make significant unique contributions to the vacancy period of tenement buildings in the study area. Others are: the level of security of the neighbourhoods, electricity, and sources of water supply to the housing units. These independent variables had p-values which were less than 0.05. Results also showed that the impacts of some of the independent variables (ie, proximity to recreational centers, and refuse dumps) on the vacancy period of tenement buildings in the study area were not statistically significant. These independent variables had p- values that exceeded 0.05.

The standardised beta coefficients in the second column of table 3 further indicated that electricity supply made the strongest unique contribution to explaining the vacancy period of tenement buildings in the study area. It had the highest beta coefficient (0.262). Other predictors which also contributed in explaining the vacancy period of tenement buildings in the study area are arranged in order of the strength of their contributions as follows: proximity to major roads (beta

coefficient = 0.229), sources of water supply (beta coefficient = 0.206), proximity to shopping centers (beta coefficient = 0.165), security (beta coefficient = 0.152), proximity to educational institutions (beta coefficient = 0.140), and health care centers (beta coefficient = 0.095).

Precisely, findings revealed that closer distances of tenement buildings to shopping centres and health care centres increased the vacancy periods for this house type. It therefore implied that these two facilities (ie. shopping centres and health care centres) constituted a disadvantage to tenement buildings (when they were within close proximity), thus tends to put off prospective tenants, and increase the vacancy period. On the other hand, closer distances to educational institutions, as well as improved security, water supply and electricity supply contributed significantly to reducing the vacancy periods of tenement buildings.

4.1.2 The impacts of Neighbourhood facilities on the vacancy periods of one-bedroom apartments

This is analysed in Table 4:

Table 4: Beta Coefficients of the independent variables (One-bedroom apartments)

	Standardised Coefficients				
		Bootstrap (1000) Estimate of Std.			
	Beta	Error	df	F	Sig.
Shopping complexes	-.199	.052	2	14.773	.000
Educational Institutions	-.233	.047	2	24.331	.000
Health care Centres	-.225	.046	2	23.513	.000
Recreation Centres	-.093	.067	1	1.938	.165
Major Roads	-.208	.053	2	15.540	.000
Refuse Dumps	.239	.047	2	26.482	.000
Security of the Neighbourhood	-.235	.051	2	21.544	.000
Electricity	-.043	.046	1	.849	.357
Water supply	-.111	.049	2	5.144	.006

Data Analysis, 2019

An examination of the standardised beta coefficients in the second column of table 4 revealed that refuse dumps made the strongest unique contribution to explaining the vacancy period of one-bedroom apartments in the study area. It had the highest beta

coefficient (-0.239). This is followed closely by security of the neighbourhood (-0.235), and proximity to educational institutions (-0.233). Water supply and shopping centres made the least contributions to the vacancy periods of one-bedroom apartments in the study area. The two variables had standardized beta coefficients of -0.111 and -0.199 respectively.

Also, the p-values in the last column of table 4 tell whether the contributions of the respective independent variables to the dependent variable are significant. Variables whose p-values were less than 0.05 implied that the variables are making a significant unique contribution to the dependent variable. A careful look at the table showed that seven out of the nine amenities considered made significant unique contributions to the vacancy periods of one-bedroom apartments in the study area. As shown in table 4, the contributions of recreation centres and electricity supply to the vacancy periods of one-bedroom apartments in the study area were not significant.

For one-bedroom apartments, closer distances to shopping centres, educational institutions, health care centres, and major roads brought about significant reduction vacancy periods. Other amenities which made significant contributions to reducing the vacancy period of one-bedroom apartments are: improved neighbourhood security, and improved water supply. On the contrary, closer distances to refuse dumps increased the vacancy period of one-bedroom apartments.

4.1.3 The impacts of Neighbourhood facilities on the vacancy periods of Two-bedroom bungalows

This is analysed in table 5:

Table 5: Beta Coefficients of the independent variables (Two-bedroom bungalows)

	Standardised Coefficients				
		Bootstrap (1000) Estimate of Std.			
	Beta	Error	Df	F	Sig.
Shopping complexes	.042	.095	1	.201	.655
Educational Institutions	-.200	.078	2	6.524	.002
Health care Centres	-.074	.093	2	.631	.534
Recreation Centres	-.086	.095	1	.819	.367
Major Roads	.115	.095	2	1.461	.235
Refuse Dumps	.476	.073	2	42.256	.000
Security of the Neighbourhood	.085	.103	1	.680	.411
Electricity supply	-.185	.098	1	3.532	.062
Water supply	-.156	.076	1	4.177	.043

Data Analysis, 2019

Neighbourhood facilities whose p-values were less than 0.05 indicated that these amenities were making a significant contribution to the vacancy periods of two-bedroom bungalows in the study area. Precisely, only educational institutions, refuse dumps, and water supply made significant contributions, while the contributions of shopping centres, health care centres, recreation centres, major roads, security, and electricity supply were not significant. Also, the standardised beta coefficient in table 5 compared the strength of the effect of each independent variable to the vacancy period of two bedroom bungalows. The standardised beta coefficients in the table revealed that proximity to refuse dumps made the strongest significant contribution to explaining the vacancy period of two bedroom bungalows in the study area. It had the highest beta coefficient (0.476). While closer distances to educational institutions and improved water supply contributed to reducing the vacancy period of this category of houses, closer distances to refuse dumps resulted in prolonged vacancy periods.

4.1.4 The impacts of Neighbourhood facilities on the vacancy period of Three-bedroom bungalows

This is analysed in Table 6:

Table 6: Beta Coefficients of the independent variables (Three bedroom bungalows)

	Standardised Coefficients				
		Bootstrap (1000) Estimate of Std.			
	Beta	Error	Df	F	Sig.
Shopping complexes	-.312	.078	2	16.215	.000
Educational Institutions	-.229	.179	1	1.624	.205
Health care Centres	-.086	.112	2	.583	.560
Recreation Centres	-.300	.099	1	9.062	.003
Major Roads	-.226	.105	1	4.644	.033
Refuse Dumps	-.195	.144	2	1.831	.164
Security of the Neighbourhood	-.150	.119	1	1.571	.212
Electricity supply	-.260	.092	1	8.053	.005
Water supply	-.037	.158	1	.056	.813

Data Analysis, 2019

Table 6 showed that the facilities/amenities which made significant contributions to the vacancy periods of three-bedroom houses in the study area are shopping centres, recreation centres, major roads, and electricity supply. These were identified by their p-values which were less than 0.05. Table 6 also showed the standardised beta coefficients which aided a comparison of the strength of the effect of each amenity to the vacancy period of three-bedroom houses. The standardised beta coefficients in the table revealed that shopping centres made the strongest significant contribution to explaining the vacancy period of three-bedroom bungalows in the study area. It recorded the highest beta coefficient (0.312). This was followed by recreation centres, which had a beta coefficient of 0.300, and electricity supply (beta coefficient = 0.260).

For three-bedroom houses, results in table 6 clearly indicated that shopping centres, recreation centres, major roads and electricity supply impacted negatively on their vacancy periods. In essence, improved electricity supply as well as closer distances to shopping centres, recreation centres, and major roads made significant contributions to reducing the vacancy period. Other amenities such as educational institutions, health care centres, refuse dumps, security and water supply were found not to have any significant impact on the vacancy periods of three-bedroom houses in the study area. Findings in this study

corroborate the work of Remoy (2010), Akalemeaku and Egbenta (2013), and McPeake (2015) and which identified low demand, resulting from a variety of neighbourhood factors as having profound impacts on the vacancy / void periods of residential buildings.

5.0 CONCLUSION

Residential property development is considered as a major form of investment in Nigeria, thus it is imperative that appropriate measures are taken to ensure that the invested capital is profitably recouped. This research is an attempt to examine the influence of the availability and proximity to neighbourhood facilities on the vacancy periods of residential properties in Minna. Landlords and real estate investors are sometimes faced with the challenge of replacing tenants within the shortest possible time, on residential properties developed in particular neighbourhoods without a detailed understanding of the unique factors that determine these delays. This research addressed the question about the extent to which the variations in duration of vacancy of residential properties in the study area can be explained by differences in the relative distances / proximities to amenities across neighbourhoods. The study provided empirical evidence on the extent to which the duration of vacancies for four (4) different house types is influenced positively and/or negatively by the identified amenities. Based on findings from this research, it is desirable that the government (being the major provider of ancillary facilities) and real estate investors go an extra mile in ensuring comfortable residential environments. This can be achieved by providing, maintaining and upgrading amenities within and around the neighbourhoods. These will attract people to the area, thus minimizing vacancy periods and ensuring that monies invested in residential real estate developments are timely and profitably recouped. It will aid investors to make more informed decisions on residential property investment with adequate knowledge of the influence of various amenities within the various neighbourhoods.

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