Volume 3, Number 2, September 2019



JOURNAL OF CONTEMPORARY RESEARCH IN THE BUILT ENVIRONMENT (JOCREBE)

ISSN: 2636-4468

PUBLISHED BY

DEPARTMENT OF BUILDING FACULTY OF ENVIRONMENTAL STUDIES UNIVERSITY OF UYO, P. M. B. 1017, UYO, NIGERIA

Editorial Objectives and Scope:

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The Journal of Contemporary Research in the Built Environment (JOCREBE) is an interdisciplinary peer-reviewed journal dedicated to publishing papers which advance knowledge on the practical and theoretical developments as well as original research work in all aspects of sustainable built environment, encompassing all capital projects including buildings, civil engineering as well as repair and maintenance of sustainable infrastructures. That is the journal covers all aspects of science, technology, business and management concerned with the whole life cycle of the built environment, from the design phase through to construction, operation, performance, maintenance, conservation and its deterioration and demolition.

Frequency of Publication

The Journal publishes two issues in one volume yearly with the first issue published in March and the second in September.

Subscription and Advertisement

The subscription and advertisement rates can be obtained from the Editor-in-Chief or the Managing Editor.

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PUBLISHED BY

Department of Building Faculty of Environmental Studies University of Uyo, Uyo, Nigeria Journal of Contemporary Research in the Built EnvironmentISSN: 2636-4468Volume 3, Number 2, September 2019© Department of Building, University of Uyo

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Journal of Contemporary Research in the Built EnvironmentISSN: 2636-446Volume 3, Number 1, March 2019© Department of Building, University of Uyo

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EDITORIAL

Anthony O. Ujene

Editor-in-Chief

On behalf of the editorial crew of Journal of Contemporary Research in the Built Environment (JOCREBE), I wish to welcome our numerous readers to Volume 3, Number 2, September 2019 edition of the Journal. I candidly applaud all the contributors for choosing JOCREBE as a medium for disseminating their well-investigated and articulated researches. This edition has tried to provide reasonable insight and solution to several problems in the Built Environment in line with the aim of the Journal. The highlight of the Twelve papers in this edition is hereby presented to stimulate your curiosity, as you are encouraged to read the main articles for proof of worth.

The first paper 'Application of BIM to construction material waste management: stakeholders' perceptions in selected states of south-south, Nigeria' by Umoren, Adewuyi and Otali, focuses on the application of BIM in solving the problem of construction material waste. The study surveyed the opinion of 197 construction professionals stratified into selected states of the South-South geopolitical zone of Nigeria. Data were analysed using relative importance index, mean score and Kruskal Wallis H test. It was found that high cost of integrated software, lack of trained professionals, and lack of technological awareness are the three most important inhibitors of BIM for construction material waste management (CMWM). The availability of trained professionals, knowledge of BIM applications, and developing a strategic implementation plan by organisations and firms are the three foremost factors facilitators. The study revealed the same perceptions of the respondents on inhibitors and differing perception on facilitators among the selected States. It recommended the utilisation of the unveiled critical demand on the players in the construction industry in the study area for the exploration of BIM for minimising waste and enhancing project performance.

The second paper by Molwus, Iorkumbur and Izam, investigated internal stakeholder participation and involvement in decision making and evaluated the degree of collaboration in terms of prevalent collaborative elements, efforts and strategies in the construction industry in Nigeria. It utilised a questionnaire survey to collect data from the six cities representing the six Geopolitical Zones of Nigeria. A cluster sampling drawn from internal stakeholders includes Client (or client representative), builders, engineers, architects, quantity surveyors, land surveyors and skilled technicians. The tools for analyses were simple percentages and mean score. It was found that collaboration takes place mostly at construction phase instead of all phases; skilled technicians and client/client representative are mostly involved in decision making instead of holistic involvement. The study recommended that the adequate involvement of all internal stakeholder should be encouraged at all phases of construction and the key elements of collaboration should be prioritised alongside collaborative efforts and strategies for less adversarial relationships and improved productivity in the construction industry in Nigeria. The third paper by Ebong and Oke reviewed the various deterrence measures integrated into building design for crime prevention in Abuja, Nigeria. The study adopted a narrative review of existing literature and observation of existing practices for deterrence in the study area. The paper presented a deterrence framework that comprised three components of; crime act considerations, deterrence considerations and deterrence application. The framework links together the theories of fear of crime, deterrence and crime opportunity. It was noted that the integration of turnstile access control mechanism into design helped to enforce orderly pedestrian entry into the Federal Capital Development Authority complex while allowing security to closely observe employees and visitors' entry. The result indicates that the design of some buildings allows for surveillance shadows which could lead to a security breach. It was recommended that deterrence measures, leveraging on situational crime prevention, should focus on crime settings by increasing the difficulties and risks of committing a crime.

The next paper by Nwosu examined the inflation hedging capability of hostel investments around the Federal University of Technology Akure (FUTA), south gate, Akure. The study used a survey questionnaire retrieved from fifteen practising registered Estate Surveying and Valuation firms in the study areas. The secondary data on inflation were obtained from the records of the Nigerian Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN). The data were analyzed through sample mean, standard deviation, and Ordinary Least Square Regression analysis. Phillip Perron unit root test used to test the stationarity of the data shows the data sets were a combination of a different order of integrations. The result of the inflation hedging capability indicated that hostel investment is not in an all-time hedge against inflation as it is traditionally perceived to be, there are instances where they provided a perverse hedge or partial hedge against inflation. The study recommended that the Nigerian government should put relevant policies in place that will bring down the inflation rate to a single digit and also maintain a single-digit inflation rate to check volatility.

The fifth paper by Anih and Ubong explored the implementation of human resource management dynamics by employees and employers of Estate firms in Uyo for real estate competencies. The study utilised Fifty-four (54) completed copies of structured questionnaire returned by twenty-seven Estate surveying and Valuation Firms in Uyo. "Human Resource Management and Employee Retention Instrument (HRMERI)" which contained 20 items on human resource management practice and 10 items on employee retention were used. The study found that compensation by real estate firms had a positive influence on employee retention through rewards and benefits. The training and development as well as performance management in real estate firms positively influenced employee retention. This was attributed to sufficient training for their jobs which contributed to achieving dynamism in the competencies of firms' goals. The study also found that the work environment in the real estate firms is a vital factor that positively influenced employee retention and was achieved by firms creating an open, comfortable and safe working environment. Employees expressed high satisfaction in the way the organizations were dedicated to diversity and inclusiveness. It was recommended that the study is an antidote to regression in real estate competencies and the application would be a driver to efficient real estate services.

The next paper by Ikediashi, Ajiero and Ohaka investigated the state of contractors' cash flow and its influence on construction project delivery in selected states of southsouth, Nigeria. A quantitative survey approach was adopted with 130 valid responses were received from 193 copies of a structured questionnaire administered. Data collected were analysed using descriptive statistics and Kruskal Wallis. Findings indicate that the top three project characteristics influencing cash flow are procurement method, project duration, and client type while project type was rated the least. It was also revealed that "on-schedule delivery of projects" was the top-rated, followed by "on-budget delivery of projects", and "projects delivered ahead of schedule". However, "projects delivered at an underrun" was the least rated. Findings also show that the influence of the contractor's cash flow on 3 of the 6 project delivery indicators were not significant as they did not meet the 3-point threshold. The study also concludes that the top three project characteristics that have an influence on contractor's cash flow are procurement method (in terms of traditional, design and build, project management etc.), project duration, and client type (public or corporate). The study recommended among others that government should enact stringent laws and guidelines to punish parties that default on project funding.

The seventh paper by Olatunji, Arowoiya and Omolewa assessed the relationship between timely delivery of construction projects and economic development in the Nigerian construction industry. The survey design was adopted to collect data from construction professionals in Ondo state which include Architects, Builders and Quantity Surveyors. The quantitative research method was adopted and the questionnaire was structured on a five-point Likert scale to elicit the opinion of respondents on timely delivery of projects and economic development. Spearman correlation coefficient was used to assess the relationship between timely delivery of construction projects and economic development. The study found that there is a slightly high relationship between timely delivery of construction projects and economic development within the Nigerian construction industry with the highest degree being 55.1% and lowest as 31%, while timely delivery of construction projects tends to increase economic growth in the study area. It was recommended that there should be proper planning of a project before the commencement of the construction so every activity can go smoothly and the project can be delivered on time. Likewise, contractors should be familiar with the site characteristics so there would not be a problem of unforeseen ground conditions.

The next paper by Olasunkanmi and Oladokun gives insight into the causes of changes and its consequences on building project performance. Descriptive and survey research method was used to evaluate the perception of construction participants and stakeholders on the significant causes of change and effects of change on the performance of building construction projects. A cross-sectional survey using 125 structured copies of questionnaire were distributed and data were analysed using descriptive, relative importance index and Kruskal-Walis tests. The finding shows that the most significant causes of change in building project include; change of plans by owners followed by the change in design, poor communication among the construction participants, owners' financial difficulties and owners' change of schedule. Further findings generally show that cost overrun has the most prevalent effect followed by quality standard, time overrun, additional money for contractor overhead and work-on-hold. It is recommended that the introduction of change management procedure in the contract document will enhance the smooth delivery of building projects with fewer disputes. It is also recommended that the Ministries (federal and state) in charge of housing should establish or have a well-defined system of managing changes in Government building construction projects rather than abrupt calling for unjustified variation by their contractors or suppliers.

The ninth paper by Adeogun, Udoekanem, Kuma and Wahab examined the relationship between infrastructure condition and residential property investment in Abuja, Nigeria. A survey approach was adopted with residential properties currently in the market generating income (rental or capital values) for investors as the study samples.

Firms of Estate Surveying and Valuation and households were used for data collection. Transactions of 718 were obtained from 1, 2, 3 and 4 bedrooms properties as well as availability and condition of infrastructure. Correlation coefficient and regression model were used to examine the relationship and effect of infrastructure condition on residential property investment returns between 2009-2018. The results revealed a significant and positive relationship between infrastructure conditions and rate of returns, while the functional condition of infrastructure in Abuja has a significant effect on the rate of returns on residential property investment. The study concluded that infrastructure condition contributes about 71% of the rate of returns on residential property and hence, a positive determinant of market performance and important information for stakeholders.

The next paper by Adewusi assessed the performance of Artificial Neural Network (ANN) and Logistic Regression Model (LRM) in credit transaction using data from Nigeria emerging economy. 2,300 data samples comprising fully and partially recovered loan accounts were obtained from the databases of eleven commercial banks and sixteen primary mortgage institutions practising in Lagos metropolis, Nigeria. Data on one dependent variable (loan recovery status) and thirteen independent variables were collected on each of the data samples. To construct LRM & ANN models, the total samples were subdivided into training/validation and testing samples. 73% of the total samples (1,679) were used for training and validation of the models while 27% of the total samples (613) were used in testing the classification performance of LRM and ANN using overall accuracy, specificity, sensitivity, as criteria for performance measurement. The result reveals among others that LRM and ANN models generated good overall accuracy values of 76.6% and 91% respectively. However, the performance of ANN is comparatively more efficiently better than that of LRM in detecting 'good' loan applicants, 'bad' loan applicants and in generating lower Type I and Type II errors than LRM. The use of ANN is therefore recommended as a credit risk evaluation technique due to its consistent performance across the performance metrics.

The eleventh paper by Abdulrazaq developed models for predicting the impact of risk factors on cash flow (CF) forecasts by contractors in Nigeria. A list of risk factors that impact on CF forecasts was identified through the review of existing literature. Data was collected via a questionnaire survey of contractors operating in the Nigerian construction industry. Two (2) sets of questionnaire surveys were conducted. The first questionnaire survey focused on determining the likelihood of occurrence/impact of thirty-one (31) risk factors on cash-out forecasts respectively. The mean, standard error and standard deviation were computed. Sixteen (16) risk factors were found to significantly impact "cash-out" forecasts- "increased duration of the project", "change in currency exchange rates", "high cost of materials", among others. The models developed showed that construction contractors' cash-out forecasts vary with the actual expenditure by +20%, +25% and +25% at 30%, 50%, and 70% completion stages respectively. Validation of the models shows a 77%, 69%, and 67% accuracy at 30%, 50%, and 70% completion stages respectively. Construction contractors practising in the Nigerian construction industry should expect positive variations to their "cash-out" forecasts during the execution of projects, hence the recommendation that they should carefully consider the sixteen (16) affecting "cash-out" before embarking on any construction project.

The last paper by Olasunkanmi and Ujene evaluated the nature of the prevailing corrupt practices and its effects on public projects delivery in Akwa Ibom state. Descriptive and survey research method was used to evaluate the perception of respondents involved in the delivery of public projects to evaluate the nature and the causal factors of corrupt practices on public projects. Purposive random sampling technique was used to determine the sample size. A total of 60 copies well-structured questionnaire were distributed and data obtained were analysed using the descriptive, mean score and Kruskal-Walis tests. The finding of the study reveals that inflation of contract sum by procurement officers, abandonment of the project by contractors, certification of substandard work by the consultants and non-implementation of the contract according to specification are the nature of corrupt practices prevailing in the study area. Also, the factors of god-fatherism and settlement, the public project as political settlement were considered responsible for causing corruption in the procurement of public projects. It is recommended that all stakeholders should give adequate consideration to the presence of corrupt practices and the influencing factors so as to curb corrupt practices for successful project delivery.

In conclusion, there is no doubt that these papers have advanced knowledge on theoretical and practical issues of the built environment and have provided the opportunity for increasing the stock of information and knowledge on problems of the built environment and possible ways of providing solutions to them. We look forward to more novel research papers for the next issues which will be out very soon.

APPLICATION OF BIM TO CONSTRUCTION MATERIAL WASTE MANAGEMENT: STAKEHOLDERS' PERCEPTIONS IN SELECTED STATES OF SOUTH-SOUTH, NIGERIA

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ABSTRACT

Purpose: Construction material waste management (CMWM) is one enigma that has given the construction stakeholders brain-cracking efforts to tackle possibly employing all the available strategies at their disposal and new inventions possible to come to a sustainable level. This study investigated the application of BIM in solving the problem of construction material waste which is one of the options yet untapped by construction stakeholders in the study area.

Design/methodology/approach: A survey research design method was used with 197 valid participants who are construction professionals stratified into their respective State of residence or professional domicile within the South-South geopolitical zone of Nigeria. Data were collected with structured questionnaires which were analysed using relative importance index, mean score and Kruskal Wallis H test for the hypotheses.

Findings: High cost of integrated software, lack of trained professionals to handle the tools, and lack of awareness of the technology are the three most important inhibitors of BIM for CMWM. The availability of trained professionals to handle BIM tools, knowledge of BIM applications, and developing a strategic implementation plan by organisations and firms are the three foremost factors facilitating the use of BIM for CMWM. The study revealed that the perceptions of the respondents on inhibitors to the usage of BIM for CMWM do not differ significantly while their perceptions on facilitators varied significantly among the selected States.

Research limitation/implications: The study relied on the expertise of the 197 professionals sampled in the three selected States to represent the six States in the South-South geopolitical zone of the country. It also depends on only fifteen inhibitors and ten facilitators influencing the application of BIM for CMWM which may not be exhaustive enough to uncover the realism.

Practical implication: The study unveiled the critical demand on the players in the construction industry in the study area for the exploration of BIM for minimising waste for enhancing project performance and advancing the course of Architectural, Engineering and Construction (AEC) professions.

Originality/value: The study uncovered the state-of-art about the management of construction material waste in the study area.

Keywords: Application of BIM; BIM; construction material waste management; stakeholders; inhibitors; facilitators.

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1. INTRODUCTION

The construction industry is one of the major contributors to the nation's structural and economic growth because of the vastness of its products. The realisation and the need for developing countries to meet up with the developed ones, and for the growth to be progressive; demands a series of obstacles to be overcome. One of such obstacles has been the issue of construction material waste which mostly occurs as a result of construction activities and reported to have become knotty due to the large volume of waste produced across the globe (Osmani, 2013). The construction industry in which these activities take place is responsible for producing a whole variety of on-site wastes, the amount and types of which depend on parametric functions such as the stage of construction, type of construction work, direct or indirect stakeholders, design change contributions, and practices throughout the project lifecycle (Liu *et al*, 2015). Jaillon and Poon (2014) also confirmed that waste could be attributed to the constant uptake of construction, demolition and renovation activities during which villages are built into towns, towns into cities and cities into megacities.

Among the researches into construction waste minimisation techniques undertaken so far, Liu et al. (2015) observed lack of a comprehensive approach that can effectively combat material waste in different phases of construction, and as such the construction industry is still in search of effective waste management tool to tackle the menace of construction waste and to enhance a profitable end product. Akinade et al. (2016) showed that the waste management tools earlier adopted were not robust enough to combat construction waste. The recent and a more reliable technology discovered which is capable of numerous benefits in the construction industry at any stage including solving the problem of waste on building sites is Building Information Modelling (BIM) (Ahankoob, 2012). Amuda (2016) observed that different, but related, construction industry parties are at variance with each other in solving problems of material waste. Rather, each of the parties is focusing on their specific area of functionalities and ignoring the adverse effects of their respective separate decisions on the other aspect of the entire project. Whereas, it is inevitable to collaborate and integrate construction project process among the various parties involved as it brings about effective coordination, effective communication and fast achievement of project objectives. Therefore, BIM's adoption or its implementation is a matter of necessity as it is capable of providing a common platform that tracks all construction stages and processes. BIM is capable of a sudden transformation of the construction industry from the traditional fragmented method of project delivery to a method which can create newly coordinated, collaborated and information exchange opportunity among the parties involved in a project (Teo, Seah & Chioh, 2006).

Furthermore, it has been reported that rework is a significant factor contributing to the costs and time overruns of construction project while the genesis of the duo is traceable to the magnitude of material waste generated on building sites (Hwang, Zhao & Yang, 2019; Adewuyi & Idoro, 2017; Adewuyi & Odesola, 2015; Adewuyi, 2012). Concomitantly, factors such as lack of communication between construction parties, omissions, design mistakes, and change orders have been identified to be some of the causes of rework whereas all these adversarial effects on a construction project can be effectively curbed with the implementation BIM. Hwang, Zhao and Yang (2019) enunciated the versatility of BIM to ensure better control of the construction process and enablement of internal coordination, cross-disciplinary collaboration, decision-making, risk management, and productivity improvement.

From the foregoing, it is obvious that the problems of construction material waste can be tackled with the implementation of BIM, thus enhancing the growth and rapid transformation of the construction industry in every part of the world. Unlike most developed countries, which are currently at best working at Construction 3.0 level (Rastogi, 2017), most of the developing countries in Africa are still struggling with the adoption of third level of construction revolution, especially Nigerian construction industry, which could be likened to that of India and Yemen that have unwillingness to accept new technology (Walmikey & Kulkarni, 2016;), is yet to fully embrace such development. In such circumstances, it is imperative for construction professionals to be aware of the gains of full adoption of current technological developments. Therefore, there is a need for application and implementation of a more efficient tool such as BIM to help tackle the issue of construction material waste which appears not to have embraced or received enough attention by construction professionals or shreds of evidence of such are lacking. Hence, there is a need to look at the influence of BIM on construction material waste management towards enhancing the reduction of waste and improving the image of the construction industry in Nigeria. Two research questions guided the purpose of the study and they are to be addressed in the search of influence of BIM on material waste on building sites: (i) What are the inhibitors to the application of BIM for managing material waste in the study area? (ii) What are the facilitators of applying BIM to curb material waste management on building sites? For the purpose of the study, the objectives of the study are to:

- i. Examine the inhibitors to the application of BIM for construction material waste management on building sites in the study area;
- ii. Determine the factors that facilitate the use of BIM for managing waste on building sites in the study area.

Two hypotheses were postulated as derived, each from the two objectives of the study.

- Ho1: There are no significant differences in the mean responses to the inhibitors of BIM application for construction material waste management (CMWM) in the study area.
- Ho2: There are no significant differences in the mean responses of factors facilitating the use of BIM for construction material waste management (CMWM) in the study area.

2. REVIEW OF RELATED LITERATURE

Building information modelling (BIM) is one of the three-dimensional technological tools as well as data communication technologies commonly employed by professionals (designers, planners, and constructors) in construction industry which can incorporate systematic and efficient integration of data identification and acquisition technologies, hence a digital representation of physical and functional characteristics of a facility (Won & Cheng, 2017). It entails the use of computer-generated models to simulate the planning, design, and construction of projects. It is a concept that is transforming the construction world internationally at the third level of the construction revolution. It is in the course of revolutionizing the construction industry due to its powerful platform for collaboration, interoperability, integrated project delivery, and knowledge sharing among others (Eastman *et al.*, 2011). The richness of a BIM system depends on the value of data integrated into it

over the last few decades, and the pattern of the relationship among the BIM systems are constantly being studied by scientists with the application of new dimensions to achieve a maximum result. BIM is used to develop a collaborative construction process that includes design, build, operate and maintenance of buildings. However, the adoption of BIM in Nigeria is very slow; it is used mostly for schematic design and presentation of drawings by Architects but yet to be duly embraced by other professionals in the construction industry with dereliction of a platform for collaborative project delivery as was also reported of China by Xu *et al.* (2018). Onungwa, Uduma-Olugu, and Nnezi (2017) showed that BIM has a high impact on client satisfaction, time for completion, quality and presentation of different concepts in schematic design. It also showed a high impact on conflict resolution, supervision, construction programming and quality of completed jobs during the post-contract stage. Won and Cheng (2017) asseverated the potency of BIM for waste generation estimation and integrated waste management system development.

2.1. Facilitators of BIM for construction waste managements

BIM embeds numerous benefits and as far as the Nigerian construction industry is concerned, these enormous benefits are yet to be fully utilised as compared to the other developed countries of the world. Indubitably, some factors are responsible for the full utilisation of BIM in the developed countries specifically facilitating its use for construction waste management. From literature, these factors are numerous but include trained professionals' availability to handle BIM tools. When there are readily trained personnel on the ground for the purpose of using this tool, many seemly insurmountable issues can be handled. Abubakar et al. (2014) enunciated some of the favourable parameters that can enhance the application of BIM for managing construction material waste on-site to include: knowledge of BIM applications, developing a strategic implementation plan by organizations and firms, inclusion in schools' curriculum, fast level of awareness, development of compatible tools, affordability of BIM software packages, ability to survive in the market (Sexton & Barrett, 2003; Shen & Tam, 2002). In Eastman et al. (2011), the interviewees of a focus group organised for the research agreed that parametric modelling which enables automatic capturing of design parameters for performance analysis is a benefit of BIM. It was observed that employing BIM, right from the design stage, can help remove human errors while the data is being entered. The ability to use BIM to virtually construct a building prior to construction of the actual building provides an effective means to check its constructability in the real world and to resolve any uncertainties during the process. This allows for more efficient, better-designed structures that limit the waste of resources, optimize energy usage, and promote passive design strategies (Won, Cheng & Lee, 2016; Ahankoob et al., 2012).

The aforementioned benefits with some others favour and enhance the application of BIM for construction waste management and have been articulated by previous studies. Xu *et al.* (2018) enumerated such enablers from previous studies to include financial savings, three-dimensional (3D) visualization, reduction of design errors and rework, a better understanding of the project, improved collaboration among stakeholders, and decreased project duration (Gholizadeh *et al.*, 2018; Poirier *et al.*, 2017; Ahn *et al.*, 2015; Migilinskas *et al.*, 2013). One of the aspects assumed to be of benefits to the construction firm with the adoption of BIM, according to Azhar (2011), is cost estimating. The study observed that BIM software has the ability to perform quantity take-off and automatically adjust and accommodate any changes occurring throughout the design and construction processes as well as reduces cost estimation time by 80%. Walmikey and Kulkarni (2016) articulated

the grey areas enhancing the management of construction material wastes through the use of BIM to include: conflict, interference and collision detection, construction sequencing and planning, reducing rework, synchronizing design and site layout, detection of errors and omissions (clash detection), and accurate quantity take-off.

2.2. Inhibitors to BIM application for construction waste managements

Despite the several benefits embedded with BIM's application; numerous factors still barricade its implementations. In the studies of Yuan, Shen, and Wang (2011) five groups of major obstacles for carrying out CWM were identified, based on the results of factor analysis, encompassing weak awareness and inadequate training, insufficient support from the local government. Extant literature have shown that there are some factors that may hinder the application of BIM to manage material waste including difficulties in operation (Hair et al., 2014), interoperability issues (Gledson, Henry & Bleanch, 2012), maintaining BIM files (Alabdulqader, Panuwatwanich & Doh, 2013), organizational innovativeness (Lee & Yu, 2016), and individual innovativeness. These findings are in consonance with the studies of Azhar (2011) submitting that the lack of initiative and training, varied market readiness and reluctance to change the existing work practices are debacles to implementation of BIM for managing construction waste, together with survival in the market as stressed by Sexton and Barrett (2003), and Shen and Tam (2002). By investigation into literature, researchers such as Abubakar, Ibrahim, and Bala (2013); Eastman et al. (2011); and Aranda et al. (2009) outlined some of the major inhibitors to the implementations of BIM to include: challenges with collaboration and teaming, legal changes to documentation, ownership and production, changes in practice and use of information and implementation issues and so on.

Additionally, there are numbers of constraints that may pose challenges to the full implementation of BIM which were highlighted and enunciated by other authors such as lack of demand from the client, insufficient evaluation of BIM value, lack of governmental policies or standards, cultural resistance at higher management levels, high investment required, insufficient BIM training and education, organizational change and adjustment in management pattern, and insufficient understanding of BIM technology or practicability (Xu *et al.*, 2018; Çıdık *et al.*, 2017; Lee & Yu, 2016; Tang *et al.*, 2015; Sackey *et al.*, 2014). According to Xu *et al.* (2018), some critical factors tend to influence the application of BIM but may be favourable or otherwise depending on how well they are managed by the construction stakeholders involved. These include development of building information standards; planning and management; collaboration among project member; BIM expertise within project teams; legal issues relevant to BIM use in the contract; project characteristics such as location, type, and nature; and budget (Said & Reginato, 2018; Papadonikolaki & Wamelink, 2017; Cao *et al.*, 2016; Eadie *et al.*, 2013).

3. Research Methodology

Building Information Modelling (BIM) is a cutting-edge technology and as such, it is a professional tool meant only for professionals' use; hence the study adopted a survey research design approach using a structured questionnaire to extract information from cognate construction professionals using stratified random sampling technique. The population of the study was limited to only registered building construction professionals such as Architects, Builders, Quantity Surveyors, and Engineers practicing, employed or residing within the selected States of Akwa Ibom, Cross River and Rivers in the South-South geopolitical zone of Nigeria. The sampling frame for the respondents was derived from the directories of the professional bodies in the study area. The number of such professionals was estimated to be 250 which form the basis of the number of questionnaires administered.

Internal consistency reliability for the instrument of data collection was analysed with the use of Cronbach alpha, which according to Sijtsma (2009), has proven very resistant to the passage of time. The result obtained showed a value of 0.859 - 0.901, depicting a good internal consistency. According to Akinade *et al.* (2018), Cronbach alpha coefficient of reliability (α) with a value greater than 0.7 is acceptable and depicts a good internal consistency.

The questionnaire was structured in such a way that proper information was extracted and it comprises three sections. Section A involved the respondent's characteristics such as the years of experience and extent of their familiarity with the use of BIM, to ascertain the authenticity of their responses. Section B collected data on the inhibitors to the application of building information modelling to material waste management while Section C evaluated the facilitators for the application of BIM on material waste management.

A five-point scale was used to rate the respondents' perceptions of the factors facilitating or inhibiting the application of BIM to material waste management respectively. The scale ranges from 1-5; which are "1" for Very Low, "2" for Low, "3" for Moderate, "4" for High and "5" for Very High. The scaling method was necessary in order to efficiently capture the opinions of the respondents without any iota of doubt as it is easily understood by the respondents, thereby enabling the collection of more information as it allows a wider range of choices. The responses to the questionnaire survey were subjected to both descriptive and statistical analyses using Relative Importance Index (RII) and Mean Score analysis while the hypotheses were tested using the Kruskal Wallis H test which is a non-parametric equivalent of t-test. Based on five-point Likert scale adopted, a construct is deemed significant if it had a RII value of 0.60. The cut-off was computed by summing the weights and dividing by the total number of weighting items and highest weight respectively: (1+2+3+4+5)/5/5 = 0.60. Thus, an attribute that have RII that are higher than 0.60 are defined as being significant, those with RII equal to 0.60 are moderate, while those less than 0.60 are insignificant. This approach, adapted from Ujene (2014), is with the expectation that the use of 0.60 as reference value will effectively cover only important variables in terms of their influence. Similarly, a cut-off point of 3.00 was utilised for significant mean score value where the analysis was based on mean score computation such that (1+2+3+4+5)/5 = 3.00.

4. DATA PRESENTATION AND DISCUSSION OF RESULTS

Two hundred and fifty (250) questionnaires were administered for the purpose of this study but one hundred and ninety-seven (197) questionnaires were properly filled and returned which were used for data analysis to achieve the objectives of the study. The one hundred and ninety-seven questionnaires returned represents 79% response rate which is within an acceptable range. In the twenty-first century, it has been submitted that there should be higher expectations for survey response rates. Expectations on response rates approximating 60% for survey research should be the goal of researchers and undoubtedly that of editors, associate editors including the peer reviewers (Fincham, 2008).

The result of the respondents' years of experience is shown in Figure 1. In Akwa Ibom

State, the results revealed that 45.3% of the respondents had 6-10 years of experience which is the highest among all the categories and in that range in that State and equally among all the selected States in the study area and 5.7% for 16-20 years, and with none of the respondents possessing up to 21 years of experience. This may be the reflection of the recently established built environment academic disciplines in the tertiary institutions within the area, especially the uptake of postgraduate studies in such disciplines. The products of such development clusters much around this area which inadvertently influences the number of practicing professionals in the built environment in the area. This is also mirrored with the 'bottom-loaded' pattern in the category of 1-5 years of experience constituting 30.2% in that State.

The result from Rivers State indicates that the highest proportion of 29.5% of the respondents are in the category of 16 - 20 years of experience which is far higher than the other two selected States and most likely revealing a pattern of drift of professionals in that category from Akwa Ibom and the Cross River States to Port Harcourt in Rivers State, being more of metropolitan city in the region. This situation can be much alluded to as observation is made of the spread of years of experience of professionals across all other categories ranging from 1 - 5, 6 - 10 and 11 - 15 years of experience unlike the uneven distribution pattern in the other two States. In Cross River State, for instance, 30.4% of the respondents had 1 - 5 years of experience and this represents the largest percentage compared to the other two selected States in that category. This is a replica of the phenomenon in Akwa Ibom State as the Cross-River State government recently upgraded the State-owned Polytechnic to University status. About thirty-four percent (33.9%) of the respondents in the category possessing above 25 years of experience must have been products of the defunct Polytechnic of Calabar. Nonetheless, the attributes of the respondents with respect to years of experience generally show that the respondents' understanding of the subject matter of this study is not in doubt. This necessitated their inclusion in the survey for this study as their inputs were significant for data collection.



Figure 2 presents the distributions of the respondents' familiarity with BIM technology and the results shows that in Akwa Ibom, a cumulative of 81.1% of the respondents are just having knowledge of the BIM technology within 0-3 years, while 18.9% recorded a 4-5 years familiarity with BIM technology and none of the respondents were familiar with BIM technology for more than 5 years. This shows a very low level of BIM knowledge and usage within this study area. This indicates that the result is in line with the assertion that BIM is a new innovative yet to gain ground within the Nigerian construction industry (Abubakar et al., 2014), especially in this study area. This is equally the replication of the argument that the bulk of the professionals in this part of the study area are recently trained products educationally. For Rivers State, 67% of the respondents are familiar with BIM technology just within the past 3 years, only 10.2% are familiar with the use of BIM for up to 5 years, and 22.7% of the respondents indicated having the knowledge of BIM technology for more than 5years. This shows a high level of knowledge of BIM technology among the construction professionals in this part of the study area. This might not be unconnected with the presence of multi-national construction giants working for the various oil companies within the area. It also portrays the presence of long-term trained experienced and versatile professionals in the area. Results from Cross Rivers State indicated that 62.5% were familiar with BIM tools just within the last 3 years, while 25.0% acquiesced to be familiar with BIM within 4-5 years and 12.5% agreed to have knowledge of BIM technology for more than 5 years. These results indicate a low usage of BIM technology in the study area or perhaps a frequent usage of lower version of BIM technology like 3D Building design model, and no or low exposure to the higher version.



4.1. Examination of inhibitors to application of BIM for CMWM

The inhibitors to the application of BIM for construction material waste management on building projects were examined. The breakdown of the ranking in terms of the overall mean score values comprising all respondents from the three selected States for the 15 studied inhibitors ranged from 2.76 to 3.68, indicating that not all the studied inhibitors were rated by respondents as significant inhibitors influencing the application of BIM to CMWM. The fifteen variables studied with their mean scores are presented in Table 1 which shows that ten (10) of the constructs are significant based on the cut-off value of 3.00 for mean score. It is revealed that high cost of integrated software with a mean score of 3.68 is the most significant barrier to the application of BIM for construction material waste management (CMWM) based on the results from all the selected States. The result also reveals that lack of trained professionals to handle BIM tools and lack of awareness of BIM technology are the second and third significant inhibitors, respectively, to the application of BIM on CMWM in the study area. In the same vein, clients' requirements (lack of interest from client) occupies the fourth place among the significant inhibitors of BIM's application to CMWM. Other constructs such as lack of enabling environment to guide implementation, frequent power failure, lack of standardisation and inappropriate pricing format, and poor internet connectivity were equally rated to be significant barriers to application of BIM to CMWM. These findings are consistent with the studies of Babatunde and Ekundayo (2019) and Abbas *et al.* (2016) who found that poor internet connectivity; BIM being resource-intensive; lack of government lead/direction; inadequate/erratic power supply; and BIM as being problematic for people with weak general IT skills were among the critical barriers to the incorporation of BIM into the curriculum of studies for undergraduates in Nigerian Universities.

Inhibitors	Ał	ζS	R	VS	CI	RS	All St	ates
	MS	R	MS	R	MS	R	MS	R
High cost of integrated software for all professionals	3.98	4	3.69	1	3.36	3	3.68	1
Lack of trained professionals to handle the tools	3.85	5	3.68	2	3.45	2	3.66	2
Lack of awareness of BIM technology	4.30	2	3.45	4	3.30	5	3.64	3
Clients' requirements (lack of interest from client)	3.74	6	3.44	5	3.46	1	3.53	4
Lack of enabling environment to guide implementation	3.34	7	3.55	3	3.14	10	3.38	5
Frequent power failure	4.43	1	2.88	10	2.95	13	3.31	6
Lack of standardisation and inappropriate pricing format	3.13	10	3.35	6	3.32	4	3.28	7
Poor internet connectivity	4.02	3	3.08	8	2.55	15	3.18	8
Social and habitual resistance to change	2.98	13	3.17	7	3.27	7	3.15	9
Manual review of extracted quantities necessary	3.13	9	3.06	9	3.05	11	3.08	10
Changes in practice and use of information	3.11	11	2.69	12	3.30	6	2.98	11
Presence of substandard BIM models	3.15	8	2.57	15	3.18	8	2.90	12
Challenges with collaboration and teaming	2.74	15	2.77	11	3.16	9	2.87	13
Legal and contractual constraints	3.11	12	2.59	14	2.96	12	2.84	14
Legal changes to documentation, ownership and production	2.92	14	2.69	13	2.70	14	2.76	15

Table 1: Inhibitors to the Application of BIM for CMWM

AKS = Akwa Ibom State; RVS = Rivers State; CRS = Cross River State; MS = Mean; R = Rank

Noticeably, the mean score ratings provided by the respondents for each of the constructs studied across the three selected States in the South-South geopolitical region of Nigeria vary across the States. This indicates differences in the aspect of challenges encountered by construction professionals among the States in view. The efforts by the BIM-experienced professionals to convince the built environment clients seem abortive because of low awareness of the benefits derivable among the clients in the study area. However, the number of the significant inhibitors in each of the States showing a mean value of not less than 3.00 (MS > 3) are not less than nine. This implies that the extents to which these inhibitors influence the application of BIM to CMWM is on the high side and efforts of the construction professional should be seriously channelled towards these factors for effective combat against construction material waste management. Legal changes to documentation, ownership, and production was accorded the lowest ratings with a mean score of 2.76 with the implication that it is of least significance as a factor thwarting the application of BIM to the management of construction material waste.

4.2. Test of differences among the selected States of inhibitors to application of BIM to CMWM

Hypothesis one was postulated to ascertain if the variations noticed across the selected States in the ratings of the studied inhibitors is significant or otherwise. This is to determine if there is a significant locational effect in the level of application of BIM to CMWM among the States in the study area. Kruskal Wallis H test was used at a 5% significance level, a p-value < 0.05 result in the rejection of the hypothesis while p > 0.05 means that the hypothesis is accepted. The result presented in Table 2 shows a p-value of 0.26 for hypothesis one, hence, the null hypothesis was accepted, meaning that there are no significant differences in the mean responses to the inhibitors of BIM usage among the States under consideration for this research. This implies that the extent of the effect of one barrier in one State has the same relative effect in the other States under consideration. It could also imply that the construction professionals operating within the States are exposed to similar working conditions.

Table 2: Test of Differences of Inhibitors to Application of BIM for CMWM

State Identification	Ν	Mean Rank	df	Sig.	Decision
Akwa Ibom	15	27.40			
Rivers	15	19.90	2	0.264	Accepted
Cross River	15	21.70			

4.3. Determination of facilitators of the use of BIM for CMWM

Determination of the factors that can facilitate the use of BIM for CMWM in the selected States was carried out. The ten facilitating factors were evaluated using the five-points Likert scaling method and the result is presented in Table 3. The analysis of the data collected from the respondents showed that all the variables were significantly rated based on RII value of 0.60 as cut-off point. The results revealed that the availability of trained professionals to handle BIM tools, with RII value of 0.77, was ranked highest factor followed by knowledge of BIM applications with RII value 0.75, and developing a strategic implementation plan by organizations and firms with RII value of 0.74 in the third rank. This implies that the more the construction professionals are exposed to and trained in the use of BIM the faster the reduction of material wastage in the construction industry will be attained.

Table 3: Facilitators of the Use of BIM for CMWM

	Akw	a Ibom	Ri	ivers	Cros	s River	All	States
Facilitators	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Availability of trained professionals to handle	0.78	1	0.82	1	0.60	1	0.77	1
BIM tools	0.78	1	0.02	1	0.07	1	0.77	1
Knowledge of BIM applications	0.73	5	0.82	1	0.68	3	0.75	2
Developing a strategic implementation plan	0.77	r	0.77	4	0.67	4	0.74	2
by organizations and firms	0.77	2	0.77	4	0.07	4	0.74	3
Inclusion in school's curriculum	0.75	3	0.79	3	0.62	7	0.73	4
Fast level of awareness	0.66	7	0.75	5	0.69	1	0.71	5
Development of compatible tools	0.75	3	0.75	5	0.56	9	0.69	6
Affordability of BIM software packages	0.72	6	0.71	7	0.55	10	0.67	7
Ability to survive in the market	0.64	9	0.70	9	0.63	6	0.67	7
Government policy and legislation	0.66	7	0.65	10	0.66	5	0.66	9
Individual's innovativeness	0.60	10	0.71	7	0.61	8	0.65	10

Availability and accessibility of trained professionals to handle BIM tools will enhance the convenience to upgrade the level of awareness of BIM to curb construction waste in the study area. Knowledge of BIM application which was ranked in the second position could be spawned as a result of the low familiarity level of BIM usage by construction professionals in the study area, hence, with the outburst of more trained professionals on the tools, the low familiarity level of BIM can be overcome. Knowledge of BIM applications is undoubtedly a major stepping stone to the investigation of advanced embedded functions of the technology, hence, when the statutory bodies, organizations, and firms responsible for the continuous development of the built environment professionals find it compulsory to inculcate the habits of introducing new benefitting technologies into their programmes, knowledge and the use of BIM will gracefully find its way to spread across the Nigerian construction industry. Similar findings were obtained by previous studies (Badrinath et al., 2016; Babatunde et al., 2018) where availability of trained staff (from academia and industry) using BIM to teach the students; BIM software availability and affordability; enabling environment-provision of IT infrastructure; cooperation and commitment of professional bodies to BIM's implementation; and awareness of BIM tangible benefits were pinpointed as important drivers of BIM implementation. The result also shows that the ratings of the factors decrease from Rivers through to Akwa Ibom and to Cross River State. This could be attributed to the fact that construction professionals in Rivers State indicated the largest percentage of years of experience which revealed a high level of BIM expertise in that State compared to others. Therefore, the differences noted in the ratings led to the postulation of hypothesis two which was put to test to confirm if the respondents in any of the selected States perceived the facilitators differently based on the variation in the years of experience, the use and familiarity with BIM technology.

4.4. Test of differences among the selected States of facilitators for application of BIM to CMWM

Table 4 presents the result of the second hypothesis tested for the differences in the mean responses to the factors facilitating the use of BIM for CMWM among the selected States. The result yielded a p-value of 0.003 leading to the rejection of the null hypothesis, hence it was concluded that there are significant differences in the mean responses of the factors facilitating the use of BIM for CMWM among the selected States in the study area. Examination of the mean ranks shows that there is wide range between that of Cross River State and those of other two States. The variation might have resulted from the variability in experiences and exposure of the respondents across the study area.

State Identification	N	Mean Rank	df	. Sig.	Decision
Akwa Ibom	10	16.55			
Rivers	10	21.65	2	0.003	Reject
Cross River	10	8.30			

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5. IMPLICATIONS FOR RESEARCH, PRACTICE AND SOCIETY

This study has unveiled the critical demand on the players in the construction industry in the study area for the exploration of BIM for minimising waste for enhancing project performance and advancing the course of Architectural, Engineering and Construction (AEC) professions. It also shows the demand for professional development on the potentials of BIM for minimising waste including all other benefits offered by BIM. Both public and private clients are expected to demand for the use of BIM and the government should put up policies for the implementation of BIM for project delivery.

6. CONCLUSIONS AND RECOMMENDATIONS

The realisation and the need for developing countries to close the gaps between them and the developed ones necessitate progressive growth and demand a series of obstacles to be overcome. This study investigated the influence of BIM in solving the problem of construction material waste management (CMWM) which is one of the options yet untapped by construction stakeholders in the study area. The study unveiled the critical challenges confronting the players in the construction industry in the study area with respect to their inability to acquire needed software and necessary training to keep abreast with their counterparts in developed countries in curbing the 'evils' of CMWM which BIM enhances. The high cost of integrated software, lack of trained professionals to handle the tools, and lack of awareness of the technology are the three most important inhibitors of BIM for CMWM. The availability of trained professionals to handle BIM tools, knowledge of BIM applications, and developing a strategic implementation plan by organisations and firms are the three foremost factors facilitating the use of BIM for CMWM. The study revealed that the perceptions of the respondents on inhibitors to the usage of BIM for CMWM do not differ significantly, therefore conclusions were reached that there are no significant differences in the mean responses to the inhibitors of BIM usage for CMWM. Conclusions were made that the construction professionals operating within the study area are exposed to similar working conditions. But the respondents' perceptions of facilitators of BIM for CMWM varied significantly among the selected States. It was concluded that there are significant differences in the mean responses of the factors facilitating the use of BIM for CMWM among the selected States in the study area. Observations were made that the variation might have resulted from the variability in experiences, familiarity with and exposure to BIM technology of the respondents. The study submits that statutory bodies, organizations and firms responsible for the continuous development of the built environment professionals should make it compulsory to introduce new benefitting technologies into their programmes to enhance the knowledge and application of BIM for CMWM.

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COLLABORATION AMONG INTERNAL STAKEHOLDERS OF CONSTRUCTION PROJECTS IN NIGERIA

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ABSTRACT

Purpose: Construction project delivery in Nigeria, like many developing countries, remains challenging in terms of collaborative effort. It is still seen to be characterised by adversarial relationships in work places thereby manifesting unsatisfactory work quality, errors and omissions in designs and other contract documents, wastages and attendant high costs, and untimely completion. Efforts have been made in understanding the practices and barriers of collaboration. This research investigated internal stakeholder participation and involvement in decision making, and evaluated the degree of collaboration in terms of prevalent collaborative elements, efforts and strategies in construction industry in Nigeria.

Design/methodology/approach: Questionnaire Survey was used to collect data for the study from the six cities representing the six geopolitical Zones of Nigeria as cluster sampling drawn from internal stakeholders: Client (or client representative), builders, engineers, architects, quantity surveyors, land surveyors and skilled technicians. Simple percentages and mean were used from the SPSS as tools for analyses.

Findings: It was found that collaboration takes place mostly at construction phase instead of all phases; skilled technicians (with Mean Score of 4.30) and client/client representative (with Mean Score of 4.26) are mostly involved in decision making instead of holistic involvement.

Originality/value: The understanding of what the issues are with Stakeholder collaboration in Nigeria has been established and adjudged to be generally on the average. It is recommended that level of internal stakeholder involvement should be encouraged by all stakeholders at all phases of construction and the key elements of collaboration should be prioritised alongside collaborative efforts and strategies for less adversarial relationships and improved productivity in construction industry in Nigeria.

Keywords: Collaboration; internal stakeholders; construction projects; Nigeria; collaborative elements.

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1. INTRODUCTION

The construction industry work processes that are dependent on effective collaboration among internal stakeholders for high productivity, are seen to be increasingly compromised by internal stakeholders. The quest for collaboration is therefore intensified among stakeholders with focus on ingredients of collaboration to ensure best practices in a team-based and interdisciplinary project strategies (Rowland, 2009). Where collaboration is lacking, effective project management remains a myth. Stakeholder collaboration is thus generally perceived to be the bedrock for all emerging management approaches (Mossman, 2013). The increased need for harmonisation of individualistic efforts is becoming a concern in the construction industry particularly in Nigeria as less attention is given to the components of collaboration. Lu, Zang, and Rowlinson (2013) emphasized that the quest for collaboration in this circumstance must take into cognisance, the independence of members, unifying purpose, voluntary links, multiple leaders and integrated levels which are perceived to be the fundamentals of effective collaboration. Collaboration can therefore be appreciated better in understanding collaborative thinking, flexibility, adaptability, acceptance, contextual roles and social changes of the construction industry. Collaboration in the construction industry is is thereby necessitated by the industry's complexity, uniqueness, fragmentation, dynamism, and communication difficulties (Rotimi, 2015).

There are many definitions of collaboration, Wilkinson (2005) defined collaboration as "A creative process undertaken by multiple individuals or work groups, sharing their collective skills, expertise, understanding and knowledge (information) in an atmosphere of openness, trust, honesty and mutual respect to jointly deliver the best solution that meets their common goal." Stakeholders, being the drivers of collaborative effort, are defined as "People or groups of people that believe that they have legitimate interest, share or claims against the substantive aspects of a project (Winch, 2007). Many years of professional practice in Nigeria reveal that effective coordination of projects remains a challenge as internal stakeholders hardly agree on technical issues, power and authority. Researchers contended over the validity of the older project management tools (Ballard, 2000; Koskela & Howell, 2008; Thomsen, 2010; Mossman, 2013).

Alufohai (2012) emphasised that Building Information Modelling (BIM) which is collaboration based is becoming a great approach in the construction industry to boost project effectiveness and efficiency of project management. BIM is also seen to be drawing attention of practitioners hence bearing increasing demand by owners, construction managers, architects, engineering firms and other stakeholders (Lu, Zhang & Rowlinson, 2013; Onungwa & Uduma-Olugu, 2016; Kapogiannis & Sherratt, 2018). Another collaboration-based approach is the lean construction, which incorporates the practices of lean manufacturing (as originated by Toyota) into construction industry with emphasis on increasing value and eliminating waste (Gould & Joyce, 2014). The lean construction approaches are concerned with efficiency in productivity. Supply chain management (SCM), another advanced management approach, is also becoming popular in recent times among researchers and practitioners within the construction industry with the aim of making the construction industry more effective with increased efficiency (McDermott & Khalfan, 2006; Barratt, 2004). SCM, like the lean construction, is a managerial concept largely hinged on effective logistics and allocation of resources (Vrijhoef & Koskela, 2000). SCM system, on another hand, is purely collaborative since it focuses on knowledge sharing, integration of activities, roles, and sharing of turf (Rowland, 2009).

Notwithstanding the fact that technology has an important role to play, experts have contended that knowledge management cannot be ensured using technology solely. Information technology (IT) alone cannot take the role of knowledge management on its own, what is often overlooked is the deployment of IT via collaborative knowledge sharing (Dave & Koskela, 2002). The distinct roles of professionals in Nigeria construction industry, outlined by Owolabi and Olatunji (2014), with less emphasis on what the issues are with collaborative effort among the stakeholders in the industry also call for concern. These distinct roles create suspicion and independent "worlds" thereby failing to promote collaboration that is generally considered pertinent for overall project performance. Darrington, Dunne and Lichtig (2010), observed that there has also been increasing concern by the Construction Users Roundtable - CURT (2004) on the need to address inadequate, poorly coordinated architectural, electrical drawings and the resulting difficulties in the field - project schedule, and cost overruns. To address these challenges, CURT (2004) advocated the use of information technology combined with changes in management structure and effective delivery processes required to deal with concerns of collaboration bordering on errors and omissions in architectural, services and construction documents. The key elements of collaboration, as summarised by Rowland (2009), include unifying purpose, independent members, voluntary links, multiple leaders and integrated levels. These elements are perceived to be the essential parameters needed for the actualisation of collaboration among internal stakeholders.

"Unifying purpose" entails shared commitment to a common goal; and this is what really drives collaboration. It is centred on understanding of common objectives; it is the glue that binds stakeholders together (Rowland, 2009). This can be seen to be created by very clearly defined and agreed goals for the purpose of collaboration which extends from abstract to concrete and specific goals and assignments. Roberts, Blundel and Dartnell (2016) considered this to mean shared vision of stakeholders which is essential in focusing on their common objective without prejudice.

"Independent members" as an element of collaboration entails that organisations, individual or collaborative entities must have the capacity to operate in isolation in the first instance. Thus, each entity retains its independence while cooperating with others on specific tasks to achieve greater and better results (Rowland, 2009). Mickan and Rodger (2000) contributed that there is a healthier coexistence among members in an organisation who operate independently than those that act as parasites as independent membership ensures give and take for a greater good.

"Voluntary links," according to Keller-Guenther and Betts (2011), becomes necessary as frequent and extensive communication is required at all times among stakeholders. According to Rowland, (2009), no one is coerced to participate. There are many crossing relationships embracing social and technological ties, but for effective collaboration to be ensured, the relationships must be voluntary (Mickan & Rodger, 2000).

"Multiple leaders" as a concept and collaborative element entails that different people in organisations should lead, depending on what needs to be done. During any given process, more than one person leads (Rowland, 2009). In this case, there are fewer bosses and more leaders who can assume leadership position when appropriate thereby promoting collaboration among internal stakeholders.

"Integrated levels" as an element of collaboration ensures the working of people on many levels within organisation and with other partner organisations in a collaborative relationship. Here, there are groups within groups nesting internally in much collaboration without reservations and suspicion (Roberts et al., 2016).

Collaborative efforts on the other hand are concerned with the deliberate and conscious attempts by internal stakeholders aimed at realising effective collaboration. These efforts continuously increase in the course of relationship among stakeholders from the lowest to the highest level; hence collaboration is viewed as a continuum (Waibel, 2010).

This is the lowest level of relationship developed with others to basically share information for mutual benefit. It is also characterised by low level of trust, limited time of engagement and no sharing of turf (Zorich et al., 2008). At this level, there is no detailed knowledge about other counterparts (stakeholders) as individuals are merely acquainted with one another with high level of reservation (psychological insecurity). These results in making stakeholders at this level of collaboration self-protective (Pacer centre, 2004). Frey et al (2006) considered this stage to be communication centred. Rowland (2009) maintained this stage of collaboration is essentially contact based.

The next level is the wilful support of members in a relationship and obviously the second step of the continuum. Stakeholders at this level also share information and further alter their activities (stands) for mutual benefit. This level according to Pacer centre (2004) is characterised by realisation of Self-worth of stakeholders, informal agreements to work together, low level of trust, complicated decision-making processes as turf also remains a challenge to all parties.

The third level of collaborative relationship extends further from exchanging information and altering of individual activities to sharing of resources among stakeholders for mutual benefit (Zorich et al., 2008). This stage, according to Rowland (2009) is characterised by the written agreements by stakeholders for working together; stakeholders' agreement to team together and not go forward without another; sharing of human, financial and technical contributions; defined benefits and established trust; and higher amount of time, commitment and trust.

The next level towards effective collaboration after sharing of resources is enhancing each other's capacity for mutual benefit as well as achievement of common goals. The key issue here is that stakeholders are willing to learn from each other to become better at what they can do. Waibel (2010) argued that collaboration at this stage cannot be said to be at best as enhancement of each other's capacity is often looked. This level of collaborative continuum, according to Rowland (2009), should be termed effective collaboration stage and is characterised by multiplication of individual strengths since an individual in an organisation matter how good, cannot be better than the collective whole and remains the subset of the whole. Furthermore, risks, responsibilities and rewards are equally shared at this stage of collaboration (Waibel, 2010).

Effective collaboration is thus seen to be beneficial in project management. Some of the benefits include: improved communication, fewer day-to-day problems, improved work quality and methods, good managerial practices, improved supply chain, reduced project delivery time, reduced conflict among stakeholders, waste reduction, and enhanced accountability (Mossman, 2013; Zamina & Pasquire, 2012; McDermott & Khalfan, 2006). However, Tee, Davies, and Whyte (2019) found that there is difficulty in getting project participants to adopt new behaviours, such as the integrating practices leading to effective collaboration. It therefore calls for interrogation as to why we are not effectively collaborating. This paper presents an attempt at unveiling more ingredients of collaboration that are key towards enhancing collaborative efforts among internal stakeholders in construction industry in Nigeria.

This research, considered basic collaborative ingredients including incidences of collaboration in participation and involvement of stakeholders, and the degree of elements efforts and strategies. This therefore informed the need to empirically study ingredients that pave way for non-collaborative outcomes using a postpositivist ideology. This ideology appreciates the fact that it is not good enough to assume an outcome, but to further establish what the causes and/or determinants of a given condition are (Creswell, 2014). Consequently, the prevalent errors in design, adversarial relationships, delays in project delivery and poor harmonisation of efforts call for investigation and determination of status of ingredients of collaboration. This research investigated the much talked about poor incidences of collaboration at different phases of construction, involvement of stakeholder participation and involvement in decision making in project management in Nigeria; as well as the level of collaboration among internal stakeholders in terms of elements, efforts and strategies of collaboration in Nigeria. The use of questionnaires in quantitative survey, as adopted in this research approach, is concerned with description of trends and attitudes (Creswell, 2014).

Six cities in each of the six geo-spatial zones of Nigeria were considered as the area of the study. The use of questionnaire was considered relevant for this study as it was used to describe the ingredients of collaborative practices among stakeholders in construction industry in Nigeria, a region geographically dispersed and multicultural. In this research, a face-to-face and e-mail approaches for distribution of questionnaires were deployed to obtain data for the research. These methods of data collection pay off when researchers do not have total access to all respondents, particularly when the area of study is geographically dispersed (Berg, 2007; Creswell, 2014).

The population for this research covered internal stakeholders in construction industry in Nigeria comprising employers, architects, engineers (electrical, mechanical, civil), builders, land surveyors, quantity surveyors and skilled tradesmen. The population considered is considerably large and infinite since the number of all professionals and skilled technicians in Nigeria is not categorically defined and thus given to assumptions. The sample size was drawn from internal stakeholders via cluster sampling which involves searching for targeted number of cases that meet stakeholder criteria (Jackson, 2012). The sample size comprised of 100 internal stakeholders from project sites from all the six cities Nigeria (Abuja, Kaduna, Yola, Lagos Umuahia and Port-Harcourt). Data analyses deployed the use of simple percentages and mean scores and relative importance index to obtain results from all categories of responses. In all of these, the results were presented in tables from where conclusions were drawn.

3. RESULTS AND DISCUSSION

The study sought to know the particulars of each respondent in order to justify the credibility of their responses to make valid conclusions from the study. Table 1 shows that Main Contractors recorded the highest response rate of 17%, while Suppliers recorded lowest response rate of 10%. Considering professional affiliation, the result indicates that majority of the respondents are Skilled Technicians with no professional affiliation represented by 21% while the least number of respondents are affiliated to Quantity Surveying and Engineers represented by 14% each. This implies that most internal stakeholders that man project sites are without professional affiliation. In terms of

respondents' years of experience, the result shows that the age category of 16-20 recorded the highest response in the industry, and the least being the category of less than 5-year experience represented by only 3%. This implies that every category of respondents in terms of years of experience was represented and the years of experience distribution is sufficient to provide useful information about the construction industry with respect to stakeholder collaboration.

Variable	Frequency	Percentage	Cumulative percentage
Respondent's position in organisation			
Employer	16	16	16
Construction manager	16	16	32
Consultant	14	14	46
Main contractor	17	17	63
Subcontractor	12	12	75
Tradesman	15	15	90
Supplier	10	10	
Total	<u>100</u>	<u>100</u>	
Professional designation of Respondents			
Builder	15	15	15
Architect	16	16	31
Ouantity Surveyor	14	14	45
Land surveyor	20	20	65
Engineer	14	14	79
skilled technician	21	21	100
Total	100	100	100
	100	100	
Professional Experience of Respondents in			
Nigeria Construction Industry			
Less than 5 years	3	3	3
5-10 years	9	9	12
11-15 years	11	11	23
15-20 years	43	43	66
21-25 years	25	25	91
25 years and above	9	9	100
Total	<u>100</u>	<u>100</u>	
Professional status of respondents			
Non Members	21	21	21
Associate member	8	8	20
Graduate member	28	28	57
Cornorate member	28	20	95
Fallow	5	5	100
	5	5	100
<u>10tai</u>	<u>79</u>	<u>79</u>	
Respondent's Location (City)			
Kaduna	15	15	15
Yola	15	15	30
Abuja	20	20	50
Lagos	20	20	70
Umuahia	15	15	85
Port-Harcourt	15	15	100
Total	100	100	

 Table 1: Background information of respondents

Pertaining to professional status of the respondents, the result reveals that corporate membership has the highest representation of 38% and the least being those with membership of fellow with only 5%. This indicates that the respondents have the required training and since professionally qualified to ensure reliability of the

conclusions from the findings. The geographical distribution of respondents shows that 20% of the respondents were drawn from Abuja (Federal capital) and Lagos each; meanwhile there was 15% representation from the remaining four cities each (Kaduna, Yola and Umuahia and Port-Harcourt). The ease with which data was collected from the two highest cities suggests that construction activities take place more at the North-central and North western Nigeria (Abuja and Lagos). The selection of cities across the country entails that the research is holistic and all-inclusive as each of the cities represents a geo-economic zone of Nigeria.

Table 2 shows that skilled workers recorded 100% participation, this is followed by Builders, Engineers, Architects and Quantity Surveyors in declining percentages of participation; while, Land Surveyors recorded the least participation with 81%. The result in Table 2 indicates that internal stakeholder participation is generally high but their involvement in actual decision-making is apparently less frequent. This negates the assumption that internal stakeholders are scarcely found or involved in project management. The participation of stakeholders which is over 80% cannot be said to be largely contributing to collaboration concerns except for micro projects with insignificantly small volume of works warranting little or no involvement of all internal stakeholder participation.

C
100
100
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95
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95
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91
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86
100
81
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100

Table2: Internal stakeholder participation in construction activities in Nigeria

The result presented in Table 3 reveals that the two categories of stakeholders are frequently involved in decision-making. The stakeholders frequently involved included skilled Client/ client Representative with a mean of 4.30, followed by technicians with a

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mean of 4.16. Meanwhile, architects and builders are sometimes involved in decisionmaking on projects. Quantity surveyors, engineers and land surveyors have the least frequency in a declining order. The result indicates that, in general terms, internal stakeholders with professional recognition and the client are sometimes involved in decision-making during projects in construction industry in Nigeria. The internal stakeholders (skilled technicians and client representatives) are mostly involved in decision-making on construction projects in Nigeria as indicated in Table 3.

Collaborative Practice	Ν	Mean Score	Std. Deviation	Rank
Client/Client Representative	100	4.30	.905	1
Skilled technician	100	4.16	.961	2
Architect	100	3.94	1.07	3
Builder	100	3.83	1.19	4
Quantity Surveyor	100	3.72	1.01	5
Engineer	100	3.64	1.05	6
Land Surveyor	100	3.15	1.04	7

 Table 3: Mean rating of internal stakeholder involvement in decision making in construction industry in Nigeria

This prevalence of unskilled workers in place of professionally recognised internal stakeholders is in agreement with what Zhang and Rowlinson (2013) found that this phenomenon is necessitated by the desire to make more profit and, perhaps, not share profit with other relevant stakeholders. The construction environment, as indicated by the result, can be more adversarial and less collaborative owing to the independent worlds created by the stakeholders.

Table 4 identified three elements of collaboration with medium prevalence rate while two have low prevalence rate. The first three elements of collaboration with medium prevalence rate are unifying purpose with mean of 3.36, independent members with mean of 3.26, and voluntary links with mean of 3.0. The last two elements of collaboration with low prevalence rate are multiple leaders with mean of 2.89, and integrated levels with mean of 2.84.

The level of collaboration investigated in terms of prevalence of elements of collaboration shows that the prevalence of elements of collaboration is generally above average but not high. This could be true as most organisations are perceived to be working without shared vision in Nigerian construction industry, with links not generally voluntary, and most members of organisations not exhibiting independent knowledge to enable them develop one another. This confirms the assertion by Rowland (2009) that the prevalence of elements of collaboration is usually not high. The respondents also indicated that different people still do not lead in most organisations which is consistent with Zamina and Pasquire (2012) that multiple leadership and Integrated levels are essential for stakeholder collaboration.

The result in Table 5 identified two collaborative efforts that are frequently made among internal stakeholders in the construction industry within the study area, while two are made less frequently. The only one out of five collaborative efforts that is frequently made is exchanging of information with mean of 4.07. The remaining four identified efforts that are

made on average by internal stakeholders include: supporting one another with mean of 3.94, altering programme activities to accommodate new ones with mean of 3.62, sharing resources among stakeholders with mean of 3.43 and integrating/enhancing each other's capacity with mean of 3.25.

The result can summarily be said to mean that collaborative efforts are sometimes made in the construction industry in Nigeria which is consistent with Tipili, Ojeba and Iliyasu (2014) that effort in effective communication (a subset of collaboration) in project delivery in Nigeria is inadequate. This could be true owing largely to the fact that there is unwillingness to change from the traditional approach of wanting to take glory alone rather than embracing the "We did it" ideology as asserted by Zorich *et al.* (2008).

Score Deviation	
Unifying purpose 100 3.36 0.86 1	
Independent members 100 3.26 0.85 2	
Voluntary links 100 3.00 0.72 3	
Multiple leaders 100 2.89 0.75 4	
Integrated levels 100 2.84 0.69 5	

Table 4: Prevalence of elements of collaboration in construction industry in Nigeria

Key: N= Number of Respondents

Collaborative Effort	Ν	Mean	Std.	Rank
		Score	Deviation	
Exchanging information	100	4.07	0.71	1
0.0				
Supporting	100	3.94	0.76	2
Altering activities	100	3.62	0.62	3
C				
Sharing of resources	100	3.43	0.83	4
6				
Integrating	100	3.25	0.80	5

Table 5: Mean rating of collaborative effort in construction industry in Nigeria

Key: N= Number of Respondents

The result in Table 6 indicates that six collaboration strategies have moderate incidence while two have low incidence rate. The first six collaboration strategies with moderate incidence rate include: links between stakeholders with mean of 3.49, agreement with mean of 3.45, defined roles with mean of 3.28, trust among stakeholders with mean of 3.18, communication frequency with mean of 3.12, and stakeholder involvement with mean of 3.03. The last three collaboration strategies with low incidence include: Development of one another with mean of 2.93, equitable resource sharing with mean of 2.90, leadership training with mean of 2.87.

In general terms, collaborative strategies have moderate degree of prevalence with links between internal stakeholders just above moderate range. This is supported by Femi (2014) that the collaborative strategies in construction industry are not at best hence adversarial relationships on construction projects remain prevalent. Even though this assertion was rather generalised, this research has revealed that the relationship-based principles upon which collaboration thrive are still at the "crawling stage" in the Nigerian construction industry.

It is, however, worthy of note that the strategies in collaboration indicated in this research directly or indirectly covers areas like collaborative planning of tasks with other internal stakeholders, collaborative review of work done with other internal stakeholders, early involvement of subcontractors in the decision-making process, understanding other tradesmen's work, and collaborative information sharing platform.

Collaborative strategy	Ν	Mean	Std.	Rank
		Score	Deviation	
Links between stakeholders	100	3.49	0.61	1
Agreement	100	3.45	0.66	2
Properly defined roles	100	3.28	0.73	3
Trust among stakeholders	100	3.18	0.66	4
Frequency of communication	100	3.17	0.60	5
Stakeholder Involvement	100	3.03	0.70	6
Development of one another	100	2.93	0.83	7
Equitable resource sharing	100	2.90	0.76	8
Leadership quality	100	2.87	0.82	9

Table 6: Mean rating of collaborative strategies in construction industry in Nigeria

Key: N= Number of Respondents

4. CONCLUSION AND RECOMMENDATIONS

The research investigated levels of collaboration among internal stakeholder in construction industry in Nigeria. To achieve this, the research considered internal stakeholder incidences of collaboration in participation and involvement in decision making in construction processes, and the level of collaboration in terms of elements, effort and strategies. The level of involvement is considered high but misdirected as less technically-oriented stakeholders are mostly involved. It can therefore be said that mere involvement cannot guarantee effective collaboration among internal stakeholders, but the involvement of relevant stakeholders at appropriate stages of the construction project. The obsession with the traditional method of procurement in Nigeria also suggests that overcoming ineffective collaboration in construction industry in Nigeria will remain a herculean task. The level of collaboration is generally low in terms of elements, effort and strategies and this can be said to be responsible for adversarial working relationship among the internal stakeholders.

The indication of levels of stakeholder involvement and collaboration in the Nigerian construction industry, by this study, has, apart from adding to knowledge, created awareness on the aspects that require attention the most, for effective collaboration to be engendered among internal stakeholders.

The study recommends that stakeholders in construction industry should at all times ensure holistic involvement of stakeholders, to promote collaboration. In like manner,

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elements, efforts and strategies of collaboration should be stepped up throughout the project delivery phases. The study also recommends for further studies, the comparative study of collaboration in building construction industry and other aspects of the construction industry.

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DESIGN AGAINST CRIME: FEAR AND DETERRENCE AS MOTIVATORS FOR CRIME PREVENTION DESIGN

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ABSTRACT

Purpose: This paper reviews various methods of deterrence measures integrated into design for crime prevention. It discusses crime prevention concepts such as surveillance and detection methods, protective barrier systems and security lighting. The paper draws attention to the place of fear in the concept of deterrence. Fear has always been one of the driving forces behind human aspiration and activity. It drives people to take action either for self-interest or self-preservation. Fear of victimisation drives people to take precaution to prevent further victimisation while fear of apprehension and punishment could deter criminals. It argues that the use of design and physical security measures can help to achieve deterrence.

Design/methodology/approach: The method adopted was narrative review of existing literature and observation of existing practices for deterrence in Abuja, Nigeria. Observation is a qualitative research method that helps a researcher to have a deeper understanding of the phenomenon under study.

Findings: The paper presents a deterrence framework that consists of three components of crime act considerations, deterrence considerations and deterrence application (crime containment). The framework links together the theories of fear of crime, deterrence and crime opportunity. The study noted that the application of turnstile access control mechanism integrated into design helped to enforce orderly pedestrian entry into the Federal Capital Development Authority complex while allowing security to closely observe employees and visitors entering the complex. The result also indicates that the design of some buildings allow for surveillance shadows which could lead to security breach.

Originality/value: It concludes that by leveraging on the principle of fear designers of buildings, the built environment and security products can contribute immensely to crime prevention and reduction. An understanding of the Crime Containment Framework will increase crime prevention practitioners' knowledge and effectiveness. Deterrence measures, leveraging on situational crime prevention, should be focussed on crime settings by increasing the difficulties and risks of committing crime.

Keywords: Crime prevention; design; deterrence; fear; punishment.

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1. INTRODUCTION

Society is a complex network of groups, organisations and institutions expressive of human relationships. The urban society, because of its nature, attracts to it people of diverse cultural, racial, religious and economic backgrounds in search of potential and actual opportunities available among divers institutions, organisations and groups. This has also produced opportunities for crime due to its anonymous setting. If there is an absence of options crime becomes a means of survival, especially in large cities. Cities are becoming more and more attractive to people because of their financial power, economic opportunities, wealth, places of interest and job opportunities that offer a standard of living many people yearn for, or the life style they promise (Burdett and Sudjic, 2011). The urban space, therefore, assumes a leading role in providing people identity and a sense of comfort (Karim and Azizi, 2015). Fear of crime is an important issue that reduces access to public spaces and restricts interaction with these places (Rezvani and Sadra, 2017). Fear has a profound effect on the spatial form of a city, neighbourhoods, building designs and spatial distribution of population. It affects interaction within the urban space. How designers form space can affect social processes greatly. The spatial arrangement of urban space is a reflection of social practices and relations.

The demands and operations of the social environment have a direct bearing on how architects design buildings and the built environment, especially the urban space. Architecture gives order to the built environment and by extension helps to influence social patterns and human interactions. It creates a meaningful structure for human activities. Different settings with different architectural design patterns have different social consequences. Thus architecture exerts a great influence on how we act or react in different settings. Human behaviour, on the other hand, affects architectural design which in turn influences the desired human behaviour (Mckay, 2014). The built environment can be manipulated through the planning and design to control social patterns. Evidences from research and practice show that undesirable social patterns of behaviour such as crime can be influenced by environmental design (Reynald, 2014; Jansen, et al., 2017; Mahmoud, 2018).

Since crime issues are not stagnant it is necessary to have some level of continuous actions designed to respond to changing urban environment, security dynamics, fears and realities. An outcome of negative security and safety dynamics is fear. Fear is the direct and immediate reaction to crime. It is the fear of criminal victimisation that drives people to take measures to prevent it. On the other hand, the fear of apprehension and punishment could deter a person from committing a crime. The deterministic model of human behaviour assumes that actions of people are determined by forces and factors operating on them. It argues that current behaviour of individuals can be influenced by the current situations they are in and the forces they encounter in those situations (Rubin and Babbie, 2009). This implies that if a would-be offender encounters a situation that is inimical to his operation he is likely to abort the criminal operation. This paper discusses the concept of fear and deterrence as powerful drivers of architectural design for crime prevention and examines the various ways that deterrence measures are applied in buildings.

1.1. Concept of fear as a motivator for crime prevention design

Fear of crime is a social phenomenon that has serious implications on the well-being and quality of life. In-spite of the efforts of relevant security agencies fears of crime and concerns about security and safety have not reduced. The media plays an active role in generating feelings of insecurity through embellishing crime reports and misleading opinions on crime and criminals. Media influence on society has grown dramatically with the advances in information technology. Information received about insecurity plays out in the mind of people with the feeling that what happens elsewhere is likely to happen where they are. This leads to panic over criminal activities that harm will happen to the collective and individual safety if something is not done. Fear is an internal feeling and arises when sensory systems in the brain have determined an external stimulus poses a threat (Moller, 2017). Furthermore, threat detection triggers a general increase in brain arousal which can result in altered threat processing: fear and anxiety disorders. Fear is an emotional response to threat and victimisation. It is a psychological reaction to present or future danger as a result of recent or past event or problem characterised by a feeling of worry, anxiety and concern. It is the feeling that something bad or dangerous will happen if adequate measures and precautions are not taken.

Fear is a reality that has physical, social, psychological and health dimensions. Crime is a key factor that is responsible for creating and intensifying it. Crimes involving the use of weapons and explosive devices could cause emotional trauma and nightmare. Pearson and Breetcke (2014) maintain that there are clear evidences provided by researchers that fear of crime could result in various mental health-related issues such as anxieties and psychological distresses. These mental health issues could also include degenerating behaviour, mood swing, delusion, hallucinations and disintegration of personality. Fear of crime could also result in detrimental physical health problems (Pearson and Breetcke, 2014; Moller, 2017). Fear can exhaust an individual both physically and emotionally thereby weakening the immune system. Some researchers also point out that the results of criminal acts are fear of victimisation or re-victimisation leading to the likelihood of poorer physical and cognitive functioning (Warburton, et at., 2006), pitiable emotional well-being and reduced standard of life (Stafford, et al. 2007). The implication of the afore-mentioned is that fear has the capacity to affect the productive output of individuals.

Hebb and Donderi (2013) posit that fear increases with intellectual capacity and argue that the level of the dread of danger is directly proportional to the information and awareness of danger. This suggests that where no knowledge of danger exists fear ceases to exist. Emotional reaction to threat (of victimisation and apprehension) increases with exposure to information. This also suggests that the more informed a person is the more he or she is susceptible to the fear of crime and/or apprehension during a criminal act. Generally, victims of crime, by reason of fear of further successful attacks adopt security measures in design and construction of buildings such as fence and gates as crime prevention measures. The perception of the certainty of being recognised and apprehended could increase the possibility of crime prevention and reduction. This perception depends on the offender's knowledge of the implication of apprehension (conviction, punishment, shame, loss of freedom and proceeds of crime, ostracism, loss of respect).

Some observers agree that only a small part of a person's knowledge is in the conscious mind at a particular period and that it is the unconscious motivations rather than the conscious that determines actions (York and MacAlister, 2015). The conscious

mind is constantly relating with the unconscious mind which is a storehouse of all the knowledge that a person has accumulated in various ways. Past experiences together with the successes, failures, consequences and feelings are pushed into the conscious mind when an opportunity presents itself. It is the unconscious mind that influences actions most. Furthermore, in today's society man is more susceptible to outside influences and therefore his attitudes can be shaped without his being aware of it. Using this principle, the environment can be manipulated by design to trigger fear of apprehension and punishment in a would-be offender and cause him to abandon his criminal intentions.

Roth and Clark (2014) argue that the human mind is configured to search for implication and significance of the information it receives. This has a link to the desire to survive. The mind organises all information it receives into a meaningful form in order to interpret it on the basis of evaluated information already stored in it. Furthermore, the mind organises data according to certain built-in preferences. This principle is the basis for an effective incorporation of security requirements into architectural design for crime prevention. Above all other considerations, the criminal prefers not to be apprehended. The architect designing for security should carefully and creatively exploit this concept. This concept should be adapted for surveillance, barrier placement and target hardening.

2. Theoretical Framework

2.1. Models of fear of crime

Previous studies on fear of crime indicates the three principal models that address fear of crime as victimisation or vulnerability, disorder and social participation/integration theories (Maskaly, 2014). Okunola and Amole (2012) classify models of fear of crime into facilitators of fear (vulnerability and disorder theories) and inhibitors of fear (social participation theory). The victimisation theory claims that if a place is vulnerable to criminal activities it will facilitate the fear of crime and victimisation in the users or visitors to the place. It argues that increased exposure to victimisation and fear could be as a result of high crime rates, economic problems and lack of resources to take reasonable precautions. This theory suggests that fear might be redefined in the light of the extent to which the reactions to fear are found to be possible/impossible or useful/un-useful after considering costs and options (Garofalo, 1981). The vulnerability of people indicates that they are at risks of becoming victims of crime (Okunola and Amole, 2012). This model strongly appeals to the need for a holistic architectural design that provides for adequate protective measures to reduce the sense of vulnerability.

The disorder model is drawn from the "broken windows" theory that poor property maintenance leads to a downward spiral of neglect, deterioration and abandonment which attracts criminal elements to a place, thereby increasing crime and fear of it (Kelling and Benton, 2015). This theory argues that human behaviour can be influenced positively by the perception of order. Designs should allow for ease of maintenance. Some designs make it difficult to access some parts of a building for proper maintenance. Specification of materials with short life-cycle leads to fast deterioration of the building and increases maintenance problems.

The social participation theory suggests that certain responses to crime can reduce or inhibit the basis for fear. It argues that increased participation by members of the

Journal of Contemporary Research in the Built Environment, Vol. 3, No. 2, Sept. 2019

community with neighbourhood cohesion can diminish worry over crime (Okunola and Amole, 2012). It involves using community control mechanisms such as police presence and residents' participation in crime prevention through collaboration with relevant law enforcement agencies and other activities such as neighbourhood watch. Participation of individuals and communities are critical to solving criminal issues (Sakip, *et al*, 2012, Maskaly, 2014). Available evidence suggests that there is a link between community cohesion where people participate to exercise control over public spaces to deter criminals and the rate of crime in the community (Levy, *et al*, 2014). Review of evidence also shows that the higher the levels of collective involvement within a community, the lower the crime rates (Basia, 2013; Levy, *et al*, 2014). This strongly suggests the need for an effective and all-inclusive stakeholder participation in crime prevention.

The theory addresses participation of only residents of neighbourhoods and communities. In this regard it has failed to capture specialised groups such as architects whose works (design of the buildings and shaping of spaces to form the physical setting of the communities) bring about social interactions. This theory needs to recognise the specialist contribution of built environment professionals in addressing the issues of crime and fear of it. Their inclusion can greatly and practically enhance and enrich the process of crime prevention in communities as participants. This paper, therefore, considers architects and built environment professionals as a prime group in the social participation model as their inputs can reduce the fear of crime.

2.2. The theory of deterrence

Fear undergirds and drives the theory of deterrence – fear of recognition, apprehension, punishment and the associated social and moral implication of the arrest and/or punishment. Deterrence is a psychological approach to crime prevention that is directed at the decision-making process of the criminal with the intension of making him/her to decide against a criminal act (Ebong, 2017). Studies reveal that the chance of being arrested is a much more effective deterrent than punishment. Kennedy (2009) observes that the theory of deterrence assumes that human beings are rational enough to ponder the consequences of their actions and to be influenced by those consequences. This theory was developed from the works of Thomas Hobbes (1588 – 1678), Cesare Beccaria (1738 – 1794) and Jeremy Bentham (1748 – 1832). These classical theorists drew attention to the facts that actions aimed at preventing crime is more effective deterrent than punishment; human beings are rational beings who weigh cost and benefit before committing any crime; and that the permeating self-interest nature of human beings could lead to crime.

Over the years, other theorists have either built on it or argued against it. An important derivative of this theory is the rational choice theory of crime prevention. Human beings as rational creatures are endowed with the freewill to make decisions. This privilege of choice is influenced by the benefits and cost of their actions (Kennedy, 2009). Furthermore, it is the behaviour with the greatest advantage that has the utmost likelihood of being acted upon. Deterrence theorists presume that human beings are self-interested and egocentric rational thinking beings. Consequently, deterrence becomes effective with the principle of certainty. This principle is based on the premise that the possibility of being caught could tilt the decision balance in favour of crime prevention. It is the perception in the mind of a would-be offender of the possibility of being caught and punished either during the crime act or after. Paternoster (2010) argues that the deterrence theory is more concerned with the perception of sanction threats and the relationship between the perception and behaviour.

This assertion, therefore, makes deterrence a perceptual theory that operates more at individual level.

2.3. Opportunity theories

Crime prevention through Environmental Design (CPTED) originates in architecture and planning and draws on many crime-related theories to strengthen and elaborate its concepts and practices (Ekblom, 2013). An understanding of the factors responsible for criminal tendencies alone does not clarify how crimes occur. To explain crime, it is imperative to understand the relationship between criminal tendencies and opportunity. Criminal disposition must interact with opportunity for a crime to occur. The aim of CPTED is, therefore, to reduce these criminal opportunities. Opportunity-based theories are also known as situation-based theories or theories of the crime event. While the theories of crime and criminality deal with the individual's tendency to commit a crime, the opportunitybased theories are concerned with the actual crime event and the environment and circumstances within which the crime occurs. Therefore, the criminal is regarded as one element among others - victims, bystanders, environmental conditions - in the crime chain (Summers, 2012). The Home Office (2016) notes that conclusive evidence indicates that the availability of opportunities to commit crime increases the incidences of crime. This justifies the assertion that crime prevention is effective when opportunity to commit crime is removed.

All the opportunity-based theories maintain that environmental characteristics impact in various degrees on the occurrence of a crime because of the opportunities created for a motivated criminal. In other words, it is the environmental features that provide the needed opportunities such as, easy access, attraction, poor asset protection and others, for crime to occur. These theories stress the interaction between the criminal and the place (environment and location) that the crime is committed. The following theories have been identified to form the current theoretical base of CPTED. They are relevant to this paper because of their emphasis on place and opportunity.

2.3.1. Crime pattern theory

The theory explains why crimes occur in certain locations. Brantingham and Brantingham (2008) argue that crime acts are not random events but occur in time and space when the activity spaces of the target and offender overlap. They contend that crime events are either opportunistic or planned and that places are either crime generators or crime attractors. Andresen (2014) examines the configurations of activity of a place in terms of 'paths' (roads and other linkages), 'nodes' (activity areas) and 'edges' (outlying areas) to determine places that are crime generators or crime attractors. A lot of crimes are known to take place because a lot of people pass through a place or are drawn to it because they consider the place to be of low risk, less difficult to operate and more rewarding to criminal activities (Ekblom, 2013). From the perspective of crime pattern theory, a criminal may find it difficult to commit a crime if a physical barrier prevents him from familiarising himself with the area beyond the barrier (Clare, Fernandez and Morgan, 2009). Therefore, physical barriers could make an area beyond the barrier an uninviting target.

2.3.2. Routine activity theory

This explains how routine activity in a place could lead to more or less crime. Changes in an environment can affect the number of targets or capable protectors against crime can affect crime positively or negatively. The routine activity theory's concept of guardianship has been an important theme of environmental and urban design theorists and architects who have variously considered how the physical environment can promote or discourage crime with emphasis on the importance of natural surveillance or what Jane Jacobs referred to as 'eyes on the street.'

2.3.3. Rational choice theory

The theory explains the criminal act from the perspective of the criminal who seeks to commit a crime by asking questions about the reward, the method to be used, the ease, the risks involved and alternative crime if prevented from committing the crime. It is more concerned with the thinking process of the criminal and how he evaluates the opportunities available for the crime. This theory helps in considering the different methods of reducing criminal opportunities. The situational crime prevention methodology draws from this theory with four major objectives for preventing crime - increase the difficulty of committing crime; make it riskier to commit crime; make smaller the anticipated proceeds; and eliminate justifications for crime. However, this theory fails to take into consideration the fact that human beings are not always rational nor do they always make rational choices, especially under the influence of substances. There are several issues competing with reason such as severe hunger and peer and economic pressures which should be controlled for. However, since architecture can influence behaviour it is reasonable to specify and integrate crime prevention mechanisms into architectural designs and buildings with the expectation that majority of the people with criminal intentions will be influenced to abandon their crime targets. In cases where these place and opportunity-based strategies do not stop crime, it may provide delay and monitoring measures that allow for response and the likelihood of arrest.

2.4. The crime containment framework

The Crime Containment Framework presented in Figure 1 is a conceptual framework developed on the premise that a criminal or would-be offender considers the risks and rewards of a criminal act while assessing the ease or difficulty of committing the crime. The framework is multi-layered and links together the theories of fear of crime, deterrence and crime opportunity. It considers vulnerability of the target or victim to be closely linked to an offender's motivation to commit a crime at any available opportunity. The victim/target, motivated offender and a crime opportunity are grouped together to form the core of the framework. This known as the crime act consideration stage. The second stage in crime containment links deterrence theory, which is concerned with the perception of sanction threats and the relationship between the perception and behaviour, with opportunity theories that seek to threaten opportunities to commit crime. Deterrence measures, leveraging on situational crime prevention, focuses on crime settings by increasing the difficulties and risks of committing crime. The application of the physical elements of security is expected to have a psychological effect on the would-be offender to convince him or her to abandon the criminal act for fear of sanction threats. The question is what do these mechanisms communicate to the would-be offender? Since it has been acknowledged that self-interest is a driving force for crime, then deterrence measures should be a driving force for self-preservation. The deterrence application (crime containment) component forms the outer layer. This layer links fear of sanctions with the decision against committing the crime, which is the major focus of opportunity theories.

2.4.1. Discussion of the framework

When a would-be offender is considering a crime act he must locate a victim and a target that has the anticipated reward. He has to be motivated enough either by greed, hunger, peer pressure, increased criminal reputation or any other factor or combination of factors to want to commit the crime. Then he must look for a suitable opportunity to commit the crime. For deterrence to occur there must first of all be a law to make the anticipated act illegal with spelt-out punishments. A published law, with the intent and purpose made known will make the would-be offender to know the full implication of his action.



Figure 1: The Crime Containment Framework

A very important aspect of the deterrence consideration component is the threat to the opportunity to commit the crime. This involves the design and physical mechanisms put in place to make the criminal opportunity not utilisable through fear of recognition and apprehension. For example, lighting does not stop crime but makes monitoring of an environment in the night easy. It makes concealment difficult so that it is easy to spot an intruder. Target hardening measures increase the difficulty to access a crime target and cause delay for security response to occur. The implication of the threat is that the criminal could be recognised, apprehended and punished. The outcome is deterrence through fear of apprehension which could cause the criminal to abandon his criminal intention. The ultimate aim of deterrence in security design and physical security is crime prevention and reduction, and not punishment. This is different from the criminal justice system that lays emphasis on punishment threat as the major deterrence to crime.

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3. MULTI-LAYERED APPROACH TO ENHANCING DETERRENCE FOR CRIME PREVENTION

3.1. Design

The built environment space is physical in nature which allows or restricts human movements and interactions that create the social fabric, functioning and processes of society. This social functioning can be affected by the feeling of safety or danger in a place leading to psychological insecurity. Urban space without its psychological security is just a sole communication artery (Rezvani and Sadra, 2017). Crime prevention should, therefore, extend beyond the physical component to incorporate measures that address psychological security. These measures are closely related to the interplay of the components of the physical form of the built environment (roads, pathways and street networks, design of residential and commercial neighbourhoods, buildings and public spaces where people access and interact physically and visually), urban characteristics and spatial distribution of population and social networks. Fear affects the spatial form of a place. Rezvani and Sadra (2017) maintain that the characteristics of poor and inefficient urban space are the creation of fear and anxiety. This puts the onus on built environment professionals to design functional urban space.

Architectural design can play an important role in addressing the issues of crime by increasing the fear of apprehension and influencing behaviour for crime prevention (Ebong, 2017). Architects and planners can unavoidably influence behaviour through the design and construction of places where people live and work (Lockton, 2011). Investigation of CPTED concepts and principles reveal an age-long method of leveraging the environment through designs that exhibits cues to affect human behaviour (Crowe and Fennelly, 2013). An evaluation of cross-sectional research and quasi-experimental studies by MacDonald (2015) indicates that place-based experiments that manipulate features of the built environment influenced criminal behaviour to reduce crime.

Teeuw and de Boer (2011) argue that direct physical measure through design is the most obvious technique of influencing behaviour and that safe behaviour to counter crime can be enforced through effective surveillance, access control and territorial control. An environment that can encourage normal behaviour and discourage undesirable ones can be created through design (Pirbasti et al., 2015). Design measures should include layers of security and control points, building hardening, material specification and construction techniques, building layout and orientation to enhance observation and views, controlled perimeter, access control, vehicle and people barrier, controlled parking, traffic and circulation and clear zones. Design can channel users to these security screening points which are points of transition from one zone to another. The numbers of these transition points depend on site layout, positioning of building and interior space functions and layout. Plate I shows a building design with blank wall that inhibit surveillance and monitoring of the environment. Blank walls create surveillance shadow. A surveillance shadow is an area outside a surveillance corridor. It impacts negatively on deterrence as offenders are likely to assume that they can access a target without being seen or recognised.



shadow that could reduce deterrence and compromise security (Residential Building, Wuse II, Abuja). Photo credit: Samuel Ebong



A good design should create surveillance corridors or clear lines-of- sight for natural and/or technology-aided surveillance and reduce surveillance shadow to the barest minimum. Plate II shows a building with properly located windows that allow monitoring of all the surrounding areas.

3.2. Protective barrier systems

Barriers are very important physical elements in site and building protection that should be integrated into design. Fennelly (2012), Baker and Benny (2012) and the US Department of the Army (2001) agree that barriers are useful in defining and protecting the boundary of a facility and activity or area. Fully integrated into the site design, they function to restrict, channel, delay or deny access to a facility or parts of a facility. They also create a psychological deterrent for any person or group of persons seeking to gain unauthorised entry. The US Department of the Army (2001) advocates the use of barriers to help in providing entry control points for identification, control pedestrian and vehicular traffic flow, define restricted and sensitive areas, delay unauthorised entry, prevent monitoring by unauthorised persons and protect assets.

Available evidence suggests that barriers are effective in preventing crime (Levy, *et al*, 2014). However, some analysts have argued that excessive use of physical barriers for target hardening can create a "fortress mentality" causing people to, out of fear, hide behind the barriers thereby rendering people policing of the environment ineffective (Schneider and Kitchen, 2007). Vehicle access control measure should be comprehensive where possible. This should include vehicle speed control and vehicle arrest systems (Plate III).

Plate IV shows turnstile access control mechanism integrated into design to enforce orderly pedestrian entry into a government complex. Man trap building access control mechanism allows one side to close and lock before the other side can unlock and open. It is configured to detect metals and therefore is useful for screening people for weapons as the inner door does not open when a metal is detected. This enables the security personnel to respond appropriately. The man trap building access control door is used by all major banks in Nigeria (Plate V).

Evidence from studies and practice indicate that fence can create territorial control that signals that intruders will be questioned. Engineered blocks and bollards are used as vehicle barrier to increase deterrence and stand-off distance to the use of bomb-ladden vehicles to target the building. Researchers have noted that a fence designed to increase visual continuity effectively increases natural surveillance. (Plate VI and VII).



Plate III: Drop arm security barricade for access control is positioned in front of the gate as a vehicle arrest system (Federal Capital Development Authirity Complex, Abuja. Photo credit: Samuel Ebong)



Plate IV: Turnstile access control mechanism at Federal Capital Development Authority Complex, Abuja. Photo credit: Samuel Ebong

Plate V: Man trap building access control door (Bank, <u>Wusell</u>, Abuja). Photo credit: Samuel Ebong



Plate VI: The fence creates a territorial identity thereby establishing ownership and control of the space within the fence. Engineered blocks and bollards are used as vehicle barrier. These increase deterrence (Ministry of Foreign Affairs, Abuja). Photo credit: Samuel Ebong



Plate VII: Metal fence with visual continuity aids surveillance. Engineered planters are used as vehicle barrier to deter use of bomb-laden vehicles to target the building (Ministry of Finance, Abuja). Photo credit: Samuel Ebong

3.3. Physical security lighting

A number of studies carried out in a variety of settings indicate that there is ample evidence that improved street and external lighting are effective in reducing property crime significantly (Welsh and Farrington, 2006 and 2009a). Other evidence suggests that it is not very effective on violent crimes (Levy, *et al*, 2014). Security lighting permits security guards to visually monitor an area at night (US Department of the Army, 2001). Its use should not be limited to psychological deterrence but, as the situation dictates, for continuous and periodic observation. It should provide illumination for the whole facility, the grounds and the perimeter (Federal Emergency Management Agency, 2007). Lighting reduces opportunities for concealment, covert entry, surprise and makes the work of a potential assailant riskier. It is particularly necessary for sensitive areas, buildings and entry control points that require constant monitoring.

3.4. Surveillance and detection devices

The Close-circuit television (CCTV) is the most common device used for surveillance and detection in crime prevention. There has been an increased awareness and its use as a crime prevention mechanism in recent years. Available evidence generally agrees that CCTV surveillance contribute to crime prevention (Welsh and Farrinton, 2008; Welsh and Farrinton, 2009b). Minnaar (2007) observes that the mining industry and gold/precious metals refineries in South Africa effectively use CCTV as a surveillance and detection mechanism to deter the smuggling and pilfering of products from their facilities. Available evidence also suggests that it effectiveness in deterring crime depends on the extent to which people are aware of its existence (Griffith, 2003; McLean *et al*, 2013). Building design configuration, planting and other landscape features and lighting can also greatly affect its effectiveness. CCTVs should have clear lines of sight for effective observation by guards and other monitoring mechanisms.

Walk-through metal detectors are also appropriate for access control and entry security to detect weapons and other concealed attack devices. The space design should allow convenient placement of the mechanism and work station. Plate VIII is an important access control deterrent mechanism used for delay and detection of weapons.



Plate VIII: M-scope metal detector for access control during a function (This Day Dome, Abuja. Photo credit: Samuel Ebong)

Journal of Contemporary Research in the Built Environment, Vol. 3, No. 2, Sept. 2019

4. CONCLUSION

Fear has always been one of the driving forces behind human aspiration and activity. It drives people to take action either for self-interest or self-preservation. The paper has drawn attention to the important role that fear plays in applying deterrence in crime prevention. It has situated fear of victimisation and apprehension as prime factors to be considered and exploited to enhance security in architectural design for crime prevention. Leveraging on the principle of fear designers of buildings, the built environment and security products can contribute immensely to crime prevention and reduction. An understanding of the Crime Containment Framework will increase crime prevention practitioners' knowledge and effectiveness.

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INFLATION HEDGING CHARACTERISTICS OF REAL ESTATE HOSTEL INVESTMENT IN NIGERIA

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ABSTRACT

Purpose: This study examines the inflation hedging capability of hostel investments around the Federal University of Technology Akure (FUTA), south gate, Akure. The study sought to undertake the economic analysis of inflation hedging of the return generated from hostel investment in Federal University of Technology Akure, South gate.

Design/methodology/approach: The study area is characterised with purely private hostel developments. The target population for the study comprises of the registered Estate Surveying and valuation firms in Akure. The survey questionnaire was administered on the twenty-five practicing registered Estate Surveying and Valuation firms in the study areas; out of this, fifteen were retrieved and used for analysis. The secondary data on inflation required for the study were obtained from the records of the Nigerian Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN). The data were analyzed descriptively through sample mean, and standard deviation, and inferentially through Ordinary Least Square Regression analysis. Phillip Perron unit root test used to test the stationarity of the data shows the data sets were a combination of a different order of integrations.

Findings: The result of the inflation hedging capability indicates that hostel investment is not an all-time hedge against inflation as it is traditionally perceived to be, there are instances where they provided a perverse hedge or partial hedge against inflation. It is expected that the findings in this study will guide investors that desire to invest in hostel. The study recommends that the Nigerian government should put relevant policies in place that will bring down the inflation rate to a single digit and also maintain a single-digit inflation rate to check volatility.

Originality/value: The study is the first to examine the inflation hedging capability of hostel real estate investment in an African emerging real estate market. This makes the study unique in nature.

Keywords: Inflation; hedging; real estate; investment; hostel.

1. INTRODUCTION

Inflation is an economic term that nation uses to guide various economic policies and programs (Osagie, Gambo, Anyakora & Idowu 2012). An inflation hedge is provided when the return on investment increases at a commensurate or higher rate more than the

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general price levels (Glascock, Feng, Fan & Bao 2005); this is the desire of investors. Every investor motive is to invest in an investment that hedge against inflation (through the rate of return of the investment) and protect the real value of the investment (Martin 2010). One quality of holding an investment is to provide an investment with a positive real rate of return during the period's inflation (Ruben, Bond & Webb 1989). However, there are investment options that are available to investors, the investment may be real or financial, and the real estate investment is the main focus of this study. Real estate investment is associated with positive return ratio, known with low-risk characteristics Chandra (2008), also hedging of unexpected inflation and delivery of streams of cash flow to the investment with the benefits accrued from total returns derived from rental and capital components. These benefit accrued from real estate returns over other investment options have enhanced its attractiveness to investors across the globe.

Real estate has an age-long standing reputation being perceived as a hedge against inflation. This connotes that it has the power to protect the investors' fund against the eroding power of inflation (Odu 2011). However, Kloosterman (2009) opined that assets which do not perform well as inflation hedges will exhibit negative return patterns that are not correlated with inflation. Therefore, the capability of an asset class in providing inflation hedge is measured by its capability to reduce the loss of purchasing power resulting from inflation (Wurtzebach, et al., 1991).

Different studies have been done in the past to ascertain the inflation hedging potentials of real estate investment. Voigtlander and Demary (2009) observed that real estate investment did not provide a hedge against inflation, Quingping (2008) shows that Taiwan real estate provided a hedge against inflation, Bello (2005) found out that real estate is not an all-time hedge against inflation. Amidu and Aluko (2006) and Odu (2011) reveals that real estate is a hedge against inflation. However, these studies show varying conclusion as regards the inflation hedging capability. In view, of the above, no known study investigated inflation hedging capability of a hostel as an example of real estate investment.

The increase in students' enrolment in tertiary institutions is growing per annum; however, the provision of new purpose-built students' hostel is limited. The provision of student hostels for all student on campus was no longer feasible. This, in turn, creates opportunities for the development of students' hostel in many cities in Nigeria by private sector/ individual investors. Hostel investment as a subsidiary of real estate investment has been perceived as a hedge against inflation. There is a need to investigate whether it really provides a hedge or not against the background of economic volatility and recession that has characterized the economy. Inflation is an integral part of the economy which affects the real estate of which hostel investment is not left out. Fraundorf (2012) is of the view that prospective investors wisely invest in assets that possess a certain degree of inflation-hedging potentials against eroding the purchasing power of the investors' funds, in certain prevailing inflationary trends. It is against this background that this study seeks to undertake the economic analysis of inflation hedging of the return generated from hostel investment in Federal University of Technology Akure, South gate. The study area is characterized with purely private hostel developments.

2. REVIEW OF RELATED LITERATURE

Inflation is considered as a purely monetary phenomenon that leads to a general increase in the price level of goods. Inflation can reduce people's purchasing power and erode their wealth in the long run (Zhe, 2010). The inflation components used for studies are generally divided into three different components: the actual, expected and unexpected inflation. The most commonly used measure of actual inflation is the Consumer Price Index - CPI (Fama & Schwert, 1977; Zhe, 2010). Expected inflation refers to changes in price levels that are expected as at the starting time of an asset, or when the asset is appraised (Appraisal Institute, 2008). The 90days Treasury bill rates are used as a proxy to measure the expected inflation (Zhou & Clements 2010; Zhe, 2010; Park & Bang 2012, Dabara, 2015). Unexpected Inflation is a period when the inflation rate is higher than economists' anticipation. The unexpected inflation is the difference between actual inflation and expected inflation (Kloosterman, 2009; Odu, 2011; Arnason & Persson 2012). These three (3) components of inflation are observed to react differently to asset returns in an inflationary environment.

Fama and Schwert (1977) studied inflation hedging abilities of some assets in the United States of America such as common stocks, government bonds, treasury bills, labour income and private residential real estate during the period between 1953 and 1971. The study adopted Fisher's (1930) proposal to test the inflation hedging characteristics of investment assets. The Consumer Price Index (CPI) was used as a proxy for actual inflation; while the nominal rate of United States 90-day Treasury bills was used as a proxy for expected inflation. Ordinary Least Square regression model was used to test the inflation hedging capability of the assets returns. The study revealed that private residential real estate returns exhibited partial hedge against expected and unexpected inflation. Hence, returns on government debt instruments exhibited a complete hedge against expected inflation; common stocks exhibited perverse hedge against expected and unexpected inflation.

Sing and Low (2000) empirically tested the inflation hedging characteristics of both property and non-property assets in Singapore. The returns data employed in this study comprised the Urban Redevelopment Authority's (URA) all-property price index. The authors used CPI as a benchmark to measure actual inflation, for the expected inflation, the lagged period 3-month Treasury bill was used as a direct proxy. The unexpected inflation was determined as the difference between the actual inflation and expected inflation. The Pearson rank correlation coefficients between the asset returns and the inflation rate were determined. Findings from the study showed that property provides a better hedge against inflation than non-property assets. The industrial property was found to be the most effective hedge against both expected and unexpected inflation, whereas shop property type offered only significant hedge against the expected inflation. In the sub-period analyses involving four different 5- yearly periods, it was found that more assets established significant hedges against both expected and unexpected inflation in the sub-period from 1993 to 1998. When the tests were extended to examine the inflation hedging characteristics of assets in the high and low inflation environments, residential property was found to be a good hedge against unexpected inflation in the low inflation period, whereas industrial property showed a better hedge against inflations during the high inflation period. In summary, property type provides a better inflation hedge against inflation than nonproperty assets. This finding is in agreement with the finding of (Li, 2001), that the abilities of real estate to hedge against inflation are often higher in the case of high inflation, but they diminish and lose the significance or even disappear in the case of low inflation.

Wang, Lee and Nguyen (2008) investigated the inflation hedging ability of Taiwan housing investment. Consumer Price Index was used as a proxy for actual inflation while the return data was obtained from Taiwanese monthly housing returns. The study was done within the period between 1991 and 2006. The study used inflation as the threshold variable to create the nonlinear vector correction model that divides the inflation rates into a high and low regime. The Augmented Dickey Fuller (ADF) unit root test and Johensen cointegration analysis were used in the analysis of the returns and inflation data. The study revealed that when inflation rates are higher than 0.83% threshold value, housing returns were able to hedge against inflation, and, otherwise, they were unable.

Voigtländer and Demary (2009) studied the inflation hedging of real estate properties comparison between direct and equity investment. The study employed Panel Data Augmented Fama and Schwert Regression. The dataset includes the total return indices for homes, offices and retail property and covers the following countries Canada, USA, Finland, France, Germany, Ireland, the Netherlands, Sweden and the United Kingdom were used. The result reveals that investment in equities and real estate equities do not protect the investor against inflation. Also, the study found out that direct investment performs better in protecting against inflation. However, different degrees of inflation protection for homes, offices and retail real estate exists. The correlation between returns and inflation is negative and statistically significant.

Zhou and Clements (2010) investigated the inflation hedging ability of real estate between 2000 and 2008. The variable used to estimate the return on direct real estate investment was the real estate price index from Chinese economic database. For inflation rates the Chinese CPI was used as a proxy, ARIMA was used as a proxy for the expected inflation and the unexpected inflation was the difference between actual and expected inflation. Before analysing the relationship of Chinese real estate prices and inflation, the stationarity of the variables was first examined using the unit root test, Engle and Granger's cointegration was used to test the hedging ability of the Chinese real estate. The study found that Chinese real estate was not an effective hedge against actual and unexpected inflation.

Amonhaemanon, Ceuster, Annaeert and Long (2013) examine whether real estate in Thailand can hedge against ex post and ex ante inflation during the 1987-2011. The Fama and Schwert (1977)'s framework was used to analyse the data. The consumer price index (CPI) in Thailand was used as a proxy for actual inflation. The actual inflation rate was decomposed into expected and unexpected inflation components in order to give a better way to defining the hedge against inflation. The study finds that real estate returns have positive relation with both ex post and unexpected inflation over the period, even though the statistical evidence does not strongly support this. Furthermore, after separating the time series into sub-periods to control for the possible structural changes in the economy, the study found that the relationship between inflation and real estate returns change under various economic environments.

Fleischmann, Fritz and Sebastian (2019) studied Real Estate, Stocks, and Bonds as a Deflation Hedge using Japan and Hong Kong as a case study. Asset returns for these product between 1986 and 2009 was examine using Fama and Schwert (1977) Regression model and Auto Regressive Integrated Moving Average (ARIMA) model to explore whether they offer a deflation hedge. The data for Japan was derived from the real estate institute in Japan while the Hong Kong data was derived from the Rating and Valuation Department in Hong Kong. The study found out that rents and real estate prices are closely linked to consumer prices. The study reveals that Hong Kong, estimated coefficients of expected changes βi are positive for all investments and range from 0.08 to 1.597. While the unexpected changes γi the estimated coefficients range from -0.199 to 1.756. The

lowest coefficients are on stocks ($\beta i = 0.008$ and $\gamma i = -0.199$), but they are not statistically significant at any level. Residential real estate offers the most strongly significant hedge against expected inflation while industrial properties offers a complete hedge against unexpected inflation. Japanese real estate also exhibits very good hedging behaviour (βi from 2.288 to 3.551; γi from 1,585 to 2.529); it a complete hedge against expected as well as unexpected price changes.

In the Nigeria context, Bello (2004) empirically investigated the inflation hedging characteristics of residential properties in Lagos Nigeria between 1996 and 2000. For actual inflation rate data, the author used the Nigerian CPI as a proxy, while for the expected component of inflation; the Nigerian three months Treasury bill rate was used as a proxy. The unexpected inflation rate was derived by subtracting expected inflation from actual inflation. The data on returns on residential properties was obtained from valuation based indices of residential property returns. Data for the study was analysed by regressing the inflation rates and rate of returns using the Fama and Schwert (1977) model. The result from the findings indicated that residential properties have a strong inflation hedging characteristics against expected inflation but not against actual and unexpected inflation. The result is controversial to the finding of Fama and Schwert (1977) that residential property was not a complete hedge against unexpected inflation. It conforms to the finding of Zhuo and Clement (2010) that real estate was not an effective hedge against actual and unexpected inflation.

Odu (2011) studied inflation hedging attributes of commercial properties in prime areas of Lagos State, Nigeria. Ordinary Least Square model proposed by Fama and Schwert (1977) was used to regress real estate rates of returns against actual, expected and unexpected inflation rates. Consumers Price Index was used as a proxy to measure the actual inflation and the 90days Treasury bill rates were used as a proxy for expected inflation. The results show that, for prime locations around Victoria Island and Ikoyi, returns on commercial properties provided perverse hedged against actual inflation; while commercial properties within Ikeja axis provided a completely hedged against actual inflation.

Ogunba, Obiyomi and Dugeri (2013) tested the inflation hedging characteristics of office and shop property investments in Ibadan metropolis in Nigeria between 2000 and 2010. The authors used the Consumer Price Index as a proxy for actual inflation; while the Nigerian 90days Treasury bill rates were used as a proxy for expected inflation. Property return data on rental values and capital values of commercial properties were obtained Estate Surveying and Valuation Firms in the study area. The Ordinary Least Square (OLS) regression by Fama and Schwert (1977) was adopted for the analysis. Findings from the results indicated that commercial property returns were a poor hedge against actual inflation, a partial hedge against unexpected inflation, and a complete hedge against expected inflation. This result complies with the finding of Odu (2011) that real estate presented a complete hedge against actual inflation. The conformity of the result may be because of the methodology that was employed by the authors for the study.

Dabara (2014) investigated the inflation hedging characteristics of residential property investments in Gombe metropolis from 2003 to 2012. The author employed the Consumer Price Index and the 90days Treasury bill rates as a proxy for actual and expected inflation respectively. Fama and Schwert (1977) Ordinary Least Square was adopted. An initial stationarity test was carried out to remove spuriousness from the data set. Findings show that residential property returns completely hedged against expected inflation, partially hedged against actual inflation, but a perversely hedged against unexpected inflation. This study used the methodology that was employed by Odu (2012) and Ogunba et al (2013).

However, the conformity of their findings may be as a result of the Fama and Schwert (1977) regression that was employed for the various study. However, the findings of Bello (2004) that residential is not and hedge against inflation is not in conformity with the findings of Dabara (2014) that residential property is a complete hedge against inflation.

Umeh and Omisore (2015) investigated inflation hedging capacities of returns on residential property investments in Ibadan. The time frame of the study is between 2002 and 2014, Ordinary Least Square regression model was employed. The inflation component was decomposed into actual, expected and unexpected inflation. The study found out that the inflation hedging capacities of real estate investments were found to vary across geographical sub-markets and return components. Residential properties did not hedge against actual inflation in all the considered areas. However, with regards to expected inflation, the capital and total returns of residential for properties in Akobo are complete hedge against inflation; while for Bodija estate, income and total return are complete and partial hedge against inflation. However, the findings of Bello (2004) that residential real estate is not a hedge against inflation contradict these findings that residential income and total return for Bodija at least is a partial hedge.

Wahab, Ola, sule, Adepoju and Dodo (2018) examine the inflationary hedging capacity of house price returns in emerging economy. Abuja was used as the study area, of which five residential housing zones were selected for the study. The study utilized Ordinary least squares (to show short run inflationary characteristics), Augmented Dicker Fuller (ADF) to test for the stationarity in the data, Engle Granger co-integration to establish long run relationships and co-integrating regression analysis to establish long run inflationary characteristics in Abuja Housing Market. The result of the Fully Modified Ordinary Least Square revealed that housing markets failed to provide a complete hedge against inflation across all the markets within a possible short run. The result of co-integrating regression revealed that housing market in Nigeria could not effectively offer a complete hedge against unexpected inflation for both short run and the long run, due to the fact the Nigeria property market is still operating a direct property market system which does adjust immediately to sudden change in economy indicators such as inflation. However, the findings of Bello (2004) that residential real estate is not a hedge against inflation conforms the findings of Wahab et al (2018) that housing market failed to provide a hedge against inflation. It contradicts the findings of Dabara (2014) that residential property is a complete hedge against inflation.

The disparity in the above findings calls for a constant investigation of inflation hedging capability of real estate investment to ascertain the hedging capability of real estate investment across the region. No known study has been done to ascertain the inflation hedging of hostel real estate investment in Nigeria. Hence the study will fill the existing gap by examining the inflation hedging capability of hostel investment in Akure.

3. Research Methodology

The target populations for the study are Registered Practicing Estate Surveying Firms that are duly registered with the Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON). The sample frame for the study is 25 as obtained from the 2019 directory of the Nigerian Institution of Estate Surveyors and Valuers (NIESV), Akure. Census survey of the whole 25 was considered because the size is within a manageable frame. The questionnaire was designed and administered on the registered practising Estate Surveyors and Valuers in Akure. They provided information on rental and capital values of hostels

from 2009 to 2018 in the study area. The secondary data on inflation was obtained from the records of the Nigerian National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN). In line with previous studies such as Bello (2005) and Ogunba et al. (2013), the actual inflation rates were derived from the Nigerian Consumer Price Index (CPI) which was computed by the NBS. The 90-day Treasury bill rate was used as a proxy for expected inflation, this was obtained from the records of the CBN, while the unexpected inflation was calculated as the difference between the actual and expected inflation. The statistical approaches that were applied in the study are descriptive and inferential statistics. The descriptive statistics include mean and time series trend analysis while the inferential statistics include ordinary least square.

The rental and capital values of hostel are converted to returns using the formula below: The Total Return is expressed as;

This can be expressed as;

TR = (IRt/CVt) + [(CVt+1 - CVt)/CVt)](2) Where Rt is the income received during period, CVt is the capital value at the start of period t, CVt-1 is the capital value at the start of period t - 1, Rt/ CVt is the income return for period t and (CVt+1- CVt)/CVt) is the capital return for period t.

In time series, it is important to carry out an initial test for the stationarity data sets to avoid spurious results in subsequent analysis and efficiently capture the long-run relationship of the dataset, thus, Philip Perron unit root equation used is expressed as:

$$CYt = \alpha + bYt - 1 + \varepsilon t \tag{3}$$

Where:

εt is a zero-mean,

k is variate stationary time series process,

 α is a k-vector of drift parameters and

 ΔY is (trend) stationary.

The hypothesis is:

Ho: $\delta = 0$ (Unit Root)

H1:δ=0

The decision rule for the analysis is that: If t*>PP critical value, = not reject the null hypothesis, i.e., unit root exists. If t*<PP critical value, = reject the null hypothesis, i.e., unit root does not exist.

)

(4)

Ordinary Least Square Regression was used to examine the inflation hedging ability of hostel investments in the study area between 2009 and 2018. The ordinary least square regression equation is expressed as:

$$Rjt = \alpha j + \beta j E(\Delta t/\phi t - 1) + yj [\Delta t - E(\Delta t/\phi t - 1] + \varepsilon jt$$
(5)

Where Rjt is the nominal return on hostel investment from period t-1 to t,

 α j is the intercept term in the regression model, it reflects the return on hostel investment type j from period t-1 to t,

Bj is the slope coefficients for expected inflation hostel investment type j with respect to income or capital return,

 $E(\Delta t/\phi t-1)$ is the best estimation of the expected value of inflation in time t

 θ t is based on the information set available up to time t-1, as denoted as ϕ t-1,

Yj is the true value of observed inflation rate from period t-1 to t is the slope coefficient for unexpected inflation for hostel investment type j with respect to income return or capital return,

 $\Delta t - E(\Delta t/\phi t-1)$ is used to measure shocks after acknowledgement of true inflation rate θt , or rather the unexpected or unanticipated inflation rate which is known in time t and ϵjt is the error term for the return of hostel investment type j from period t-1 to t.

The regression equation will further be broken down into actual inflation, expected inflation and unexpected inflation components as income and capital returns to know how they react differently to the different inflationary phenomenon. Thus:

The regression equation for actual inflation is given as:

$\mathbf{Rt} = \alpha + \beta (\mathbf{AIt})$	(6)
The regression equation for expected inflation is given as:	
$\mathbf{Rt} = \mathbf{\alpha} + \mathbf{\Upsilon} \text{ (EIt)}$	(7)
The regression equation for unexpected inflation is given as:	
$Rt = \alpha + \Upsilon (EI) + \delta (AI - EI)t$	(8)

Where:

Rt is the mean nominal return of hostel investment at time t;

 α is the intercept term in the regression model, which also reflects the real rate of return on the property asset;

 β is the coefficient for actual inflation for the property asset, with respect to income return, capital return or total return;

AIt is the observed inflation rate from period t -1 to t;

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 Υ is the coefficient for expected inflation,

EIt is the expected inflation estimate for period t;

 δ is the coefficient of unexpected inflation for the property asset with respect to income, capital or total return and

(AI - EI) t is the unexpected inflation estimate for period t.

4. RESULTS AND DISCUSSION

This section presents the results from the analysis of data obtained for the study. The rental, capital and total returns obtained from the two most dominant types of hostel developments in the study area are presented in Table 1.

Table 1: Total, Income and Capital Returns for the hostel developments between 2009 and2018

Years	INCOME RETURN		CAPITAL RETURN		TOTAL RETURN	
	Tenement	Self-	Tenement	Self-	Tenement	Self-
		Contain		Contain		Contain
2009	0.35	0.44	5.26	5.26	5.61	5.70
2010	0.33	0.42	5.00	5.00	5.33	5.42
2011	0.34	0.43	8.89	11.41	9.23	11.84
2012	0.32	0.40	2.04	3.06	2.36	3.46
2013	0.34	0.39	16.66	7.86	17.01	8.25
2014	0.31	0.38	8.27	4.45	8.58	4.84
2015	0.31	0.37	3.91	1.73	4.23	2.10
2016	0.30	0.40	0.00	5.44	0.30	5.84
2017	0.30	0.40	5.00	6.37	5.30	6.77
2018	0.30	0.39	5.95	2.74	6.26	3.13
SUM	3.2	4.02	60.98	53.32	64.21	57.35
AVG	0.32	0.40	6.1	5.33	6.42	5.74
MAX	0.35	0.44	16.66	11.41	17.01	11.84
MIN	0.30	0.38	0.00	1.73	0.30	2.10

Table 1, shows the returns of hostel investment types in the study area. It is noticeable that tenement building has its highest total return in 2013 with a return of 17.01% and the lowest total return was seen in 2016 with a return of 0.30.%. The high return could be connected to high demand in the property type in the location during the period. The total return of tenement declined between 2014 and 2016 and picked up in 2017 with a return of 5.30%. It is noticeable that self- contain building has its highest total return in 2011 with a return of 11.84% and the lowest total return was seen in 2015 with a return of 2.10%. The high return could be connected to a high demand in the property type in the location during the period. The total return of self-contain declined between 2013 and 2015 and picked up in 2016 with a return of 5.84%. It is noticeable that there is no significant increase in the income return of both tenement and self-contain buildings during the period under review. None of their returns hits the 0.5% mark. This shows that the returns are not significant enough to be considered as an increase during the period under review.

YEAR	ACTUAL	EXPECTED	UNEXPECTED				
2009	12.59	3.67	8.92				
2010	13.76	3.85	9.91				
2011	10.85	10.07	0.78				
2012	12.24	14.11	-1.87				
2013	8.52	11.6	-3.08				
2014	8.06	10.93	-2.87				
2015	9.01	9.65	-0.64				
2016	15.63	10.44	5.19				
2017	16.55	14.36	2.19				
2018	12.15	11.02	1.13				

Table 2: Inflation components during the period

Source: Nigeria Bureau of Statistics/ CBN Statistical Bulletin and Official Report

It is noticeable that tenement building has its highest capital return in 2013 with a return of 16.66% and the lowest capital return was seen in 2016 with a return of 0.00%. The high return could be connected to a high demand in the property type in the location during the period. The capital return of tenement declined between 2014 and 2016 and picked up in 2017 with a return of 5.00%. It is noticeable that self-contain building has its highest capital return in 2011 with a return of 11.41% and the lowest capital return was seen in 2015 with a return of 1.73%. The high return could be connected to a high demand in the property type in the location during the period. This finding conforms to the findings of Hwa (2003) and Dabara (2015) that real estate properties provide higher returns. The returns of the study show that the average rental, capital and total return exhibited positive returns this is confirmed by the finding of Idowu (2006) that the return in the capital and rental value should show a positive return to classify that the investment is viable.

Table 2 shows the analysis of the inflation components from 2009 to 2018 of hostel investment in the study area. The inflation measure used for the study was divided into three components; actual, expected and unexpected. The decomposition of inflation into various components was done because real estate investment reacts separately to the inflation components.

Table 2 shows the inflation rates for actual, expected and unexpected from 2009 to 2018. The table reviews the rate of inflation volatility in the Nigerian economy. It can be deduced from the table that the actual inflation rates show volatility which shows the Nigerian economy instability. The annual actual inflation within the period of 2009 to 2012 maintained a double-digit, from 2013 to 2015, it was on a single-digit and in 2016 to 2018 it moved to a double-digit. The expected inflation was seen to be progressing from 2009 to 2012 and decreases from 2013 to 2015 before it keeps rising again. The unexpected inflation dropped to 0.78 in 2011 and increased to 5.19 in 2016. The implication of the result shows that the Nigerian government is facing a serious challenge of maintaining a single-digit rate. The finding is in agreement with the findings of Dabara (2015) that the Nigeria government is finding it difficult to bring down and maintain inflation figures within a single-digit range. However, it contradicts with the finding of Zhou and Clement (2010) that actual inflation rates were found to be mostly in a single-digit range. The trend graph is shown in Figure 1.

Figure 1 shows the trend of actual, expected and unexpected inflations in Nigeria during the period under review, the coefficient for actual inflation (0.772) is positive, implying that unit changes in time will result to a rise of 0.772 in actual inflation. The R2 shows the level of reliability of prediction, 41.5% for actual inflation. The R2 for actual inflation is low implying that there may be other factors that contribute to the variation in the actual inflation. Also, the figure revealed that with time the actual inflation tends to increase with

an increase in time. The coefficient for expected inflation (0.177) is positive, implying that unit changes in time will result in a rise of 0.177 in expected inflation. The R2 shows the level of reliability of prediction, 3.4% for expected inflation. The R2 for expected inflation is very low implying that there are other factors that contribute to the variation in the expected inflation. Also, the figure revealed that with time the expected inflation tends to increase with an increase in time. The coefficient for unexpected inflation (0.151) is positive, implying that unit changes in time will result in a rise of 0.151 in unexpected inflation. The R2 shows the level of reliability of prediction, 2.5% for unexpected inflation. The R2 for unexpected inflation is very low implying that there are other factors that contribute to the variation in the actual inflation. Also, with time the actual inflation tends to increase with the increase in time



Figure 1: Inflation Components in the Last Ten Year

Actual inflation = 0.772x + 5.719; $R^2 = 0.415$ Expected Inflation = 0.177x + 10.95; $R^2 = 0.034$ Unexpected Inflation = 0.151x + 12.63; $R^2 = 0.025$

Table 2 presents the Philip Perron unit root test of the rate of returns and the rate of inflation components. The computed Philip Perron test analysis was done at "tau" 5% significant levels. The null hypothesis (H0) of a unit is rejected if the p-value is greater than 0.05 and accepted if the p-value is less than 0.05. The unit root test results show that the times series variables are integrated at different order integration. Based on the unit test result, Ordinary Least Square was used to assess inflation hedging capability of real estate returns.

Table 3 examines the inflation hedging capability of hostel investment in the study area. The inflation hedging capability is considered based on the inflation components, these components are actual inflation, expected inflation and unexpected inflation. The decision rule for the inflation hedging capability is as follows if the Coefficient beta is between 1 and 0.5, the asset is a complete hedge against inflation if the coefficient beta lies between

0.4 and 0.1 the asset is said to be a partial hedge against inflation. If the coefficient beta is less than 0 that is a value of beta is negative it is a perverse hedge against inflation (Odu (2011); Dabara (2015).

Level			First Difference			
	t-Statistic 5%	Prob.		t-Statistic 5%	Prob.	Order of Integration
Actual Inflation	-1.9882	0.504	d(Actual Inflation)	-1.9959	0.021	I(1)
Expected Inflation	-3.2598	0.027	d(Expected Inflation)	-3.3210	0.250	I(0)
Unexpected Inflation	-1.9959	0.001	d(Unexpecte d Inflation)	-1.9959	0.026	I(0)
TReturn self-contain	-3.6651	0.028	d(T-Return self-contain)	-10.2429	0.000	I(0)
T-Return Tenement	-2.9197	0.081	d(T-Return Tenement)	-7.5928	0.000	I(1)
C-Return self-contain	-3.6830	0.028	d(C-Return self-contain)	-10.2214	0.000	I(0)
C-Return Tenement	-2.9217	0.081	d(C-Return Tenement)	-7.5824	0.000	I(1)
R-Return self-contain	-3.2005	0.054	d(R-Return self-contain)	-3.3660	0.047	I(1)
R-Return Tenement	-1.6984	0.399	d(R-Return Tenement)	-15.54321	0.000	I(1)

 Table 2: Philip-Perron unit root test for returns/inflations data sets (2009-2018)

Table 3 shows the reaction of the inflation components to total return, capital return, and income return of hostel investment from 2009 to 2018 in the study area. It is observable in Table 3 that for total return, tenement property showed a complete hedge against actual inflation, a perverse hedge against expected inflation and a partial hedge against unexpected inflation. The hostel real estate investment can be classified under residential real estate investment. This is contrary to the findings of Zhou et al (2005) that residential property is a hedge against both expected and unexpected inflation also Rubens, Bond and Webb (1989) concluded that residential, commercial and farmland real estate provide at least partial hedges against inflation. Tenement R square for actual inflation is 30.4% and expected inflation R square is 40.9% while unexpected inflation R square is 84.7%. The implication of the R square indicates that 84.7% of the variation in the return of the tenement property is explained by unexpected inflation, the R square was seen to be lowest in actual inflation and highest in unexpected inflation. The self-contain total return showed a perverse hedge against actual and unexpected inflation, a complete hedge against expected inflation. The inflation hedge of the total return of self -contain contradicts earlier findings of Chen and Sing (2006) that residential real estate is at least a partial hedge against inflation. The Self-contain R square for actual inflation is 35.4% and for expected inflation R square is at 44.9% while unexpected inflation R square is 39.1%. The implication of the R square indicates that 44.9% of the variation in the return of the self-contain property is explained by the expected inflation, the R square was seen to be lowest in actual inflation and highest in expected inflation.

	Inflation		Standardized	R	P-	Type of
	Components	Constant	Coefficients Beta	Square	Value (prob)	Hedge
Total Return	Actual Inflation	7.170	0.788	0.304	0.028	Complete
Tenement	Expected Inflation	6.168	-0.091	0.409	0.202	Perverse
	Unexpected Inflation	12.681	0.064	0.847	0.007	Partial
Total Return	Actual Inflation	7.170	-0.201	0.354	0.038	Perverse
Self Contain	Expected Inflation	6.168	0.788	0.449	0.212	Complete
	Unexpected Inflation	5.479	-0.081	0.391	0.242	Perverse
Capital Return	Actual Inflation	7.170	-0.196	0.604	0.025	Perverse
Tenement	Expected Inflation	6.168	-0.201	0.509	0.252	Perverse
	Unexpected Inflation	0.135	0.537	0.338	0.322	Complete
Capital Return	Actual Inflation	7.170	0.792	0.304	0.028	Complete
Self Contain	Expected Inflation	6.168	-0.196	0.409	0.202	Perverse
	Unexpected Inflation	0.135	0.310	0.338	0.322	Partial
Income Return	Actual Inflation	7.170	0.520	0.414	0.028	Complete
Tenement	Expected Inflation	6.168	0.111	0.709	0.202	Partial
	Unexpected Inflation	0.135	0.069	0.538	0.322	Partial
Income Return	Actual Inflation	0.741	0.105	0.144	0.396	Partial
Self Contain	Expected Inflation	1.465	0.836	0.373	0.268	Complete
	Unexpected Inflation	0.135	0.520	0.338	0.322	Complete

Table 3: Inflation-Hedging characteristics of hostel investment in Akure (2009 – 2018)

It was also seen in Table 3 that for the capital return, tenement property showed a perverse hedge against actual inflation, a perverse hedge against expected inflation and a complete hedge against unexpected inflation. Tenement R square for actual inflation is 60.4% and expected inflation R square is 50.9% while unexpected inflation R square is at 33.8%. The implication of the R square indicates that 60.4% of the variation in the return of the tenement property is explained by the actual inflation, the R square was seen to be lowest in unexpected inflation and highest in actual inflation.

The self-contain showed a complete hedge against actual inflation, a perverse hedge against expected inflation and a partial hedge against unexpected inflation. Self-contain R square for actual inflation is 30.4% and expected inflation R square is 40.9% while unexpected inflation R square is 33.8%. The implication of the R square indicates that 40.9% of the variation in the return of the self-contain property is explained by the expected inflation, R square was seen to be lowest in actual inflation and highest in expected inflation.

Further from table 3, for income return, tenement property showed a complete hedge against actual inflation, partial hedge against expected and unexpected inflation. This conforms to the earlier findings of Chen and Sing (2006) that residential real estate is at least a partial hedge against inflation. Tenement R square for actual inflation is 41.4% and the expected inflation R square is at 70.9% while unexpected inflation R square is 53.8%. The implication of the R square indicates that 70.9% of the variation in the return of the tenement property is explained by expected inflation; the R square was seen to be lowest in actual inflation and highest in expected inflation.

The self-contain showed a partial hedge against actual inflation, a complete hedge against expected inflation and a complete hedge against unexpected inflation. Self-contain R square for actual inflation is 14.4% and expected inflation R square is 37.3% while unexpected inflation R square is 33.8%. The implication of the R square indicates that 37.3% of the variation in the return of the self-contain property is explained by the expected inflation, R square was seen to be lowest in actual inflation and highest in expected inflation.

5. CONCLUSION

The study sought to undertake the economic analysis of inflation hedging of the return generated from hostel investment in Federal University of Technology Akure, South gate. The study area is characterised with purely private hostel developments. The study examined the rate of return of hostel investment, the inflation components and the inflation hedging capability of hostel investment. The result of the investigation has shown that the average return of total, capital and rental return for hostel investment shows a positive return. The decomposition of the inflation rates into various components was necessitated by the fact that real estate returns react differently to the individual inflation components. From the study, it was discovered that the hedging capability of hostel investments in FUTA South gate area varies. The rental income for tenement and self-contain shows at least a partial hedge against the three inflation component. Testing for total and capital returns against inflation showed different hedging attributes. While some are a complete hedge, others showed partial and perverse hedge. This revealed that the general belief that real estate is always a hedge against inflation is not always true at all times. It implies that the findings of this study will guide both individual and hostel investors in FUTA South gate area so as to know the hedging capability of the inflation components and not to go by the general perceived thought that real estate investment is a hedge against inflation. The study recommends that the Nigerian government should put relevant policies in place that will bring down the inflation rate to a single digit and also maintain a single-digit inflation rate to check volatility.

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DYNAMICS OF HUMAN RESOURCE MANAGEMENT FOR REAL ESTATE COMPETENCIES AMONG ESTATE SURVEYORS AND VALUERS IN UYO

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ABSTRACT

Purpose: The study explored the implementation of human resource management dynamics by employees and employers of Estate firms in Uyo for real estate competencies.

Design/methodology/approach: Survey research method was used. One hundred (100) structured questionnaires were administered to fifty Estate surveying and Valuation Firms in Uyo. "Human Resource Management and Employee Retention Instrument (HRMERI)" which contained 20 items on human resource management practice and 10 items on employee retention were used. Fifty-four (54) completed instruments were returned by twenty-seven firms; these represented 54 % of the firms observed.

Findings: The study found that compensation by real estate firms in Uyo had a positive influence on employee retention through rewards and benefits. The training and development as well as performance management in real estate firms positively influenced employee retention. This was possible through sufficient training for their jobs which contributed to achieving dynamism in the competencies of firms' goals. The study also discovered that work environment in the real estate firms is a vital factor that positively influenced employee retention and was achieved by firms creating an open, comfortable and safe working environment. Employees expressed high satisfaction in the way the organizations were dedicated to diversity and inclusiveness.

Research limitation/implications: The returned copies of the questionnaire (54 %) were low, due to the apathy of the respondent on completing the instruments. The uncompleted copies of the questionnaire were 46 %. The implication is that the completed questionnaire copies were not sufficient to make generalized inference.

Practical implications: The study obtained R-Square value of .856 and adjusted R-Square value of .884 which implied that 86% of the total variation in employee retention was explained by employee compensation, performance management, training and development, and work environment.

Originality/value: This research has not been published or sent to be vetted for publication by any organisation. The study is an antidote to regression in real estate competencies and the application would be a driver to efficient real estate services.

Keywords: Compensation; employee retention; human resource management; performance evaluation; real estate competencies.

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1. INTRODUCTION

This study explores the dynamics of human resource management (HRM) for improved real estate competencies among employees and employers of estate firms in Uyo. From the extant literatures, Jorrit, Tanya and Karin (2018) argue that HRM implementation in some organisations remains one-sided and static. Moreover, scholars have failed to provide an accurate overview of the dynamics of HRM implementation. Ifediora and Keke (2019) researched on human resource practices in real estate project management and found that success of real estate projects is dependent on quality of human resource practice. They noted that all the stages of the real estate project should be well monitored to ensure compliance especially as it concerns HR practices. In Uyo, this subject area remains unexplored in the profession of estate surveying and valuation. Substantial issues of concern include: compensation of workers or employees for the work done; training and development of staff of the organisation for improved skills both technically, scientifically and administratively; performance management on the sides of both the employers and the employees to evaluate the results obtainable from the employees through effective supervision of the employers; the work environment which is supposed to be friendly for efficient performance; and the employee retention which should represent evidence of satisfaction with the systemic arrangement. These enumerated issues are scarcely discussed in the fora of estate surveyors and valuers and may critically hamper the progress of the professionalism of the profession.

Human resource management practices are set of procedures that constitute the development of employees, capacity to use their talent for the organisation's goals and objectives so as to achieve competitive advantage (Khadka, 2009). It is imperative for organizations to implement human resource management practices that would motivate and ensure its human resource is well taken care of. Retaining competent employee is more important than going through recruitment and selection process in order to identify talented employee. The growth of an organization depends upon the retention of key and talented employees. The assumption which this study would test is that there is no significant effect of compensation, performance management, training and development, and work environment employee retention in Real Estate firms in Uyo.

2. LITERATURE REVIEW

2.1. Concept of human resource management (HRM)

HRM practices are distinct activities, functions and processes that aim to attract, develop and maintain organization's human resources, and are also geared toward improving employee commitment and retention. HRM practices are the best means by which organizations can influence and shape their worker's attitudes, skills and behaviour in the performance of their jobs and therefore achievement of organizational goals (Chiboiwa, Samuel, & Chipunza, 2010). Employee retention involves staying with skilled workers for a long period of time (Taplin & Winterton, 2007). Retaining skilled employees is very important to organizations transitioning from start-up stages to foster growth so it is important to keep sharp talents near organization's core competencies. The reason for employee retention is to help a firm reduce turnover cost, therefore organizations should retain best performers and competent workers with skills matching with the business main talent needs (Zingheim, Schuster & Dertien, 2009). Armstrong (2006) defines employee retention as developing policies and programs that will ensure that organizations keep their productive employees for a long period. Retention programs are designed and aimed at ensuring that human resources remain committed to the organization. The most successful organizations are the ones that attract, develop and retain individuals who have the ability to manage a global organisation that is responsive to customers and the opportunities being presented by technology. Given this, organisations take steps to retain employees, to avoid unwanted turnover due to stress, low job satisfaction, unsatisfactory working condition, and inadequate benefits. It is the human resource responsibility to find, assimilate, develop, compensate and retain talented employees. However, many organisations both public and private still face a challenge of employee retention since talented people have the luxury of choice in the global skills market.

A study on employees, retention being affected by HRM practices was conducted by (Deery, 2008). The variables tested in the study were training and development, team development, performance appraisal, person-organization fit, internal communication system, employee empowerment, employment security, and reward and compensation. Feedback forms or questionnaires circulated to employees in middle management in the textile industry. The study revealed a strong positive relationship between employee retention and HRM practices. The study found that retain-ability of employees in an organization would improve if proper HRM practices were adopted. Another study by Eisenberger, Stinglhamber, Vandenberghe, Sycharski and Rhoades (2002) in the banking industry in Ghana on the effects of human resource management practices on employee retention concluded to be of significance. The study concluded that the practices influenced retention of employees in banks: employee engagement, work-life balance and compensation.

Okotoh (2015) carried out a study to examine the effects of reward management practices on employee retention at Communications Authority of Kenya. The study found a strong relationship between retention and employee reward management. The study established the importance of developing an employee retention practice, reward management policy and total reward system. The benefits were pension scheme, health insurance, life assurance, etc. Eisenberger, et al. (2002) carried out a case study of Standard Group Limited on HRM practices influence on the retention of key employees in Kenya's the media industry. The study found that the company valued leadership qualities aligned with the recruitment process and the company's retention strategies. A survey by Wanjiru (2007) on factors influencing employee retention in manufacturing firms in Nairobi established that to a great extent, firms in the manufacturing sector valued the gaining of competitive advantage and engaged in proper HRM practices to ensure retention of the most key employees. Lepilale (2009) investigated the relationship between employee retention practices and labor turnover in Nairobi's Five Star Hotels and found that organizations value good compensation practices as a way of retaining employees and that compensation influences employee retention.

A study by Kazira (2014) to analyse the relationship between HRM practices and commitment of the employees in Kenya's retail banking sector, with a special focus on Standard Chartered Bank concluded that the practices; reward management, recruitment, orientation, performance management, training and development, health and safety, job analysis and design and career development did influence employee commitment. Recruitment and orientation influences employee commitment in that it informs them about the job. Performance management helps to identify employee needs and helps in placing what they require to improve their performance. Reward management systems influence employee commitment as they feel motivated to perform when they get satisfaction from
the rewards. Training and development influences both professional and personal career development. Health and safety influences employee commitment in that when they feel safe and secure, they are motivated to work.

2.2. Compensation of employees for work done

Compensation reveals the intention and commitment of employees and is also a compelling reason for employees to remain with their employers. Organizations have therefore opted to compensation and benefits that is market competitive to be appealing and retain competent and talented employees (Parker & Wright, 2000). Gberevbie (2008) argued that good compensation and reward packages enhanced by effective disbursement system can play a role in attracting the very best talent. It may also influence employee behavior and performance outcome as well as facilitate talent retention. Compensation (Hutchings, De Cieri, & Shea, 2011). Good rewards and benefits increase employee's commitment to the organization and discourage employees from seeking other job opportunities (Hutchings et al 2011). Mathis and Jackson (2004) noted that compensation and reward system has an effect on employee retention and thus they are a vital dimension to effective HRM practice.

2.3. Training and development for skill development

The training and development process is a way through which an employer can show their commitment to the employees. They do this by investing in time and resources spent on equipping employees with advanced skills required for better performance (Storey & Sisson, 1993). Employees tend to be more loyal to an employer who is loyal and helpful in their career growth. Most organizations that are successful understand that having training programs are also an important way of attracting and retaining the best talent that appreciates an employer that cares for their growth (Meyer and Smith, 2000) thus the importance of employers providing the opportunity of employees learning and also acquiring new skills (Deery, 2008).

2.4. Performance management for sustainable growth

Performance management is the alignment of organizational and individual objectives through ensuring corporate values are upheld by all individuals. Performance management establishes an understanding between what needs to be achieved, how it will be achieved and what approach of people management will increase the opportunity to achieve success (Zingheim et al., 2009). Performance management according to Armstrong (2009) is a "strategic and integrated approach to increase the effectiveness of organizations by improving the performance of the people who work in them and by developing the capabilities of teams and individual contributors." Therefore, performance management is about working together with an employee to identify their weaknesses and strengths in performance and on the way forward in helping them become more effective and productive workers by focusing on targets, standards and performance indicators (Eisenberger et al., 2002).

2.5. Work environment for effective productiveness

Work environment can be defined as where an employee works and is important since it significantly affects their performance, productivity and decision to remain for a longer period. Employees focus on their place of work so as to be personally comfortable and also facilitate their retention. According to Bratton and Gold (2009), the environment of work affects decisions of employees on whether to leave or stay in an organization. There is an emerging need to keep individual's commitment to their place of work by provide a conducive work environment (Chiboiwa, Samuel & Chipunza, 2010). People love work while others prefer working in a place that gives them a feeling that they have achieved and that they have made a difference in an organization that has team members who work in unison and strive to ensure that the organization is growing and moving forward (Meyer & Smith, 2000).

2.6. Employee retention for chain productivity

Ngethe, Iravo and Namusonge (2012) conducted a study on the Mining Industry in Ghana with regard to the effects of HRM practices on employee retention. He found that the factors that mostly affected employee retention included; 1) the opportunity for learn and acquire new skills in an environment promoting teamwork, 2) active participation in the policies relating and guiding their lives at work, 3) an opportunity to freely express their views and air them out, and 4) the organization communicating clearly on the firm's expectations towards the employees providing a work environment that is safe. Effectively applying the mentioned practices may lead to employee turnover reduction especially in their mining industry. The study established that health and safety, communication, training and development, information sharing, welfare, compensation, incentives and job security factors are important in the mining industry in terms of turnover rate reduction.

A study on employees' retention being affected by HRM practices was conducted by Deery (2008). The variables tested in the study were training and development, team development, performance appraisal, person-organization fit, internal communication system, employee empowerment, employment security, and reward and compensation. Feedback forms or questionnaires circulated to employees in middle management in the textile industry. The study revealed a strong positive relationship between employee retention and HRM practices. The study found that retain-ability of employees in an organization would improve if proper HRM practices were adopted. Another study by Deery (2008) in the banking industry in Ghana on the effects of human resource management practices on employee retention concluded to be of significance. The study concluded that the practices influenced retention of employees in banks: employee engagement, work-life balance and compensation.

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Gberevbie, (2008) carried out a case study of Standard Group Limited on HRM practices influence on the retention of key employees in Kenya's the media industry. The

study found that the company valued leadership qualities aligned with the recruitment process and the company's retention strategies. A survey by Wanjiru (2007) on factors influencing employee retention in manufacturing firms in Nairobi established that to a great extent, firms in the manufacturing sector valued the gaining of competitive advantage and engaged in proper HRM practices to ensure retention of the most key employees. Lepilale (2009) investigated the relationship between employee retention practices and labour turnover in Nairobi's Five Star Hotels and found that organizations value good compensation practices as a way of retaining employees and that compensation influences employee retention.

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3. Research Methodology

The study adopted a survey design. This research design was considered appropriate because it allowed the researcher to examine the study variables as they existed in the population using a representative sample without having to manipulate the variables or administer some sort of treatment to induce the observed influence. The population of the study comprised all the fifty (50) real estate firms in Akwa Ibom State. The population of the firms was used as the sample of the study because the population was not large. One hundred structured questionnaires were administered to the respondents using Human Resource Management and Employee Retention Instrument (HRMERI)." The questionnaire contained 20 items on human resource management practice and 10 items on employee retention. The questionnaire was structured in a 5-point rating scale of strongly agree (SA), agree (A), undecided (U), disagree (D) and strongly disagree (SD). SA was assigned 5 points, A; 4-points, U; 3-points, D; 2-points and SD; 1-point for positive statement items and 1-point was assigned to SA, 2-points to A, 3-points to U, 4-points to D and 5-points to SD for negative statement items. The instrument was personally administered by the researcher in all the selected firms. The mean response was $\{(5+4+3+2+1)/5\} = 3$. Thus 3.0 and above was considered agreed and below 3.0 disagreed. Out of the 100 instruments administered, 54 were returned which gave a return rate of 54 %. Data obtained from the questionnaires were analyzed using weighted mean and multiple regression analyses. The analyses were conducted using Eviews software version 10.

3.1. Regression model

The regression model used is given below: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$ *Y* is 'the Employee Retention (dependent variable)

 β_0 is the constant

 $\beta_1, \beta_2, \beta_3$, and β_4 are the regression parameter

 X_1, X_2, X_3 and X_4 are the independent variable (Compensation, Training and Development, Performance Management and Work Environment); ϵ is the error term.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Data presentation

In Table 1, the result shows that the respondents disagreed to four of the five items as shown by the mean response of below 3.0. The respondents (staff) agreed that people who are hardworking and results-oriented are rewarded in the organization as shown by the mean response of 3.16.

Table 1: Compensation

Items	Mean	Decision
The non-monetary benefits that I receive here are better than those I could get at other firms	2.13	D
My organisation has transparent and equitable policy of compensation	2.42	D
People who are hardworking and results-oriented are rewarded in the organization.	3.16	А
The salary and benefits I receive in this organisation are commensurate with my responsibilities.	2.62	D
Compensation is satisfactorily reviewed from time to time and are based on job performance	2.48	D

Table 2: Training and Development

Items	Mean	Decision
My organisation has variety training programmes to improve ability of	2.77	D
employees		
This organisation provides opportunities for staff training and career	2.83	D
development on a yearly basis.		
My organisation regularly sponsors me to participate in training or	2.60	D
career development programmes		
The organisation has provided me with training opportunities enabling	2.11	D
me to extend my range of skills and abilities		
This organisation is committed to the training and development of its	2.74	D
employees		

Table 3: Performance Management

Items	Mean	Decision
I have a clear understanding of my performance standards and		
expectations to successfully deliver on my job	3.23	А
My performance is appraised, progress and feedback are discussed	3.16	Α
regularly		
Performance management practices are participative and transparent	2.14	D
Performance development plans/goals are reviewed frequently	3.62	А
Performance evaluations are conducted fairly and I have a clear		
understanding of how performance evaluation is done	2.33	D

The result in Table 2 shows that the respondents disagreed to all the items concerning Training and development.

In Table 3, the result shows that three of the items had the mean response of above 3.0 (cut off point). The respondents however disagreed that performance management practices are participative and transparent and that performance evaluations are conducted fairly and I have a clear understanding of how performance evaluation is done. This is shown by the mean response of below 3.0.

 Table 4: Work Environment

Items	Mean	Decision
There is an open, comfortable and safe work environment	2.81	D
The organization structure facilitates teamwork, that enhance effective		
and efficient tasks accomplishment	3.27	А
The organization clearly communicate its goals and strategies to me	4.21	А
Relationships between colleagues at my workplace are friendly and	2.66	D
relaxed		
I am satisfied with the culture of my workplace.	2.09	D

In Table 4, the respondents agreed that the organization structure facilitates teamwork, that enhance effective and efficient tasks accomplishment and also agreed the organization clearly communicate its goals and strategies to me. There was however disagreement on three of the items.

Table 5	5: Emp	lovee F	Retention
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Items	Mean	Decision
I feel proud to tell other people about the organisation I work for	3.35	A1
I do not have any intention to resign from this organisation		
within a shorter time	2.29	D2
I would be happy to spend the rest of my career with this organization	2.37	D3
I am prepared to remain in the organisation because of training and		
development opportunities	2.61	D4
My immediate supervisor gives me credit for a job well done	4.22	A5
I am satisfied with the organisation as a place to work	3.21	A6
I feel emotionally attached and feel very committed to remain with my		
current organisation	2.48	D7
I am not keen to leave my organisation right now	2.89	D8
I am searching for a better job in another organisation at the moment	4.34	Α
Whenever I get a job in another organisation, I will definitely leave	4.51	А

The result in Table 5 shows that five of the items on employee retention had mean respondents of above 3.0 and equally five items below the cut off mean point of 3.0. This shows that the respondents agreed to five of the ten items and equally disagreed to five.

4.2. Test of the hypothesis

H0: There is no significant effect of Compensation, Training and Development, Performance Management and Work Environment on Employee Retention in Real Estate firms in Akwa Ibom State.

This hypothesis was tested using multiple regression analysis as shown in Table 6. The result as presented in Table 6, gives the R-Square value of .856 and adjusted R-Square value of .844 which implies that 86% of the total variation in employee retention was explained by employee compensation, performance management, training & development and work environment and after adjusting for the number of independent variables in the model, the total variation in employee retention explained employee compensation, performance management and work environment is about 84%. The F-statistic of 72.637 with the corresponding probability value of .000 measured the adequacy of the regression model and the overall influence of employee compensation,

performance management, training & development and work environment. Since P=.000<.05 (level of significance), it means that the model is a good fit and the explanatory variables jointly influenced the dependent variable (employee retention) significantly.

Method: Least Squares Sample: 1 54 Included observations: 54	MION			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
С	8.736448	2.879381	3.034141	0.0039
COMPENSATION	0.561496	0.166036	3.381778	0.0014
PERFORMANCE	0.702249	0.106866	6.571305	0.0000
TRAINING	0.015194	0.160937	0.094408	0.9252
ENVIRONMENT	0.618564	0.117168	5.279307	0.0000
R-squared	0.855690	Mean dependent	var	39.55556
Adjusted R-squared	0.843910	S.D. dependent v	ar	5.311670
S.E. of regression	2.098547	Akaike info crite	rion	4.408389
Sum squared resid	215.7910	Schwarz criterion	1	4.592554
Log likelihood	-114.0265	Hannan-Quinn ci	riter.	4.479414
F-statistic	72.63692	Durbin-Watson s	tat	0.626062
Prob(F-statistic)	0.000000			

 Table 6: Influence of Human Resource Management Practices on Employee Retention

 Dependent Variable: RETENTION

The coefficient of the constant term is 8.736 implies that holding all the explanatory variables constant, employee retention remains at 8.736 unit. The coefficient of is 0.561 which means that keeping the effect of other explanatory variables in the model constant, a unit change in compensation will cause a change in employee retention by 0.561 unit. The t value is 3.382 with the probability value of .0014<.05(level of significance). This shows that employee compensation has a significant effect on employees' retention. The coefficient of performance management is 0.702 with t value of 6.571 and P-value of 0.0000<.05(level of significance) means that a unit changes in performance management will cause a change in employee retention by 0.702 unit since P=0.0000<0.05(level of significance). This implies that performance management has a significant effect on employee retention. The coefficient of training and development is 0.015 with t value of 0.094 and P-value of 0.925 implies that a unit change in employee training & development will cause a corresponding change of 0.015 unit in employee retention. This implies that employee training & development has no significant influence on employee retention. The coefficient of work environment is 0.619 with a t-value of 5.279 and the probability value of 0.0000; imply that work environment has a significant effect on employee retention. Since all the coefficients are positive, it implies that human resource management practice has a significant effect on employee retention.

4.3. Discussion of findings

The study established that compensation in real estate organizations in Uyo has a positive influence on employee retention through rewards and benefits offered as evidenced by; the benefits awarded in their organizations which are non-monetary where better than those in other firms. This study is in line with Bratton and Gold (2009) explained compensation as the most important factor in employee retention. They also feel that their organization have transparent and equitable compensation policy. Kazira (2014) states that, skillful and competent person will perform productively if they are given the right rewards for their efforts, the salary offered to employees is important for any organization who

intends to retain workers. Hard-working employees and who are results oriented ought to be rewarded well. Additionally, employees feel that the salary and benefits they receive match with their responsibilities and compensation and these are well reviewed from time to time based on individual job performance. Every employee would love to be appreciated and receive compensation for work done. The positive responses rendered by compensation shows a remarkable rate of employee retention since employee place a lot of value on compensation.

The study established that training and development in real estate firms in Uyo positively influences employee retention by; receiving sufficient training to enable them do their job effectively. Training and development at the organization contribute to achieving effectiveness and efficiency of this organization's goals. An organization providing opportunities for staff training and career development regularly is important. This essentially improves the ability of employees to perform. This is also supported by organization having a variety of training programs to improve ability that allow employees extend their range of skills and abilities.

It is important to note that training needs are identified through a formal performance appraisal process and some organizations would sponsor their employee to participate in career development programs. This is a sign that an organization is committed to the training and development of its employees. As noted by Storey and Sisson (1993), training represents an employer commitment to his workforce, good training programs enables employees to have a high commitment to the organization. This results in low staff turnover and employees would stay in the organization for longer periods. Zingheim et al., (2009) states that lack of personal growth in an organization results in career stagnation and leads to a greater number of employee intentions to leave. Prince (2005), in its advice to organizations says that support to employees to make long-term commitment to them is through increased training and development programs.

The study established that performance management in real estate firms in Uyo positively influences employee retention by; employees understand their performance standards and expectations. Taplin and Winterton (2007) recommended that considering the variety of human resources practices available. A performance appraisal system is important in retaining talented employees. The participation of an employee in an appraisal process offers equity, fairness and justice thus giving benefits to organizational in terms of commitment (Down 2007). The performance appraisal system offers an opportunity where progress and feedback are discussed and provides a mechanism to share organization's goals and objectives with employees. Most employees in the organizations under study agree that the performance management practices in their organizations are participative, transparent and the performance development plan are reviewed frequently by the supervisor with the employee hence giving all employees a chance to have fair performance evaluation with an understanding of the criteria for performance assessment. Performance management practices are aligned to the organizational strategic goals and objectives. These findings are consistent with that of Parker and Wright (2000) who stated that performance appraisal help employers to periodically evaluate an employee's performance which is an important factor in employee retention. An appraisal system must be transparent in nature. The process should be well laid out and straightforward so as to avoid any kind of doubt so as to enable employees accept feedback on their job performance with an open mind. This is consistent with the research done by Lepilale (2009) where performance appraisal has a direct positive causal connection with employee retention.

The study also established that work environment in real estate firms in Uyo is a vital factor that positively influences employee retention by: organizations creating an open,

comfortable and safe working environment. Employees expressed high satisfaction by the way the organization is dedicated to diversity and inclusiveness. An organization structure that facilitates teamwork and communicates its strategies to its employees enhances accomplishment of tasks and goals. Friendly and relaxed relationships between colleagues at the workplace makes employees get satisfied with the culture of the workplace. In line with a study undertaken by Down (2007), he contends that an improved work environment reduces intention of turnover of auditors and thus improves the organizations retention therefore work environment is a critical component in employee retention.

5. CONCLUSION AND RECOMMENDATIONS

The study concludes that compensation affects employee retention in the real estate to a great extent; the coefficient of compensation is 0.561 which means that keeping the effect of other explanatory variables in the model constant, a unit change in compensation will cause a change in employee retention by 0.561 unit. The t value is 3.382 with the probability value of .0014<.05(level of significance). This implies that employee compensation has a significant effect on employees' retention. The study also concludes that performance management enhances retention of employees in real estate organizations. The coefficient of performance management is 0.702 with t value of 6.571 and P-value of 0.0000<.05(level of significance) means that a unit change in performance management would cause a change in employee retention by 0.702 unit. Since P=0.0000<0.05(level of significance). This implies that performance management has a significant effect on employee retention. In the study, training and development does not enhance employee retention in real estate organization. The coefficient of training and development was 0.015 with t value of 0.094 and P-value of 0.925 which implies that a unit change in employee training and development would cause a corresponding change of 0.015 unit in employee retention. This implies that employee training and development has no significant influence on employee retention. The study further concludes that work environment enhances retention of employees in real estate organization. The coefficient of work environment is 0.619 with the t-value of 5.279 and the probability value of 0.0000 which implies that work environment has a significant effect on employee retention. Since all the coefficients are positive, it implies that human resource management practice has a significant effect on employee retention. Thus, the outcomes of this study have clearly shown that HRM practices (compensation, performance management and a good work environment) do have a significant impact on employee retention. Estate firms in Uyo, from all sectors need to work on these identified determinants and make effort to apply them and the employee retention would certainly be fostered.

The following recommendations were made:

- 1. Compensation is significant to employees, but employers should not consider it as the only basis for retaining their employees, rather employees should also merit the kind of compensation they receive.
- 2. Real estate firms should device other current HRM practices that can make substantial effect and impact on retaining talented and skilled employees.
- 3. There should be wider communication of performance management policies within the organization as it makes employees clear about their performance expectation as contribution to employee retention.
- 4. From the study, the HR managers need to devise efficient and effective retention initiatives to maintain highly competent employees. There is need for real estate

sector to continually search for best practices of retaining employees and in order to gain a competitive advantage in the market.

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CONTRACTORS' CASH FLOW AND PROJECT Delivery in Akwa Ibom and Rivers States, Nigeria

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ABSTRACT

Purpose: The aim of the study is to investigate the state of contractors' cash flow and its influence on construction project delivery in selected states of south-south Nigeria with a view towards improving contractors' cash flow. The study objectives are: to ascertain the influence of project characteristics on contractors' cash flow projections for construction projects and assess the influence of contractors' cash flow projection on project performance.

Design/methodology/approach: In line with quantitative survey approach adopted for the study, 193 copies of a structured questionnaire were administered while 130 valid responses were received, translating into a response rate of 67.4%. Data collected were analysed using descriptive statistics and Kruskal Wallis. Findings indicate that the top three project characteristics that had influence on cash flow are procurement method, project duration, and client type while project type was rated the least.

Findings: Findings also reveal that "on schedule delivery of projects" was the top rated, followed by "on budget delivery of projects", and "projects delivered ahead of schedule". However, "projects delivered at an underrun" was the least rated. Findings also indicate that the influence of contractor's cash flow on 3 of the 6 project delivery indicators were not significant as they did not meet the 3-point threshold. The study also concludes that the top three project characteristics that have influence on contractor's cash flow are procurement method (in terms of traditional, design and build, project management etc.), project duration, and client type (public or corporate).

Practical implications: The study recommends among others that government should enact stringent laws and guidelines to punish parties to a contract that defaults on the issue of funding of projects. This will address delay in project execution and other risks that could hamper project delivery.

Originality/value: The study established that the top three project characteristics that have influence on contractor's cash flow are procurement method (in terms of traditional, design and build, project management etc.), project duration, and client type (public or corporate); and that good cash flow management of projects has the highest impact on timely delivery of projects.

Keywords: Cash flow; project characteristics; project performance; Nigeria.

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1. INTRODUCTION

The construction industry is reputed to be one of the largest contributors to the global economy accounting for a sizeable proportion in the Gross Domestic Product (GDP) of both developed and underdeveloped countries (Crosthwaite, 2000). According to Lowe (1993), the value added by construction is in the range of 7% to 10% for highly developed economies and around 3% to 6% for the developing economies such as Nigeria. As with other developed and developing nations, construction is vital to Nigeria's economic development which is why it produces nearly 70% of the nation's fixed capital formation and accounts for 1.4% of the country's GDP (VETITA, 2011, World Bank, 2013). Researchers have long attested to the claim that financial management is a veritable tool in construction industry (El Razek, Hosny, and Beheri, 2014). A healthy cash flow position results in liquidity of a company which helps it sustain its operation resulting in generation of higher profits and prudent re-investment of the profits results in the growth of the firm. Consistent positive cash flow position will facilitate higher profit levels and hence excess cash for investment.

Cash flow is defined by Oxley and Poskitt (1996) to be the difference between net receipt (cash in) and net disbursement (cash out) occurring in a given period. In the construction industry, Al-Joburi, Al-Aomar and Bahri (2012) disclosed that receipts (cash in) are derived from funds received in the form of monthly payments, stage of work payments, release of retention funds, and final account settlements. Disbursements (cash out) on the other hand relate to funds expended on a contract in order to pay wages and subcontractors, buy materials as well as plants and equipment. It is important to affirm that every client has the obligation to meet up with the demand responsibility of cash flow requirements of its contractors in construction projects. Therefore, regular payment from the client into the project forms the source of project cash flow for the execution of the project which invariably cannot be overemphasised.

The construction industry has continued to experience one of the highest rates of insolvency and bankruptcies when compared to other sectors such as manufacturing. Arditi, Koksal and Kale, (2000), Khosrowshahi (2000) and Ojo, (2010) have all argued that this scenario in the construction industry has been due to poor financial management, difficulties in raising long term capital, which leads to liquidity problems and high sensitivity to cash flow fluctuations especially inadequate attention to cash flow forecasting.

The influence of cash flow on project outcome has been emphasised in the literature. The determinants of project success are delivery with the appropriate cost limit, measurable time frame, acceptable quality standard, and a high level of client satisfaction (Ojo, 2012). Researchers argue that a positive net cash flow favourable to the contractor has a positive relationship with successful project outcome. In a study on cash flow and organisational performance, Nwanyanwu (2015) discovered that there is a strong positive relationship between cash flow position and net profit. Therefore, cash flow positions determine the extent of net profit performance. However, one noticeable limitation is that the study used organisation performance as the dependent variable while it was carried out in the hospitality and print media sector. This study empirically assesses the influence of contractors' cash flow as independent variable on project outcome as the dependent variable.

Given the background above, this study investigates the state of contractors' cash flow and its influence on construction project outcome in selected states of south-south Nigeria with a view towards improving contractors' cash flow and ultimately bolstering project delivery. Nigeria's south-south geopolitical zone is made up of six states including Akwa Ibom and Rivers states. They account for 50% of Nigeria's GDP, 95% of her foreign exchange earnings, and 80% of all budgetary revenues that amount to over 7 trillion naira annually (Ikediashi and Ajiero, 2019). The need to empirically examine contractors' cash flow and its influence on construction project outcome in two major stakeholder states in south-south Nigeria with a view towards bolstering project delivery in the study area is the main concern of the study.

The specific objectives are to:

- i) Examine the influence of project characteristics on contractors' cash flow projections for construction projects in the study area; and
- ii) Assess the influence of contractors' cash flow projection on project performance in the study area.

2. LITERATURE REVIEW

2.1. Concept of cash flow

Cash flow is a concept used in accounting to describe the flowing in and flowing out of money within an organisation (Nwanyanwu, 2015). Money which is cash comprises of cash at hand, cash in bank, stocks and bank overdrafts repayable on demand. There are two schools of thought in the literature on the concept of cash flow in construction management. According to Al-Joburi et al (2012), the first sees it as the difference between cash in (monies received) and cash out (monies disbursed) within a stated period under review. What this means is that a positive cash flow is an indication that there is enough cash to spend after deducting expenses; while a negative cash flow is an indication that there wold be need for overdraft to meet up with obligations relating to a project execution. Some of the obligations include payments to subcontractors, servicing of loans, wage bills, procurement of resources such as plants and equipment, as well as settling final accounts. The second school of thought sees cash flow as the transfer of cash in and out of an organisation (Cooke and Jepson, 1986). In other words, cash that is employed to manage a firm either in the form of initial capital or continuous injection of money into the business at intervals is regarded as positive cash flow and is credited as received in the company books. On the other hand, monies disbursed by a company is termed negative cash flow and is debited in the company books. The difference between these two is the net cash flow. Cash flow management is a general process of planning, forecasting, manipulating and controlling of cash flows either at the project or corporate level. Cash flow monitoring and controlling entails adequate planning of fund utilizations, efficient monitoring of budget implementation and effective evaluation of results. It has been argued by Nwanyanwu (2015) that the strength of cash flow position of a firm is a determinant to how successful it is able to manage its finances in order to achieve stated corporate objectives. Therefore, cash flows are indispensable parts of an organisation's strategic operations. This is because it needs the inflow to manage inventories, fixed assets and outflows for operational expenses (Pandey, 1979).

2.2. Cash flow and the construction industry

It has been argued that the robustness of a country's construction industry is a function of how vibrant and organised the cash flow mechanism is which is why Ojo (2012) had pointed out that financial factors have significant impact on the success or failure of the construction industry. The Construction industry has been seen as one with high certainty of risks mainly due to both in-house and outside difficulties. These challenges include fragmented nature of the industry, excessive competition due to a relatively low barrier to entry, high uncertainty in planning and implementation, and unpredictable fluctuations in construction project delivering (Ojo, 2012). Construction sector recorded high rate of business failure globally with 20.1% and more than 80% of these failure were attributed to lack of financial control (Emidafe, 2016).

The heartbeat of the construction industry is undoubtedly good cash flow management system in place for projects. Knowledge of it enables project managers to rationally make strategic decisions with regards to cash flow forecasting. On the other hand, inaccurate prediction and forecasting of cash flow can result in bankruptcy, financial distress and possible folding up of companies within the construction industry (Kaka and Price, 1993; Chukwudi and Tobechukwu, 2014). The main factors affecting cash flow in a construction project is the widespread practice of delay and underpayment by the clients, inaccurate Cash Flow Forecasts (CFF) and lack of efficiencies in monitoring and controlling of construction cash flow (Hoseini, Andalib and Gatmiri, 2015). A positive cash flow is ultimately needed to generate profits, to pay employees' salaries and wages, taxes and servicing interest on borrow funds, materials, plant, subcontractors' accounts rendered and overheads expended during the progress of the contract (Odeyinka, Kaka and Morledge, 2003).

The construction industry has been plagued over time by the problem of cost overrun mostly caused by cash flow challenges. This has given rise to several conflicts between clients and others stakeholders such as the contractors which have led to project abandonment. It is pertinent therefore to understand how the cash flow mechanism affects the construction industry.

2.3. Project characteristics

A project is a temporary, unique and progressive attempt or endeavour made to produce some kind of a tangible or intangible result (a unique product, service, benefit, competitive advantage, etc.). It usually includes a series of interrelated tasks that are planned for execution over a fixed period of time and within certain requirements and limitations such as cost, quality, and performance. Westland (2006) describes a project as a unique endeavour to produce a set of deliverables within clearly specified time, cost and quality constraints.

Before then, the Project Management Institute (PMI) (2004) had defined a project as 'a temporary endeavour undertaken to create a unique product, service or result'. The product, in the context of the construction industry, may be a building, services installation or other infrastructural project. Hence, the relevant mix of professionals is often assembled together with the aim of achieving this goal. This group of professionals is expected to possess the relevant skills, knowledge, tools and techniques to achieve the project goals. The application of these variables, skills, knowledge, tools and techniques, with the aim of achieving the required objective is referred to as project management (PMI, 2004). A project always has an owner (client) who, in the private sector, can be an individual or a company etc., and in the public sector, a government undertaking or a joint sector organisation, represent¬ing a partnership between public and private sector. Clients in the construction industry have been described as a heterogeneous group made up of private or public organisations operating in different environments with diverse reasons for their existence. This agrees with some research work by Sanusi (2008) and Ojo (2012). Ojo (2012) indicated client type as one of the five major characteristics. These five major characteristics include: client type, project type, project duration, project value and procurement method. Also, a project has a clearly defined objective to achieve within a distinct time, cost and technical performance. Money is a function of time which also bears on the quality of a product. It must be noted here that projects have a start and an end, and a life cycle. The organisation of project changes as it passes through this cycle, the activities starting from conception stage, mounting up to the peak during implementation and, then, back to zero level on completion and delivery of the project.

Project is multifaceted and consumes resources. These resources are materials, financial, equipment, human and time because of its complexity and scope. There must be an effective cash flow for utilization of these resources. The tasks that projects are assigned to solve, are defined in terms of more or less precise and realistic goals. Being a temporary arrangement, and also because the undertaking is more or less unique, uncertainty is often greater in the construction industry than what is common in permanent organisations. Samset (2003) noted that because projects are unique undertakings, they involve a degree of uncertainty. Uncertainty characterises situations where the actual outcome of a particular event or activity is likely to deviate from the estimate or forecast value. It follows that decision-making becomes more difficult as uncertainty grows. Further, that the availability of relevant information increases predictability and reduces uncertainty seen from the decision maker's point of view. Because of the uncertainty associated with planning and implementation, the extent to which the project will attain its goal is also uncertain. This is one of the reasons why improved know-how and tools that can better the planning and management of projects are of great and increasing economic significance. It is also one of the reasons why there has been an increasing tendency to evaluate ongoing and completed projects. Ritchie and Marshall (1993), opined that uncertainty may have many various causes, related to the situation itself, the design of the project, the time perspective, available information, the implementation of the project, etc. According to Samset (2003), there are numerous examples of projects that have caused high additional cost for the society both during and after they have been implemented. Morris and Hough (1991), in their study of major projects, concluded that the track records of projects are fundamentally poor, particularly for the larger and more difficult ones. Overruns are common. Many projects appear as failures, particularly in the public view. It therefore seems that there is a contradiction between the increasing use of projects and the fundamental problem of projects often overrunning their budgets and exceeding their set limits. However, in reality, most projects attain their objectives in one way or another. Samset (2003), noted that there are several reasons for the increasing use of projects today. One answer is that many tasks in society are so enormous and complex that individual organisations lack the competence or capacity to carry them out alone. This is particularly the case in small countries. Another answer is that the project focuses and visualizes the task, and therefore has a motivating effect on all stakeholders.

Samset (2003) has also indicated that in projects, responsibilities are clarified and the different parties are made accountable. Moreover, the project is an expedient way of

transferring risk from the financing to the implementing party. The project is also a conducive way of organisation, which allows participants to pool resources and cooperate towards a common goal.

2.4. Cash flow and project delivery

Cash flow defines the expenses and revenue of the single project or whole company per time and reflects their present and future situations by demonstrating net cash conditions (Usman et al., 2016). Cash flow is a financial model necessary to count the demand for money to meet the project cost and the pattern of income it will generate (Smith, 2008). According to Usman et al. (2016), Construction is capital intensive and money is the lifeline of any construction work which dictates the scope, pace, quality, direction and final product. Money needed to acquire construction resources such as materials, labour, plants and management expertise. The contractor also requires working capital to finance day-to-day activities on a construction site. Barbosa and Pimentel (2001), indicated that the cash flow of the project normally consists of a complete history of all payments, cost, and all revenues. Furthermore, cash flow prediction needs to be effective and fast enough, according to the inadequate time and costs especially at the tendering phase. Contractors scarcely prepare a detailed construction plan at this phase, and usually waiting until the contract being awarded. So, a fast and effective approach for prediction of cash flow is highly desirable. Cash flow is a useful tool for capital budgeting practices in decision - making process while making anew investment (Usman et al., (2016). It is good for cost planning technique helps in taking bid/no bid decisions of the company during the tendering stage of the project. Besides, cash flow will assist the contractors in the selection of contracts that will not cause serious cash problems due to the lack of sufficient financial resources (Kaka and Price, 1993). Also enables tracking both cost and revenue of the project through time. It will be useful in pretender stage for making good estimation and determine the contingency, make-up percentage of the bid cost. It develops a cash conscious culture in the company by promoting allocation, usage and control of resources effectively (Usman et al., 2016).

Cash management is required for planning, monitoring and controlling the cash flow of the project and taking necessary actions against anticipated cash flow problems, in order to complete the project on time, within the budget and to the expected quality (Usman et al., 2016). An efficient cash management should control the expense of the project and consider the possible rate increase in inflation and its pressure on the project expenses. It should also optimise cash collection and improve cash capacity to make the project more profitable. Usman et al (2016) opined that the financial management strategy and the cash flow are the two interrelated items of a project affecting and determining each other. Since cash flow is the plan of predicting the future cash requirement of the project, all attitudes about the prospect of the project should take into account while developing flow. For instance, for the same project, the final cash flow curve will change considerably if the contractor planning to apply the front- loading strategy. Besides, if cash shortage foreseen by the cash flow analysis of the project, the company should prepare financial management strategies to cover the cash deficit and complete the project (Usman et al., 2016). Therefore, it is important to determine possible strategies while making cash flow analysis. Marc (2009) has indicated some tactics applied by the contractor to improve the cash deficiency of a project such as front- loading and back-loading. Front loading is mostly used in unit price type of contracts. In tendering stage, the contractors enhance the cash flow conditions without changing the tender price by increasing the work items going to be constructed at early stage and reducing those going to be held on at the end in order to balance the cost of the original tender price. Back loading involves situation where the contractors foresaw cash problem due to inflation, they try to postpone the item to be constructed at the expense of the earlier ones.

According to Samset (2003), projects are evaluated more frequently than institutions and other more permanent initiatives. This is because projects are temporary undertakings that are implemented in a confined period of time, where there is a desire to evaluate the outcome before the project is formally terminated. The concept of project success has remained ambiguously defined both in the project management literature and, indeed, often within the psyche of project managers. Projects are often rated as successful because they have come in on or near budget and schedule and achieved an acceptable level of performance. Other project organisations have begun to include the client satisfaction variable in their assessment of project success. Until project management can arrive at a generally agreed upon determinant of success, our attempts to accurately monitor and anticipate project outcomes will be severely restricted (Pinto and Slevin, 1988).

3. Research Methodology

3.1. Research design

This study adopted survey design. According to Creswell (2009), it provides quantitative or numerical description of trends, attitudes or opinion of a population by studying a sample of that population. The researcher then generalises or makes claims about the population from the sample results. The approach was adopted because it enabled the researcher to collect quantitative data (in this case, cash flow related data) which can be analysed quantitatively using descriptive and inferential statistical tools; while data collected can help to explain reasons for particular relationships between variables, and produce models of the relationships; the possibility to generate findings that are representative of the whole population (Saunders, Lewis, and Thornhill, 2009).

3.2. Area of study

The study was carried out in two of the six states that make up the oil rich South-South geopolitical zone of Nigeria. Nigeria's south-south geopolitical zone is made up of six states including Akwa Ibom, Bayelsa, Cross Rivers, Delta, Edo, and Rivers. The zone accounts for 50% of Nigeria's GDP, 95% of her foreign exchange earnings, and 80% of all budgetary revenues that amount to over 7 trillion naira annually (Ikediashi and Ajiero, 2019). According to the official website of Akwa Ibom State government, akwaibomstate.gov.ng (2012), Akwa Ibom state was created on September 23, 1987 out of the then Cross River state and lies between latitude 4035" and 5033" North and longitude 7035" East. It is bounded in the west by Cross River State, on the North by Abia state, and on the South by the Gulf of Guinea. It is currently the highest producer of oil and gas in Nigeria which has accounted for the high level of infrastructural development going on in

the state. This has attracted the influx of major local and international contractors to the state. On the other hand, Rivers State prides as the most populous state in the south-south geopolitical zone with a population of 5,198,716 making it the sixth populous state in Nigeria (National Population, 2006). Created on May 27, 1967, it is bounded on the south by the south-eastern states of Anambra, Abia, and Imo; to the east by Akwa Ibom state; and to the west by Bayelsa and Delta states (Ikediashi, 2014). It serves as the economic nerve centre of Nigeria's oil and gas industry which has made it to be one of the greatest construction hub in Nigeria. The two states were selected for the study to examine the state of cashflow for construction works in the study area given that the states are witnessing massive construction activities in which the researcher has been personally involved.

3.3. Population and sample

Population of a study is defined as the collection of all items whether of people or of objects or of events, that are to be considered in a given problem situation (Udofia, 2011). Population of this study comprised of clients, consultants and contractors for government and private oriented projects in the two states of Akwa Ibom and Rivers. Sample on the other hand, is a small part of the population observed for the purpose of making inferences about the population (Corbetta, 2003). Target respondents who formed representatives of clients, consultants and contractors were mainly built environment professionals such as Builders, Quantity Surveyors, Architects and Civil Engineers. However, the sample frame which forms a list of people, places, or items from which the sample is to be drawn (Udofia, 2011), was drawn from the registrar of the relevant bodies in the two states. These included the NIOB, NIA, NIQS, and NSE. Meanwhile, only registered civil engineers were extracted from the list of engineers in the registry of NSE. This is shown in Table 1.

State	NIOB	NIQS	NIA	NSE (NICE)	Sample Frame
Akwa Ibom	25	54	55	23	157
Rivers	31	64	69	51	215
Total	56	118	124	74	372

 Table 1: Sample frame of the study

To generate the group sample size, the formula suggested by Yamane (1967) was adopted. It states that:

$$n = \frac{N}{1 + N(e)^2} \dots (Equation 1)$$

Where n = sample size, N = Population size, e = level of precision = 0.05 at 95% confidence level. The result is shown in Table 2. To aggregate the group sample size proportionally into each professional body, the formula adopted by Nwankpa (2011) was used. It states:

Where n = sample frame of each stratum

N = Total population

S = Total sample size

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The same approach was adopted by Ebiloma (2017). Table 2 shows how it was used to generate sample size for each professional body in each of the two states.

Tuble 21 Sample Size calculation			
Professional body	Sample frame	Sample (n)	
NIOB	56	29	
NIQS	118	62	
NIA	124	64	
NSE (NICE)	74	38	
Total	372	193	

Table 2: Sample size calculation

A total sample size of 193 was therefore used for the study.

3.4. Sampling techniques

This study adopted stratified random sampling and simple random sampling techniques. Stratified random sampling was used to divide the respondents based on location (states) so as to obtain a proportional representation from each of the two states. For each state, it was also used to stratify respondents based on their professional affiliations. To obtain the actual sample size for respondents from each professional body, the formulas suggested by Yamane (1967) and Nwankpa (2011) were used. The result is shown in Table 2.

Simple random sampling is a probability sampling technique where each and every respondent in a finite population has an equal chance of being included in a sample. For this study, names of respondents drawn from the directories of the professional bodies were coded and the codes written on slips of paper before a lottery was conducted as suggested by Kothari (2004). This was repeated several times until the actual number of sample units required were met.

3.5. Data collection

Data for this study was collected through a structured questionnaire. The questionnaire approach which underpins survey research design is very appropriate because of its inherent advantages. For instance, the responses will be gathered in a standardised way thereby facilitating easier analysis while bias errors are drastically reduced. Besides, it will be relatively faster and more convenient to collect potential information from a large group of respondents (Saunders, Lewis, and Thornhill, 2009). The questionnaire addressed questions relating specifically to (1) sample characteristics (respondents and projects), (2) contractors' cash flow projections and (3) project delivery in terms of time and cost.

The scale of measurement for the study included nominal, interval and ordinal (Likert) scales. Nominal and interval scales were used for questions relating to personal and project characteristics while Likert scale was used for questions relating to the objectives of the study. The five point Likert scale ranged from the least rating of 1 to the highest rating of 5. In particular, respondents were asked to rate the level to which they think the listed project characteristics have influenced accuracy of cash flow for projects they have been involved using a 5 point Likert scale of: 1 = very low influence, 2=low influence, 3=slightly high influence, 4=high influence and 5=very high influence. They were also asked to rate the extent to which they believe that contractors' cash flow has impacted on project delivery indicators using the scale of 1 = strongly disagree, 2=disagree, 3=slightly agree, 4=agree and 5=strongly agree.

To demonstrate the extent to which the constructs in the questionnaire would yield consistent findings, Cronbach's alpha was adopted. According to Pallant (2010), alpha values of 0.7 and above are sufficient. Table 3 shows results of the reliability analysis and clearly indicates that all the constructs are above the suggested threshold.

Constructs	Alpha value	Number of items
Risk factors	0.828	31
Project characteristics	0.833	5
Project delivery	0.813	6

Table 3: Reliability analysis result

In order to validate contents of the questionnaire, draft copies were scrutinised by a team made up of a researcher, representative each of a contractor, a client and a consultant to some on-going projects. This led to some adjustments and re-alignments to ensure effective delivery in the administration of questionnaire. Copies of the questionnaire were then administered by the researcher to 193 respondents who represented clients, consultants and contractors in the survey.

3.6. Data analysis

Data collected was analysed with the help of Statistical Package for Social Sciences (SPSS) Version 22. Specifically, descriptive statistics were used to analyse objectives of the study while Kruskal Wallis test was used to test the three hypotheses postulated for the study. According to Pallant (2010), it is a non-parametric statistical tool based on chi-square distribution to test difference between several independent groups in distributions which are not normally distributed. The decision rule is that the null hypothesis is accepted if the significant level presented as asymptotic significance is greater than 0.05 (5% level of significant difference), otherwise the null hypothesis is rejected and alternate hypothesis is accepted.

4. **Results and Discussion of Findings**

4.1. Response rate analysis

A total of 193 copies of the structured questionnaire was however distributed to respondents. The results of analysis is indicated in Table 4.

Table 4: Response rate analysis result				
Professional body	Administered	Returned	Response	rate
			(%)	
NIOB	29	13	44.8	
NIQS	62	29	46.8	
NIA	64	58	90.6	
NICE(NSE)	38	30	78.9	
Total	193	130	67.4	

The results show that architects had the highest return rate of 90.6% while builders had the least rate of return of 44.8%. However, of the 193 administered, 130 respondents returned valid responses giving a cumulative response rate of 67.4%.

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4.2. Sample characteristics

Table 5 shows the breakdown of respondents into sex, profession, organisation, work experience and location.

Characteristics	Frequency	Percentage (%)
Sex		
Male	112	86.2
Female	18	13.8
Total	130	100
Profession		
Builders	13	10.0
Quantity surveyors	29	22.3
Architects	58	44.6
Civil engineers	30	23.1
Total	130	100
Organisation		
Client	37	28.5
Consultant	35	26.9
Contractor	58	44.6
Total	130	100
Work experience		
0-2 years	10	7.7
2-5 years	42	32.3
5-10 years	76	58.5
Over 10 years	2	1.5
Total	100	100
Location		
Akwa Ibom	50	38.5
Rivers	80	61.5
Total	130	100

Table 5: General characteristics of respondents

The results indicate that male respondents were 86.2% of the total respondents while female participants were paltry 13.8%. This apparent low response of female respondents could be attributed to the fact that the construction industry especially in Nigeria is dominated by the male folks.

In terms of **professional affiliation**, the architects were the highest number of participants with 44.6%. This was followed by the civil engineers at 23.1%, the quantity surveyors at 22.3%, and the builders at 10%. In terms of organisational affiliation, contractors had the largest number of respondents at 44.6%, followed by clients at 28.5%, and consultants at 26.9%. This was expected especially given that the research was about an issue of concern to contractors. However, in a cross tabulation analysis shown in Table 6, it was discovered that out of 37 respondents who represented the client organisations, 17 were architects, 10 were civil engineers, and 3 were builders, while 7 were quantity surveyors. Also in contractor organisations, there were 24 architects, 16 civil engineers, 7 builders and 11 quantity surveyors that represented the consultant organisations. The outcome is an indication that there was a proportional balance of the built environment professionals in the three classes of organisation used for the survey.

		Organisation						
		Client	Contractor	Consultant	Total			
Profession	Architect	17	24	17	58			
	Civil engineer	10	16	4	30			
	Builder	3	7	3	13			
	Quantity surveyor	7	11	11	29			
Total	· · ·	37	58	35	130			

Table 6: Profession versus Organisation Cross tabulation

In terms of **work experience** in the construction industry, 58.5% of respondents had experience of between 5 and 10 years. This was followed by those within the range of 2 to 5 years at 32.3% while those with a range of 0 to 2 years were 7.7% of respondents. Only 1.5% of respondents had over 10 years of experience. This shows that a good number of respondents are experienced and share reliable information about the concept of cash flow in the construction industry. In terms of location, 61.5% of respondents are based in Rivers state while 38.5% are based in Akwa Ibom state. However, in the cross tabulation analysis of professional affiliation against location, the results show that architects formed the largest number of participants in both states (please see Table 7 below).

Table 7: Profession versus Location Cross tabulation

		Location						
		Akwa Ibom	River state	Total				
Profession	Architect	17	41	58				
	Civil engineer	9	21	30				
	Builder	9	4	13				
	Quantity surveyor	15	14	29				
Total		50	80	130				

Overall, the results on profile of respondents show that there was a proportional spread of respondents across all indicators while respondents who returned valid responses were knowledgeable and experienced. Therefore, information received from them were deemed reliable and free of any bias.

4.3. Influence of project characteristics on contractor's cash flow

The first objective was to ascertain the influence of project characteristics on contractors' cash flow projections for construction projects in the study area. To carry this out, 5 most cited project characteristics were sourced from the literature and subjected to the opinion of respondents. They were asked to rate the level to which the project characteristics have influenced cash flow projections for projects they have been involved using a 5 point Likert scale of: 1 = very low influence, 2=low influence, 3=slightly high influence, 4=high influence and 5=very high influence. The result of the analysis is presented in Table 8.

Result from Table 8 shows that procurement method (in terms of traditional, design and build, project management etc.) was the most rated project characteristic that has influence on contractor's cash flow. This is closely followed by project duration at 2nd, and client type (public or corporate) at 3rd while project type (public or private) was rated the least. The result however indicates that all the project characteristics have significant influence on contractor's cash flow projections for construction projects in the study area all had mean score above the 3-point threshold.

		2									
Code	Project	Builders		Quantity Architects		ects	Civil		Overall		
	characteristics			surveyors				engineers			
		Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
PC01	Project type (public or private)	4.615	3	3.724	5	3.379	5	3.700	5	3.654	5
PC02	Procurement method	4.539	4	4.276	3	3.983	2	4.266	2	4.169	1
PC03	Project value (project sum)	4.692	2	4.379	1	3.828	3	3.867	4	4.046	4
PC04	Project duration	4.231	5	4.172	4	4.120	1	3.967	3	4.108	2
PC05	Client type (public, private or corporate)	4.769	1	4.310	2	3.724	4	4.267	1	4.085	3

Table 8: Results of analysis for influence of project characteristics on contractor's cash flow

4.4. Test of hypothesis three on influence of project characteristics on contractor's cash flow projections

The first hypothesis postulated for the study states that there is no significant difference in the perception of respondents (based on their professional affiliations) on the influence of project characteristics on contractor's cash flow projections in the study area. Kruskal Wallis test was used to test the hypothesis. The decision rule is that the null hypothesis is accepted for p-values is greater than 0.05 (5% level of significant difference), otherwise the null hypothesis is rejected. The results of analysis are presented in Table 9.

 Table 9: Kruskal Wallis test result for influence of project characteristics on contractors' cash flow projections for construction projects

Profession	Ν	Mean	Chi	Df	p-value	Decision
		rank	square			
Builders	13	97.38	11.907	3	0.008	Reject
Quantity surveyors	29	65.91				
Architects	58	59.65				
Civil engineers	30	62.60				

The result from Table 9 shows that the p-value for the hypothesis is 0.008, which is less than the 0.05 significant level benchmark. The hypothesis is therefore rejected, indicating that there is significant difference in the perception of Builders, Architects, Civil Engineers and Quantity Surveyors on the influence of project characteristics on contractor's cash flow projections.

4.5. Contractor's cash flow and project delivery

The second objective was to assess the influence of contractors' cash flow on project performance in the study area for construction projects in the study area. Respondents were asked to rate the extent to which contractors' cash flow has impacted on project delivery (time and cost) using a 5-point scale of 1 = strongly disagree, 2=disagree, 3=slightly agree, 4=agree and 5=strongly agree. The result of the analysis is presented in Table 10.

Code	Project	Builders		Quanti	Quantity Architects		Civil		Overall		
	performance		surveyors				engineers				
	targets	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
PD01	Projects	2.308	5	2.310	5	2.241	6	2.700	5	2.369	5
	delivered										
	behind										
	schedule										
PD02	Projects	3.923	2	4.000	2	4.138	1	4.000	1	4.054	1
	delivered on										
	schedule										
PD03	Projects	3.539	3	3.552	3	3.621	3	3.567	3	3.585	3
	delivered										
	ahead of										
	schedule										
PD04	Projects	4.154	1	4.138	1	3.966	2	3.833	2	3.992	2
	delivered on										
	budget										
PD05	Project	2.692	4	3.276	4	2.552	4	3.100	4	2.854	4
	delivered at										
	an overrun										
PD06	Project	1.923	6	2.138	6	2.345	5	2.533	6	2.300	6
	delivered at										
	an underrun										

Table 10: Results of analysis for influence of contractor's cash flow on project delivery

Table 10 shows that "on schedule delivery of projects" was rated 1st by respondents, followed by "on budget delivery of projects" at 2nd, and "projects delivered ahead of schedule" at 3rd. However, "projects delivered at an underrun" was the least rated. The result also indicates that the influence of contractor's cash flow on 3 of the 6 project delivery indicators were not significant as they did not meet the 3-point threshold.

4.6. Discussion of findings

Findings show that procurement method has the greatest influence on contractor's cash flow according to the opinion of respondents. This is in agreement with the findings of Ruben and Ger (2008) and Ling (2004) that discovered that every procurement method in use has high impact on cash flow for construction and engineering projects. Plausibly, the type of procurement route (which may be traditional, design and build, or project management) used for executing projects could determine how successful or woeful the inflow and outflow of cash required for the project can be. Project type (public or private) was rated however the least rated. This may mean that respondents do not see project in terms of its type as having any contributory influence on the contractor's cash flow. Findings also indicates that all the project characteristics have significant influence on contractor's cash flow projections for construction projects in the study area all had mean score above the 3-point threshold. The p-value for the third hypothesis is 0.008, which is less than the 0.05 significant level benchmark. The hypothesis is therefore rejected, indicating that there is significant difference in the perception of Builders, Architects, Civil Engineers and Quantity Surveyors on the influence of project characteristics on contractor's cash flow projections. What this implies is that there are dissenting voices among the respondents on the influence of project characteristics on contractor's cash flow.

Findings on the assessment of the influence of contractors' cash flow on project performance in the study area for construction projects indicates that "on schedule delivery of projects" was the top rated and followed by "on budget delivery of projects" and "projects delivered ahead of schedule". However, "projects delivered at an underrun" was the least rated. This implies that respondents are of the view that a good cash flow management of projects has the highest impact on timely delivery of projects. This is because when money and other resources are flowing in and out of a project normally, the project is bound to be delivered on schedule. This is also true of other project delivery indicators such as on budget and ahead of schedule.

5. CONCLUSION AND RECOMMENDATIONS

The aim of the study was to investigate the state of contractors' cash flow and its influence on construction project delivery in selected states of south-south Nigeria with a view towards improving contractors' cash flow and ultimately bolstering project delivery. Four objectives were formulated to achieve the aim. In line with quantitative survey approach adopted for the study, 215 copies of a structured questionnaire were administered while130 valid responses were received to give a response rate of 60.5%. Data collected were analysed using descriptive statistics and Kruskal Wallis.

Based on findings that emanated from the study, it is concluded that the top three project characteristics that have influence on contractor's cash flow are procurement method (in terms of traditional, design and build, project management etc.), project duration, and client type (public or corporate). Finally, the study concludes that effective management of contractor's cash flow projections has the most significant influence on projects being delivered on schedule.

The following recommendations are made based on findings of the study:

- 1. Clients should properly cash back projects by ensuring that cash flow mechanism of contractors is not unnecessary disrupted so as to achieve successful project delivery.
- 2. Government should enact stringent laws and guidelines to punish parties to a contract that defaults on the issue of funding of projects. This is to avoid delay in project execution and other risks that could hamper project delivery.
- 3. The study was based on perception of respondents. Although very difficult to get due to strict confidential nature of financial data, further research could be conducted using hard/archival financial data to develop robust cash flow predicting models.
- 4. The study was mainly quantitative-based research. A more inclusive qualitative case study research involving interviews and group discussion could be carried out to triangulate outcome of this study.
- 5. The study was restricted to two of the six states that make up the south-south geopolitical zone mainly due to some unavoidable restraints. A further research could be conducted to accommodate more or all of the states with a view towards generating a comprehensive database that could be used to compare with studies from other geopolitical zones in Nigeria.

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TIMELY DELIVERY OF PROJECTS AND ECONOMIC DEVELOPMENT IN NIGERIAN CONSTRUCTION INDUSTRY: A CASE STUDY OF ONDO STATE

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ABSTRACT

Purpose: The relationship between timely delivery of construction projects success and economic development in Nigerian construction industry involves managing the resources—workers, machines, money, materials and methods used. Some projects are effectively and efficiently managed while others are mismanaged, incurring much delay and cost overruns and negatively affecting the economy. This paper assessed the relationship between timely delivery of construction projects and economic development in Nigerian construction industry.

Design/methodology/approach: Survey design was adopted to collect data from professionals from the study area. Questionnaires were administered to construction professionals in Ondo state which include Architects, Builders and Quantity Surveyors. The quantitative research method was adopted for this study and the adopted questionnaire was structured on a five-point Likert scale to elicit the opinion of respondents on timely delivery of projects and economic development in the Industry. Spearman correlation coefficient was used for assessing the relationship between timely delivery of construction projects and economic development.

Findings: It was evident from the study that there is slightly high relationship between timely delivery of construction projects and economic development within Nigerian construction industry with the highest degree being 55.1% and lowest as 31%. The findings revealed that timely delivery of construction projects tends to increase economic growth in the study area.

Originality/value: This study recommends that there should be proper planning of a project before the commencement of the construction so every activity can go smoothly and the project can be delivered on time. Likewise, contractors should be familiar with the site of the construction so they can have knowledge of the topography so there would not be problem of unforeseen ground conditions.

Keywords: Construction industry; economic development; infrastructure; project success.

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1. INTRODUCTION

Project success can be defined as meeting goals and objectives as prescribed in the project plan. A successful project means that the project has accomplished its technical performance, maintained its schedule, and remained within budgetary costs (Anaman 2007). Construction industry has contributed to changes in the level of development in the country through generation of employment; direct creation of wealth and reduction of poverty by contributing to the Nigeria Gross National Product (GNP) and GDP (Satope and Akanbi, 2014). According to Olajide (2004) Economic development is the process whereby the real per capita income increases over a long period of time. Development from the standpoint of what has been happening to poverty, unemployment and inequality over time. One of the important role in the effective management of a project is Project management tools and techniques. Therefore, a good project management lies in the management tools and techniques used to manage the project (Kumaraswamy and Chan, 2002). Project management involves managing the resources—workers, machines, money, materials and methods used. Some projects are effectively and efficiently managed while others are mismanaged, incurring much delay and cost overruns and negatively affecting the economy (Frimpong, 2003). Assessing construction projects' delivery time is critical in today's market-driven economy.

According to Eriksson (2007), to improve the economy and maximize long-term return on public investment, government agencies have recently started utilizing new types of contracting methods that are designed to achieve multiple project objectives, including minimizing construction cost and duration, while maximizing its quality. When time factors in construction of projects are allocated correctly, this leads to timely delivery of the projects and there won't be cost overruns, the project can be put to good use and this will improve the social and economic development (Odeyinka, 1997). The timely delivery of a construction project would not cause high overhead costs because there won't be need for longer time of work and increase in labour costs (Assaf, 2006). Long et al., (2004) opined that the delivery of construction projects on time leads to the satisfaction of all construction parties involved. Timely delivery of a project serves as a crucial benchmark for assessing the performance of a project and the efficiency of the contractor (Kumaraswamy and Chan, 2002).

Significant research advancements have been made in the area of optimizing construction resource utilization (Calderon and Serven (2004); Estache (2005); Assaf, (2006) and Frimpong, (2003)). This led to a number of optimization models. These models can be classified according to their optimization objectives into models that attempted to minimize project time and/or improve resource utilization, minimize time and cost for non-repetitive construction using time-cost trade-off analysis and minimize time and/or cost for repetitive construction. So, this research assessed the relationship between timely delivery of construction projects and economic development in Nigerian construction industry. While the above research study seeks to provide significant contributions to the area of optimizing construction resource utilization, there has been little or no reported research focusing on multi objective models for optimizing construction time, cost, and quality. All construction contracts allocate time between clients and contractors. Hence the benefit of this study would better inform improved project relationships and communications and also improve construction administration practices between clients and contractors.

2. LITERATURE REVIEW

2.1. The relationship between the timely delivery of construction projects and economic development

The construction industry is an important part of thee economical backbone in many countries, often accounting for between 7—10 percent of the Gross Domestic Product, (Winch, 1996; Voordijk et al, 2000). Construction products and processes have a large impact on safety, health and environmental aspects, (Bayliss et al., 2004). Since all human beings in modern societies are directly affected by its processes and/or products, the importance of a well-functioning construction industry is beyond doubt (Cheung et al., 2004; Eriksson, 2007). In many countries the construction industry has, however, attracted criticism for inefficiencies in outcomes such as time and cost overruns, low productivity, poor quality and inadequate customer satisfaction (Latham, 2004). Practitioners, researchers and society at large have, therefore, called for a change in attitudes, behaviors and procedures in order to increase the chances for construction projects to be successful and result in improved end products (Dubois and Gadde, 2002).

Both developing and developed nations have realized and understood the significance of construction sector in socio-economic and sustainable development of a country. Construction activities are closely linked with the various phases of economic development of a country. This has been discussed for several years at macroeconomic level in America. Historically construction activities have been associated with the process of industrial and urban development since the dawn of Industrial Revolution, (Rostow, 2003). Construction is an industry that involves complex and dynamic processes. It consists of successful coordination of multiple discrete business entities such as professionals, tradesmen, manufacturers, trade unions, investors, local authorities, specialists, trade contractors and others.

Construction projects impact on a nation's economy. Successful completion of construction projects leads to wealth creation; socio-economic growth and improved standards of living. Nations are evaluated as "developed", "developing" and "underdeveloped" based on the quantity and quality of completed construction projects in their domain. The key role of construction sector in aggregate economy has been widely highlighted in the literature. It is stated that there is a direct relationship between construction output and national output. It is also pointed out that the construction output grows more rapidly than national output when economy grows and vice versa, Wells (2006). This implies that the construction sector is highly integrated with other sectors of the economy through both backward and forward linkages and strongly linked with many economic activities. These linkages are stems for the sector through which it generates higher multiplier effect in the economy. So that any change in the construction sector must affect other sectors of the economy and finally impact goes to national income (Ofori, 2000). Hence the construction industry is often considered as an engine of economic growth specifically in developing economies. The industry can activate and successfully- consume locally produced material and manpower in the construction and maintenance of buildings and infrastructures to motivate local employment and improve economic efficiency (Anaman 2007). Construction sector thus has a great impact on socio-economic development of a country.

2.2. Infrastructural facilities extension

Infrastructure is basic essential services that should be put in place to enable development to occur, (Jodie and Ogunrinola, 2011). Economic development of Nigeria can be facilitated and accelerated by the presence of infrastructure. If these facilities and services are not in place, development will be very difficult and in fact can be likened to a very scarce commodity that can only be secured at a very high price and cost. The provision and development of infrastructures has been the subject of much theoretical analysis and empirical studies. The relationship between infrastructural development and economic growth has, in recent years become one of the most important economic topics in both academic and policy cycle, (Roller and Waverman 2009). Economic growth implies increase in per-capital Gross Domestic Product hereafter written as GDP.

2.3. Wealth creation

Construction projects impact on a nation's economy. Successful completion of construction projects leads to wealth creation; socio-economic growth and improved standards of living. Nations are evaluated as "developed", "developing" and "underdeveloped" based on the quantity and quality of completed construction projects in their domain. The key role of construction sector in aggregate economy has been widely highlighted in the literature. It is stated that there is a direct relationship between construction output and national output. It is also pointed out that the construction output grows more rapidly than national output when economy grows and vice versa. (Wells, 2006).

2.4. Socio-economic growth

Given the recognized importance of timely delivery of construction project to economic development and growth, construction has been used mainly by policy makers as a tool, and changes to the portion of public spending going towards construction activity has been a feature of various governments' fiscal policy measures. Indeed, the importance of the industry to economic growth, especially in the case of developing countries, where evidence suggests that the share of construction output to national output is highest and of greater importance (Ruddock and Lopes, 2006), continues to motivate research into the sector. Hosein and Lewis (2004) suggested that the importance of construction in particular to a developing country, is due to its size, the fact that it provides investment goods, and the size of government investment.

2.5. Improved standard of living

Improvement in standard of living is the direct result of economic growth. Per capita consumption of goods and services increase because per capital production of goods and services increase. When more is been produced, more can be consumed. Therefore, when a construction project is delivered on time, the infrastructure can be used for what it is meant for and it can affect the economy positively. The ideal measure would include GDP or GNP per capita and they include investments in equipment and industries which increase the ability to produce more and ultimately consume more, in turn improving living standards.

3. Research Methodology

3.1. Survey

The research design used was quantitative research using survey technique to get results. Survey research uses questionnaires to collect data from a sample that has been selected to represent a population to which findings can be generalized (Kothari, 2004). Since the building construction industry was being considered, both consultants and contractors in Akure was focused on as respondents. Moreover, the population falls within manageable size, therefore, census method is adopted. The completed and returned questionnaires were analysed. The respondents were asked to express their level of assessment on a 5-point Likert. 124 questionnaires were administered to construction firms in Ondo on a 5-point Likert-type scale with focuses 1 and 5 representing strongly disagree and strongly agree, respectively. Other parts of the questionnaire are intended to assemble demographical data about the respondents.

3.2. Data collection

For the purpose of this research the research population was registered professionals in the Construction industry in Akure, Ondo State which include 27 Architects, 40 Builders & 57 Quantity Surveyors. 124 questionnaires were administered to construction professionals in Ondo state where 102 were retrieved and 90 were suitable for analysis. This is representing a response rate of 82 percent, which is far above the usual response rate of 20-30 percent for questionnaire surveys in construction management studies which were suggested by Akintoye (2000). This research work employed the use of primary data. The procedure for data collection for this research work as span a month and the questionnaire was self-administered to professionals. Out of 124 distributed questionnaires 90 were returned which 15 represent Architects, 32 Builders, and 43 Quantity surveyors. 60% of the respondents were from consulting firms and 40% were from contracting.



Figure 1: Type of organization

Also 46.7% of the respondents has an experience between 1-5 years, 26.7% of the respondents has an experience between 6-10 years, 6.7% of the respondents has an experience between 11-15 years, 8.9% of the respondents has an experience between 16-20 years while 11.1% of the respondents has an experience above 20 years. This means that they are appropriate to fill the questionnaire according to level of experience



Figure 2: Years of experience

3.3. Data analysis

An appropriate technique of analyzing data is very important to be able to process the data collected accurately. Correlation is the technique that is concerned with describing the strength of the relationship between two variables by measuring the degree of scattering of the value data (Kothari & Garg, 2014). Spearman correlation coefficient was used for assessing the relationship between timely delivery of construction projects and economic development. Its value ranges from -1.0 to +1.0 and it is used to examine the association level or the strength of the relationship between two variables (Oke, Aghimien and Olatunji, 2015).

4. PRESENTATION OF RESULTS

A spearman's rank-order correlation was used to determine the relationship among infrastructural facilities extension, wealth creation. Socio economic growth and improved standard of living. The table 1 is presented.

The values of the Spearman's rank correlation coefficients show that there is relatively good agreement among the variables in ranking the relationship between the timely delivery of projects and economic development of Ondo State, Nigeria. The highest degree of agreement is between is between socio-economic development and reduction of number of abandoned projects (55.1), followed by 48.9% which is between Cost and time optimum use and reduction of number of abandoned projects, 42.4% between infrastructural facilities extension and socio economic growth, followed by 37.9% between socio economic growth and Cost and time optimum use, followed by 32.7% between Cost and time optimum and infrastructural facilities extension, then 31% between Reduction in number of abandoned projects and Infrastructural Facilities Extension. The correlation coefficient as positive coefficients, this shows that the increase in one variable (timely delivery) brings about the increase in the other variables (economic development). The 0.551 implies there is large strength of relationship of the two variables. The lowest correlation coefficient which is 0.31 has medium relationship strength.

			Infrastructural Facilities Extension	Cost and time optimum use	Socio- economic growth	Reduction in number of abandoned projects
Spearman's rho	Infrastructural Facilities Extension	Correlation Coefficient	1	.327*	.424**	.310*
		Sig. (2-tailed) N	90	0.028 90	0.004 90	0.038 90
	Cost and time optimum use	Correlation Coefficient	.327*	1	.379*	.489**
		Sig. (2-tailed) N	0.028 90	90	0.01 90	0.001 90
	Socio-economic growth	Correlation Coefficient	.424**	.379*	1	.551**
		Sig. (2-tailed) N	0.004 90	0.01 90	90	0 90
	Reduction in number of abandoned projects	Correlation Coefficient	.310*	.489**	.551**	1
		Sig. (2-tailed) N	0.038 90	0.001 90	0 90	90

Table 1: Spearman's Rank Correlation Coefficients

* Correlation is significant at the 0.05 level

(2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

From the analysis in Table 1, there is slightly high relationship between timely delivery of construction projects and economic development of Ondo State, Nigeria with the highest degree being 55.1% and lowest as 31%. This agrees with Bayliss (2004), Wells (2006), and Hosein and Lewis (2004). The importance of the construction industry and the timely delivery of construction projects to economic growth, especially in the case of developing countries where evidence suggests that the share of construction output to national output is highest and of greater importance (Ruddock and Lopes, 2006). Hosein and Lewis (2004) suggested that the importance of construction in particular to a developing country, is due its size, the fact that it provides investment goods.

5. DISCUSSION OF FINDINGS

6. CONCLUSION AND RECOMMENDATIONS

The relationship between timely delivery of construction projects success and economic development in Nigerian Construction Industry involves managing the resources— workers, machines, money, materials and methods used. Some projects are effectively and efficiently managed while others are mismanaged, incurring much delay and cost overruns and negatively affecting the economy. Assessing construction projects' delivery time is critical in today's market-driven economy. According to Eriksson (2007), to improve the

economy and maximize long-term return on public investment, government agencies have recently started utilizing new types of contracting methods that are designed to achieve multiple project objectives, including minimizing construction cost and duration, while maximizing its quality.

From the study, there is slightly high relationship between timely delivery of construction projects and economic development within Nigerian construction industry with the highest degree being 55.1% and lowest as 31%. The importance of the construction industry and the timely delivery of construction projects to economic growth, especially in the case of developing countries where evidence suggests that the share of construction output to national output is highest and of greater importance. This stand with Hosein and Lewis (2004) that the importance of construction in particular to a developing country, is due its size, the fact that it provides investment goods. This study recommends that there should be proper planning of a project before the commencement of the construction so every activity can go smoothly and the project can be delivered on time. Likewise, contractors should be familiar with the site of the construction so they can have knowledge of the topography so there would not be problem of unforeseen ground conditions. Cost and time should be utilized optimally so there would not be any overrun and the construction project will be delivered.

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EVALUATING CAUSES OF CHANGE IN BUILDING CONSTRUCTION PROJECTS

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ABSTRACT

Purpose: Change in building construction project is inevitable and can occur at any stage, it has different source and reason due to involvement of many participants. Therefore, the study gives insight into causes of these changes and its consequences on building project performance.

Design/methodology/approach: Descriptive and survey research method was used to evaluate the perception of construction participants and stakeholders to evaluate significant causes of change and effects of change order on performance of building construction projects. 125 well structured, cross-sectional questionnaires were distributed and data obtained were analysed using descriptive, relative importance index and Kruskal-Walis tests.

Findings: Feedback from the respondents revealed the most significant causes of change in building construction projects to include change of plans by owners followed by change in design, poor communication among the construction participants, owners' financial difficulties and owners' change of schedule. Further findings on the effect of change order on the performance of building construction projects shows that on the general notes, cost overrun is the most prevalent effect followed by quality standard enhanced, time overrun, additional money for contractor overhead and work-on-hold (in descending order).

Research limitation/implications: This study is limited in scope to all such building construction projects in the study area (public buildings, commercial, hospital and others), also restricted to the opinion of 104 participants who duly completed and return their questionnaire. It has found that managing changes at project level is a critical problem faced by the construction industry. An understanding of the causes of change (that leads to change order) would be helpful for building construction professional and participants in managing change/variation orders.

Practical implications: Introduction of change management procedure in the contract document will enhance smooth delivery of building projects with less disputes. The change will be managed to maximise the benefit and minimise penalties. It is also recommended that the Ministries (federal and state) in charge of housing should establish or have a well-defined system of managing changes in Government building construction projects rather than abrupt calling for unjustified variation by their contractors or suppliers.

Originality/value: The study highlighted and established changes in building construction projects and the effects of change order on performance only in Akwa Ibom state.

Keywords: Change; change order; variation; management; construction projects.

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1. INTRODUCTION

Changes are very common and likely to occur at any stage of building construction projects. Managing changes effectively is crucial to the success of building construction project delivery as negligence of it has negative effect on orderly sequence, adversely impacting productivity and accordingly causing schedule delays and cost overruns (Anees Mohamed and Abdel Razek, 2012).

All the major participants in the building construction projects (owners/clients, designers, consultants, constructor or contractors) play different roles in construction processes that culminate in changes. These can be demand for amendment by the client's organisation, incomplete information available to the consultants, assumption by the designer, and personal experience of the contractor, all constitute change. Both change and re-work are done in the form of either 'adding', 'deleting' or 'replacement'. However, in construction, change option is the more general one given the same problem and different behavioural pattern. Ndihokubbwayo and Haupt (2009) argued that construction has a physical manifestation, therefore, construction rework is usually accompanied with the demolition of what has already been built, and it has a bigger direct impact on the construction performance than the change option.

Change in building construction projects can be expected, but the potential for cost and schedule consequences of these changes must be understood by those directing the change. Those consequences involved not only the work package/element for which the change is directed but other work packages and overhead functions as well. It is difficult for the clients to visualise the end product they requested hence, a degree of change should be expected. According to Anees (2012), these changes are commonly referred to as change orders. A motivation for the interest in change control is the recognition that late changes during construction may cause serious disruption (Ibbs, Wu and Kwak, 2001). Changes such as changing resource availability, environmental conditions, contractual structures and relations often occur in construction (Arain and Pheng, 2005) and according to Motawa (2005) may lead to incomplete plans and to some degree of unrealistic forecast.

Construction project change will never fade or vanish and is not expected to disappear, therefore the best option is to manage them to prevent negative consequences. There are many sources and causes of change, and in the thought of Lazarus and Clifton (2001), are to be managed to maximise the benefit, minimise the penalties, and ensure that both benefits and penalties are distributed equitably. Important and necessary change may lead to consecutive delays in project schedule, re-estimation of the work statement and extra demand of equipment, materials, labours and overtime, health and safety plans may also be adversely affected. There is a need to have a formalised change management process through which issues arising from changes are resolved to avoid big number of claims and dispute. A1-Dubaisi (2000) revealed in the study that improving the administration process of change orders is beneficial in reducing the cost and risk for all the project participants and encouraging a more trustful relationship. Serag, Olufa, Malone and Radwan (2010) stated that the change orders are very common in almost every construction project nowadays, often resulting in increases of 5-10% in the contract price.

There are beneficial change/variation and the project team should be able to take advantage of it when opportunity arises (Arian and Low, 2005). The need for amendment in a construction project may necessitate changes due to various factors. Studying the problem collectively as early as possible can minimise changes/variation but if beneficial, variation can be made. The potential effect of variation must be recognised by project management team in order to minimise their adverse impact to the project. Hanna and Swanson (2007) suggested some strategies that the client /developer and the contractor can undertake whenever there are variations (Changes) which have cumulative impacts in the project to reduce disputes. A study on 15 different projects in Kuwait by Duaij, Awida and Kollarayam (2007) showed that no construction projects were completed without variation/change orders; only one (1) project was completed with net omissions in variation. This result is in line with most of the previous researchers' statement that no projects can be completed without variation.

Building construction projects are sponsored/financed mainly by individuals, private firms, government agencies (on behalf of government) or directly by government itself. These categories (of people, individuals, firms or agencies) are referred to as owner/client. The approval for change/change order/variation comes from the client while the implementation of agreed change is done by the constructor/contractor and enforced by the consultant through some laid down procedures that may carry along some end users. Clients, constructors/contractors, consultants and others (project team (for non-profit making organisation such as churches) community liaison officers(CLO) for community based projects) are the major participant in building construction projects with varying degree of roles and different levels of effectiveness in change management processes. Developing a framework will allow the process to run smoothly and all encumbrances to enforcing and implementing change order will be checked, reduced or totally eradicated.

The aim of the paper is to evaluate the causes of change in building construction projects that leads to change order. In other to achieve this aim, the objectives are to: first, evaluate the significant causes of change in building construction projects and second, determine the effects of change order on the performance of building construction projects. Two hypotheses were postulated to validate the findings of this study. The first hypothesis states that there is no significant difference in the perception of construction participants on significant causes of change in building construction projects. The second states that there is no significant difference in the perception of construction participants on the effect of change order on the performance of building construction projects. The outcome of these hypotheses will give an insight into the significant cause of change in building construction projects. It will also enable the construction stakeholders to understand the effect of change order on performance of building projects.

2. LITERATURE REVIEW

This literature review is done based on the research objectives developed for the purpose of this study. Classification of changes by different author/contributor, nature, sources, causes of change and effect of change order were reviewed.

2.1. Concepts definitions and distinctions

2.1.1. Defining change

Change in a broad engineering sense has been defined by Jarrett, Eckert, Caldwell and Clarkson (2011) as a modification made to part, drawing or software that have already been released during the product design process and life cycle, regardless of scale or type. A change may encompass any modification to the form, fit and/or in part; moreover, it may lead to a variation in interactions and dependencies, of the constituent elements of the product (Jarrett, Eckert, Caldwell and Clarkson, 2011). On a construction project a change is understood as an event that results in an alteration of the projects original scope, execution time, cost and/or quality of work (Ibbs, Nguyen and Lee, 2007). This may be either to the product or to the related documentation. Changes may be categorised by time (anticipated/emergent, proactive/reactive, pre-fixity/post-fixity); need (elective/required, discretionary/non-discretionary, preferential/regulatory) or effect (beneficial/neutral/disruptive) (Mottawa, Anumba and Pena-Mora, 2007).

2.1.2. Distinguishing variations and change orders

While the terms 'Variation', 'Change' and 'change order' are used interchangeably by some authors, in strict terms a 'Variation' or 'Change" is any type of deviation from an agreed upon, well-defined scope or schedule of works (Keane, Sertyesilisik and Ross, 2010) and a 'Change Order' is that formal document that provides authorisation relative to the contractual agreement and which becomes part of the projects documentation (Keane, Sertyesilisik and Ross, 2010). A 'Change Order' is thus an order given by the employer and authorising a variation (Charoenngam, Coquinnco and Hadikusumo, 2003). A 'Change request' denotes the request for a variation, while the order characterises uses the employer - authorized instruction for it. The change order may be complex as it may require the construction team to engage with a substantial amount of information, which needs to be appropriately "sent, checked, corrected, approved, requested, clarified, transmitted or submitted" (Charoenngam, Coquinco and Hadikusumo, 2003).

2.2. Classification of changes

Change is defined as "the act or an instance of making or becoming different, an alteration or modification" (Concise Oxford Dictionary, 1990). There are many different reasons and sources for change which will never fade or vanish. Since change will never disappear as it has become part of construction project, the best option is to manage them to prevent negative consequences. The changes are to be managed to maximise the benefits, minimise the penalties, and ensure that both benefits and penalties are distributed equitably (Lazarus and Clifton, 2001).

Change management occurs in construction at two levels: organisational and project level (Erdogan, Anumba, Bouchlaghem and Nielsen, 2005). Throughout a project, construction organisations are faced with many changes most of which are design changes (DCs). Project changes (PCs) are inevitable even if there had been detailed studies during the design development and prior to the construction stage. When change occur at the project level, the focus is on trying to cope with the changes that occur in the project due to internal or external reason. Several reasons for change at project level from the literature are summarised according to Erdogan, Bouchlaghem and Nielsen, (2005) in Table 2.1.

ACCORDING TO	PROJECT CHANGES (PCs)			
Type of impact (CII 1994)	BENEFICIAL CHANGES	DETRIMENTAL CHANGES		
	Reduce cost, schedule or degree of difficulty REQUIRED CHANGES	Reduce owner value have neglect impact on the project ELECTIVE CHANGE		
Need for change (CII 1994)	Implemented to meet the objectives or regulatory/legal/safety /engineering requirement/ standards	Enhance the project but are not required to meet the original objectives		
Initiation	EMERGENT/REACTIVE	ANTICIPATED/ACTIVE		
Nature/Responsiveness of	CHANGES	CHANGES		
change (Burnes 1996)	Unplanned, unexpected. The response is after the occurrence	Expected before it occurs, therefore necessary actions are taken		

 Table 2.1:
 Classification of changes

2.3. Nature and sources of change

According to literatures, reasons for change are categorised under two main headings: External reason and internal reasons. External Reasons are the factors that occur outside the project and they cannot be controlled by the organisation. Internal reasons result from the changes in project. The reasons in the literature are summarised in Table 2.2.

Although the specific change reasons for each level differ at some point, the big picture is the same. Project level Change Management (CM) is about coping with the changes in the project and taking the necessary actions to minimise loss and if possible increase the profit.

	EXTERNAL REASONS	INTERNAL REASONS
Reasons for Project changes (Kast and Rosenweig 1974) (Kitchen and Daly 2002) (Lazarus and Clifton 2001)	Changes (Cs) regarding economic and financial Issues. Changes in environmental issues Changes in ecological issues Technology Cs Cs in the standard and regulations Political changes Force majeure	Cs in the organisational culture Cs in the system of project planning. Cs in the project plan execution. Cs in the overall change control system Cs in the documentation system In effective decision making Design improvement Unexpected weather condition Design error Designer change of mind Changed design parameters. contract disputes Cs in the project
		Cs in the project

Table 2.2: Reasons for changes at project level

2.4. Project change management (PCM)

Project changes are considered to be any additions, deletions, or other revisions to project goals and scope whether they increase or decrease the project cost or schedule (Ibbs, Wu and Kwak, 2001). Lazarus and Clifton (2001) Widens this definition and define the change in a construction project as anything that affects: The scope requirements or brief for the project; The capital cost, whole-life cost or value of the project; The times required to design or construct the project; The project team relationships and appointment; Project – associated risk allocations or scope; The form of procurement.

The changes in projects are primarily due to rework, variations (Changes orders), or unexpected events such as industrial action and inclement weather (Love, Itolt, Shen, Li and Irani, 2002). The main causes of rework are design changes (DCs), construction changes and design errors (Love and Li 2000). Design changes (DCs), also referred to as engineering changes (ECs) are defined as changes and/or modification in forms, fits, functions, materials, dimensions of products and constituent components (Huang, Yee and Mak, 2001).

The ECs are one of the biggest problems both in the construction and manufacturing industries. Three kinds of ECs are specified in the manufacturing industries depending on when they occur in the design process: ECs during initial design; ECs after the initial design period; ECs during the major reconstruction of a product (Rouibah and Caskey 2003). The first two kinds are also observed in the construction industry as a change in design development and change after design development namely pre-fixity change and post – fixity change respectively (Lazarus and Clifton 2001). The impact of the changes accruing early in the design process is not very large. The second type, ECs after the initial design period cause greater disruption since the production has already started. The third type of ECs in the manufacturing industry refers to the development of versions and variant of the product is not observed in the construction industry, since construction projects are one off projects.

The most common reasons and sources for the change orders in the construction can be summarised as : changed requirement of the employer; Design errors such as mistaken quantity estimates, planning mistakes, inadequate arrangement of contract interfaces, inconsistency between drawings and site conditions, citation of inadequate specifications and etc.; Un foreseen conditions regarding the site conditions or administrative aspects such as change of work rules/regulations, change of decision making authority, special needs for project commissioning and ownership transfer, neighbourhood pleading (Hsieh, Lu and Wu, 2004; Cox, Morris, Rogerson and Jared, 1999; Love et al., 2002).

2.4.1. How to handle changes in construction projects

Lazarus and Clifton (2001) divide the effects of the changes within the project team into two as direct effects and indirect effects. Direct effects are easily feasible compared to indirect effects. Directs effect of change within the project team may be need to review their work, change their project information and outputs, update their communication to the others, expend additional time and cost implementing the change, reorganise and schedule their work methods, production schedules and deliveries, introduce acceleration measures to maintain the project programme. Potential indirect effects include: increased coordination failures and errors, increased waste in the process from abortive work and out of sequence working, reduction in productivity, quality of the product and profit, uncertainty and consequently lower morale.

Most of the studies in the literature provide guidelines for how to manage changes. The principles of effective (CM) model set by CII (1994) are as follows: Promote a balanced change culture; Recognise change; Evaluate change; Implement change; Continuously improvement from lessons learned. This model and the algorithms based on these principles are also published by Ibbs, Wu and Kwak (2001)

Reviewing these principals and algorithms, Lazarus and Clifton (2001) proposed separate CM procedure for changes during design development, urgent post fixing changes and non-urgent post fixity changes. The EPSRC – funded research project 'Managing change and Dependency in Construction' developed a toolkit enabling users to project a rich description of the change event. The toolkit blends change prediction and CM with knowledge management concept and work flow approach (EPSRC, 2005). Love et al. (2002) Investigates the CM through a system dynamics perspective and suggests that the dynamics of a project system should be evaluated and monitored by the project managers in accordance with the following functions: planning for being proactive; organizing; commanding; controlling.

Since most of the PCs are DCs, the design process requires more attention. Therefore, another approach in literature aimed at leading the companies to implement concurrent engineering to improve communication and handle changes quickly. Concurrent engineering and Design and Build approaches are believed to be more successful in minimising the number of design changes or coping with them during the construction stage provided that they have a well-built communication system and focus on the customer needs (Moore and Dainty, 1999; Faniran, Love, Treloar and Anumba, 2001; Lau, Mak and Lu, 2003).

2.5. Systemising changes in construction project

Systemising changes could be performed by causes or consequences of the changes in projects. Research by Nahod (2012) resulted in seven main causes of change (Table2.3).

S/N	CAUSES OF CHANGES	% OF	SOURCE OF CHANGE
		CHANGE	
1	Investors' change requests caused by	25%	Project Stakeholders
	additional recognised need for a project		
2	Partially incomplete project documentation	21%	Project Stakeholders
3	Change of technology caused by lack of availability of designed technology in the market	18%	Project Conditions
4	Lack concrete construction material in region caused by high or low current demand	12%	Project Conditions
5	Lack of financing for the timely completion of a project	10.5%	Project constraints
6	Contractors change request for easier operations higher income, within the allowable limit of the projects	8%	Project Stakeholders
7	Project documentation alignment with new regulations adopted in the period between project design and realisation	4%	Project Conditions
8	Others	1.5%	

Table 2.5: Cause of changes	Table	2.3:	Cause	of changes
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The main cause of construction changes are investors requirements for higher standards in relation to those planned to be realised in the execution phase of a construction project. All stakeholders are fully dedicated to a project and its details only in the execution phase, when they see alternatives to achieving the goals. Incomplete documentation is a cause of change due to poor or neglected coordination on the part of all of the projects stakeholders. Deadline for partial design are too ambitious, while synchronisation of all parts of a project is replaced with a buffer to enable timely project deliverables. This buffer is usually used for making up for lost times, instead of for synchronisation that is subsequently neglected. So documentation is ultimately composed of unadjusted parts and does not form the logic of the whole project. Investors sometimes

change their priorities or for other reasons redirect to financing, so a project can end up being cancelled due to a lack of funds.

INVESTOR	DESIGNER	CONTRACTOR	PROJECT
			MANAGER
Designer are insufficiently involved in the project and don't elaborate it in detail	Investors often changes input for the projects	Design documentation is incomplete	Investors disclaims liability because he is not in the profession, but wants to impact on project management
The market is chaotic and incomprehensible	The investor under- estimates the importance and the time required for design	The investor has a new ideas during the realisation phase	-
Contractors only care about earnings and neglect the quality	The contractor does not examine the bidding documents sufficiently		

 Table 2.4: Causes of changes by main stakeholders

The analysis of the consequences of change on project realisation must be performed quickly and effectively, and certainly before making a final decision of change approval. If this analysis is not adequate, it can have a negative impact in the project (Nahod, 2012). According to Nahod (2012), the consequences of changes are divided into six groups: Change in the project scope, which manifests as additional works; Indirect impact on other parts of the project; Time extension; Cost overruns; Negative impact on the quality of performed works; Change in the engagement of resources on the project.

It is clear that investors' requirements impact additional works the most (in 83% of project with scope changes) (Nahod, 2012). Undermining the harmony of the whole project is usually the result of execution as a whole an increase in expenditure's and negative effects on the quality of the work for the realisation of the project. In practice this means temporary suspension of works on the project due to lack of funds to complete the project. Incomplete project documentation, according to research conducted, mainly results in changes in the engagement of resources and consequently invokes organisational changes in the phase of realisation.

Nahod (2012) submitted that scope management is one of the angles of the project management triangle, which means that together with time and cost it represent one of the most significant constraints and focuses on the project. There can be no project success without a systematically and professionally appointed system for managing the scope.

3. Research Methodology

The quantitative descriptive survey approach which involves the use of structured questionnaires was employed in this study. The population of the research consist of four categories among the stakeholders in building construction industry in Akwa Ibom State namely: the client's organisation, the contractors' organisation, the consultants and others (project team (for non-profit making organisation), community liaison officers (for community based projects)). The non-availability of access to data on the construction participants in the study area made it difficult to ascertain the population frame of the study.

The sampling technique used was purposive also known as Judgemental, selective or subjective sampling because the units to be investigated were based on the Judgement of the researcher. The main goal of this technique was to focus on a particular characteristic of the population that was of interest, which also help to provide answers to research question. Therefore, a total of 125 questionnaires were distributed to sample the opinion of respondents across the three senatorial district of the state to obtain primary data for the work.

The questionnaire was divided into four sections. The first section (A) of the questionnaire identified the general characteristics of the respondents. The second section (B) focused on the description of the nature of building project in which the respondent is involved and general question about change order. The third section (C) listed out the significant causes of change in building construction project. The fourth section (D) highlighted the effects of change order on performance of building construction project.

Distribution of questionnaire was considered the most suitable method to collect primary data for the study, hence a five-point Likert scale questionnaire was developed to provide the respondents ease of answering the questions as per their level of agreement and ranking (McLeod, 2008). The Likert scale follows the format of: 1) Strongly Disagree; 2) Disagree; 3) Moderate; 4) Agree; 5) Strongly Agree for level of agreement; 1) Very Low; 2) Low; 3) Moderate; 4) High; 5) Very High for level of ranking.

4. **RESULTS AND DISCUSSION OF FINDINGS**

4.1. Characteristics of the respondents

The characteristics of the respondents such as sex, educational qualifications, stake in the projects, professional affiliation, membership status, years of experience used for the study were evaluated and presented in Table 4.1. Also project characteristics the respondents were involved in such as construction type, contract type and project ownership type were also evaluated.

According to the result shown in Table 4.1 most respondents were male and possessed mostly HND and BSc as minimum qualification, this was more than required an educational qualification adequate to understand the implication of the research work. Majority of the respondents (74%) are core construction professionals (that is Architects, Builders, Engineers and Quantity surveyors) with membership status ranging from associate to fellow as the highest, this indicate the level of proficiency in construction work. In terms of work experience, about 76% of the respondents have acquired the necessary experience, having between or more than 10 years' experience, hence were conversant with happenings in the industry. The result also revealed that the project handled by the respondents were

majorly private and government owned and 86% of them are new building projects and the contract were awarded mostly in lump sum.

Features	Sub features	Ν	%
	Male	94	90.4
Sex	Female	10	9.6
	Total	104	100
	OND	2	1.9
	HND	26	25.0
	BSc	34	32.7
Educational Qualification	PGD	11	10.6
Educational Quantication	MSc/Mtech	12	11.5
	PhD	11	10.6
	Others	8	10.0
	Total	104	100
	Client	104	17.2
Stales in the project	Consultant	10	17.5
Stake in the project	Consultant	35	33.7 27.5
	Contractor	39	37.5
	Others	12	11.5
	TOTAL	125	100.0
	NIA	26	25.0
	NIOB	19	18.3
	NSE	20	19.2
Professional affiliation	NIQS	12	11.5
	NITP	2	1.9
	NIESV	2	1.9
	Others	23	22.1
	TOTAL	104	100.0
	Technician	1	1.0
	Licenciate	13	12.5
Membership status	Associate	38	36.5
	Graduate	32	30.8
	Corporate	4	3.8
	Fellow	16	15.4
	TOTAL	104	100.0
	1-5vrs	13	12.5
Years of experience	6-10vrs	30	28.8
remp or enperionee	11-15vrs	18	17.3
	16-20vrs	18	17.3
	Above 20vrs	13	12.5
	Others	12	11.5
	TOTAL	104	100.0
	Livo	61	58 7
Senatorial district of operation	Eket	28	26.0
Senatorial district of operation	Ikot aknana	15	14.4
	тота	104	14.4
	Drivete	54	51.0
	Frivate	29	31.9
Project owner type	NCO-	50	30.3
	NGOS	11	10.6
	Others		1.0
	IOTAL	104	100.0
	New	89	85.6
	Addition	3	2.9
Type of construction	Renovation	7	6.7
	Rework	1	1.0
	Others	4	3.8
	TOTAL	104	100.0
	Unit price	43	41.3
	Lump sum	54	51.9
Contract type	Actual cost plus profit	7	6.7
	margin		
	TOTAL	104	100.0

Table 4.1: Descriptive results of respondents' characteristics

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4.2. Causes of change in building construction projects

A set of selected causes of change as peculiar to the study area are presented to the respondents, these causes are presumed to lead to change order, Table 4.2 shows a display of result with their relative important indexes and rank.

Table 1 2. Dana antian	- f + -: : f: +		
Fable 4 Z [*] Perception	of most stonilicant	causes of change by	construction participants
i abic i a i ciception	or most significant	ouuses of onunge of	construction purchase

S/N	List variables	Clie N=	Clients Consultants N=18 N=35		Contractors N=39		Others N=12		
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
1	Change in design	0.912	1	0.772	3	0.810	2	0.700	7
2	Change of plans by	0.856	2	0.846	1	0.856	1	0.900	1
3	Poor communication system among construction participants	0.812	3	0.778	2	0.758	5	0.809	3
4	Substitution of materials	0.800	4	0.714	5	0.764	4	0.700	7
5	Owners change of schedule	0.800	4	0.738	4	0.744	6	0.734	5
6	Errors and omissions in design	0.788	6	0.738	4	0.728	7	0.666	8
7	Owners financial difficulties	0.744	7	0.714	5	0.806	3	0.784	4
8	Contractor financial difficulties	0,734	8	0.652	9	0.652	12	0.850	2
9	Contractor desire to improve his financial condition	0.712	9	0.640	11	0.620	15	0.716	6
10	Weather condition	0.688	10	0.572	19	0.662	10	0.416	16
11	Technology change	0.666	11	0.658	8	0.616	16	0.484	18
12	Lack of coordination between consultant and contractor	0.666	12	0.668	6	0.616	16	0.616	10
13	Safety consideration	0.634	13	0.646	10	0.564	21	0.350	19
14	Inadequate soil	0.600	14	0.618	13	0.580	19	0.466	15
15	investigation Value engineering	0.600	14	0.646	10	0.656	11	0.584	11
16	Inadequate site inspection	0.566	16	0.622	12	0.594	18	0.484	14
17	Differing site condition	0.566	16	0.652	9	0.648	13	0.416	16
18	Conflicts between contract document	0.556	18	0.668	6	0.672	9	0.400	17
19	Ill-defined scope of work	0.512	19	0.662	7	0.676	8	0.400	17
20	Ill-defined project objectives	0.512	20	0.606	14	0.626	14	0.500	13
21	Communual/youth disturbances	0.500	21	0.600	15	0.620	15	0.634	9
22	New government regulation	0.422	22	0.588	17	0.570	20	0.216	22
23	Land acquisition matter	0.412	23	0.418	21	0.390	23	0.516	12
24	Unavailability of	0.388	24	0.594	23	0.600	17	0.266	21
25	equipment	0.378	25	0.582	18	0.594	18	0.300	20
26	Defective workmanship Unavailability of skill	0.356	26	0.548	20	0.488	22	0.300	20

From the Table, the relative important indexes show the top five (5) significant causes of change order (overall) as follows: Change of plans by owners; Change in design; Poor communication system among construction participants; Owners financial difficulties; Owners change of schedule

Table 4.3 shows the causes of change in descending order for each participant (clients, consultants, contractors and others) as extracted from Table 4.2.

TADIC 4.5. 10p m/c si	ginneant eauses of chang	se by each construction p	articipants
The clients	The consultants	The contractors	Others
Change in design	Change of plans by	Change of plans by	Change of plans by
	owner	owner	owner
Change of plans by owners	Poor communication system among construction participants	Change design	Contractor financial difficulties
Poor communication system among construction participants	Change in design	Owners financial difficulties	Poor communication system among construction participants
Substitution of materials or procedure	Owners financial schedule	Substitution of materials and procedure	Owners financial difficulties
Owners change of schedule	Errors and Omissions in design	Poor communication system among construction participants	Owners change of schedule

Table 4.3: Top five significant causes of change by each construction participants

4.2.1. Test of hypothesis one on significant causes of change in building construction projects

The hypothesis earlier postulated need to be tested to be able to make any definite statement on the perception of construction participants on the level of significance of various causes of change. The confidence level is set at 95% to achieve this with significance level at 0.05. If the p-value is less than or equal to 0.05, the null hypothesis is rejected and the alternative is accepted. Otherwise the null hypothesis is accepted and the alternative rejected.

Kruskal Wallis test was conducted to determine whether or not there is variation in the perception of construction participants on the significant causes of change in building construction projects in the study area. The result is presented in Table 4.4. As shown in the table, fifteen (15) variables have p-values greater than 0.05 and are not significant. For these variables (with p-value > 0.05), the null hypothesis is accepted and according to construction participants, there is no significant difference on their being the significant causes of change. However, eleven (11) variables have p-values less than 0.05 and are therefore significant with null hypothesis rejected and alternative accepted. This by implication means, for these variables, the construction participants believe there exist reasonable difference on their being the significant causes of change in building construction projects.

S/N	Causes of change		Respondent	designation		Chi sq	Sign	R
		Client (N=18)	Consultant (N=35) Mean rank	Contractor (N=39)	Others (N=12)	DF=3		
1	Substitution of Materials and	60.06	47.87	54.86	47.00	2.819	0.420	NS
2	Conflicts between Contract Document	44.03	58.67	59.19	25.46	15.318	0.002	S
3	Change of Plans by Owners	52.06	50.56	51.86	60.92	1.405	0.704	NS
4	Owners Change of Schedule	59.06	51.16	50.87	51.88	1.137	0.768	NS
5	Ill-defined Scope of work	39.83	58.96	60.40	27.00	16.98	0.001	S
6	Contractor Desire to Improve His Financial Condition	59.50	50.74	48.15	61.25	3.009	0.379	NS
7	Errors and Omission in Design	59.22	52.10	53.47	40.42	3.106	0.376	NS
8	Contractor Financial Difficulties	57.97	47.96	48.17	71.63	7.444	0.059	NS
9	Unavailability of Skills	34.94	65.54	56.44	28.00	23.328	0.000	S
10	New Government Regulation	41.47	62.73	59.27	17.21	26.249	0.000	S
11	Safety Consideration	57.78	61.73	51.47	21.00	18.395	0.000	S
12	Technology Change	58.39	58.19	54.17	21.67	15.669	0.001	S
13	Owners Financial Difficulties	51.75	46.67	57.17	55.46	2.548	0.460	NS
14	Ill-defined Project Objectives	41.00	56.11	58.18	40.75	6.8995	0.075	NS
15	Change in Design	71.14	47.54	54.58	32.25	15.449	0.001	S
16	Lack of Coordination between Consultant and Contractor	54.75	55.67	49.47	49.71	1.046	0.790	NS
17	Value Engineering	49.08	53.56	55.54	44.67	1.773	0.621	NS
18	Differing Site Condition	46.58	59.14	57.55	25.58	14.160	0.003	S
19	Unavailability of Equipment	35.67	61.81	61.65	20.83	27.201	0.000	S
20	Defective Workmanship	34.14	60.86	62.01	24.75	24.788	0.000	S
21	Weather Condition	63.31	47.81	59.58	26.96	15.136	0.002	S
22	Inadequate Soil Investigation	48.56	60.24	52.88	34.58	7.783	0.051	NS
23	Inadequate Site Inspection	50.64	58.97	52.38	36.79	5.502	1.390	NS
24	Poor Communication System among Construction Participants	57.67	52.11	49.26	56.42	1.320	0.724	NS
25	Communal/Youth Disturbances	41.75	53.03	55.62	56.96	3.141	0.370	NS
26	Land Acquisition	52.81	51.81	48.64	66.58	3.606	0.307	NS

Table 4.4: Variation of the perception of construction participants on level of significance of causes of change in building construction projects

N-Frequency; S-Significant; NS-Not significant; R-Remark

4.3. Effect of change order on performance of building construction projects

The second objective determined the effect of change order on performance of building construction projects. Before determining the effect of change order, three major performance indicators (cost, time or schedule and quality) among others were presented to respondents as primary driving factor for change order in the questionnaire and fifty-one percent (51%) chose quality. Further investigation conducted on project cost and schedule(time) overruns reveals the following as shown in Table 4.5. Sixty-one percent (61%) of the respondents agreeing that the percentage cost overrun for the project is between 0-5% and 6-10% while thirty percent (30%) goes for between 16-20% and above 20%. On the other hand, fifty-four percent (54%) believe 10-20% schedule overrun is prevalent, thirty percent (30%) says less than 10% delay is experienced on the project delivery time while 21-50% delay is experienced by 11% of the respondents.

Percentage	Frequency	Percent	Percent	Percent	Frequency	Percent	Percent
cost			cum	schedule			cum
overrun				overrun			
No Idea	3	2.9	-	No idea	2	1.9	-
Below 0%	7	6.7	9.6	Less than	31	29.8	31.7
				10%			
0-5%	20	19.2	28.8	10-20%	56	53.8	85.5
6-10%	33	31.7	60.5	21-50%	11	10.6	96.1
11-15%	10	9.6	70.1	Above	3	2.9	99
				50%			
16-20%	16	15.4	85.5	Others	1	1.0	100
Above 20%	15	14.4	99.9	Total	104	100.0	100
Total	104	100.0	99.9				

 Table 4.5:
 Percentage cost and schedule overrun

Table 4.6 summarises the perception of the respondents who participated in the survey on the prevalent effects of change orders on various performance indices of building projects. Relative importance indexes were calculated and ranked accordingly, the top five most prevalent effects in descending orders are as follows: Cost Overrun (increase in project cost); Quality Standard Enhanced; Time Overrun (delay in completion schedule); Additional Money for Contractor Overhead; Work-on-hold.

Further analysis of respondents' opinions and views based on different construction participant's perception are as shown in Table 4.7 It is evident that all the construction participants have four (4) of the top five prevalent effect common, cost overrun, quality standard enhanced, time overrun and additional money for contractor overhead. Clients, consultants and contactors also believed work-on-hold is among the top five while others (project team and CLO) share a divergent view on this by saying it is disputes between parties to contract that ranked fifth.

4.3.1. Test of hypothesis two on the effect of change order on performance of building construction projects

In order to ascertain if the variation in the effects of change order on performance of building construction projects is significant or not, the second hypothesis was postulated as stated. In testing this hypothesis, the confidence level is also set at 95% significance and the decision rule is; if the p-value is < 0.05, null hypothesis is rejected and the alternative is accepted.

S/N	Effect of change order	Clie N=	ents =18	Consı N=	ıltants =35	Contra N=	actors	Others N=12	
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
1	Quality standard enhanced	0.856	1	0.748	3	0.728	3	0.800	2
2	Additional money for contractor overhead	0.778	2	0.720	4	0.672	5	0.784	3
3	Cost overrun	0.374	3	0.822	1	0.806	1	0.884	1
4	Time overrun	0.666	4	0.778	2	0.770	2	0.666	4
5	Work-on-hold	0.666	4	0.714	5	0.718	4	0.584	6
6	Disputes between parties to contract	0.522	6	0.674	7	0.652	7	0.634	5
7	Professional reputation of one or more parties to the contract adversely affected	0.500	7	0.698	6	0.666	6	0.416	9
8	Complaints of one or more parties to contract	0.484	8	0.634	8	0.626	9	0.434	8
9	Demolition and rework	0.484	8	0.634	8	0.642	8	0.416	9
10	Additional health and safety equipment	0.444	10	0.554	10	0.534	12	0.316	12
11	Additional specialist equipment and personnel	0.388	11	0.612	9	0.620	10	0.384	10
12	Degradation of health and safety	0.378	12	0.526	11	0.558	11	0.316	12
13	Time reduction	0.356	13	0.394	13	0.416	15	0.450	7
14	Decrease productivity	0.334	14	0.526	11	0.518	13	0.334	11
15	Degradation of quality standard	0.312	15	0.486	12	0.508	14	0.234	14
16	Optimum cost reduction	0.312	15	0.348	14	0.390	16	0.284	13

 Table 4.6: Perception of the effects of change order on performances by construction participants

N: Frequency; RII-Relative importance index

Table 4.7: Prevalent	effects of change order	based on construction	participants'	perceptions.
The Clients	The Consultants	The Contractors	Others	

The Chents	The Consultants	The Contractors	Others
Quality Standard enhanced	Cost overrun	Cost overrun	Cost overrun
Additional Money for contractors overhead	Time Overrun	Time Overrun	Quality standard enhance
Cost overrun	Quality standard enhance	Quality standard enhance	Additional Money for contractors overhead
Time Overrun	Additional Money for contractors overhead	Work-on-hold	Time Overrun
Work-on-hold	Work-on-hold	Additional Money for contractors overhead	Disputes between parties to contract

Kruskal Wallis test was conducted to ascertain the difference on the perception of construction participants on the effect of change order on performance of building construction projects. The result is shown in Table 4.8. According to the table, seven (7) variables have p-values greater than 0.05 and are not significant therefore null hypothesis is accepted and alternative rejected. However, nine (9) variables are significant with p-values less than or equal to 0.05, hence the rejection of null hypothesis while alternative is

accepted. The implication of this is that, those seven (7) variables with p-value > 0.05, the construction participants believe there is no difference on their having effect on performance as a result of change order while the nine (9) variables with p-value < 0.05, according to construction participants, believe there is difference on their having effect on performance as a result of change order.

Table 4.8:	Variation	on the pe	rception	of constru	uction par	rticipants	on effect	s of change	order
on perform	ance of bu	ilding con	nstructior	n projects					

S/N	Effect of change order on performance	<u></u>	Respondent	designation		Chi sq	Sign	R
		Client (N=18)	Consultant (N=35)	Contractor (N=39)	Others (N=12)	DF=3		
			Mean rank					
1	Time overrun	41.22	58.19	56.17	40.92	6.575	0.087	NS
2	Cost overrun	39.83	56.14	51.65	63.63	5.988	0.112	NS
3	Disputes btw parties to contract	37.64	57.69	55.04	51.42	6.025	0.110	NS
4	Additional specialist equipment/personnel	30.67	60.26	62.63	29.71	24.508	0.00	S
5	Complaints of one or more of the parties to the contract	37.94	60.86	58.29	31.13	15.522	0.001	S
6	Quality standard	67.81	49.47	46.38	58.25	7.937	0.047	NS
7	Professional reputations adversely affected	35.97	63.83	59.03	23.04	25.585	0.000	S
8	Additional health and safety equipment	43.53	60.39	57.88	25.46	16.102	0.001	S
9	Degradation of quality	35.17	59.59	62.83	24.25	25.013	0.000	S
10	Decrease productivity	34.08	60.91	58.78	35.17	16.215	0.001	S
11	Additional money or	61.69	51.90	45.55	63.04	5.674	0.129	NS
12	Work-on-hold	49.06	55.53	56.53	35.75	5.476	0.140	NS
13	Demolition and rework	41.47	57.99	58.74	32.75	11.062	0.011	NS
14	Optimum cost reduction	48.17	52.01	58.28	41.63	3.993	0.262	NS
15	Time reduction	46.36	51.99	53.72	59.25	1.596	0.660	NS
16	Degradation of health and safety	34.72	58.57	63.45	25.88	24.362	0.000	S

4.4. Discussion of findings

The result of findings on the most significant causes of change in building construction projects reveals that change of plans by owners was ranked by the respondents as the most significant cause of change followed by change in design, poor communication among the construction participants, owners' financial difficulties and owners' change of schedule. The implication of this is that within the study area, change of plans by clients is the prevalent factor or cause leading to change order. This result is in agreement with the submissions of Hsieh, Lu and Wu (2004); Love, Holt, Shen and Li (2002); Cox, Morris, Rogerson and Jared (1999); that change requirements of the owner is the most common reason and source leading to change order. The result is contrary to the previous research conducted by Anees, Mohammed and Abde Razek (2013) in Egypt where the top five causes leading to change order are lack of coordination between contractor and consultant, errors and omissions in design, value engineering, change in design and change of plans by owners (in descending order). Also the outcome of the research on findings on perceptions of different construction participants on causes of change is in variant with the submissions of Anees, Mohammed and Abdel-Razek (2013), this is largely due to different research area, location, environment with different mentality and perception to contract issue/system. Careful examination of the results of findings of Enshassi, Arain and Al-Raee (2010) revealed different pattern of thoughts and perceptions, this is due to the fact that the research is conducted in a war prone area of Gaza strip. Conclusively, the research environment, location and study area has a great influence on the causes leading to change order.

Findings on the effect of change order on the performance of building construction projects shows that on the general notes, cost overrun is the most prevalent effect followed by quality standard enhanced, time overrun, additional money for contractor overhead and work-on-hold (in descending order). This outcome is in tandem with the result of Anees, Mohammed and Abdel-Razek (2013). The effect of change order is prevalent on the three (3) main building project performance indicators; increase in project cost, delay in delivery time or schedule and quality standard enhanced. Further investigation of the opinions of different building construction stakeholders (clients, consultants, contractors and others) is in agreement with the above findings. They all agree that cost overrun, time overrun and quality standard enhanced are the major performance indicators being affected by change order.

5. CONCLUSION

Changes within building construction projects are inevitable, but should be kept to a minimum and when they do occur, should be managed to maximise the benefit and minimise the penalties. This paper has reviewed the findings of a literature on change and change management concepts in construction. It has found that change management occurs at the project level and at the organisational level, change management is a critical problem faced by the construction industry.

The most significant causes of change leading to change order in the study area as set out in the specific objectives of the study have been highlighted and presented. An understanding of the causes of change would be helpful for building construction professional and participants in assessing change/variation orders.

The effects of change order on performance are complex and influenced by numerous interrelated factor. Quality standard was regarded as the primary driving force for change order in the study area, cost overrun (increase in initial project cost) and time overrun (delay in delivery time or schedule) are the most prevalent effect change order has on building construction projects.

6. **Recommendations**

The various body regulating construction professionals' activities will need to do more in the area of public enlightenment and campaign to educate private construction and consulting firms on the need to have a formal system/procedure for handling and managing changes, and also incorporating change order clause in their contract system. The Ministry (federal and state) of Housing should establish or have a well-defined system of managing changes in Government building construction projects rather than abrupt calling for unjustified variation by their contractors or suppliers.

There is also a need to establish a comprehensive database that includes unit price, contractor/constructor, supplier and specification, which should be updated periodically. This will enhance the awareness of construction participants and professionals across the entire construction industries on the knitty-gritty of change order implementation and procedure.

Also, the adoption and inclusion of the developed framework in the project/construction management practice will enhance smooth implementation of change order as change request form would have formed part of the contract document, hence disputes/issues that may have arisen over project contract is avoided.

The findings from the study would also be valuable for all construction professionals and participants in general.

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MODELLING THE DYNAMIC EFFECT OF INTERACTION BETWEEN URBAN INFRASTRUCTURE CONDITIONS AND RESIDENTIAL PROPERTY INVESTMENT RETURNS IN ABUJA, NIGERIA

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ABSTRACT

Purpose: The study examines the relationship between infrastructure condition and residential property investment in Abuja, Nigeria. It was carried out with specific focus on the effect infrastructure conditions impacts on property investment returns in the selected residential submarkets of Abuja.

Design/methodology/approach: A survey approach was adopted with residential properties currently in the market generating income (rental or capital values) for investors as the study samples. Firms of Estate Surveying and Valuation and households were also used for data collection. Transactions of 718 were obtained from 1, 2, 3 and 4 bedrooms properties as well as availability and condition of infrastructure. Correlation coefficient and regression model were used to examine the relationship and effect of infrastructure condition on residential property investment returns between 2009-2018.

Findings: The results from analysis revealed a significant and positive relationship between infrastructure conditions and rate of returns. This has also shown that the functional condition of infrastructure in Abuja has a significant effect on the rate of returns on residential property investment hence a good market performance.

Research limitation/implications: In examining the level of infrastructure condition on rate of returns on residential properties, an assessment of some basic infrastructure type such; water supply, electricity, access roads, streetlights, drainage system, waste management, health, recreation, education, and security within the selected locations in Abuja were used. The rate of returns was measure from 2009 to 2018.

Originality/value: The conclusion from the result is that infrastructure condition contributes to about 71% of the rate of returns on residential property and hence, a positive determinant of market performance.

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Keywords: Infrastructure condition; property investment; returns; neighbourhood; rental trends.

1. INTRODUCTION

Infrastructure is the fundamental support system serving a country, city and other areas; it includes the services and facilities necessary for an economy to function effectively (Tomlinson, 2001; Mendez, 2007). Infrastructure stands out glaringly as one of the pointers to an ideal urban economic development and its worth cannot be restrained since it plays a vital role in the growth and development of a nation. They also serve as one of the major pull factor of investments to any location being it real estate or any form of investment. Ogbuefi (2002) and Ajakaiye (2008) asserted that property investments performance indicators such as value indices, yields and total returns promote improvement in the analysis of the property investment returns at every location where invested real estate especially residential property is located. The improvement in these indicators is mostly enhanced by availability and functionality of neighborhood facilities and services.

Overtime, evidences have emerged of the close link between urban infrastructure and real estate investment and how same has impacted either negatively or positively on investment returns. Though the availability and quality of these infrastructures may vary from place to place and/or based on needs, it is apparent that certain infrastructure has been practically found to have significant influence on property values at certain point and at certain locations. Among which include commercial environment, road conditions, security, and physical structure of building and serenity of environment (Famuyiwa & Otegbulu, 2012; Ajayi, Jimoh & Jimoh, 2014). In some areas or locations, certain infrastructures such as good road network, electricity supply; portable water; drainage system; waste management system; recreational facilities security have been identified to have significant influence on rental values (Oduwaye, 2002; Ajibola et al., 2013; Amenyah, 2013; Udoka, 2013). These are also known to have improved residential property investment performance.

Returns on property investment indicate the percentage of the invested money returned to a property investor after the deduction of associated costs thus, other property investment indices are, price base index, level and type of information index and market capitalization index. The returns on property investment on the other hand, is dependent upon many characteristics associated with that property such as physical characteristics of property; location of the site in relation to employment centers and other facilities, accessibility and economic characteristics of neighbourhood. Oftentimes the common understanding has been that performance of investment in residential property is related significantly to availability, condition and adequacy of urban infrastructure. Therefore, in measuring the return on investment of residential property, the indices, say for one, two, three and four bedroom properties, need to be developed and to encompass the availability and condition of the infrastructure within a particularly chosen location. However, this is mostly not the case as there are no developed infrastructure conditions indices (ICI) upon which valid performance of residential property investment return option can be measured or estimated.

It is on the above premise that, this study aimed to examine the relationship between infrastructure conditions and residential property investment returns in Abuja, Nigeria. It is the study objective to assess and determine residential property investment returns for a period of 10 years (2009 - 2018); to assess and develop infrastructure condition indices (ICI) for some of the basic neighbourhood facilities and services in the study area; to measure the effect of infrastructure condition on residential property investment returns in Abuja, Nigeria.

It is the expectation that the outcome of this study will serve as yardstick for corporate investors to measure the performance of property investments in the light of available infrastructure. Professionals in the real estate industry will also found the outcome here beneficial in terms of information for their consultancy. It also a knowledge gap identified and addressed that contribute to existing body of literature.

2. LITERATURE REVIEW

Generally, there is a link between investment in residential property market, provision of infrastructure and the economy of any nation. The link could either have forward positive effects if there is sufficient provision of infrastructure and effective operation of property market or it could be backward negative if there is a disconnect or inadequacy in the provision of infrastructure and ineffectiveness in the property market operation. According to Samjay (2013) residential property markets supported by adequate infrastructure provision indicate important interface with economic activity and strength of the financial markets of the country. Around the world, majority of the financial institutions depend on residential property assets for up to 42% of their operations, therefore, crucial adjustment in the residential property markets can have great impact on residential property rental and sales pricing performance which can in turn have effect on the economy.

The study of Walter (2009), analysed the relationship between infrastructure and residential property investment which was framed on the fact that infrastructure is one of the fundamental factors that boosts values and returns on residential property investment. Hence, the study sought to examine the extent of this effect on residential property investment market in Kumasi, Ghana between 2001 and 2008. The result indicates a positive effect and by implication assisted the real estate entrepreneurs in preparation of proper cash inflow and also enhances consolidated cash outflow projections. Investors in residential property will be able to further make informed decisions that will profit their investments from such study outcome.

Oduwaye (2002) examined the level of adequacy of infrastructure availability on property investment return in Akure, Nigeria. Infrastructures used for the study were road, electricity supply, water, drainage system, waste management system and recreational facilities. A sample of 343 households was used and data subjected to descriptive analysis techniques using the relative important index (RII) to rank the level of infrastructure, the outcome indicates significant inadequacy. The implication of the findings is that the lack of adequate good road network, electricity supply; portable water; drainage system; waste management system; recreational facilities has contributed negatively on real property value and consequently its returns. Udoka (2013) adopted a similar methodology while examining the relationship between infrastructure provision and real estate investment returns in Akwa Ibom state, Nigeria. The use of descriptive analysis was made from the data collected from 250 residential properties. The results of the ranking using the RII indicates that infrastructure such as roads, hospitals, schools, water supply and sewage contributed positively towards the improvement in residential property investment performance.

Ajayi, et al (2014) in their study of Minna, Niger State, used similar infrastructure to those of Oduwaye (2002) and Udoka (2013) to measure the effect on property rental values within a timeline of 1998 – 2009. They employed a regression analysis technique to measure the probable impact of some of the infrastructure on property rental values. The study found that not much impact have been made so far by these infrastructure except for access to road which contributed to about 43.9% variation in rental values. Further, the study could not provide the effect of these infrastructures on investment returns; it did not also explore the level of condition of the infrastructure itself other than its availability. Famuyiwa and Otegbulu (2012) examined the influence of public infrastructure on property value in Lagos, Nigeria. The data on 118 residential properties were modeled into hedonic regression for the purpose of valuation. The results showed that out of fifteen (15) infrastructural facilities used, six were determined to have significant impact and these were; accessibility, commercial environment, road conditions, security, physical structure of building and serenity of environment. Their level of significance therefore explained about 66% variation in property price returns.

In Kenya, Gatauwa and Murungi (2015) used Meru County as a case study to assess the influence of infrastructural provision and real estate investment returns. The study examined transport and communication factors, social amenities, industrial development, educational institutions and commercial development. A total of 955 real estate properties were sampled, data obtained was subjected to regression analysis and the outcome revealed that these infrastructures accounted for 89.3% variation in the performance of property investment in Meru County. The conclusion therefore was that infrastructure development has a great impact on real estate investment return among other factors as it will lead to demand for real estate property and hence, positive returns.

Hwa (2000), in his study takes a much broader case study approach to examine the challenges and prospects infrastructure has on residential real estate investment in the cities of Mumbai, Delhi and Gurgaon in India. A survey was made of 100 key players to obtain primary data while the secondary sources were the predominant data source and collection during the survey. The secondary sources were through newspapers, magazines, journals, internet and visits to the various real estate investments companies. The outcome from analysis revealed that infrastructure has contributed prominently towards the real estate investment returns.

Samjay (2013) studied income from residential properties between 2005 and 2012 in Atlanta Georgia, USA, from the investment point of view. With the use of return equations, estimations were conducted to analyse whether or not income level from property varied as a result of availability of neighbourhood infrastructure, holding their income-affecting variables (such as location, improvements) constant. It was discovered that return on residential property is highly influenced by infrastructure. The study involved comparison of yearly return increase in the effective rent charged for privately owned residential properties and the official yearly returns increase set through official negotiation for municipality-owned residential housing to see whether excessive price increases (indicating infrastructure drift) could be found. Evidence was found to support the existence of such drifts. This was as a result of effective and functional infrastructure provided and their good management.

Other studies identified transport infrastructure, energy infrastructure, information and communication infrastructure, social amenities, industrial development and educational infrastructure to have greater influenced on property returns. (Corgel et al., 1998; Gatauwa & Murungi, 2015). The results from other studies has also shown that burglary proof, paved premises, street light, gate house and fenced-wall were relatively important facilities influencing property returns and tenants' satisfaction (Olujimi & Bello, 2009; Olujimi, 2010; Sodiya et al., 2016). The studies also found a significant difference in rent passing and sale of property across the housing estate.

Base on the findings from all previous empirical studies reviewed under this study, It was discovered that each and every neighbourhood have its peculiarities in terms of characteristics, infrastructure availability and condition. At same time they are subject to different returns on investment because of variation in fundamental property investment return determinants (Flatherty 2004, Olujimi & Bello 2009, Udoka 2013, Samjay 2013). In view of this, it is vital to pinpoint necessary property investment return growth variables which represent the Nigerian economy; availability and condition of available infrastructure and nature of residential property investment market in the country. Thus, this study is intended to identify these principal pointers and utilize them with the aim to examining their influence on residential property investment returns in Abuja.

Therefore, it has become clear in view of the foregoing studies the missing link between infrastructure and residential property investment returns. The missing areas are; the absence of the construction of infrastructure condition indice (ICI) and its influence on residential property investment returns. Most studies do use infrastructure availability only and others adequacy to measure its effect on residential property investment returns. the other area is the development of property return indices upon which the influence of ICI can be adequately capture in assessing the relationship of level of effect one exert on the other. This is the missing gap that forms the basis for this study.

3. Research Methodology

The study adopted a survey approach with residential properties currently in the market generating income (rental income) for the investors within Abuja Metropolis as the population. The total number of residential rental properties (RRPs) was generated through the households' population supported by the availability of records on the RRPs under the management portfolio of the practicing firms of estate surveying and valuation within the selected neighbourhood of Maitama, Wuse II, Lugbe and Kubwa. The use of Google earth pro and physical enumeration was also adopted to enhance accuracy and adequacy. The total sample frame generated summed up to 8,543 RRPs (Table 1). The sample size as determined for each of the neighbourhood was carried out with the use of Frankfort-Nachmias (1996) formula for sample size determination as follows:

$$n = \frac{Z^2 p q N}{e^2 (N-1) + Z^2 p q}$$

Where N = population size;

n = sample size

p = 95% confidence level of the target population

e = Acceptable error Z = 1.96 (the standard normal deviation at 95% confidence level)

1 4	Table 1. Sample size determined and questionnane distribution					
Location	Neighbourhood	bourbood Population Sa		Number		
Location Ne	Neighbournood	Topulation	Administered	Returned		
Abuja	Maitama	1,785	316	185		
	Wuse II	1,856	318	193		
	Lugbe	2,880	345	183		
	Kubwa	2,022	323	157		
	Total	8,543	1302	718		

Table 1: Sample size determined and questionnaire distribution

Hence a total of 1302 questionnaire were administered eliciting information on the availability and condition of infrastructure in the selected neighbourhoods (Table 1). The technique adopted for analysis of data are, descriptive statistics that were used in the construct of infrastructure condition index. Further, a multiple regression analysis technique was also used to develop a model for the prediction of residential investment return in the selected neighbourhoods of Abuja.

3.1. Variables definition and model

A multiple regression model can be specified as:

$Y = b_0 + b_1 X_1 + b_2$	$X_2 + b_3$	$X_3 \underline{\qquad} b_n X_n + e \dots; (1)$
Where		
Y	=	Dependent variable
X1, X2, X3Xn	=	Independent variables
b0	=	Constant
b1, b2, b3 Bn	=	Coefficient or parameters which show the extent to
	which e	ach of the independent variables affects variable Y.
e	=	Error term which represent other omitted variables.

The regression model for the study is described below based:

 $R = a + \beta WT + \beta ELEC + \beta DRN + \beta RD + \beta WDIS + \beta SECT + \beta REC + \beta STRLG$ $+ \beta EDU + \beta TELE + \beta HEL + e \qquad (2)$

R = Returns, WT = Water Supply ELEC = Electricity, DRN = Drainage RD = Road WDIS = Waste disposal SECT = Security, REC = Recreational STRLG = Streetlight EDU = Education, HELH = Health,

 $\alpha = Intercept$

 $\varepsilon = \text{error term}$

Data measurement for the variables included in the model is as shown in Table 2.

Table 2: Data measurement for model development

Variables /Total Return Index (TRL)	Description/ Rate (%)	Scale
Water condition index	Quality index 1%-99%	Ratio
Electricity condition index	Relative supply Index 1%-99%	Ratio
Drainage condition index	Standard quality index 1%-99%	Ratio
Road condition index	Standard quality 1%-99%	Ratio
Waste disposal	Quality of physical environment	Ratio
Security condition index	Relative level of security (1%-99%)	Ratio
Recreation facilities condition	Relative availability index (1%-99%)	Ratio
Streetlight condition index	Relative availability index (1%-99%)	Ratio
Education facilities condition	Relative availability index (1%-99%)	Ratio
Health.	Relative availability index (1%-99%)	Ratio

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Rate of returns on property investment

The rate of returns for One Bedroom (1B/R) property in Abuja is presented in Table 3 and the average rate of returns trended on double digit rate over the period understudy. Kubwa had its highest rate of return (RoR) in 2010 while Lugbe peaked at 20.50 in 2012. However, Maitama performed better comparatively reaching 38.99 and 39.84 in 2013 and 2016 respectively, though Maitama also recorded the least among all the submarkets in 2018.

	1	1 5			
Year	Kubwa	Lugbe	Wuse II	Maitama	
2009	19.23	15.49	19.45	21.98	
2010	23.19	18.13	14.17	27.63	
2011	15.66	16.11	15.27	32.06	
2012	20.85	20.50	15.19	23.98	
2013	14.59	17.35	15.38	38.99	
2014	15.23	18.73	28.34	35.09	
2015	14.56	17.24	14.53	26.37	
2016	16.53	17.84	19.54	39.84	
2017	17.12	16.59	17.59	30.68	
2018	17.09	18.65	10.32	7.88	

For the Two Bedroom (2B/R), the annual RoR peaked higher in Kubwa in 2010 with Lugbe having the least RoR while Maitama average higher comparatively. (See Table 4). It has shown that the average RoR also trended in double digit indicating a good performance,

Year	Kubwa	Lugbe	Wuse II	Maitama
2009	21.43	22.88	10.34	20.34
2010	38.95	26.94	16.42	29.19
2011	17.99	17.54	27.10	30.35
2012	13.70	17.25	36.76	39.36
2013	21.52	21.52	27.73	22.59
2014	21.28	21.24	17.77	11.41
2015	16.96	16.96	28.37	22.68
2016	11.96	11.97	17.81	32.93
2017	13.34	6.55	34.98	18.85
2018	14.05	11.26	37.84	30.98

Table 4: Rate of returns on 2B/R property investment

The 3 bedroom properties also show a double digit annual RoR property investment indicating the property market for this accommodation type performed well within the period understudy (see Table 5). However, the performance for Maitama in 2010 showed a single digit indicating poor performance comparatively, though the RoR rose significantly to 38.49 and 31.49 in the subsequent years.

Year	Kubwa	Lugbe	Wuse II	Maitama
2009	11.24	13.44	12.45	22.44
2010	19.39	19.60	18.01	9.79
2011	24.96	22.28	26.72	38.49
2012	17.60	19.06	27.20	31.49
2013	12.09	15.26	37.87	20.02
2014	26.12	24.12	38.28	19.08
2015	29.97	13.97	18.62	21.63
2016	23.87	20.87	28.42	30.99
2017	18.27	21.50	27.24	37.82
2018	19.42	24.44	39.31	26.37

Table 5: Rate of returns on 3B/R property investment

The RoR as shown in Table 6 revealed that Lugbe performed better comparatively maintaining an average above 20 throughout the study period. The result also indicates a general performance in property market, with the exception of Wuse II and Maitama in 2017 and 2016 showed a single digit rate of return which is the signal of a poor performance.

Take of Returns on 4D/R Hoperty investment						
Year	Kubwa	Lugbe	Wuse II	Maitama		
2009	18.86	22.19	16.34	27.21		
2010	20.32	20.32	10.79	21.89		
2011	21.27	21.09	10.80	19.65		
2012	20.06	20.45	10.88	15.93		
2013	26.44	26.22	11.03	33.92		
2014	24.69	24.69	11.53	22.80		
2015	23.34	22.79	12.08	13.30		
2016	18.10	20.98	11.27	6.63		
2017	23.54	21.46	3.75	36.42		
2018	21.67	21.45	9.08	41.18		

Table 6: Rate of Returns on 4B/R Property Investment

4.2. Construction of infrastructure condition index (ICI)

In analyzing data for the infrastructure condition, data were collected and measured on a 5-point Likert scale and a reliability test was conducted to ascertain the degree of consistency of the data among items using the Crombach alpha (α) technique. The result indicated a minimum acceptable coefficient of 0.75 (75%) for all the items in the study area. On a neighbourhood basis, the degree of reliability was computed at 77%, 79%, 86% and 89% for Kubwa, Lugbe, Wuse II and Maitama respectively. To determine the benchmark towards the development of ICI, a hypothesised mean was calculated as ((5 + 4 + 3 + 2 + 1)/5) = 3.00. (Ikediashi, Ogunlana & Boateng, 2014). This mean (3.000) was further converted to percentage for easy of interpretation of the ICI. by dividing by the highest number on the scale as thus; 3/5 = 0.6 (60%) therefore, any ICI above 60% indicates a better infrastructure condition while those below the benchmark indicates poor condition.

Infrastructure	Kubwa (α = 0.77)				Lugbe ($\alpha = 0.79$)			V	Wuse II ($\alpha = 0.86$)			Maitama ($\alpha = 0.89$)				
	N	Su	Mean	ICI	N	Sum	Mea	ICI	N	Sum	Mea	ICI	N	Sum	Mean	ICI
		m					n				n					
Water supply	157	507	3.23	65	183	615	3.36	67	193	886	4.59	92	185	854	4.62	92
Electricity	157	567	3.61	72	183	651	3.56	71	193	793	4.11	82	185	871	4.71	94
Access Road	157	515	3.28	66	183	581	3.17	63	193	795	4.12	82	185	864	4.67	93
Security	157	471	3.00	60	183	515	2.81	56	193	800	4.15	83	185	793	4.01	80
Drainage System	157	460	2.93	59	183	560	3.06	61	193	790	4.10	82	185	850	4.59	92
Waste Disposal	157	482	3.07	61	183	585	3.20	64	193	801	4.15	83	185	759	4.10	82
Recreation Facilities	157	504	3.21	64	183	621	3.39	68	193	794	4.11	82	185	745	4.03	81
Education	157	463	2.95	59	183	512	2.80	56	193	809	4.19	84	185	746	4.03	81
Health	157	495	3.15	63	183	590	3.22	64	193	799	4.14	83	185	784	4.24	85
Street Light	157	512	3.26	65	183	610	3.33	67	193	820	4.25	85	185	796	4.30	86
Valid N (list-wise)	157				183				193				185			

Table 7: Infrastructure condition index (ICI) in Abuja

In view of the above, ICI for Kubwa as determined, ranges between 0.59 - 0.72 (59% - 72%), Lugbe, ICI ranges 0.56 - 0.71 (56% -71%), Wuse II ICI ranges between 0.82 - 0.92

(82% - 92%) and Maitama ICI ranges between 0.81 - 0.94 (81%-94\%). This outcome suggests that Kubwa and Lugbe has some infrastructure that are in good and functional condition while others are not whereas infrastructure condition in Wuse II and Maitama are better than those of Kubwa and Lugbe comparatively. See table 7 for detail ICI for all infrastructure available in the selected neighbourhoods.

4.3. The relationship between ICI and PRI

The result of the strength of relationship between ICI and Property Returns Index (PRI) indicates a significant strong and positive relationship. (See Table 8 below). Water, electricity, access road and neighbourhood security relates positively with PRI. Drainage system correlates strongly with PRI in Wuse II and Maitama while the relationship is insignificant at Kubwa and Lugbe. The results also show that the condition of waste disposal relates better with PRI compare with Kubwa, Wuse II and Maitama whereas, health relates significantly in Kubwa and highly insignificant in Wuse II. Further, recreational facilities strongly correlate with PRI in Wuse II, the condition of health facilities maintained strong correction with PRI in Kubwa while the availability and condition of street lights maintained strong correlation with PRI in both Wuse II and Maitama. The implication of these outcomes is that, all the aforementioned infrastructure are likely to cause positive significant change in return on residential properties invested across the neighbourhoods.

Infrastructure	Kubwa ®	Ν	Lugbe ®	Ν	Wuse II ®	Ν	Maitama ®	Ν
Water supply	.89*(.000)	189	.79*(.001)	183	.65*(.025)	193	.69* (.021)	185
Electricity	.59*(.017)	189	.78*(.001)	183	.75* (.12)	193	.61* (.031)	185
Access Road	.69*(.007)	189	.83*(.000)	183	.69*(.031)	193	.57* (.045)	185
Security	.88*(.000)	189	.56*(.032)	183	.82*(.001)	193	.85* (.000)	185
Drainage System	.46(.262)	189	.16 (.421)	183	.62*(.035)	193	.68* (.029)	185
Waste Disposal	.17(.477)	189	.79*(.012)	183	.45(.124)	193	.34(.654)	185
Recreation Facilities	.12(.434)	189	.26(.327)	183	.59*(.048)	193	.23(.701)	185
Education	.33(.321)	189	.15(.421)	183	.42(.145)	193	.41(.312)	185
Health	.63*(.013)	189	.45(.122)	183	.39(.451)	193	.48(.073)	185
Street Light	.11(.661)	189	.05(.512)	183	.72*(.002)	193	.50* (.045)	185

Table 8: Correlation between ICI and PRI in Abuja

4.4. The effect of infrastructure condition on property investment returns (PIR)

The results of analysis for Kubwa, Lugbe, Wuse II and Maitama shows that the regression model is fit for the purpose of prediction of the effect of infrastructure condition on residential property investment returns in Abuja. The result presented in Table 9 below is the result 157 property transactions in Kubwa residential property submarket. The study employed multiple sales and letting approaches for analysis the result for Kubwa revealed 65% variation in PIR which can significantly explained by the conditions of water supply, electricity, access road, neighbourhood security and health facilities. This therefore implied that, these infrastructure conditions are can exert a statistically significant effect on PIR in Kubwa residential submarket. It also shows that a 1% improvement in the conditions of the

infrastructure will cause positive significant change in PIR by 37%, 36.9%, 76.1%, 58.5% and 60.9% respectively. With the F-statistics of 9.24 which is significant at p-value of 0.000 less than 0.05 precision level, the model is considered fit for the purpose of prediction as adopted for Kubwa.

Model	Unstandardis	sed Coefficients	т	Sia	DЭ	Б	# voluo	
	B Std. Error		1	Sig.	K2	Г	p-value	
(Constant)	10.648	3.069	3.469	.001	.65	9.24	.000	
Water supply	.370	.198	1.867	.044				
Electricity	.369	.208	1.775	.048				
Access Road	.761	.208	3.659	.000				
Security	.585	.266	2.198	.029				
Drainage System	.017	.197	.086	.932				
Waste Disposal	.322	.205	1.571	.118				
Recreation Facilities	.006	.218	.029	.977				
Education	.268	.192	1.397	.164				
Health	.609	.208	2.933	.004				
Street Light	.205	.218	.939	.349				

Table 9: Regression estimates of ICI and property investment returns in Kubwa

$$\begin{split} R &= 10.64 + .370WT + .369ELEC + .017DRN + .761RD + .322W + .585SECT \\ &+ .006REC + .205STRLG + .268EDU + .609HELH + e \end{split}$$

The outcome for Lugbe residential property submarket with 183 transactions indicates a 69% variation in the PIR that can be explained by the influence of the conditions of access roads, security, drainage system, waste management, education, and health facilities. This shows a slight variance from Kubwa. (See Table 10). The infrastructure has maintained a significant effect on the PIR to a level that any change or improvement in their conditions by 1% will cause a significant positive change in the PIR by 19.2%, 22.2%, 52.0%, 18.6%, 28.9% and 23.1% respectively. With p-value of 0.000 less than $\alpha = 0.05$, the model has a good predictive ability and fit for analysis for Lugbe residential property submarket.

e		U					
Model	Unstandard	ised Coefficients	Т	Sig.	R2	F	P-value
	В	Std. Error					
(Constant)	6.791	1.003	6.772	.000	.69	15.4	0.000
Water supply	.013	.066	.196	.845			
Electricity	.058	.057	1.002	.318			
Access Road	.192	.091	2.096	.038			
Security	.222	.070	3.175	.002			
Drainage System	.520	.061	8.500	.000			
Recreation facilities	.073	.046	1.590	.114			
Waste Disposal	.186	.070	2.673	.008			
Education	.289	.070	4.153	.000			
Health	.231	.072	3.214	.002			
Street Light	.079	.070	1.140	.256			

Table 10: Regression estimates of ICI and PRI in Lugbe

R = 6.79 + .013WT + .058ELEC + .520DRN + .192RD + .186WD + .222SECT + .073REC + .079STRLG + .289EDU + .231HELH + e

The result for Wuse II revealed a total of 193 transactions in the property submarket and the outcome from the analysis indicates 70% variations in the use II residential property market. Through multiple sales and letting approaches the result revealed that 70% variation in the PIR that can be explained by six infrastructure types. These are; water supply, electricity, access roads, neighbourhood security, drainage system and recreational facilities. They have been determined to significantly influence the residential property market performance. (See table 11). Therefore, with the p-value of 0.000 less than $\alpha = 0.05$ level, the model is also deemed to have a good predictive power. This has shown that a 1% improvement in the conditions of water supply, electricity, access roads, security, drainage system and recreational facilities can impact positively on the return on investment by 4.9%, 13.6%, 16.1%, 27.9%, 35.3% and 8.4% appropriately.

Model	Unstandardi	zed Coefficients	Т	Sig.	R2	F	P-value
	В	Std. Error					
(Constant)	1.376	2.527	.545	.007	.70	10.02	0.000
Water supply	.049	.214	.229	.019			
Electricity	.136	.259	.522	.002			
Access Road	.161	.265	.606	.045			
Security	.279	.233	1.196	.033			
Drainage System	.353	.219	1.610	.009			
Recreation	.083	.166	.499	.018			
Waste Disposal	.624	.222	2.804	.206			
Education	.678	.230	2.943	.104			
Health	.467	.248	1.886	.361			
Street Light	.194	.240	.809	.419			

Table 11: Regression estimates of ICI and PRI in Wuse II

R = 1.37 + .049WT + .136ELEC + .353DRN + .161RD + .624WD + .279SECT + .083REC + .194STRLG + .678EDU + .467HELH + e

The analysis of the effect of infrastructure condition on investment performance of residential properties in Maitama is presented in Table 12 in line with the result, 185 property transactions in Maitama residential property submarket were recorded. The result revealed that 80% variation in PIR can be significantly explained by five infrastructure types. These are; water supply, access road, security, drainage system, recreational facilities, waste disposal and health facilities and combine maintained a significant influence on performance of residential property investment submarket in Maitama. This is such that any significant change in these infrastructure conditions by 1% improvement, will cause positive significant change in property return by 13.5 34.2%, 17.8%, 15.2%, 11.8%, 20.3%, and 20.3% respectively. In view of this, the model is fit for the purpose of prediction since f-statistics (10.02) is statistically significant at p-value (0.000) less than 0.05 level of correctness; therefore, the model can be used for the prediction in Maitama residential property investment submarket.

M- 1-1	Unstandardiz	ed Coefficients	т	с. [.]	ЪЭ	Б	D
Model	В	Std. Error	1	51g.	K2	Г	P- value
(Constant)	3.265	.852	3.830	.000	.80	9.08	.000
Water Supply	.135	.052	2.568	.001			
Electricity	.031	.073	.423	.673			
Access Road	.342	.078	4.365	.000			
Security	.178	.083	.141	.008			
Drainage System	.152	.067	2.272	.024			
Recreation facilities	.118	.053	2.233	.027			
Waste Disposal	.203	.067	3.030	.003			
Education	.146	.084	1.737	.084			
Health	.203	.077	2.636	.009			
Street Light	.021	.079	.269	.788			

Table 12: Regression estimates of ICI and property investment returns in Maitama

R = 3.26 + .135WT + .031ELEC + .152DRN + .342RD + .203WD + .178SECT + .118REC + .021STRLG + .146EDU + .203HELH + e

Infrastructure are a very critical subset of our built environment system. The basic types like water supply, electricity, access roads, streetlights, drainage system, waste disposal, health, recreation and security are very important towards enhancing a good quality of and functional living environment and for investment. A streak of studies has established a clear and positive link between infrastructure and property values/returns while others found otherwise at certain locations. In the Abuja property market, infrastructure availability and conditions has accounted for a viable investment returns in residential properties, the performance of these property types has trended in mostly double digits' rate of return in the last 10 years (2009-2018). On location basis, Wuse II and Maitama submarkets presents a better infrastructure condition indices and contributed to about 70% and 80% in the rate of return compare with Kubwa and Lugbe with 65% and 69%. On aggregate for Abuja property market, infrastructure conditions have accounted for 71% of the rate of return and positive residential property market performance.

5. CONCLUSION

The study has assessed the effect of infrastructure conditions on residential property investment returns in Abuja. This was achieved by developing infrastructure condition indices from water supply, electricity, access roads, streetlights, drainage system, waste disposal, health, recreation and security and residential property return indices to be able to determine the effect appropriately. It was found that infrastructure conditions in Wuse II and Maitama are way above average indicating indices of 82% - 92% and 81% -91% above the average international standard benchmark of 60%. While Kubwa and Lugbe maintains a little above average as comparatively. (AAPPA- Australian Association of Higher Education Facilities, 2000). Therefore, the infrastructure conditions in Abuja are in a good condition and has affected positively the market performance in terms of rate of returns on residential property investment.

The implication of this outcome is that the real estate sector contributes to the national GDP though it may not be as expected, the contribution can be enhanced by property market

efficiency and its products. Therefore, as one of the determinant of market viability and performance, infrastructure is expected to be maintained in a functional condition that will in turn improve the values of residential properties. This will provide the government better rates and taxes after assessments and adequate revenue will be generated and thus available funds for the maintenance and expansion of infrastructure in Abuja.

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AN EVALUATION OF CLASSIFICATION PERFORMANCE OF ARTIFICIAL NEURAL NETWORK AND LOGISTIC REGRESSION AS LOAN SCORING MODELS

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ABSTRACT

Purpose: Application of credit risk evaluation techniques has continued to receive more research attention in the advanced economies than emerging economies. However, the findings on the classification performance of these techniques have been mixed. The current paper aims at assessing the classification performance of Artificial Neural Network (ANN) and Logistic Regression Model (LRM) in credit transaction using data from Nigeria emerging economy.

Design/methodology/approach: 2,300 data samples comprising of fully and partially recovered loan accounts were obtained from the databases of eleven commercial banks and sixteen primary mortgage institutions practicing in Lagos metropolis, Nigeria. Also, data on 14 variables comprising one dependent variable (loan recovery status) and thirteen independent variables were collected on each of the data samples. To construct LRM & ANN models, the total samples were subdivided into training/validation and testing samples. 73% of the total samples (1,679) were used for training and validation of the models while 27% of the total samples (613) were used in testing the classification performance of LRM and ANN using overall accuracy, specificity, sensitivity, Type I and Type II errors as criteria for performance measurement. SPSS version 21 was adopted for data analysis.

Findings: The result of the analysis reveals among others that LRM and ANN models generated good overall accuracy values of 76.6% and 91% respectively. However, the performance of ANN is comparatively more efficiently better than that of LRM in detecting 'good' loan applicants, 'bad' loan applicants and in generating lower Type I and Type II errors than LRM. The use of ANN is therefore recommended as a credit risk evaluation technique due to its consistent performance across the performance metrics.

Research limitation/implications: The findings of the paper provide input for lending decision in lending institutions in Nigeria which is capable of minimizing bad debts & non-performing loans thereby enhances stability in financial institutions. However, the finding of the current research is of country-specific, further study may compare the classification capacity of LRM and ANN across advanced and emerging economies. Also, future studies may adopt larger samples than the ones adopted in the current study for more inclusive researches.

Originality/value: As noted above, studies on classification performance of ANN & LRM have been well documented in the advanced economies like UK, USA, China etc, the current paper extends the frontiers of knowledge to the existing body of literature in the advanced economies

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while making one of the foremost empirical articles to examine the subject matter in emerging economies.

Keywords: Artificial neural network; classification performance; default; loan evaluation; logistic regression; loan recovery.

1. INTRODUCTION

Accessibility to credit facility is a strategic input in investment initiation and expansion which also determines the performance of any nation's economy (Omondi and Jagongo, 2018). Generally, loans are sourced from lending institutions usually with covenants of repayment by borrowers (Taiwo, Falodun and Agwu, 2016; Berger, et al, 2019). It is pertinent to note that the approval decision of credit by lending institutions is often associated with risks in terms of default and non-recovery of defaulted accounts. Loan default and poor recovery of same are global phenomena though at varying degrees (Adewusi, 2015 and Guha et al, 2020), for example, International Swaps and Derivative Association Inc (2008) reveals that the global volume of credit default grew from US\$631.5 billion in 2001 to US\$54.6 trillion by mid-2008 yielding an alarming growth rate of 854.6% in less than a decade. The non-performing loans range from 19% to 48% in the banking portfolio (Nigerian Deposit Insurance Co-operation 2010). It is noteworthy that the challenge on non-performing loans is yet to significantly respond to policy remedies in developing countries especially in Nigeria (Adewusi et al 2016 and Sofayo, 2017). The decision to approve or reject loan applications portends risk of losing returns/principal (Singh, 2020). The decision to wrongly reject loan application reduces the lender's returns while inappropriate approval of 'bad' loan applications produces the risk of losing both the principal and accruable interest. The huge capital loss through non-performance of loans can be ascribed to the use of credit risk evaluation techniques that cannot cope with the reality of uncertainties (Bekhet and Eletter, 2014; Nyasaka, 2017; Leah, 2018 and Grima, and Thalassinos, 2020).

The global financial crisis in 2008 resulted from an unreliable credit rating assignment to mortgage-backed securities (Bae and Kim 2015). Risk estimate is a major factor contributing to any credit decision and it is a key determinant of profitability in lending transactions. However, while the risk is desirable and unavoidable in the business of lending institutions, inability to precisely determine it may adversely affect credit management (Bekhet and Eletter, 2014 and Agustia, et al, 2020). Credit scoring models are employed to determine loan applicant's ability to repay financial obligation (Emel, et al, 2003 and Maldonado, et al, 2020), the objective of the credit scoring model is to classify loan applicants into low risk and high-risk categories (Akkoe, 2012 and Lahsasna, et al 2012). The use of subjective/personal judgment of loan officers on the ability of loan applicants concerning loan repayment is prone to human error and inconsistency (Sofayo, 2017). It is necessary to rely on models and algorithms rather than human judgment in consumer lending because of the vast decisions that are involved (Khandani, et al, 2010 and Zeng, 2020). A little improvement in the accuracy of the credit decision might reduce credit risk and translates into important future savings (Chen and Huang, 2003, Tsai and Wu, 2008 and Lahsasna et al, 2010)

Due to the significance of credit risk evaluation, several studies have proposed embracing data mining tools in lending institutions to improve their risk assessment and management of same (Akkoe, 2012). Logistic Regression Model, Discriminant Analysis, Artificial Neural Networks, Genetic Algorithms, Genetic programming. K-Nearest Neighbour model, Decision Tree, Support Vector Machine and some hybrid models have been used to evaluate credit risk with promising results in terms of predictive accuracy (Bekhet and Eletter, 2014). It is noteworthy that the findings of the predictive capabilities of these loan evaluation algorithms are to a large extent inconclusive in terms of their appropriateness, suitability, and superiority of one over the others. Although credit risk appears to be a global challenge, the advanced countries of the world have done considerable works by adopting more futuristic and sophisticated credit risk assessment techniques (Adewusi, et al, 2016). However, it is noteworthy that the subjective method of assessing loan applicant's creditworthiness appears prevalent in most developing countries (Sofayo, 2017).

Artificial Neural Networks and Logistic Regression models are one of the most efficient and widely used methods for credit risk assessment (Bekhet and Eletter, 2014). However, the findings on the relative predictive ability of the two models require more research efforts especially in terms of their suitability and appropriateness in the loan classification task. The questions are, what is the classification performance of each of the techniques? How reliable are these models in detecting problem loan applications and non-problem loan applications? Against this backdrop, the current study assesses the predictive classification accuracy of LRM and ANN to determine their relative appropriateness and suitability in credit risk measurement.

The rest of the paper is structured as follows: the first section focuses on background introduction followed by a review of relevant literature, research methodology, discussion of result and concluding remarks.

2. LITERATURE REVIEW

Research efforts have continued to focus on credit risk assessment in lending institutions, the studies include the following but are not limited to them. Desai, et al (1996) compare the performance of multilayer perceptron, LRM and Linear discriminant analysis. The authors conclude that the difference in the performance of these models in risk evaluation is not statistically significant especially between LRM and ANN. Chem and Huang, (2003) examine credit rating prediction models using support vector machine (SVM) and Back- Propagated Neural Network (BPNN) to evaluate credit risk using 21 variables from the USA and Taiwanese financial markets. The results show that SVM achieved a better overall accuracy compared to BPNN. Limsombunchai et al (2005) investigate Agricultural loans in Thailand using LRM and ANN, 16,560 data of borrowers between 2001 and 2003 were gathered. The study reveals that in terms of precision, the ANN model might not necessarily predict the borrower's creditworthiness and default risk better than LRM, However, most ANN models can detect Type 1 error than LRM.

Moreover, Koh et al (2006) assert that the best performing credit risk evaluation technique is logistic regression, Neural Network, and decision tree. Similarly, Odeh et al (2006) evaluate loan default in eleven states of the USA (Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, North Dakota, Ohio, Tennessee, and Wisconsin) with a large sample dataset of 157,853 credit transactions. ANN and LRM were used in estimating the probability of borrower default, the results show that the LRM model gives the best performance in identifying problem loans but exhibits poor

performance in predicting problem-free loan applicants, however, ANN displayed the best accuracy in correctly predicting problem free loans.

Gouvea and Goncalves (2007) assess the predictive performance of ANN, LRM and Genetic Algorithms (GA) in Brazilian financial institutions with a dataset of 20,000 comprising of 'good' and 'bad' loan applicants spanning between 2002 and 2003, the result of the study indicates that LRM presented a slightly better result than ANN but both models were better than the model generated by GA.

Also, Youn and Gu (2010) compare the accuracy of LRM and ANN in predicting business failure for Korean lodging firms. The results indicate that ANN records better overall accuracy and correctly classified 'good' loan applicants while both models give the same Type 1 error. Yap, et al (2011) investigate the creditworthiness of borrowers and compared the accuracy level of LRM and decision tree (DT). The result concludes that there is no significant difference in the performance of LRM and DT. In another study, Blanco, et al (2013) use a multilayer perceptron Neural Network to develop a specific micro-finance credit screening model, they compared the performance of the MLP model against three statistical techniques- linear discriminant analysis, quadratic discriminant analysis, and Logistic Regression Model. The MLP model achieved higher accuracy with lower misclassification errors than others. The finding confirms the superiority of MLP over the parametric statistical techniques.

Furthermore, Bekhet and Eletter (2014) investigate default risk in Jordanian Commercial banks between 2006 and 2011 using 496 cases of creditworthy and noncreditworthy loan applicants. The creditworthiness of borrowers was evaluated using LRM and Radial Basic Function- RBF (a form of Neural Network). It was revealed that both models show promising results and can be concluded that there is no overall best model, Although, LRM performed better than RBF about the overall classification accuracy while the RBF model outperformed the LRM model in screening rejected applicants, identifying potential defaulter and also minimize Type II error.

Bae and Kim (2015) investigate personal credit rating prediction using Ubiquitous data mining (UDM), Bayesian style frequency Matrix (BFM), Multi-Layer Perception (MLP), classification tree (CT), Neural Networks rule extraction (NR) and Logistic Regression (LR) The study employed a dataset of 10,062 from January 2004 to December 2008 and concludes that LR, MLP, CT BFM, NR, and UDM have performance accuracy values of 69.%, 72.7%, 69.1%, 68.6%, 70.6% and 78.6% respectively with UDM rated more efficient than the rest models. Adewusi, Oyedokun, and Bello (2016) assess the classification performance of ANN using data from defaulted accounts obtained from the databases of commercial banks and Primary Mortgage Institutions in Nigeria from 2007 to 2015. The results reveal among others that ANN recorded better classification performance in detecting problem loan applications than non- problem loan applications.

In a more recent research effort, Allam et al (2019) explore the systematic application of neural network-based models versus logistic regression for predicting 30 days all-cause re-admission after discharge from a heart failure (HF) admission. Using a large administrative dataset, the result shows that neural network models and logistic regression have a comparable performance on HF re-admission prediction and that patient timeline data boosts prediction performance. Another study by Christodoulou et al (2019) compares the performance of the logistic regression model (LRM) with machine learning (ML) for clinical prediction modelling. The results show no evidence of the superior performance of ML over LRM.

It is pertinent to note that due to growing uncertainty in society, more studies may be needed to establish the relative appropriateness of ANN and LRM as decision support techniques.

3. Research Methodology

3.1. Variable description, dataset, and variable measurement

Table 1 shows the variables used in the analysis, the dependent variable is loan recovery status which is measured as fully recovered and partially recovered loans. The fully recovered loans refer to loan accounts with optimal performance in terms of recovery while partially recovered loans are loan accounts with poor recovery performance. The dependent variable (loan recovery with a value of 1 and 0 for fully and partially recovered loans respectively). The independent variables were segmented into macroeconomic variables (GDP, INF and INT rates), borrower characteristics (Type of borrower, years of the borrowers' relationship with the bank and history of default of a borrower), loan characteristics (loan duration, loan-to-value ratio, loan size, and loan supervision) and collateral characteristics (value of collateral, Age of collateral asset). In the aspect of variable measurement, GDP, INF and INT rate, loan size, loan duration, loan to value, age of collateral and value of the collateral are measured on continuous scale measurement while recovery status, type of borrower, loan supervision and monitoring of borrower are measured as dummy variables.

Variable	Definition	Measurement
	Dependent Variable	
RECOV_STATUS	Loan recovery status	Dummy (1, if the loan is fully recovered, 0 if otherwise)
	Independent Variables	· · · ·
Macro-economic inc	licators	
GDP	The annual growth rate in GDP	Scale (%)
INF Rate	Inflation rates	Scale (%)
INT Rate	Interest rates	Scale (%)
Borrower characteris	stics	
TYPE_BORR	Type of borrower	Dummy (1, if private borrower, 0
		if corporate borrower)
RELAT_BORR	Years of relationship with the bank	Scale (year)
HIST_BORR	Borrower history of default	Dummy (1, if the borrower has a
		history of default, 0 if otherwise)
Loan characteristics		
LOAN_SIZE	Loan size	Scale (₦ million)
LOAN_DURA	Loan duration	Scale (month)
LTV	Loan-to-Value	Scale (ratio)
SUPERV_LOAN	Loan supervision and monitoring by the	Dummy (1, if bank partners with
	lender	the borrower, 0 if otherwise)
Collateral characteri	stics	
AGE_COLLA	Age of collateralized real property	Scale (year)
VALUE_COLLA	Value of the collateralized property	Scale (₦ million)

Table 1: Variable definition and measurement

Data on the fourteen variables (1 dependent and 13 independent) were collected on each of the data samples (2,300), obtained from the databases of the eleven Commercial Banks and sixteen Primary Mortgage Institutions in Nigeria. The variable definitions and measurements are contained in Table 1. The variables used are either dichotomous or

continuous. Following the procedure of Bekhet and Eletter (2014), the categorical variables were converted into numerical values to be used by the neural network model while all the scale variables were standardized using the rescaling of covariate option in SPSS to improve the network training. SPSS software version 21 was adopted to perform the analysis in the study. These problem loans were later classified as fully-recovered (FR=1192) or partially-recovered (PR=1108) depending on the success achieved after recovery actions were taken. LRM and ANN models were adopted in this study as risk assessment techniques for ANN model development, the dataset is sub-divided into three groups, which are training, validation (to prevent model overfitting) and holdout samples. 1,074 (46.70%) and 613 (26.65%) data samples representing a combined total of 73.35% of the total samples are adopted for both training and validation while the remaining 613 (26.65%) was taken as holdout samples for evaluating the classification accuracy.

3.2. Classification models

Logistic Regression, Factor Analysis, Multiple Regression, Discriminant Analysis, ANN, Vector Support Machine, Decision Tree, K-nearest Neighbor Algorithm, Genetic Algorithm, Fussy Logic and a host of other hybrids have been used as credit risk assessment techniques (Bekhet and Eletter, 2014), the study chooses Logistic Regression and ANN as loan classification models because of the nature of our dependent variable which is dichotomous. Both models have enjoyed increasing use in computing the conditional probability of class membership (Yap, et al, 2011). However, the findings on their relative predictive classification abilities are mixed (Khieu et al, 2012). Logistic Regression is a predictive model widely used in classification problems (Bekhet and Eleter, 2014 and Chen, Xie, Wang, Hong, Bui and Ma, 2017). LRM is a linear regression in which the target variable is a non-linear function of the probability of being 'good' (Thomas, 2000). LRM is a common modelling technique that classifies between two groups using a set of predictor variables (Akkoc, 2012). It has the flexibility of incorporating both qualitative and quantitative factors and it is more efficient in classification problems than other statistical methods (Bandyopahya and Saha, 2009).

The works of Dermine and Neto de Carvalho, (2006) and Khieu, et al (2012) on the appropriateness of Quasi-Maximum Likelihood Estimation (QMLE) to classification and group membership are adopted in the current study. Hence, the effects of the explanatory variables on the criterion variable can be expressed in equations 1, 2, 3 and 4:

Where LR = loan recovery status, taking the values of 1 if the defaulted loan was fully recovered eventually and 0 if otherwise.

 \propto_0 is constant; β_j = coefficient associated with the exogenous predictors; X_{ij} = explanatory factors (as contained in Table 2).

If P_I be the probability of recovery of defaulted loans of borrower i.

$$LR = \frac{e^{\sum_{j=1}^{n} \beta_j X_{ij}}}{1 + e^{\sum_{j=1}^{n} \beta_j X_{ij}}} \dots 2$$

Transforming equation 1 we derive the odd ratio as;

$$\frac{p_i}{1-p_i} = \exp\left(\alpha_0 + \sum_{j=1}^n \beta_j X_{ij}\right) \dots 3$$

And the Logit Model is then expressed in equation 4;

On the other hand, Artificial Intelligence (AI) forecasting techniques such as artificial neural networks have been receiving much attention lately (Reddy and Kavitha, 2010). ANN has been described as having the ability to learn like humans by accumulating knowledge through repetitive learning activities (Paliwal and Kumar, 2009). ANN is often given different names: (1) Connectionist models (2) Parallel distributed processing (3) Neuromorphic system and (4) neural computing. ANN is a branch of Artificial Intelligence (AI) in which structures are based on the biological nervous system. It can learn from experience and generalize from previous examples to new problems. ANN is a powerful data modelling tool that can capture and represent complex input/output relationships. It can represent both linear and non-linear relationships.

It is a technique used for classification, prediction, and recognition of a pattern in data when the relationship between the independent and dependent variables is complex and non-linear (Phatilwuttipat et al, 2012).

3.3. ANN model

The model consists of the three main layers as shown in figure 1 below: the input layer, hidden layers, and the output layer.

3.3.1. Input Layer

The activity of the input layer units represents the raw information that is fed into the network. The input layer presents data to the network and the size of the input layer or of nodes is determined by the number of data. The network can be designed to accept sets of input values that are binary or continuous (Ballal, 1999). In this regard, our input variables include GDP, Inflation rate, Interest rate, loan to value ratio, loan amount, loan duration, borrower status, borrower's history of default, year of business relationship with the bank, loan supervision, collateral value and age of collateral.

3.3.2. Hidden layers

The activity of each hidden unit is determined by the activities of the input units and the weights (wij) in the connections between the input and hidden units (wijxi). Hidden layers act as layers of abstraction, pulling features from inputs, they do not directly interact with the outside world (Goh, 1996). The final number of hidden layers requires determination which is by a trial and error process. While Fj is the transfer function from the hidden to output layers as shown in Figure 1.

3.3.3. Output layers

The output layer provides the forecast values. The behavior of the output unit depends on the activity of the hidden units and weights between the hidden and output units.



Figure 1: ANN structure of a computational unit **Source:** Adapted from James and Carol (2000)

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Descriptive statistics of the variables

The result of the analysis is discussed in this section. Table 2 presents the frequency distribution of the samples.

Variables		Frequency	Percent
Rec_status	Partially recovered	1108	48.2
	Fully recovered	1192	51.8
	Total	2300	100.0
Borrower Status	Corporate	891	38.7
	Private	1409	61.3
	Total	2300	100.0
Borrower History of Default	Once in default	582	25.3
	Never defaulted	1718	74.7
	Total	2300	100.0
Bank Participation in Project	Not participated	2140	93.0
	Participated	160	7.0
	Total	2300	100.0

 Table 2: Variable frequency distribution

The frequency distribution of the variables in the study is presented in table 2. As shown in table 2, 48.2% (1109) and 51.8 (1192) of the 2,300 loan accounts sampled were partially and fully recovered respectively. A total of 61.3% were private borrowers which indicates that financial institutions extended a greater percentage of loans to the private sector, this may have a multiplier effect on the entire economy.

The majority of these loans (74.7%) were granted to borrowers who never defaulted in their past transactions with the banks while only 25.3% were granted to one-time defaulted borrowers.

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	Ν	Range	Mini.	Max.	Mean	Std. Dev.	Skewness	Kurtosis
Rec_status	2300	1	0.0	1.0	0.5	0.5	-0.1	-2.0
Gross Domestic Product	2300	3.6	6.0	9.6	7.7	1.1	-0.1	-1.3
Inflation	2300	128.3	-52.5	75.8	14.7	37.4	0.3	-0.4
Interest Rates	2300	49.5	-16.1	33.4	0.8	10.1	0.8	0.5
Loan Amount	2300	6999.95	0.1	7000.0	167.5	759.4	7.7	62.8
Value of Collateral	2300	44999.2	0.8	45000.0	352.0	2752.0	15.0	239.2
Loan-to-value	2300	0.99	0.0	1.0	0.7	0.2	-1.3	2.2
Loan Duration	2300	106	6.0	112.0	20.1	12.3	1.4	2.3
Borrower Status	2300	1	0.0	1.0	0.6	0.5	-0.5	-1.8
Borrower History of Default	2300	1	0.0	1.0	0.8	0.4	-1.1	-0.7
Number of Year of Relationship with bank	2300	15	0.0	15.0	4.9	3.3	0.4	-0.4
Bank Participation in Project	2300	1	0.0	1.0	0.1	0.3	3.4	9.5
Age of Collateral	2300	27	1.0	28.0	14.0	5.5	-0.3	-0.4

Table 3: Descriptive statistics of the variables

Table 3 presents descriptive statistics of the sampled variables, from the table, GDP has a mean value of 7.7, Inflation has the highest mean value of 14.7 of all the macroeconomic variables considered. High inflation could pose economic challenges to the entire economy in the country thereby affecting its performance (Bernanke, Laubach, Mishkin, and Posen, 2018). An appropriate policy formulation is needed to stabilize the rate of inflation to achieve a healthier economic growth.

4.2. Test of fitness for logistic regression model

Table 4 presents the test of fitness for LRM, the result of chi-square was presented using an omnibus test which tests the significances of the LRM model. The table provides statistical evidence that there is a relationship between the selected variables and the dependent variable. (loan Recovery). The Chi-square figure of 851.89 is significant at $P \le 0.00$ which indicates that the stated null hypothesis (there is no significant relationship between the predictor variables and the dependent variable) is rejected. Because of the significant relationship at $P \le 0.00$, then the alternative hypothesis is accepted, that there exists a relationship between the selected variables and loan recovery.

C	hi-square	df	Sig.
Step	776.523	12	.000
Block	776.523	12	.000
Model	776.523	12	.000
Omnibus Test			
-2 Log likelihood	Cox & Snell R So	quare	Nagelkerke R Square
1560.230a	.369		.492
Hosmer and Lemeshow Test			
Chi-square	df		Sig.
258.23	8		.270

Table 4: Logistic regression model test of fitness

Also, Hosmer and Lemeshow test were carried out, the Hosmer and Lemeshow (H-L) are used basically to test the hypothesis that there is no linear relationship between the predictor variables and the log odds of the response variable. Peng et al (2002) assert that when the H-L test is not significant then it could be concluded that the model developed fits the data well. Table 4 also shows the H-L test result which indicates a chi-square figure of 258.23 at P \leq 0.270 which is not significant. This shows that the model fits the data well and that the null hypothesis should be rejected and the alternate hypothesis, that there is a linear relationship between the weighted combination of the predictor variables and log odds of the criterion variable be accepted. This is consistent with Homer and Lemeshow (2001) that low value and non- significance of the H-L test indicates a good fit to the data.

Variables	В	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.f	or EXP(B)
							Lower	Upper
GDP	.225	.064	12.551	1	.000	1.253	1.106	1.419
INFLA	023	.002	149.102	1	.000	.977	.974	.981
INT	086	.007	151.961	1	.000	.917	.905	.930
Loan Amount	004	.002	4.045	1	.044	.996	.992	1.000
Value of Collateral	002	.001	3.877	1	.049	.998	.995	1.000
Loan-to-value	-1.087	.403	7.266	1	.007	.337	.153	.743
Loan Duration	.016	.006	7.589	1	.006	1.017	1.005	1.028
Borrower Status	.728	.136	28.641	1	.000	2.071	1.586	2.704
Borrower History	.581	.153	14.429	1	.000	1.787	1.325	2.412
of Default								
Number of Year of	.143	.021	45.816	1	.000	1.154	1.107	1.202
Relationship with								
bank								
Bank Supervision	388	.283	1.880	1	.170	.679	.390	1.181
and monitoring								
Age of Collateral	.082	.012	47.269	1	.000	1.085	1.060	1.111
Constant	-2.955	.644	21.044	1	.000	.052		

Table 5: Variables in logistic regression model

PredictRecStatus = ((0.225*GDP) - (0.023*INFLA) - (0.086*INT) - (0.004*Loan_Amount) - (0.002*Value_colla) - (1.087*LTV) + (0.016*Loan_duratn) + (0.728*Borrw_Stat) + (0.581*Borr_HisDEFT) + (0.143*Num_yrrela) - (0.388*Bank partic) + (0.082*Age Collate)) - 2.955 -------5

Table 5 shows the effect of each predictor through the B coefficient. The sign of each B determines the direction of the relationship between each variable and the criterion variable (Bekhet and Eletter 2014). The table shows that all the variables in the model except bank participation in the project, the implication of this is that good attention must be given to those variables that are significant, this will enhance loan recovery in lending institutions. Variables with negative B indicate a decrease in the probability of loan recovery. In this regard, Gross Domestic product, Borrower status, Borrower history of default, Year of business relationship with the lender, loan duration, Age of collateral and value of the collateral will increase the probability of loan recovery while such factors as

interest rate, inflation rate, and loan supervision will decrease the probability of loan recovery. To assess the riskiness of each of the 613 prospective borrowers, equation 5 is used in predicting the risk associated with prospective loan applicants, the cut-off value of 0.5 as adopted by Bekhet and Eletter (2014) was used as the threshold value which implies that when P<0.5 the applicant is classified into the set of low-risk category while when P> 0.5, the applicant is classified into a high-risk category. To determine the riskiness of each of the 613 prospective applicants, their data were imputed into the derived probability equation 5 which results in LRM classification Table 6:

			Predicted	RecStatus	Total
			Partially recovered	Fully recovered	
LRM	Partially recovered	Count	213	80	293
		% within	72.7%	27.3%	100.%
		Rec_status			
	Fully recovered	Count	74	246	320
		% within	23.1%	76.9%	100.%
		Rec_status			

Table 6: LRM classification ability

4.3. ANN credit scoring

ANN model was built using the same dataset used in developing the LRM model to compare the accuracy of the two models. The same numbers of independent variables were also examined.

As earlier indicated, LRM and ANN models were adopted in this study as risk assessment techniques, 2,300 loans were used for LRM and ANN. For ANN model development, the dataset is sub-divided into three groups, which include training sample, testing sample (to prevent model overfitting) and holdout sample, 46.7% (1074) and 26.7% (613) of the cases were set aside as training and testing samples respectively while the rest 613 (26.7%) taken as holdout sample for evaluation of classification accuracy as shown in Table 7.

			Sample allocation			Total
			Trainin	Test	Holdout	
			g			
Rec_status	Partially	Count	523	292	293	1108
	recovered	% within Rec_status	47.2%	26.4%	26.4%	100.%
	Fully recovered	Count	551	321	320	1192
		% within Rec_status	46.2%	26.9%	26.8%	100.%
Total		Count	1074	613	613	2300
		% within Rec_status	46.7%	26.7%	26.7%	100.%

Table 7: ANN model development

ANN network information is presented in Table 8 showing all the variables. Table 8 indicates ANN layer network information as generated by SPSS version 21. The model

selected the best architecture for the network automatically, the input layer houses 12 units which represent the independent variables, the hidden layer has 6 units, the activation function being hyperbolic while the output layer generated 2 units with activation function being softmax. Relative classification performance of both models are presented in Table 9.

Table 8: ANN netwo	rk information		
Input Layer	Covariates	1	GDP
		2	NFL
		3	INT
		4	TYPE_BORR
		5	RELAT_BORR
		6	HIST_BORR
		7	LOAN_SIZE
		8	LOAN_DURA
		9	LTV
		10	SUPERV_LOAN
		11	AGE_COLLA
		12	VALUE_COLLA
	Number of Units		12
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1a		5
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables Number of Units	1	RECOV_STATUS 2
	Activation Function		Softmax
	Error Function		Cross-entropy

a. Excluding the bias unit

Overall classification accuracy, true classification percent correct (sensitivity and specificity) and misclassification error (Type I and Type II error) were evaluated and the result is shown in table 9, this is done to discover the predictive capacity of the two models. The classification accuracy rate is among the most common quantitative measures used in evaluating the predictive accuracy of classification models (Abdou, et al 2007). The overall percentage correct attained by a model may sometimes be misleading, thus, to interpret the model performance in a more meaningful way, the misclassification cost of Type I and Type II errors must be differentiated (Bekhet and Eletter, 2014). For better research precision, the current study adopts the positions of the two authors for a better understanding of the predictive performance of the two models.

The overall classification accuracy of the two models using test samples is 79.1% and 91.2% for LRM and ANN respectively. Percentages of 65% and above are acceptable to practitioners as a standard classification percentage for decision making (Gouvea and Goncalves, 2007). While the two models are adequate as loan classification tools judging from their respective overall accuracy, however, the overall classification capacity of ANN is higher than that of LRM. This finding is consistent with the finding of Youn and Gu (2011) where they claimed that ANN has a better overall predictive classification percentage than LRM. However, the finding of Bekhet and Eletter (2014) is contrary to the finding of the current study as they asserted that LRM had a better overall classification percentage than ANN.

Item	Predicted Val	ue of ANN and	LRM				Remarks
	LR	М			ANN		
	Partially	Fully	Percent	Partially	Fully	Percent	
	Recovered	Recovered	Correct	Recovere	Recover	Correct	
	Loan	Loan	(%)	d Loan	ed Loan	(%)	
Partially Recovered Loan	TN (213)	FP (80)	72.7	TN (263)	FP (30}	89.8	ANN> LRM (ANN Detects Problem Loan Applicants Better
Fully Recovered Loan	FN (74)	TP (246)	76.9	FN (24)	TP (296)	92.5	Than LRM) ANN> LRM (ANN Detects Good Loan Applicants Better Than LRM)
Overall percentag e			74.9			91.2	ANN> LRM (ANN has a better overall accuracy Better than LRM)
Type 1 error			27.3			10.2	ANN> LRM (ANN has a lower value of bad loan applicants wrongly classified as good loan applicants than LRM)
Type 2 error			23.1			7.5	ANN< LRM (ANN has a lower Percentage of good loan applicants wrongly classified as good loan applicants than LRM)

Table 9: Relative classification performance of LRM and ANN

TN=True Negative, FN = False Negative, TP=True Positive, FP= False Positive

In terms of sensitivity analysis (percent correct of good samples), that is, the percentage of good samples classified as good samples. LRM has 76.9% while ANN has 92.5% of good applicants classified as good applicants. This indicates that the ANN model is efficiently better than LRM in classifying 'good' applicants as 'good' applicants -a difference of 15.6%. This finding is consistent with Odeh et al (2006), ANN displayed the best accuracy in correctly predicting 'good' applicants as 'good' applicants. In terms of specificity analysis (percent correct of bad samples), this is the ability of a model to classify 'bad' applicants as 'bad' applicants. LRM obtained 72.7% and ANN generates 89.8% accuracy when classifying 'bad' loan applicants as 'bad' loan applicants. Again, ANN classification accuracy of 'bad' loan applicants classified as 'bad' loan applicants is 17.1% higher than that of LRM. This finding agrees with the work of Limsombunchai et al (2005) that ANN has often predicted the borrowers' worthiness better than LRM. Lastly, misclassification errors of the models were examined from two perspectives, firstly, Type I error which is the wrong classification of 'bad' applicants as 'good' loan applicants, secondly, Type II error which is the wrong classification of 'good' loan applicants as 'bad' applicants.

From table 9, the model generated a Type 1 error of 27.3% and 10.2% for LRM and ANN respectively. It thus means that ANN wrongly classified only 10.2% of the total samples as 'good' loan applicants while LRM has 27.3% of 'bad' applicants wrongly classified as 'good' applicants having a difference 17.1%, this implies lending decisions.

The model with a low misclassification Type I error possesses sufficient merit in supporting lending decisions. This corroborates the findings of Youn and Gu (2010) and Adewusi (2015) that most of ANN models can detect Type 1 error much better than LRM

Type II error of the two models was also examined; Type II error is the incorrect classification of 'good' loan applicants as 'bad' loan applicants. Table 9 also shows that LRM has 23.1% of 'good' applicants incorrectly classified as 'bad' applicants while ANN has 7.5% of 'good' applicants incorrectly classified as 'bad' applicants. In this regard, LRM still has a higher value of good applicant wrongly classified as bad applicants than ANN, this could impact negatively on lenders' profit as Type II error results in loss of interest to lenders. Most lenders are out to make a profit for the credit granted to borrowers, in such a situation, ANN models might produce a better result than LRM.

5. CONCLUSION

The current study attempts to assess the relative predictive performance of LRM and ANN as credit scoring models. The samples were divided into training/validation and holdout sub-divisions. The predictive efficiency of the models was assessed in table 9 using 613 data samples of unknown borrowers, it was revealed that the ANN model consistently outperformed LRM using the overall percentage accuracy, percent correct of loan applicants, Type I and Type II errors.

From the foregoing analysis, the two models have performed beyond 65% considered as acceptable standards by lenders (Gouvea and Goncalves, 2007) which indicates that the two models are good as credit scoring models. The study concludes that while LRM and ANN models accuracies are found within the range of 65% and above acceptable to most lenders, the paper observed that ANN is consistently better than LRM as claimed by some studies (Pandey, Choudhury, Jagdev, and Dehuri, 2013; Iturriaga, and Sanz, 2015 and Koh, Tan and Goh, 2015). ANN model may provide a more comfortable platform for lending decision making.

Furthermore, the finding of the current study is limited to the size of the data utilized and obtained from the study area, further study may consider larger samples across some selected countries for comparison purpose.

6. ACKNOWLEDGEMENTS

The author acknowledges the efforts of Dr. T.B. Oyedokun for guiding the use of ANN. The assistance of loan recovery officers of the participating lending institutions is equally and highly appreciated.

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MODELS FOR PREDICTING THE IMPACT OF RISK FACTORS ON CONSTRUCTION CONTRACTORS' CASH-OUT FORECASTS IN NIGERIA

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ABSTRACT

Purpose: Researches have shown that construction contractors face challenges when attempting to manage their present and future financial requirements via cash flow (CF) forecasting and/or the use of cash flow forecasting (CFF) models. Consideration for risk factors impacting on CF forecasts/CFF models has also been identified as a key issue affecting contractors' application of CFF models. This study developed models for predicting the impact of risk factors on CF forecasts by contractors in Nigeria. A list of risk factors that impact on CF forecasts were identified through the review of existing literature. The identified risk factors were then investigated in relation to the likelihood of occurrence and the impact on CF forecasts, if they occur.

Design/methodology/approach: Data was collected via a questionnaire survey of contractors operating in the Nigerian construction industry. Two (2) sets of questionnaire surveys were conducted. The first questionnaire survey focused on determining the likelihood of occurrence/impact of thirty-one (31) risk factors on cash-out forecasts respectively. Contractors were asked to rank on a scale of 0 to 5 the likelihood of occurrence/impact of the risk factors. The responses obtained were subjected to analysis with the use of IBM SPSS (version 21) software. The mean, standard error and standard deviation were computed. The computed means were used to rank the likelihood of occurrence/impact of the factors in descending order. **Findings:** Sixteen (16) risk factors were found to significantly impact "cash-out" forecasts-"increased duration of the project", "change in currency exchange rates", "high cost of materials", among others. The models developed showed that construction contractors' cash-out forecasts vary with the actual expenditure by +20%, +25% and +25% at the 30%, 50%, and 70% completion stages respectively.

Research implications: The findings from the research imply that several risk factors have different degree of occurrence and impact on cash-out forecasts in the Nigerian construction industry.

Originality/value: Construction contractors practicing in the Nigerian construction industry should expect positive variations to their "cash-out" forecasts during the execution of projects. Major recommendation; contractors should carefully consider the sixteen (16) affecting "cash-out" before embarking on any construction project.

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Keywords: Forecast; cash-out; risk; factors; construction; Nigeria.

1. INTRODUCTION

Managing cash out forecasts is an essential component of financial management in the construction industry. Cash out in construction contracts is concerned with the payments to subcontractors, suppliers and other activities to ensure smooth operation on a construction site. Construction Contractors know that there can be a significant lapse in time from the point at which they are granted a project, incur labour, material and other costs, to the time they are actually paid for completed work. Consequently, an inability to properly plan for the outflow of cash during the life span of a project may well result in the abandonment of the project (Kenley, 2003).

Several factors affect cash out to a contractor working on a project. These factors include (i) duration of the project (ii) retention conditions (iii) times for receiving payments from employers (iv) credit arrangement with suppliers, equipment rentals etc. and (v) times of payment to subcontractors (Park, Han & Russel, 2005). Other factors affecting cash out forecasting include the type of client, size of the project, the procurement route, type of the project etc. (Kaka and Khosrowshahi, 1996). Thus, the need for forecasting the cash out requirement of a project at the right time, in order to determine when and where to borrow or redirect funds cannot be over emphasised.

In an attempt to assist contractors and employers forecast their cash requirements, several researchers have made efforts to develop forecasting models. These attempts became popular over thirty years ago within the construction industry. The approach of early studies may be characterised as nomothetic- the studies attempted to discover general laws and principles across categorised or none categorised groups of construction projects (Kenley, 2003). Some of the techniques used for modelling cash flow forecasts include polynomial regression (Balkau, 1975; Bromilow and Henderson, 1978; Peer, 1982), Weibull-linear model (Tucker, 1986), Logit models (Kenley and Wilson, 1986, 1989), neural network (Boussabaine and Kaka, 1998) and fuzzy logic (Boussabaine and Elhag, 1999; Chen, Dan & Roy, 2013).

The nomothetic approach adopted by early researchers became unpopular because of several shortcomings that resulted in the inability of the models to yield realistic results. These short comings emanated as a result of the uniqueness of construction projects arising from difference in payment conditions (Chen et al., 2005), time lag between billing and actual payment (Park et al., 2005), type of project (Boussabaine and Elhag, 1999), procurement route (Kaka and Price, 1991; Kaka and Khosrowshahi, 1996), type of client and several other factors. This paved way for the introduction of the idiographic approach- the search for specific laws pertaining to individual projects.

Researchers have shown that models developed using the idiographic approach, are more accurate than the nomothetic models (Kenley and Wilson, 1986; Kaka and Price, 1991; Boussabaine and Elhag, 1999). Despite these improvements, forecasts by existing models continue to vary considerably with actual expenditure (Odeyinka, Lowe & Kaka, 2002, 2008: Ross et al., 2013, Zayed and Liu, 2014). According to Ross, Dalton and Sertyesilisik (2013), Odeyinka, Lowe and Kaka (2013), Zayed and Liu (2014), the variation between the forecasts and the actual is as a result of non-consideration of risk factors inherent in construction by the models developed. Hence, more researchers are advocating for understanding and evaluating the impact of risk factors inpacting on cash-out forecasts. Zayed and Liu (2014) in a comparative test of risk factors impacting on cash

out forecasts in North America and China showed that the risk factors had regional dimensions. Results from Zayed and Liu (2014) showed that extent of impact of the risk factors are regionally endemic owing to geotechnical, cultural, attitudinal and other regional issues.

In Nigeria, authors have linked project abandonment to delays associated with payments (Ogunsemi, 2000; Aibinu and Jagboro, 2002; Ogunsemi and Jagboro, 2006; Olawale and Ming, 2009). These delays, according to the authors, were caused by cash out management problems and other factors like procurement route, availability of credit facilities, interest rates, retention rates, time lags between billing and actual payment, project type, type of client (public or private) etc. The cash flow management issues that have been linked to project abandonment in Nigeria are mostly risk issues impacting on cash out forecasts- interest rates, availability of credit facilities, procurement route, project complexity and the likes. Abdulrazaq, Ibrahim and Ibrahim (2017) found that sixteen (16) risk factors significantly influence cash-out forecasts for projects executed in Nigeria. These include- "charging of 'land dues' by locals (illegally)", and "Variations", "bureaucracy in processing payments (giving bribes to "speed up" payment) among others.

However, risk assessment models that are available in literature did not consider some risk factors like "charging of 'land dues' by locals (illegally)" (Dantata, 2007), "change in government officials" (Dusai, 2011), "bureaucracy in processing payments (giving bribes to "speed up" payment) (Aibinu and Jagboro, 2002; Dantata, 2007; Dusai, 2011), "change in activities' start time" (Ross et al., 2013), "bureaucracy in processing payments (giving bribes to "speed up" payment) (Abdulrazaq, Ibrahim & Ibrahim, 2017), among others. The purpose of this study is to develop models for forecasting cash out that will include these neglected risk factors.

2. REVIEW OF RELATED LITERATURE

Researchers' interest in risks associated with cash flow forecasts was triggered when it became obvious that ignoring the risks associated with forecasting cash flows was a fundamental reason why inaccuracies were continuously obtained from cash flow forecasting models (Odeyinka, 2003). In the last two decades' efforts have been made to investigate and report risk and associated factors that are responsible for variations between forecast and actual cash out forecasts.

Kaka and Price (1991) attempted to develop a model capable of forecasting net cash flows at the tendering stage. They argued that generating cash flow forecasting models based on value curves was not ideal due to different "loadings" and "estimating" approaches. The contractor, they posited, rarely loads the cost of items in a contract with the same rate. The possibility of building an ideal cost curve was examined by building an average curve with data obtained from seventeen project. The average curve obtained was used to forecast net cash flows for five projects. It was discovered that the model performed well on the five projects used for testing its validity. In developing the model, the researchers took into account "all the effective variables". Theses effective variables as pointed out by Kaka and Price (1991) include- front end loading, error in measurement, inflation, retention rate and payment delay by clients, which effectively, can be considered as risk factors affecting cash flow forecasts.

Kaka and Khosrowshahi (1996) studied the effect of different procurement routes on contractor's cash flows. Historical data obtained from 150 construction projects were

collected under four criteria - type of project, size of the project, company type and procurement route. The effect of these criteria on the S-curve was then examined. Several tests carried out on the curves generated revealed that different procured projects with different sizes produced different patterns. Company type and type of project did not significantly affect the shape of the S-curve. Results also revealed that, in some cases, the variation in procurement routes had a significant effect on contract cash flows. Three factors were particularly identified as the cause of the variation in cash flows-cash delays, retention condition and the procurement route.

Odeyinka, Lowe and Kaka (2002) argued that the models developed for cash flow forecasting have failed to consider the associated risk factors. Consequently, they identified and assessed the risk factors responsible for variations in construction cash flow profiles. The major risk factors affecting cash flow forecasts were found to be "changes in design or specifications", "contract conditions pertaining to cash flow", "interim valuations" and "certificates and construction programming" issues. However, the study was conducted in the UK where the researchers identified as having "a stable economy".

Odeyinka and Ojo (2007) developed a conceptual framework for assessing risk impacts on clients' cash flow. The framework proposed a step-by-step approach for developing a model to predict clients' risks in relation to cash flow. The framework suggested identifying risk factors affecting cash flow forecasting from existing literature and discussion with construction clients. This will be followed by identification of significant risk factors impacting on clients' cash flow. Cash flow data from various projects will then be obtained and grouped according to type, client, procurement and duration. The significant risk factors will then be used to determine the extent of occurrence of the identified factors in projects. The extent of risk occurrence responsible for variations between actual and forecasted cash flow will then be determined at different completion stages of the projects. The pair of data obtained will then inform the researchers to develop the model for determining impact of risks on client's cash flow. The model development will focus on clients' negative cash flow only as this appears to be the cash position of the client during construction.

Park *et al.* (2005) proposed a model for forecasting cash flow which considered time lag between cost incurred and value earned by the contractor during the construction stage. The model took cognisance of monthly actual costs incurred against planned costs during the construction stage. Moving weights were obtained via a series of ratios comparing cost categories and budgets (initial and final). These moving weights were used to forecast subsequent costs on monthly bases. The model developed was tested against existing fixed weight model (F.W.M). The tests show that Moving weight model (M.W.M) is more accurate than F.W.M. This research restricted itself to activities during construction and did not take into consideration cost activities before and after the construction stage.

Kaka and Khosrowshahi (2008) developed a mathematical based model which sought to address the difficulties encountered by large companies when collecting data for use in computer based models. The research assumed that future works start at the middle of each year and by using a standard value build-up curve, average duration and total value of work needed, models for forecasting turn over and working capital required by Contractors at company level were proposed. The hypothetical models were tested using a previously developed and tested computer based model. However, the research did not capture how on-going works can be incorporated into the model. Neither was it able to address forecasting at individual project level.

Motawa and Kaka (2009) proposed a model that uses a series of integral equations to enhance cash flow through analysing alternative payment mechanisms (e.g. cost reimbursement, lump sum, cost-plus a percentage, target cost etc). The model also incorporates a system for paying off-site materials based on whether off-site materials are not to be considered, to be considered fully before provided on site and before construction starts or to be partially considered before provided on site, then fully considered once construction starts.

Buertey *et al.* (2010) developed a model for predicting construction cash flow in Ghana. Analysis of data gathered through a questionnaire survey of stakeholders showed that 18 factors significantly affected cash flow forecasts for contractors in Ghana. The factors include availability of credit facility, advance payments, period of honouring certificates by client, front/back end loading, etc.

Cui, Hastak and Halpin (2010) developed a model for the system analysis of cash flow management strategies. The strategies studied included front-end loading, back-end loading, overbilling, under billing and trade credits. The study concluded that by using an overbilling and under billing strategy a project management team could reduce project overdraft balance by as much as 11.4%. A properly implemented trade credit strategy would result in another 19% reduction in overdraft going by the developed model. The use of the model was limited by the fact that it can be used only when system parameters for specific projects are customised.

Jiang, Issa and Malek (2011) developed a multi-objective cash flow planning model, known as the Pareto Optimality efficiency network model, which considers typical banking instruments, the constraints of financial market, budget constraints and retention. A good view of cash flow management is provided by the model. However, other factors like client's progress payment, delayed payment and penalties for delays were not captured.

Lucko (2011) used singularity functions to model cash flow profiles. Singularity functions define ranges of behaviour between cut-offs and are yet to flexibly and accurately model profiles. The various payment terms and cash flow profiles of the data collected were modelled using the function. The study introduced new capabilities of singularity functions for financial modelling and optimisation by integrating different cost behaviours and payment terms.

Hoseini, Andalib and Gatmiri (2015) developed a stochastic, simulation-based framework for forecasting construction projects cash flow at the bidding stage, considering the effect of delay in payments. The authors developed the model using a beta-distributed random variable based on expert judgement, by considering the time between carrying out an activity and receiving its corresponding payment. Monte Carlo simulation was then performed to extract the cumulative probability distributions of maximum required finance and financial costs. Application of the model in a real life highway contract proved the its efficacy as there was variation between the model's performance and the contractor's initial forecast.

3. Research Methods

The sixteen significant risk factors identified by Abdulrazaq, Ibrahim and Ibrahim (2017) were adopted for this study. A two-stage field survey was carried out. The first stage consisted of investigating thirty-one risk factors identified from literature in relation to the likelihood of their occurrence and the impact, if they occur. A list of registered contractors was obtained from the government establishment saddled with the responsibility of registering and ensuring continuity of construction and other contractors in Nigeria. The Corporate Affairs Commission (CAC) is the sole organisation responsible for this. A comprehensive list consisting 61,893 construction contractors was obtained. This number

represented both extant and extinct contractors as at April 2018. In order to obtain a list of contractors actively involved in the industry, the current list of contractors who had paid all taxes prescribed by the government was obtained from the Federal Inland Revenue (FIRS). This reduced the list of contractors to 10,213. This constituted the target population.

Probability sampling technique was adopted in order to identify the sample size. Cochran's (1977) table for determining minimum returned sample size for a given population size for continuous and categorical data was used for determining the appropriate sample size for this study (margin of error = 0.05, alpha level = 0.5). A total sample size of 370 was identified to be sufficient for the study. Contractors whose annual turnover ranged between "less than \$100million" (small contractors) to "above \$500million" (Large contractors) (see table 4.6) were considered.

In the first survey, the questionnaire was divided into two parts (sections A and B). This was done to make the questionnaire easy to understand and very clear to the respondents. Section "A" requested general information from the respondents. These include mainly information about the respondents such as name of organisation, type of projects commonly executed, position of the respondent in the organisation, the average duration of projects executed, average value of project executed, the procurement route commonly adopted in projects executed, the annual turnover of the organisation and the nature of the client served. The provision of the 'other (please specify)' option was included to each category of the questions to reduce rigidity which may artificially constrain the responses (Fellows and Liu, 1997). These pieces of information were to enable the grouping of the responses provided by the respondents.

In section B of the questionnaire, 31 risk factors derived from literature as potentially affecting cash-out flow forecasts were listed. Respondents were then requested to provide opinions regarding the likelihood (i.e. probability) of each factor occurring and the likely impact should the factor occur. Respondents were asked to score their opinion on a 0-5 Likert type scale, zero being included so as to accommodate the instances where the risk factor was not applicable (Holton and Burnett, 1997). The highest likelihood of a risk factor occurring and maximum impact was each assigned a score of 5. A third category was included in table 1 seeking for respondents' opinion of the variation between the forecasts and actual cash-in/cash-out at 30%, 50% and 70% completion of the projects. Respondents were requested to indicate whether the variation between the forecasts and actual were negative or positive.

In the second survey, the questionnaire was also divided into two parts (sections A and B). Section "A" requested general information from the respondents. These include mainly information about the respondents such as name of organisation, type of projects commonly executed, position of the respondent in the organisation, the average duration of projects executed, average value of project executed, the procurement route commonly adopted in projects executed, the annual turnover of the organisation and the nature of the client served. The provision of the 'other (please specify)' option was included to in each category of the questions to reduce rigidity which may artificially constrain the responses (Fellows and Liu, 1997).

In section "B" of the questionnaire for the second survey, two tables were presented. The first table consisted of 16 significant risk factors derived from analysis of the responses from the first survey as potentially affecting cash-out forecasts. Respondents were then requested to provide opinions regarding the likelihood (i.e. probability) of each factor occurring. On the second table, respondents were asked to approximate percentage difference between actual and forecasted expenditure in percentages, at 30%, 50% and 70% completions of executed projects as a result of the risks occurrence.

Sixty-one contractors that were conveniently sampled were asked to rank on a scale of 0 to 5 (Where 0= not applicable, 1= very low, 2= low, 3= medium, 4= high and 5= very high), the likelihood of occurrence of the identified risk factors. A second table requested the contractors to indicate, in their experience, the difference in percentages between actual cash-out and forecasted cash-out (i.e. actual minus forecasted) as a result of the occurrence of the risk factors. The retrieved questionnaires were used to develop the models. The numerical data were compiled and entered into the Statistical Package for Socials (IBMSPSS version 21) software. The scores for the sixteen significant factors obtained from 50 respondents were entered as independent variables (or "predictors") while the percentage variations between actual and forecasted "cash-out" at 30%, 50% and 70% completion stages were entered as dependent variables in the "neural network" section of the software. Seventy-nine percent of the questionnaires (38 number) were used for training the model, twenty percent (i.e. 10 number) for testing and the remaining one percent were excluded for having outlier inputs. The IBM SPSS neural network software did the training and testing automatically.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Model architecture and models

Figure 1 depicts the Architecture for the Artificial Neural Network model. The figure is termed "feedforward" architecture because the connections in the network flow forward from the input layer to the output layer without any feedback loops. In this figure:

- i. The input layer contains the sixteen significant factors, which are recognised by the neural network as the "predictors". Each predictor is represented by a different colour and the scores entered by the respondents are indicated in boxes. For example, the scores entered for risk factor number 1 (i.e. "change in currency exchange rates") range from 4 to 5 only. This means that the respondents scored the factor "high" or "very high" for the chances of it occurring in projects. While serial number 2 (i.e. "changes to initial design") had scores ranging from 3 to 5.
- ii. The hidden layer contains 10 unobservable nodes. The value of each hidden unit is some function of the predictors generated by the network. The hidden nodes determine the relationship between the inputs and the outputs in what is termed a "black box" manner. This means that Apart from defining the general architecture of a network and perhaps initially seeding it with random numbers, the user has no other role than to feed it input and watch it train and await the output. The learning itself progresses on its own. The final product of this activity is a trained network that provides no equations or coefficients defining a relationship (as in regression) beyond its own internal mathematics. The network 'is' the final equation of the relationship.
- iii. The output layer contains the 3 responses on the differences between the actual and predicted forecasts as depicted by the respondents, in percentages. Each output unit is some function of the hidden units. In this case, three output units are depicted. The network uses 70% of the data for training and 30% for testing, as shown on table 2. Table 2 shows the practical results of using the network. For each sample, Cells on the diagonal of the cross-classification of cases are correct predictions while cells off the diagonal of the cross-classification of cases are

incorrect predictions. Thus, of the 34 cases held for training the network, 15 out of 17 cases for 20% were correctly classified, 7 out of the 9 cases for 25% were correctly classified and all the eight cases for 30% were correctly classified. Overall, 88.2% of the cases are trained correctly.



Figure 1: Artificial neural network model architecture and weight matrix from questionnaire survey

The testing sample shows an overall 52.9% correct classification of the cases. This implies that for five out of ten times the variation to the contractor's forecasts will be 20% (20% being the best forecast). Tables 2 provides the network's model for predicting the impact of the sixteen significant risk factors.

The testing sample shows an overall 69.2% (Table 3) correct classification of the cases at 50% completion of works. This implies that for seven out of ten times the variation to

the contractor's forecasts will be 25%. The testing sample shows an overall 91.7% (Table 4) correct classification of the cases at 70% completion of works. This implies that for nine out of ten times the variation to the contractor's forecasts will be 25%.

				Predicted	
Sample		20.00	25.00	30.00	Percent Correct
Training	20.00	15	1	1	88.2%
	25.00	1	7	1	77.8%
	30.00	0	0	8	100.0%
	Overall Percent	46.9%	53.1%	0%	88.2%
Testing	20.00	3	2	0	60.0%
	25.00	0	7	0	100.0%
	30.00	2	0	0	0.0%
	Overall Percent	64.7%	35.3%	0.0%	52.9%

 Table 2: Model for predicting Impact of Risk Factor on cash out (at 30% completion)

Table 3: Model for predicting Impact of Risk Factor on cash out (at 50% completion)

				Predic	ted	
Sample		10.00	25.00	30.00	40.00	Percent Correct
Training	10.00	1	2	0	0	33.3%
	25.00	0	13	1	0	92.9%
	30.00	1	8	2	0	18.2%
	40.00	0	5	2	0	0.0%
	Overall Percent	5.7%	80.0%	14.3%	0.0%	45.7%
Testing	10.00	0	1	0	0	0.0%
	25.00	0	8	0	0	100.0%
	30.00	0	1	1	0	50.0%
	40.00	0	2	0	0	0.0%
	Overall Percent	0.0%	92.3%	7.7%	0.0%	69.2%

Table 4: Model for predicting Impact of Risk Factor on cash out (at 70% completion)

			P	redicted	
Sample		15.00	25.00	30.00	Percent Correct
Training	15.00	4	0	0	100.0%
	25.00	0	24	0	100.0%
	30.00	0	0	9	100.0%
	Overall	10.90/	(1.00/	24.20/	100.00/
	Percent	10.8%	04.9%	24.3%	100.0%
Testing	15.00	1	0	0	100.0%
e	25.00	0	9	1	90.0%
	30.00	0	0	1	100.0%
	Overall Percent	8.3%	75.0%	16.7%	91.7%

4.2. Validation of models

The remaining 11 data set were used to test the predicting ability of the models. A comparison between the predicted and the actual variation was made).

	at 30% completion			at 50% completion			at 70% completion		
			Relative absolute			Relative absolute			Relative absolute
	Actual	Predicted	Percentage	Actual	Predicted	Percentage	Actual	Predicted	Percentage
Data set No.	variation	variation	deviation	variation	variation	deviation	variation	variation	deviation
1	30.00	25.00	17%	35.00	25.00	29%	35.00	25.00	29%
2	30.00	25.00	17%	35.00	25.00	29%	35.00	25.00	29%
3	30.00	20.00	33%	15.00	25.00	67%	35.00	25.00	29%
4	35.00	20.00	43%	35.00	25.00	29%	40.00	25.00	38%
5	30.00	20.00	33%	35.00	25.00	29%	35.00	25.00	29%
6	30.00	25.00	17%	40.00	25.00	38%	45.00	25.00	44%
7	25.00	25.00	0%	30.00	25.00	17%	40.00	25.00	38%
8	25.00	20.00	20%	35.00	25.00	29%	45.00	25.00	44%
9	30.00	20.00	33%	35.00	25.00	29%	35.00	25.00	29%
10	35.00	20.00	43%	35.00	25.00	29%	35.00	25.00	29%
11	25.00	25.00	0%	20.00	25.00	25%	20.00	25.00	25%
	Mean Percentage Error=		23%		Mean Percentage Error=	31%		Mean Percentage Error=	33%
	Mean Percentage Accuracy		77%		Mean Percentage Accuracy	69%		Mean Percentage Accuracy	67%

Table 5: Performance of Neural Network Models (at 30%, 50%, and 70% completion stages)

From Table 5 it can be deduced that the highest accuracy level is achieved at the 30% completion stage (77% accuracy). The finding disagrees with Odeyinka *et al.* (2013) model, which was found to be more accurate at the 50% completion.

4.3. Discussion of results

The results obtained have variations with those obtained from previous studies. In a study of risk factors affecting construction cash flow forecasting in the UK, Odeyinka et al. (2013) identified "changes to initial design", "inclement weather", "variation to works", "labour shortage" and "production time slippage" as the 5 top-most risk factors occurring. The same factors ranked 17th, 19th, 12th, 39th and 16th in the present study. Incidentally, "Client's insolvency", "Labour Strikes", and "Civil Disturbance" ranked very low in both studies. This implies that the civil unrests and labour strikes rarely impacts on the cash-out forecasts by contractors in both the UK and Nigeria. Most significant factors impacting on the forecasts in Nigeria are either rating low or totally absent in the UK construction industry (e.g. "increase in duration of the project", "change in currency exchange rates", "shortage of key plant items" etc). This may have stemmed from the fact that the two economies differ considerably. A similar survey carried out by Shehu et al. (2014) revealed that in Malaysia "late payment from contractor to subcontractors and suppliers", "dispute between contractor and subcontractor, "late payment from client to contractor" and "bureaucracy in government agencies" are crucial factors affecting contractor's forecasts. The present study has some similarities with that carried out in Malaysia. "Delay in payment from client" and "increase in the duration of the project" also ranked very high as in the study in Malaysia.

None of the factors highlighted by Zayed and Liu (2014) was found to be significant in the present study. Zayed and Liu (2014) emphasised on the impact of location on factors affecting cash flow forecasts. Data for the study was collected from North America and China. Result from the survey showed a significant difference in the impact of the following risk factors in the two locations- "contractor's personal relation with the consultant team", "contractor's personal relation with the owner", "lack of skilled labour", "change of progress payment duration", "change of labour and staff wages", "delay of making payments to suppliers", and "number of claims".

The findings from the research imply that several risk factors have different degree of occurrence on cash-out forecasts in, and different degree of impacts on cash-out forecasts in the Nigerian construction industry. Construction contractors practicing in the Nigerian construction industry should expect and be prepared for positive variations to their "cash-out" forecasts during the execution of projects.

5. CONCLUSION AND RECOMMENDATIONS

This paper set out to offer two contributions in the domain of "cash-out" forecasts in the construction industry. This was achieved by developing a predictive model based on sixteen significant risk factors found to impact on cash out forecasts by contractors. An attempt was made to show the variation between the actual and predicted cash-out at significant milestones of a project.

It can be concluded that sixteen risk factors significantly impact cash-out forecasts for contractors in the Nigerian construction industry. These factors include "increased Duration of the Project", and "charging of land dues by locals (illegally)", among others. A close look at the significant risk factors can be classified thus: client-related, Environment–related, market-related and contractor-related.

The second conclusion is based on the the predictive neural network models developed. It can be concluded that there are positive variations (between actual and forecatsed "cashout") of 20%, 25% and 25% at 30% completion, 50% completion and 70% completion stages of projects, respectively.

The following recommendations were made:

- Construction contractors practicing in the Nigerian construction industry should plan against positive variations to their "cash-out" forecasts during the execution of projects.
- ii. Construction contractors in Nigeria should carefully consider the sixteen (16) significant risk factors affecting cash-out before embarking on any construction project.
- iii. This study did not consider the risk factors along procurement routes and project types. It is therefore suggested that future research should be carried out to model the risk impacts along these divides.

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CORRUPT PRACTICES IN DELIVERY OF PUBLIC PROJECTS IN AKWA IBOM STATE

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ABSTRACT

Purpose: One major hindrance to national development in the developing countries is the cancer of corruption that has eaten deep into the fabrics of the entire society. Therefore, the aim of the study is to evaluate the nature of the prevailing corrupt practices and its effects on public projects delivery.

Design/methodology/approach: Descriptive and survey research method was used to evaluate the perception of respondents involved in delivery of public projects to evaluate the nature and the causal factors of corrupt practices on public projects. Purposive random sampling technique was used to determine the sample size. A total of 60 well-structured questionnaires were distributed and data obtained were analysed using descriptive, mean score and Kruskal-Walis tests.

Findings: The opinion of contractors, procurement officers and enlightened citizens (within project domain) who are deemed to be stakeholders in public project procurement in Akwa Ibom state revealed the nature of corrupt practices prevailing in the study area. The finding of the study reveals that inflation of contract sum by procurement officers, abandonment of project by contractors, certification of substandard work by the consultants and non-implementation of contract according to specification are the nature of corrupt practices prevailing in the study area. Also, the factors of god-fatherism and settlement, public project as political settlement were considered responsible for causing corruption in procurement of public projects.

Research limitations/implications: This study focused on the corrupt practices prevalent in the delivery of public projects in the study area. One major limitation is the sample size as it was restricted to the opinion of 48 respondents who returned their questionnaire. The result of this finding is based on the peculiarity of the study area and hence may not be generalised. The contribution to knowledge is that this study reveals the nature and extent of corrupt practices in procurement of public projects.

Practical implications: Corruption and corrupt practices in the society is as old as creation herself, therefore require change in our national orientation and value system. Until our value system deviate from practice of god-fatherism/settlement in our political system, the spate of infrastructural deficit which is currently being experienced shall continue.

Originality/value: The study x-rayed and established the nature of corruption/corrupt practices prevalent in delivery of public projects only in Akwa Ibom state.

Keywords: Akwa Ibom State; construction; corrupt practices; corruption; public projects.

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1. INTRODUCTION

Construction activities have become a major tool by the third world and even developing countries to drive growth and infrastructural development. This has contributed to the socio-economic well-being of the citizens by creating employment and serves as means of earning livelihood by many. There is subsequently influx of foreign construction companies who want to establish their presence and emergence of indigenous ones who want to maximize the available opportunity for growth. It has also consequently led to increase in revenue generation to the Government by way of direct/indirect taxes. Therefore, construction sector is an important sector that contributes significantly to the economic development of a nation through provision of necessary infrastructure that enhances growth of other sectors. In Nigeria, 8 million people which represent about 25% of the nation's workforce are employees of construction industry, it is regarded as the largest employers of construction labour in Africa (Inuwaet al., 2015).

The industry is home to many stakeholders, among who are Government, private firm/organisation, individuals, academic and others. The industry is open to all, it is a strategic tool to achieving sustainable development as many have identified areas of need and may want to invest in it as a way of solving societal problems. In the opinion of Isa (2013) and Oyewobiet al. (2011), construction industry is heterogeneous in nature and therefore prone to ethical erosions and bedevilled with corrupt practices. The construction projects involve various processes and require the contribution of many different stakeholders because of different phases of work, and a great deal of inputs from both the public and private sectors (Abdul-Aziz and Mohmad, 2010). One of the major challenges confronting the industry is its notoriety for corruption (Jong, Henry and Stansbury, 2009).

Olatunji and Muhammed (2013) submitted that corruption had been defined by previous researcher based on the political, cultural and the extent of civilization of the society. What is considered a corrupt practice in developing world may not be in the Western world and vice-versa. The acceptance of a gift by public official in appreciation of display of competence and performance of duty is not viewed as corruption in Nigeria but rather a motivation to do more, it is against the norm and ethics of public work in the Western world and therefore a corrupt practice. Authority is exercised in Nigeria by using personal discretion to bend rules in favour of certain individuals but high level corruption in other climes. Furthermore, corruption is also any act of inducement intended to force an action to be carried out or committed outside the set rules and procedure. According to Obayelu (2007), corruption was defined by World Bank as abuse of public office for private advantage. Although defining corruption in concise and concrete terms may be difficult due to its complexity but there exists a consensus as to what exactly constitute a corrupt practice. Oxford Advanced Learners dictionary defines corruption as "dishonest or wicked behaviour". It is a process of using one's power in a dishonest, illegal or immoral way to attract an advantage to oneself (Alemika, 2012). Lash (2003) on the other hand said that immoral and dishonest or exploitation of power in economic, financial and political spheres for personal gains is corruption. Any action taken in social economic, political and financial realms which is morally unacceptable, bad or illegal is corruption (Egbu, 2012). A model to illustrate the dynamics of corruption was developed by Klitgaard (1996) where it stated that C =M+D-A: C=corruption; M=monopoly of power; D=discretion and A=accountability.

Construction activities are segmented into various portions with many participants, hence prone to corruption. They sometimes operate in a complex contractual structure that can prop up a variety of psychological human behavior and attitude that may be inclining towards corrupt tendencies (Mohd-Nordin, Takum and Nawawi, 2012; Stansbury 2005). Construction projects comprises many stages that are littered with corrupt practices. This often leads to negative and devastating effects on the quality of built environment, increased cost and schedule overrun and competitive performance of the industry (Sohail and Cavill, 2006; Murray and Meghji, 2009). Park &Blenkinsopp (2011) said corruption is a deviant behaviour of departing from normal duties of a public role, pecuniary or status gain, and violates official ethics of public services due to private-regarding influences. Neelankavil (2002) and Otusanya (2011) opined that it is a complex set of personal enrichment processes which involves many types of crime and oftentimes some form of illicit human behaviour too difficult to recognise or measure. Some environmental factors such as distorted or opaque government behaviour and decisions, weak or ineffective anti-corruption institutions, cultures that intertwined giftgiving with bribery, poor quality of public service and inadequate openness in trade wand market access, all lead to corrupt activities (Luo, 2004).

Third world countries (otherwise called developing countries) especially of the sub-Saharan region had been plagued with corruption more than the rest of the world. This has brought serious set-back in terms of socio-economic and infrastructural development, it is due mainly to poor public procurement system according to findings. If the process is not reviewed, x-rayed or urgent reform is not carried out, the cycle of un-development may not abate in spite of huge investment committed to that effect. The process begins with the contract award system. According to global survey on corruption, it was discovered that the volume of bribes exchanging hands through public sector procurement is estimated between \$390-400billion per year (Lengwiler and Wolfstetter, 2006). Corruption in Sub-Saharan Africa was estimated to be almost up to 70 per cent of public procurement contracts (Mawenya, 2008).

Nigeria as a whole and Akwa Ibom in particular is not left out in the wind of corruption blowing across the length of Africa. Akwa Ibom is located in the Niger Delta region of Nigeria; the region rich in oil and natural resources thereby enjoying large percentage of revenue accruing to her from the centre. The state ought to be an epitome of steady growth and infrastructural development more than it is currently witnessing. There is a wide spread allegation of corruption in this region as the money received by the individual state Government does not correspond to the physical development on ground. It is also a common knowledge that public projects serve as conduit pipe for siphoning public fund, hence, the need for this study to unravel the nature of prevailing corrupt practices in public projects delivery and the causal factors in the study area.

1.1. Aim and objectives of the study

The aim of the study is to unravel the nature of the prevailing corrupt practices and its causal factors in public project delivery in Akwa Ibom state. The following objectives are listed to achieve the aim of the study; they are to:

- i. evaluate the nature/extent of various corrupt practices in public projects delivery,
- ii. evaluate the causal factors responsible for corruption in public projects,

1.2. Research hypotheses

Two hypotheses were postulated to justify the opinion of respondents on the study.

- **Ho**: There is no significant difference in the perception of respondents on the prevailing corrupt practices in public projects.
- **Ho**: There is no significant difference in the perception of respondents on the causal factors responsible for corruption in public projects.

2. REVIEW OF RELATED LITERATURE

This section focuses on reviewing the extant literature dealing on corruption and corrupt practices, nature and characteristics of construction industry globally and in Nigeria as a whole.

2.1. Attributes and nature of Nigeria construction industry

The construction industry accounts for about one-third of gross capital formation. In Nigeria alone, it accounts for about 70% of the nation's fixed capital formation and 1.4% gross domestic product (GDP). The construction industry in Nigeria employs almost 8million people which is about 25% of the nation's workforce and regarded as the largest employer of construction labour in Africa (Inuwa et al., 2015). Inuwa et al. (2015) enumerated the importance of the sector to the nation's economy and the cardinal role played in nation's development. Isa (2013) and Oyewobi et al. (2011) considered that the heterogeneous nature of the industry made it prone to ethical erosions and is therefore bedevilled with corrupt related practices.

Procurement sector in Nigeria bears the risk of corruption more than any other sector (Anigbogu and Shawarka, 2011). It was further submitted that no arm of Government is free from corruption especially when award of contract is involved, this has battered the image of the country. Having said this much about procurement sector in Nigeria and established in other parts of the nation, there is no literature to justify the risk of corruption in this sector in Akwa Ibom state. Therefore, the roles of procurement officers in aiding and abetting corrupt practices in the study area need to be investigated so as to establish the impact on public project delivery.

In the view of Oyedele (2013), construction industry is a segmented sector and are majorly divided into 3 segments based on their activities, they are; building construction by contractors/constructors, civil works construction such as road and highway construction, bridges, tunnel and other civil projects, specialty trade contractors who perform specialized activities relating to construction, these category includes carpentry, tiling, painting, plumbing, mechanical and electrical works, earth moving equipment and machineries leasing. No matter the segment, as long as it is involved in construction activities, there is manifestation of corruption and need to be looked into.

2.2. Corrupt tendencies in Nigeria construction industry

Corrupt tendencies are such actions that enhance, promote, aid and abet corruption in construction. These tendencies in construction industry manifested in many ways due to the segmentation of the industry. Many authors have taken time to look at various avenues through which corrupt tendencies persist. Hawkins (2013) mentioned project size,

uniqueness that inflate cost, Government involvement that enable official indulgent in bribery, while Adeyemo (2015) in corroborating the findings of Anigbogu and Shwarka (2011) stated some features that made Nigeria construction industry prone to corruption to include; complex contractual structure, diversity of skills, different project phases, project size, uniqueness of project, complexity of projects that allows passing of blame to others, concealment of some items of work by other items, lack of transparency, absence of or minimal monitoring by public building professionals. There is need to subject the outcome of these previous researches to further scrutiny or verification in the study area before the generalised statement could be established.

Akinsola and Omolayo (2013) identified some pre contracts activities such as bribe to obtain planning permission, employment of illegal workers, collusion between bidders, over pricing, bribery to obtain contract, leaking of information to preferred bidder, production of fraudulent invoices among others as being responsible for promoting corrupt tendencies in construction industry in Nigeria and the UK. Other corruptible practices that emerge during procurement are; bid shopping, under bidding, cover bidding, bid rigging, undertaking work without adequate qualification/experience/training by individuals or organisation while during tendering stage, there may be agreement by contractor to withdraw an offer he has made in exchange for money or accepting monetary bribes in order not to tender for contract already being invited for (Al-Sweity, 2013; Nawaz & Ikram, 2013). According to Al-Sweity (2013), during construction phase, there are cases of illogical request for time extension, material theft, doctoring of daily report for compensation purposes and others. Although, the corrupt practices mentioned earlier have been established in other parts of the nation, this research effort intend to find out their applicability and manifestation in the study area. Also, are these pre-contract activities obtainable in the study area, or were there measures already in place to curb or prevent some, if not all of them?

2.3. Previous empirical studies on corrupt practices

Extracts from the study conducted by Ayodele, Ogunbode, Ariyo and Alabi (2010) indicated that poverty level, excessive love for money/greed, politics in award of contract/God-fatherism, professional indiscipline, profit maximization by Contractors, quackery, fall-out of endemic societal corruption and favouritism are some of the causes of corruption in the construction industry in Nigeria. The study further recommended some measures that could be taken to tackle the menace. Among others, the study suggested better remuneration in term of wages and salary for government officials/civil servants, proper counselling of contentment to the contractors, elimination of Godfatherism syndrome in the award of contract by observing due process as outlines in public procurement Act put in place by Federal Government of Nigeria (2007), vibrant professional institution to monitor the activities of construction professionals with aim of bringing to book any erring one, public enlightenment and sensitisation to kick out quacks in execution of public projects from inception to completion, avoidance of sub-standard materials and workmanship by contractors.

Though this study was carried out in Nigeria but was done in a different environment from the study area. Most of the practices adjudged to be corrupt here may not be in the study area and vice-versa. It is necessary to determine to what extent are these practices actually perceived to be corrupt in Akwa Ibom state and discover others not stated here.

In a paper entitled "Fraud and corruption in construction contracts in Nigeria" by Adetola (2017), the author x-rayed the ingredients of fraud and corruption in Nigeria public
system. Most public works are procured through a contract system. Contract is defined as a legally binding relationship with specific details of a mutual agreement made between two or more parties. Fraud occurs when at least one party intentionally misrepresents the terms listed in the contract, inflicting damage on one or more of the other parties to the contract.

Among others, it began by public office holder dipping their hands in public fund because we run a government without institutionalized adequate financial control system. There were cases of corruption reported in recent times of senior public servant found in possession of money meant for other purposes, of particular interest were those reported in the Punch Newspaper of November 13th, 2015 and The Nation Newspaper of 1st October 2015. According to the author, corruption is a global phenomenon as cases of United Kingdom Government (National Audit Office) who found that not less than 10% of the 65billion pounds spent in the construction industry annually is lost to fraud. Same goes to Netherlands and United State of America where money expended on infrastructural developments ends up private official's pockets. The author highlighted three major areas targeted for fraud and corruption as; payment method, quantity verification and quantity specification and execution.

The paper concluded that the level of fraud and corruption in Nigeria system had reached an epidemic state and surpassed those of foreign counterparts with construction contracts responsible for lion share of it. The author suggested that concerted effort is required from all citizens to curb the menace of corruption. Government agencies should recognise the roles and responsibility of professionals in their establishment and allow them to function accordingly instead of allotting these roles to just one particular directorate or division which will not promote checks and balances. Also, Government should find a way of dealing with method of advance payment in contract as it is a major attraction to fraud and corruption.

From the forgoing, it is necessary to determine the roles of professional (if any) in the procurement sector of the study area. The method of payment either through advance payment or bond payment guarantee should be investigated. Transparency International (TI, 2011) asserts that majority of construction businesses around the globe "are vulnerable to corruption ... and the industry is one of the most corrupt sectors in which to do business". Also, reports from Chartered Institute of Building (CIOB, 2013) publication 'Exploring corruption in the UK Construction Industry' seem to corroborate the aphorism that the construction sector is corrupt.

Arewa and Farell (2015) opined that the way and manner construction organisation operates tends to make them prone to corrupt practices, the attributes and traits of fraud and corruption reveals the close relationship with culture, organisation values and belief of the people. The involvement of lengthy chains of supply, complex contractual agreement, deployment of multiple sub-contractors are all customary cultural practices of most organisation that open doors to corruption (Arewa and Farell, 2015). Among others, factors that may support fraud and corruption in an institutionalised manner as revealed by study conducted by Arewa and Farell (2015) are the pervasive use of subcontractors and consultants, the lack of transparency in tendering processes, lobbying for contracts, cover pricing and cartels. Ernst and Young (2012) argued that these provide opportunity for clients, consultants, contractors and suppliers to leverage payments or other benefits for private gains.

Osei-Tutu, Badu and Owusu-Manu (2010) submitted based on their findings that, among others, what constitute major corruption practices in Ghana infrastructure projects delivery are conflict of interest, bribery, embezzlement, kickbacks, tender manipulation and fraud.

Though, the research was purely review and explanatory without any empirical analysis to support the discussions and thus could not be generalised in a wider context to capture the entire public procurement practice in Ghana public infrastructure delivery, the paper suggested that implementation of sound procurement performance measurements would be imperative in the bid to curb corruption practices. It also proposed that creative and logical introduction of monitoring systems when planning, executing and completing projects were as important as having knowledge about and debating issues related to corruption by the society.

3. Research Methodology

The study adopted exploratory and descriptive survey approach, questionnaire was used as an instrument of gathering data for this research. The study population consists of government procurement officers (in Ministries and Departmental Agencies/other establishments of both state/federal governments in Akwa Ibom), established contractors with government (both state and federal) and enlightened citizens. Only contractors who are known to have handled or still handling construction projects were considered. The enlightened citizens were such people in the project environment who are learned and conversant with workings/activities of government as it regards project execution and were carefully chosen to fulfil research objectives. The sample size is judgmental as it was difficult to assess the list of registered contractors and unfriendliness of government procurement officers. The projects considered were majorly roads, hospitals, hostels and any such building construction by the government for public utilities. The data obtained were analysed using descriptive, mean score and Kruskal-Walis tests.

The sample frame of sixty structured cross-sectional questionnaires were administered to three respondents namely; contractors, procurement officers and enlightened citizens where public projects are domiciled. The questionnaires were distributed among the three senatorial district of Uyo, Eket and Ikot-ekpene in the order 30:15:15. The respondents were given in the ratio 20:5:5 for Uyo:Eket:Ikot-ekpene respectively for contractors, 9:3:3 in the same order for procurement officers and 9:3:3 following the same order for enlightened citizens. Uyo senatorial district receive more attention because of the concentration of public projects in the state capitals. Also, few procurement officers were considered in the other 2 senatorial district due to scarce concentration of projects except higher institution projects.

The questionnaire was divided into three sections. Section one captured the respondent's characteristics such as sex, educational qualification, stake in the projects, professional affiliations, membership status of professional body (if any), years of experience, senatorial districts, project owner type, type of construction and contract type. The second parts sought the respondent's opinion on the nature of corrupt practices prevailing in public projects delivery in the study area, the third section extracted opinions of respondents on causal factors responsible for corrupt practices in public projects.

The measurements were on a five Point-Likert scales of 5-strongly agree; 4-agree; 3moderate; 2-disagree; 1-strongly disagree for section 2 and 3. Kruskal-Walis test was used to analyse the respondent perceptions and variations, while mean score was used to rank the opinions.

4. RESULTS AND DISCUSSION OF FINDINGS

The results of data analysis are presented in this section.

4.1. Questionnaire distribution and rate of return

The questionnaires were distributed among the respondents and rate of return shown in Table 1.A total of 60 copies of questionnaire were distributed across the three senatorial districts of the state. Only 48 copies were duly completed and return, which represent 80% return rate and was adjudged good for analysis.

Group of respondents	Locat	tion of Stu	ıdy	Total Distributed	Total Returned (% Returned)	Percentage Returned (%)
	Uyo	Eket	Ikot- Ekpene			
Contractors	20	5	5	30	27 (90%)	56.3
Procurement officers	15	3	3	15	10 (67%)	28.8
Enlightened Citizens	9	3	3	15	11 (73%)	22.9
TOTAL				60	48 (80%)	80

Table 1: Questionnaire distributions for respondents in the study area.

4.2. Characteristics of respondents used for the study

Characteristics of the respondents whose perception were investigated such as sex, educational qualification, stake in the projects, professional affiliation, membership status and experience are presented on Table2.

According to the result shown in Table 2, most respondents were male and possessed mostly BSc and the least HND (about 8 respondents), this educational qualification is adequate for proper understanding of the research purpose. Majority of the respondents are construction professionals except4 who are procurement officers belonging to management professionals, with membership status ranging from graduate to corporate as the highest, this indicate the level of proficiency in construction work, in terms of work experience, only 8 respondents could be said not to have acquired the necessary experience but majority are having between or more than 10 years' experience, hence were conversant with happenings in the industry. The result also revealed that the project handled by the respondents were mostly government owned, constituting building projects and road construction and were awarded either in lump sum for buildings and unit price for roads, though few direct labour and labour-only contracts were also considered.

4.3. Evaluation of nature of corrupt practices in public project delivery

The first objective is to evaluate the nature of corrupt practices and the extent of its occurrence in the study area. For this purpose, fourteen acts or conducts that constituted corrupt practices in the procurement of public projects in the study area were selected and presented to the participants. Table 3a shows a display of result with their mean scores and rank based on the perception of respondents.

Features	Sub features	N	%
	Male	45	93.8
Sex	Female	3	6.3
	TOTAL	48	100.0
	HND	8	16.7
	BSc	27	56.3
Educational qualification	PGD	4	8.3
	MSc	8	16.7
	PhD	1	2.1
	TOTAL	48	100.0
	Contractor	27	56.3
Stake in the project	Procurement officer	10	20.8
	Enlightened citizen	11	22.9
	TOTAL	48	100.0
	NIA	5	10.4
	NIOB	19	39.6
Professional affiliation	NSE	15	31.3
	NIQS	5	10.4
	Others	4	8.3
	TOTAL	48	100.0
	Technician	3	6.3
	Licenciate	1	2.1
Membership status	Associate	3	6.3
	Graduate	17	35.4
	Corporate	23	47.9
	Fellow	1	2.1
	TOTAL	48	100.0
	1-5yrs	8	16.7
Years of experience	6-10yrs	22	45.8
	11-15yrs	12	25.0
	16-20yrs	2	4.2
	Above 20yrs	4	8.3
	TOTAL	48	100.0
	Uyo	29	60.4
Senatorial district of operation	Eket	7	14.6
	Ikot-ekpene	12	25.0
	TOTAL	48	100.0
	Higher	14	29.2
	institution/school		
Project owner type	Government	25	52.1
	NGOs	9	18.8
	TOTAL	48	100.0
	Building	36	75.0
	Road	10	20.8
Type of construction	Hospitals	1	2.1
	Sport complex	1	2.1
	TOAL	48	100.0
	Unit price	17	35.4
	Lump sum	16	33.3
Contract type	Cost reimbursable	2	4.2
	Labour only	6	12.5
	Direct labour	7	14.6
	TOTAL	48	100.0

Table 2: Descriptive results of respondents' characteristics

According to Table 3a, inflation of contract sum (with the aim of collecting excess sum later) has the highest mean score of 4.18 and 4.20 by both contractor and procurement officers respectively. It was adjudged by both contractor and procurement officer as being the most prevalent. On the other hand, abandonment of project (by the contractor after collecting reasonable amount of the contract sum) has a MIS value of 3.545 based on the

perception of the enlightened citizen. This was believed to be the most prevalent corrupt practice in the study area.

List of Variables	Contracto	ors N=27	Procure	ment officer N=10	Enlighten	ed Citizens N=11
	Mean	Rank	Mean	Rank	Mean	Rank
Inflation of contract sum	4.1481	1	4.2000	1	3.3636	5
Collection of kick-back	3.9259	2	3.4000	10	3.3636	6
Abandonment of project	3.5926	3	3.8000	4	3.5455	1
Certification of substandard	3.5926	4	4.0000	3	3.0909	13
work by consultant						
Non implementation of	3.5556	5	4.0000	2	3.2727	7
contract according to specification						
Award of contract to ghost	3.4444	6	3.4000	11	3,1818	12
company/firm	5.1111	Ũ	5.1000		5.1010	12
diversion of fund meant for	3.4074	7	3.5000	6	3.4545	3
project						
unauthorised sale of	3.4074	8	3.4000	8	3.4545	4
material						
double payment for same	3.3333	9	2.9000	14	3.1818	11
work already done						
short-changing of	3.2963	10	3.3000	13	3.1818	8
government project as						
individual				_		<u>^</u>
use of substandard material	3.2593	11	3.5000	7	3.1818	9
for construction	2 1 4 0 1	10	2 4000	0	2 1010	10
doctoring of design to	3.1481	12	3.4000	У	3.1818	10
substitution of material	2 0741	12	2 8000	5	2 7272	14
	2.0741	13	2.2000	5	2.1215	14
diversion of material	3.0/41	14	3.3000	12	3.5455	2

 Table 3a: Perception of respondents on nature of corrupt practices in public project delivery

Table 3b shows the corrupt practices in descending order for each respondent (contractors, procurement officers and enlightened citizens). All the respondents agreed to inflation of contract sum and abandonment of projects as two common corrupt practices among the top five in the study area.

Table 3b:	Ton	five nature	of	corrupt	practices	hv	each	participant	s
Table 50.	rop	nve nature	UI	conupi	practices	U y	caen	participant	0

Contractors	Procurement officers	Enlightened citizens	
Inflation of contract sum	Inflation of contract sum	abandonment of project	
collection of kick-back	non implementation of	diversion of material	
	contract according to specification		
abandonment of project	certification of substandard work by consultant	diversion of fund meant for project	
certification of substandard work			
by consultant	abandonment of project	Unauthorised sale of material	
non implementation of contract	substitution of material	Inflation of contract sum	
according to specification			

The information in Table 3b was directly extracted from Table 3a. It shows the perception of each respondent on the nature of corrupt practices prevailing in the study area.

While to the contractors and the procurement officers, inflation of contract sum was adjudged to be rampant, the enlightened citizen believed it was abandonment of project (by the contractor).

4.3.1. Test of hypothesis one on nature of corrupt practices prevailing in the study area

The hypothesis earlier postulated need to be tested to be able to make any definite statement on the perception of participants (contractors, procurement officers and enlightened citizens) on the nature of prevailing corrupt practices in public projects. If the p-value is less than or equal to 0.05, the null hypothesis is rejected, otherwise the null hypothesis is accepted.

 Table 3c:
 Kruskal-Walis test for testing perception of respondents on prevailing corrupt

 practices in public project delivery

Prevailing corrupt practices in public project delivery	Mean Rank
Contractors	22.29
Procurement officers	26.57
Enlightened citizens	15.64
Chi-Square	5.660
Df	2
P-value	.059
	0.05
Significance level	Accept
Decision	

Kruskal Wallis test was conducted to determine whether or not there is variation in the perception of respondents on the nature of prevailing corrupt practices in public projects in the study area. The result is presented in Table 3c. As shown in the table, the p-value is 0.059 which is slightly higher than the significant level of 0.05, therefore the null hypothesis is accepted, that is, there is no variation in the opinion of respondents on the prevailing corrupt practices in public projects delivery in the study area. The result by implication means the respondents agreed to the existence of the prevalence of corrupt practices in the delivery of public projects in the study area.

4.4. Evaluation of causal factors responsible for corrupt practices in public projects

The second objective evaluated the causal factors responsible for corrupt practices. There are twenty-nine of these factors identified from literature and were presented to respondents for their opinion. The result in Table 4a shows the perception of each respondent.

As shown in Table 4a, godfatherism and settlement was ranked highest with MIS of 4.370 by the contractor. It was adjudged as the leading factor causing corruption in the delivery of public projects according to the opinion of contractors. This is closely followed by public project as political settlement because it was ranked next. On the other hand, procurement officers submitted that public project as political settlement with the highest rank and MIS value of 4.800 is the leading factor. It was also followed by godfatherism and settlement. The enlightened citizen agreed with procurement officer in their opinion. It was submitted that public project as political settlement with MIS of

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4.550 is the leading causal factor but mentioned low salary of public administration employees as the next.

Table 4a.: Percepti	ion of responder	its on the causal f	actors responsible for	corrupt practices in
public projects deli	very			

List of Variables	Contractors		Procurement		Enlightened Citizens		
	N=27 of		officer N	officer N=10		N=11	
	Mean	Rank	Mean	Rank	Mean	Rank	
godfatherism and settlement	4.3704	1	4.6000	2	4.3636	4	
public project as political settlement	4.2963	2	4.8000	1	4.5455	1	
infiltration of professional ranks by quacks	4.1481	3	3.9000	16	3.9091	14	
community agressive demand	4.1111	4	3.9000	17	4.0000	10	
gratification expectation	4.0370	5	4.1000	6	4.0000	13	
expectation of loyalty from superior	3.9259	6	4.0000	10	3.3636	27	
official							
community leadership antecedents	3.8889	7	4.0000	13	3.5455	23	
informal social security i.e project as part	3.8519	8	3.8000	18	4.1818	7	
of national cake							
Lack of transparency in procurement	3.8148	9	4.3000	4	4.3636	3	
system							
low salary of public administration	3.8148	10	4.0000	11	4.4545	2	
employees							
corrupt tolerant society/community	3.7778	11	3.7000	21	4.1818	8	
lack of transparency in execution process	3.7778	12	4.0000	7	3.7273	16	
lack of control by supervisory institution	3.7037	13	4.0000	7	3.5455	24	
outright theft or diversion of fund	3.6667	14	4.0000	8	3.4545	26	
imposition of unqualified workforce	3.5556	15	3.6000	22	3.6364	19	
contract purchase and resale by influential	3.5556	16	4.1000	5	3.6364	18	
people							
non observation of ethics and professional	3.5556	17	3.8000	19	4.0000	12	
standard							
slow bureaucratic procedure	3.5556	18	4.0000	12	4.2727	6	
Un-coordinated financial sector()	3.5185	19	4.4000	3	3.6364	22	
inappropriate sanctioning method	3.5185	20	4.0000	14	3.7273	17	
artificially created superiority of	3.4815	21	3.8000	20	3.6364	21	
government official							
lack of control by supervisory agency	3.4815	22	3.9000	15	3.8182	15	
lack of competence by contracting firm	3.4815	23	3.4000	27	3.6364	20	
non job satisfaction of government official	3.4815	24	3.5000	25	4.0000	11	
socio-economic condition of government	3.4815	25	3.3000	29	4.1818	9	
officials							
secret or lack of bidding process	3.4444	26	4.0000	9	3.3636	28	
poor state of public administration	3.3704	27	3.3000	28	4.3636	5	
weak or compromised professional	3.2593	28	3.6000	23	3.5455	25	
institute							
Inter-tribal/ethnic conflicts	3.1852	29	3.5000	24	3.2727	29	

Table 4b shows the top five causal factors responsible for corrupt practices in public project delivery in the study area and there seem to be an agreement on two factors that appear in the top five of each respondent. All the respondents agreed that godfatherism and settlement with public project as political settlement rank among the five topmost factor causing corrupt practices in the study area.

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Contractors	Procurement officers	Enlightened citizens
godfatherism and settlement	public project as political	public project as political
	settlement	settlement
public project as political	godfatherism and settlement	low salary of public
settlement		administration employees
infiltration of professional	Un-coordinated financial sector	Lack of transparency in
ranks by quacks		procurement system
community aggressive		
demand	Lack of transparency in	godfatherism and settlement
	procurement system	
gratification expectation	contract purchase and resale by	poor state of public
	influential people	administration

Table 4b: Top five causal factors responsible for corrupt practices in public projects delivery

4.4.1. Test of hypothesis two on causal factors responsible for corrupt practices in public projects

In order to ascertain the level of significance of the variation of opinion expressed and to be able to make a categorical statement on the perception of respondents, the second hypothesis postulated must be tested. In testing the hypothesis, the confidence level is set at 95% with significance level at 0.05. The decision rule is that if p-value < 0.05, the null hypothesis is rejected and the alternative is accepted. Otherwise the null hypothesis is accepted and the alternative rejected. Kruskal Wallis test was conducted to ascertain the difference in the perception of respondents on the causal factors responsible for corrupt practices in public projects delivery in the study area. According to the result presented in Table 4c, the p-value is 0.066, therefore the null hypothesis is accepted.

Table 4c: Kruskal-Walis test for testing perception of respondents on causal factors

 responsible for corrupt practices in public project delivery

Causal factors responsible for corrupt practices in public projects	Mean rank
Contractors	35.10
Procurement officers	48.76
Enlightened citizens	48.14
Chi-Square	5.423
Df	2
P-value	.066
	0.05
Significance level	
Decision	Accept

Accepting the null hypothesis that there is no significant difference in the perception of respondents on the causal factors responsible for corruption in public projects indicate that those factors are here with us. It is a statement of fact as shown in Table 4b that godfatherism and public projects as political settlement are two major syndromes responsible for corruption in our society, this is supported by Ayodele et.al. (2010). The result by implication indicate a congruence of opinion among the stakeholders of major causes of corruption in public works. Though other factors do exist but the opinion of respondents in the study area pin pointed god fatherism/settlement and public project as political settlement as the major factors responsible for corrupt practices.

4.5. Discussion of findings

The result of the study revealed a level of agreement among the stakeholders of the prevalence of corrupt practices in the delivery of public projects in the study area. Unless these practices are nipped in the board, it may cripple infrastructural and economic development of the people living in the area. The finding from this study is at variance with previous studies especially that of Adetola (2017) that only stated fraud through payment method as the most common corrupt practices. This finding had been able to establish the key roles of each stakeholder as corruption in procurement of public projects begins with procurement officers.

Other findings of the study indicated God fatherism/settlement and public project as political settlement as major cause of corrupt practices in the delivery of public projects. This study agreed with the earlier work done by Ayodele et al. (2010). According to Ayodele et al. (2010), godfatherism/politics in award of contract, excessive love for money/greed, poverty level and others were among the causes mentioned though in no particular order. Adeyemo (2015) listed many factors that induced corruption in construction but did not mention our political principle and ideology, while Akinsola and Omolayo (2013) identified some pre-contracts activities such as bribe to obtain planning permission, employment of illegal workers, collusion between bidders etc. as some factors but the finding of this study has added another dimension to these pre-contract activities. Most corrupt practices according to the study findings are pre-contract activities as less is witnessed and easily curbed at construction stages. Almost all the respondents agreed to this fact as revealed in Table 4b, the five topmost factors responsible for corrupt practices in public works are pre-contract based activities except for community aggressive demand and gratification, as submitted by contractor.

5. CONCLUSION AND RECOMMENDATIONS

The study x-rayed the corruption in construction sector or industry with emphasis on public project. Insight has been provided into what constitute corrupt practices in Akwa Ibom state with many revelations from the participants. The opinion of respondents who are deemed to be stakeholders in public project procurement in Akwa Ibom state revealed the nature of corrupt practices prevailing in the study area. Among others, the top five frequent practices are: inflation of contract sum; abandonment of project; collection of kick back; certification of substandard work by consultant and non-implementation of contracts according to specifications. There is an overwhelming agreement by contractors and procurement officers in this but the enlightened citizens slightly differ.

The study also concludes that only two factors were considered responsible for causing corruption in procurement of public projects, they are: god-fatherism and settlement; public project as political settlement. The top five causal factors of each respondent have only these two as common to all. This result by implication means for socio economic development of the area, the menace of god-fatherism and settlement (a brother to man-know-man), the idea of using public infrastructural project as political settlement must be dealt with decisively.

Going by these conclusions and unless Government agencies responsible for the award of contracts are alive to their responsibilities, the trend will continue. Therefore, the study recommends the use of private consultants in tendering/bidding process to remove all forms of excesses and also appointment of independent consultants to monitor progress of work/certification.

It is also recommended that the public, through civil society and human rights groups should take the responsibility of leading the campaign against the political class in this direction otherwise the future of un-born generation may have been sacrificed without knowing. Government must set in motion a high powered reorientation campaign and lead by example. The campaign and compliance should begin from the top that is, it must be seen as top-bottom approach so as to convey a strong message to the populace. Our eroded value system must be re-galvanised to lay a better foundation for our tomorrow.

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