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BENCHMARKING PERFORMANCE MEASUREMENT SYSTEMS IN BOTSWANA'S CONSTRUCTION SECTOR

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ABSTRACT

The performance of Botswana's construction industry has been steadily declining in recent years. Furthermore, the industry has been docked with many projects that are not delivered on time, go over budget, sub-standard quality or are just abandoned. The frequency of occurrence of such projects has been alarming and has raised the question of whether there is a comprehensive system in place to monitor and control these projects. Some of the adverse effects of these delays and misappropriations are; costs escalating above budgeted values and quality of the deliverables shifting from the standard and agreed specification. Performance Measurement Systems (PMS) can be used to determine progress towards achieving certain goals and milestones in the life cycle of a project. These PMS are not new to the construction industry as they have been adopted in the industry for some time now. Therefore, the advantages of employing or implementing such systems are well documented but a lot of troubles apparently solvable by PMS are still encountered within Botswana's construction industry.

A research survey was conducted on construction companies in Botswana with the purpose of finding out the extent of adoption of performance/progress measurement systems in Botswana's construction industry and the barriers to their implementation in the industry. From the research it was found that most companies have not adopted PMS due to lack of understanding on the methods.

Keywords: Botswana construction industry, construction projects, performance measurement systems, key performance indicators.

1. INTRODUCTION

The construction industry is vital for the development of any nation. According to Takim and Akintoye (2002) in many ways, the pace of the economic growth of any

nation can be measured by the development of physical infrastructures, such as buildings, roads, bridges, etc. Due to the economic significance of the construction industry, the performance of construction companies and projects are extremely important in Botswana. Botswana's construction industry comprises of small, medium and large contractors including international companies. The majority of construction companies, owned by Botswanan citizens' fall into the small and medium-size categories. The government of Botswana is the major client; therefore, government projects take precedence over all types of major construction activities (Swarnadhipathi and Boyd 2007). The growth of the construction industry is always linked to the government's investment in infrastructure and buildings mainly related to the mining industry. Thus, proving once again how influential the government is in the development of construction. (Kaboyakgosi and Sengwaketse 2003).

According to Palalani (2000), the construction industry is besieged with a number of challenges including sub-standard quality, information scarcity, inappropriate contracts, poor planning and lack of vision by the entire industry. The Botswana Confederation of Commerce, Industry and Manpower (BOCCIM) Study Report of 2008 revealed that the problem reported by Palalani (2000) was more severe than thought. Among the projects sampled by the study for investigation, 13% had been abandoned and were retendered for completion. When considering those which were completed without retendering, only 35% and 15% had been completed within cost and time, respectively *(implying 65% and 85% of the projects had cost and time overruns, respectively)*. When the two attributes were combined, only 8% of the total non-retendered projects were delivered within both time and cost. Thus implying that, 92% of the projects had experienced at least a cost overrun, time overrun or both (Ssegawa, et al. 2010). The study indicated one of the major reasons hampering project delivery in the construction industry was "inefficient and inappropriate decisions and actions taken relating to the planning and implementation of the project"

Adeyemi and Masalila (2016) investigated delay factors of construction projects and found that the five most important causes of construction delays by ranking as perceived by clients were: (1) Contractor's improper planning; (2) contractor's site management: (3) inadequate contractor experience: (4) labor supply problems and (5) subcontractor problems. The five most important causes of construction delays by ranking as perceived by consultants were: (1) contractor's improper planning: (2) contractor's site management; (3) shortage in material: (4) inadequate contractor experience, and (5) inadequate client's finance and payments of completed work. The five most important causes of construction delays by ranking as perceived by contractor were: (1) contractor's poor site management: (2) inadequate client's finance and payments of completed work: (3) subcontractors; (4) inadequate contractor experience, and (5) equipment availability and failures.

According to Deng et al (2012) the major problem indicated above can be tackled by use of PMS in construction industry. This view is shared by Wegelius-Lehtonen (2001) who postulated that the need for PMS is imminent in the construction firms since construction firms have many simultaneous construction projects, from which the relevant performance information is needed. There are also tens of material groups and subcontractors, whose performance should be monitored

together with construction firms' practices. In addition to monitoring, performance measures can also be used as a basis for progressive improvement of company productivity.

As a process, performance measurement is not simply concerned with collecting data associated with a predefined performance goal or standard. Performance measurement is better thought of as an overall management system involving prevention and detection aimed at achieving conformance of the work product or service to your customer's requirements. Additionally, it is concerned with process optimization through increased efficiency and effectiveness of the process or product. These actions occur in a continuous cycle, allowing options for expansion and improvement of the work process or product as better techniques are discovered and implemented. In the manufacturing and construction industries, performance measurement is used as a systematic way of judging project performance by evaluating the inputs, outputs and the final project outcomes. (TRADE 1995)

The aim of this study is therefore to benchmark the adoption and implementation of PMS in Botswana‘s construction industry. This work is necessary since it will allow the identification of PMS adoption and implementation barriers. Hence understanding the challenges in the adoption and implementation of PMS will assist in the formulation of appropriate strategies to effectively implement performance measures. Thus this should help the country move a step closer to reviving the construction industry.

2. LITERATURE REVIEW

2.1 Botswana Construction Industry

In Botswana, the industry has been at the forefront of national infrastructure building from scratch after independence (Magang, 2000). Its contribution to the economy has been immense in terms of housing, employment, support for manufacturing industries and GDP. In the last decade, for example, the average contribution to GDP by the sector has been on average about 6.6% while its absorption of labour has averaged 9% on an annual basis. The employment and GDP contribution trend is depicted in Figure 1.

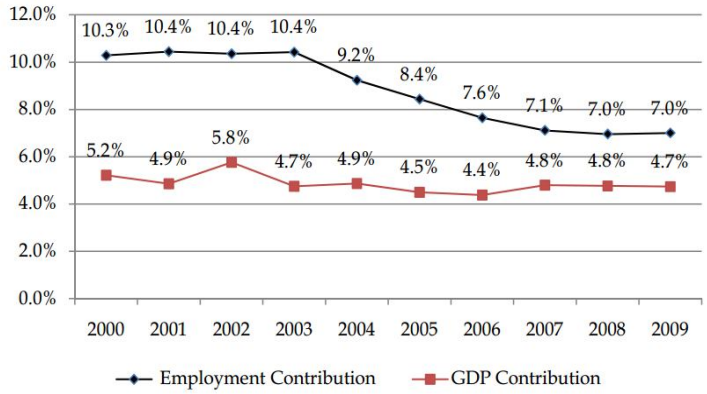

Figure 1: Contribution of Botswana’s construction industry to employment and GDP. Source (CSO 2009)

Over the past decades some researchers studying the construction industry in Botswana, have been progressively indicating that the industry is challenged by a number of aspects which need fixing. A BOCCIM study report of 2008 identified one the causes of poor performance of the industry was how the industry is organised. The study found that the industry is hardly organised and well-coordinated. It lacks leadership and a vision to take it forward and contribute more meaningfully to socio-economic development. It is punctuated by many voluntary organisations which, lack legal backing to register and regulate members or would-be members. Figure 2 attempts to illustrate the current picture of the industry, dividing it into three components namely, suppliers, clients and the business environment.

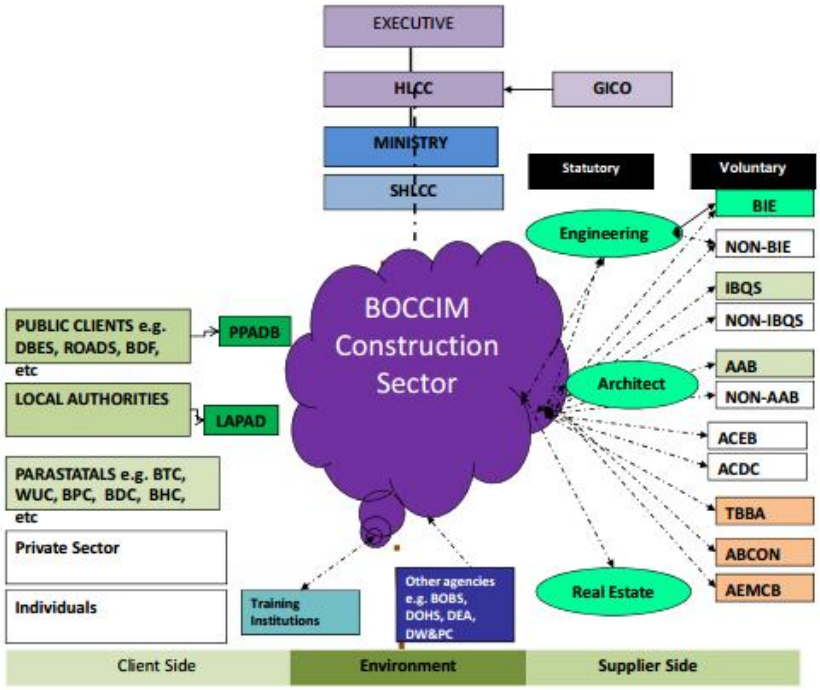

Figure 2: Diagrammatic representation of the Construction Industry in Botswana. Source (Ssegawa, et al. 2010)

The diagram in Figure 2 shows a grouping of clients on the left ranging from the central and local government, parastatals, private sector to individuals. The public and local authorities' asset procurement and disposal entities are also prominently indicated. Most notably is the PPADB which has the mandate of procurement and disposal of assets and registering contractors.

On the right hand side of the Figure 2 are supplier groupings made of associations, which are mainly voluntary in nature in regard to membership. They range from professional to trade associations of contractors, material and plant supplier. New legal entities are beginning to appear on the horizon in form of regulatory councils or boards especially for the professions in the construction industry, for example, engineers, quantity surveyors and architects (and affiliated professions like the Botswana Institute of real Estate).

In the middle of Figure 2 is BOCCIM Construction Sector (a division of BOCCIM which is an amalgamation of private sector service providers). It is important to note that BOCCIM Construction Sector membership is private and voluntary. It is also led by a group of volunteers from various facets of the construction industry. Theoretically, BOCCIM Construction Sector attracts other interested parties or stakeholders of the industry, for example, training institutions.

2.2 Performance Measurement Systems (PMS)

Performance measurement systems entail the regular collecting and reporting of information about the inputs, efficiency and effectiveness of process or projects. PMS can be used to judge project performance, both in terms of the financial and non-financial aspects and to compare and contrast the performance with others, in order to improve programme efficiency and effectiveness. Moreover, according to Steven et al (1992), measurements are needed to track, forecast, and ultimately control those variables that are important to the success of a project, and this has been agreed by many researchers and practitioners such as Love and Holt (2000) and Chan, (2001).

The ability to measure the performance of operations can be seen as an important prerequisite for improvement, and companies have increased the capabilities of their PMS over the last years (Fawcett and Cooper 1998). Some of the most common performance measurement tools are described by Simmons (2000) are as follows:

- Key performance indicators (KPI) are the navigation instruments that companies use to understand whether they are on track or veering off the prosperous path. They serve to reduce the complex nature of organizational performance to a small number of key indicators in order to make performance more understandable and digestible.
- Enterprise risk management (ERM) represents a set of tools and approaches to identify, assess and manage corporate risks. While risk management started its life very much as an internal control back-room function, today it has moved up onto the boardroom agendas of most businesses
- Performance appraisals is a tool to assess job performance of individuals in a company. If performance appraisals are done right they can very well facilitate meaningful communication, ensure individual goals are aligned with the objectives of the business, motivate and engage employees.
- Balanced scorecard (BSC) is another popular measurement tool that has been designed to articulate the strategic objectives of a business and then align performance measures and action plans to these strategic objectives to ensure the strategy gets executed.
- Benchmarking is traditionally seen as comparing your own performance with external best-practice performance or competitors (where best practice performance can come from outside the sector or industry a company operates in).

The use of simple and well-designed PMS is essential for supporting the implementation of business strategies. PMS provides the information required for process control and makes it possible to tackle challenging goals (Formoso and and

Lantelme 2000). Without the use of appropriate PMS, it becomes difficult for organizations to understand why poor performance continues, or how improvement could be achieved. (Leong and and Tilley 2008)

2.3 PMS in the Construction Industry)

In There has been a lot of research on performance measurement in general. In the last couple years, a number of studies have reported implementing performance measurement. However, very few studies were reported on PMS in the construction industry. (Nudurupati et al. 2007)

According to Beatham et al.(2004) there are three specific types of measures, which can be used in the construction industry which are, KPIs, KPOs (key performance outcomes) and perception measures. KPIs are measures that indicate the performance of processes. They are used as leading indicators, which gives opportunity to change and to take appropriate corrective action before the situation gets out of control. KPOs are the results of a completed action or process. They do not offer an opportunity to change the outcome as they are lagging indicators. They are used to measure the results of processes and sub-processes, whose results cannot be altered. Perception measures can be either leading or lagging indicators, they are usually measured on the perception (feedback) of people on the performance.

According to Robinson et al (2005), construction organisations have shown interest in PMS. It is therefore argued that the evaluation of performance in the construction is more oriented towards the project level (Love and Holt, 2000), and mainly focuses on the “tangibles” or “hard” factors while neglecting the “intangibles” or “soft” factors (Love and Holt, 2000). Further, the utilisation of the three traditional performance indicators; time, cost, and quality have been identified as the common approach of measurement. Table 1 shows common performance indicators as identified by different authors utilised in the construction sector.

Table 1 Summary of available previous studies on performance indicators used at project level.

No.	Author and year	Performance indicators
1	Pillai et al. (2002)	Benefit, Cost effectiveness, Risk, Customer commitment, Project status, Stakeholders, Decision effectiveness, Project management, Production
2	Cheung et al. (2004)	People, Safety, Cost, Client satisfaction, Time, Communication, Quality, Environment
3	Wong (2004)	Staff experience, Contractor experience, Resources, Time, Site

		management, Cost, Safety, Quality
4	Constructing Excellence (2005, 2006, 2009) and Roberts and Latorre (2009)	Client Satisfaction, Profitability, Defects, Productivity, Predictability cost time, Safety, Construction cost time, Social indicators, Variance cost time, Environment, Contractor satisfaction
5	Rankin et al. (2008) and Canadian Construction Innovation Council (CCIC) (2007)	Cost, Scope, Time, Innovation, Quality, Sustainability, Safety, Client Satisfaction
6	Luu et al. (2008)	Construction cost, Team performance, Construction time, Change management, Customer satisfaction, Material management, Quality management, Safety
7	Skibniewski and Ghosh (2009)	Construction cost, Defects, Construction time, Client satisfaction product, Predictability cost and time
8	Toor and Ogunlana (2010)	On time, Safety, Under budget, Defects, Specifications, Stakeholders, Efficiently, Disputes, Effectiveness
9	Construction Industry Institute (CII) (2011)	Cost, Accident, Schedule, Rework, Changes, Productivity

Adopted from Al-Sulaihi et al (2012).

A study by Nudurupati et al (2007) has shown that by introducing small changes in the construction industry through a structured PMS with appropriate management information systems, there can be significant improvements that successfully address all stakeholder requirements, which focus on critical improvement areas as well as bringing cultural changes.

3. RESEARCH METHODOLOGY

The methodology adopted in this research study consisted of a survey of PMS

adaptation and utilization within Botswana construction industries.

The survey questionnaire developed, asked a series of questions regarding the awareness of PMS, extent of use of PMS, barriers to PMS adoption, problems/challenges encountered in PMS use, and benefits achieved as a result of PMS adoption. The questionnaire formulated was sent to construction companies registered with Public Procurement and Asset Disposal Board (PPADB) as contractors engaged in building works.

Construction companies in Botswana need to register with PPADB which is under the Ministry of Finance and Development Planning, to operate in Botswana except for large scale international companies. The PPADB has six categories of contractors, where categorization is based upon the maximum value of a single project that a particular company can handle. PPADB takes into consideration several factors such as available resources (plant, vehicles, funds, etc.), the number of trained professionals involved in the business, previous projects undertaken (locally and/or internationally) and references of good standing in the industry, when determining the category. Citizen-owned companies belong to the lower classes up to Class 'D' with a very few at Class 'E'. Questionnaires were distributed via e-forms by email to 146 construction companies (in different categories) selected randomly in different parts of Botswana.

In order to ascertain PMS adoption barriers, respondents were provided with a sample of possible areas of performance measures that can be undertaken in the construction industry and then asked to identify, from that list, the barriers hindering them from implementing measurement. The provided areas included: construction cost, construction time, cost predictability (design and construction), time predictability (design and construction), defects, client satisfaction with the product and client satisfaction with the service; and three company performance indicators namely; safety, profitability and productivity.

4. FINDINGS AND DISCUSSION

In The survey instrument was designed in way to anticipate a response time of two weeks. A total of 80 completed surveys were returned for a response rate of about 54 %. With respect to population class, the survey response percentages are within a few percentage points of target population.

Table 2 shows the number of employees at the companies that responded to the questionnaire

Table 2: percentage of respondents

Number of employees	Percentage
Less than 25	75
Between 25 and 100	21.25
Between 100 and 500	3.75
More than 500	0

Of the companies which responded, 75% are small sized companies, 21.25% are medium sized companies and 3.75% are considered to be large companies based on number of employees. Size of the respondent companies is further echoed in table 3 which shows the PPADB categorization of the companies.

Table 3: PPADB category and percentage of respondents

Category	Percentage
OC	62.5
A	12.5
B	8.75
C	6.25
D	6.25
E	3.75
TOTAL	100

Most small sized companies are found at the OC category. As already mentioned, categorization is based upon the maximum value of a single project that a particular company can handle as determined by PPADB. OC and A category are considered to be small sized companies, B and C categories are considered to be medium sized while those at D and E represent large scale companies.

From the research it was found out that 65% of the respondent companies know of PMS in one form or another. This is a surprising finding given the increasing number of failed projects in Botswana over recent years. Since most are familiar with PMS the question now becomes whether they are implemented or not. 35% of respondents do not know of PMS, however this does not imply that the companies have not implemented or used one of the PMS tools under different names and formats. Of the 65% that know about PMS only 38.5% have actually adopted PMS. The most commonly adopted tools include Key Performance Indicators, Benchmarking and Balanced Score Card.

The respondents further indicated some the benefits they have enjoyed since adopting PMS. These are depicted in table 4 below.

Table 4: Benefits of PMS as indicated by respondents

Benefit	Percentage
Reduced operational costs	84.6
On time delivery of project stages	76.9
Reduced rework	59.6
Better control of stages	75

The companies that know about PMS but have not adopted them attributed it to the various reasons depicted in table 5.

Table 5: Respondents barriers of adoption of PMS

Barrier	Percentage
We lack staff with sufficient knowledge of these practices	50
Top management does not support this type of change	31.25
Lack of emphasis on the tools and PMS specific budget	18.75

Table 5 shows the PMS adoption barriers identified by the research participants. The majority of participants identified lack of staff with sufficient knowledge on PMS as the main barrier to adoption. This indicates that while companies may be aware of the benefits of implementing PMS, they are unable to adopt them due to lack of people with practical knowledge on how to implement the tools. The next major barrier to PMS adoption was identified as lack of support from top management, 31.25% of the research participants identified this as a barrier. This further indicates a lack of knowledge on PMS as such methodologies that are well documented to bring about significant cost reductions and provide better control of projects cannot garner support from decision makers.

From the results of the questionnaires it can be concluded that use of PMS in Botswana's construction industry is very much at its infancy. Without its adoption projects will continue to experience delays with significant time and cost overruns. It's been suggested by Adeyemi and Masalila (2016) that the main project delaying factors in the eyes of the client, consultants and contractor relate to poor planning and management. These can be directly alleviated by PMS.

Performance measurement has played an important role in other sectors companies, providing essential information for planning and control of management processes. They also allow the monitoring and control of the objectives and strategic goals (Sink and Tuttle, 1993; Neely et al. 1995). The most prominent and readily applicable PMS to Botswana is KPI and Benchmarking.

Benchmarking can help increase the sector's performance because it allows the continued improvement of the organizations and their processes, by comparing and evaluating their performance relative to best practices in the sector. In fact, benchmarking has been a very useful practice, not only in the pursuit of superior performance but also in identifying the organizations problems. (Pinheiro 2011)

KPIs can show how much progress is being made toward important project goals. They can be used in the recognition of problems, which identification occurs when a particular indicator shows a deviation from an established pattern. (Sink and Tuttle, 1993). Processes can only be controlled from the moment the company is able to

define their performance standards. KPIs contain information that can also be used not only to evaluate, but also to learn. Indeed, learning is more than evaluation. The objective of evaluation is to determine what is working and what isn't. The objective of learning is to determine why (Behn, 2003)

Benchmarking and Key Performance Indicators (KPIs), can represent a substantial help for professionals in the construction sector, giving them the ability to provide products and services with the best relation quality/benefit, which will be recognized by its customers, and simultaneously allowing them a more efficient monitoring of construction projects, contract management and performance evaluation of the entities involved. Thus, companies need to look at benchmarking and KPIs as a mean of making them viable and profitable, something that in the future will bring, first, a sustainable competitive advantage compared with other companies in its market and, on the other hand, the possibility of attracting new customers and create more value for themselves and for their stakeholders. (Pinheiro 2011)

5. CONCLUSION AND RECOMMENDATION

In PMSs have been identified as one of the most effective productivity improvement tools of the 21st century. Many other construction companies have implemented PMS and achieved advantageous results. Botswana's construction industry is plagued with its non-performance, constant cost overruns and late delivery of projects to name just a few, and yet the industry is slow to adopt PMS. The aim of this research was to investigate adoption barriers preventing Botswana constructor companies from adopting PMS as well as to investigate implementation challenges hindering the successful implementation.

Results of the research show that most construction companies in Botswana know about PMS but have not adopted them citing the lack of knowledgeable staff on the tools and lack of management support to implement PMS. Most of the respondent companies are categorized as SMEs category, this indicates that due to the size of the organizations, the companies may not have enough resources to develop personnel adept in PMS and can be tasked with developing expertise in this area.

Based on the analysis and conclusions of this research paper, a number of recommendations are summarized below:

- Botswana construction industry needs to put a considerable effort in understanding PMS. Construction Industry Trust Fund can help or offer training on such systems and tools to decision makers at construction companies.
- Companies should learn how to benchmark. Benchmarking is the simplest performance measurement tool to use. Taking note of companies that have successfully implemented PMSs and adapting lessons learnt to their own can make significant improvement. Companies can also invest in staff to learn on such methodologies.
- Construction companies should include PMS plan in their strategic planning. This will ensure that resources are set aside for PMS adoption, implementation and continuous improvement.

- Government assistance in training scarce in such a sector should be a priority. As previously mentioned most companies are SMEs, thus resources for staff development could be lacking. This is where a government which wants its construction sector to prosper should step in to assist. However this should not be limited to the construction sector only. There should be a statutory agencies supporting mainly SMEs to grow. Growth including development of staff and support in implementation of cost reducing initiatives.
- PPADP, the department tasked with registering construction companies could play a bigger role in the sector by not only registering companies but by applying more stringent checks on company owners and staff that they are well qualified to carry out construction projects.
- A more stringent evaluation process is required after projects are delivered late to find the consequences which often manifest as cost overruns, loss of profit, increased overheads, stress, acrimony among stakeholders, corporate contractor failure, litigation, loss of job opportunities and resources tied up in delayed projects.

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BEST PRACTICE GUIDE TO PROCUREMENT CHALLENGES OF PUBLIC-PRIVATE PARTNERSHIPS IN INFRASTRUCTURE DEVELOPMENT IN MALAWI

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ABSTRACT

Procurement of Public-Private Partnerships (PPPs) is underpinned by the project's potential to deliver Value for Money (VfM) through risk transfer to the private sector and the existence of enabling environments. In Malawi, PPP is a relatively new concept confined to the rail services, Information Technology and Airline sectors. Its use is quite limited in infrastructure development and there is no clear understanding or perception of the required PPP enabling environments and framework arrangements to assess risk transfer and VfM which are vital in steering successful PPPs and motivate private sector investment. The aim of this paper was two-fold, thus to review PPP procurement challenges from a Malawian perspective and propose a PPP methodology framework for best practice in infrastructure development from the findings. Semi-structured telephone interviews and Inductive thematic analysis were used.
Findings indicated that despite the potential for infrastructure PPPs in Malawi, the procurement process has several challenges some of which are common to the global PPP market. These include the protracted PPP procurement process of 12 to 24 months; handling of unsolicited bids; structure of the Special Purpose Vehicle; lack of robust assessment tools to ascertain VfM and risk transfer; limited capacity of local firms in handling PPP deals; high cost of private sector finance; funding restrictions and political risk. The PPP methodology framework for best practice in Infrastructure development was proposed and documented.

Keywords: Enabling environments, Methodology Framework, Procurement process, Risk transfer, Value for Money.

1. INTRODUCTION

Most governments world-wide have turned to Public-Private Partnerships (PPPs) to develop infrastructure and reduce dependence on public funds for development projects (Wamuziri and Jiang, 2008; Badu et al., 2012; Diz, 2014). Public-Private

Partnerships are long term agreements between the public and private sector for developing public assets using private finance and expertise in a favourable environment provided by the public sector (Kumaraswamy and Zhang, 2001; Wamuziri and Jiang, 2008; Malawi-Gazette, 2011).

Several European countries (Netherlands, Italy, Portugal, France, Germany and United Kingdom) have adopted the use of PPPs to develop infrastructure and enhance service delivery (Bult-Spiering and Dewulf, 2006). Leading among these is the United Kingdom through its Private Finance Initiative (PFI) which is a form of PPPs and has helped it achieve development even in the face of severe expenditure deficits (Akintoye et al., 2003).

Similarly, Sub-Saharan African governments have also turned to PPPs as evidenced by its adoption and use in South Africa in energy deals and toll roads, Nigeria in toll roads, airports, silos and water reservoirs and Kenya in the transport and energy sector (Thomson, 2005; Burger, 2009; Ugboaja, 2010; MENA, 2012; Iloh and Bahir, 2013).

In Malawi, PPP is a relatively new concept confined to the rail services, Information Technology and Airline sectors. Its use is quite limited in infrastructure development and there is no clear understanding or perception of the required PPP enabling environments and framework arrangements to assess risk transfer and Value for Money which is vital in steering successful PPPs and motivate private sector investment. Although such is the case, Malawi's annual infrastructure funding requirements are pegged at $0.6 billion for the period 2006 – 2015 and face an infrastructure funding deficit of $300 million annually. Its annual capability in meeting this deficit is $175 million from the two largest funding sources thus the public sector and donors (Foster and Shkaratan, 2011). This has impacted on infrastructure development as well as affecting the country's competitiveness both regionally and globally hence being ranked 117 out of 142 countries on the Global Competitiveness Index (Ojukwu et al., 2013). The aim of this paper was two-fold, thus to review PPP procurement challenges from a Malawian perspective and propose a PPP methodology framework for best practice in infrastructure development from the findings.

2. PUBLIC-PRIVATE PARTNERSHIPS

Public-Private Partnerships is an umbrella term for projects jointly commissioned by the private and public sector thus encompassing a variety of names. In Australia, they are referred to as Privately Financed Projects (PFPs), while the UK term them as Private Finance Initiatives (PFIs), most parts of Africa including Malawi maintain the term PPPs (Jefferies, 2006; Akintoye and Beck, 2009; World-Bank, 2009; PPP-Policy, 2011). But what do PPPs entail? Understanding the process and structure of PPPs helped in appreciating the challenges that go with its procurement. Although much focus was on an ideal PPP system which is the PFI of the UK, its maturity and leading role in the global PPP market renders it perfect to be inferred on most PPP models (Ojukwu et al., 2013).

2.1 Procurement Process in PFI

Private Finance Initiative procurement process commences with the Outline Business Case (OBC) which highlights the rationale for the project using a 6% discount rate to ascertain viability (Shaoul, 2005; World-Bank, 2009). The OBC includes three options thus "do nothing", "do the minimum" and the "preferred option". The preferred PFI proposal is compared to a hypothetical model known as the Public Sector Comparator (PSC). If the PFI has a lower cost than the PSC then a Full Business Case (FBC) is developed (Hannah (2008).

Shaoul (2005) criticises and questions the dependability of a hypothetical PSC model as in practicality, the PSC can never be opted for the actual PFI project since it is no more than a conjectural model that cannot materialise. Similarly, Gaffney et al., (1999) contends that feasibility of PFI's Business Case (BC) is masqueraded by HM Treasury's imposed 6% discount rate which is taken as a policy decision aimed at pushing government's agenda towards private finance. Underpinning their argument, they conducted an analysis that exposed the fragility of the BC if a minimal reduction is applied to the discount rate (Table 1).

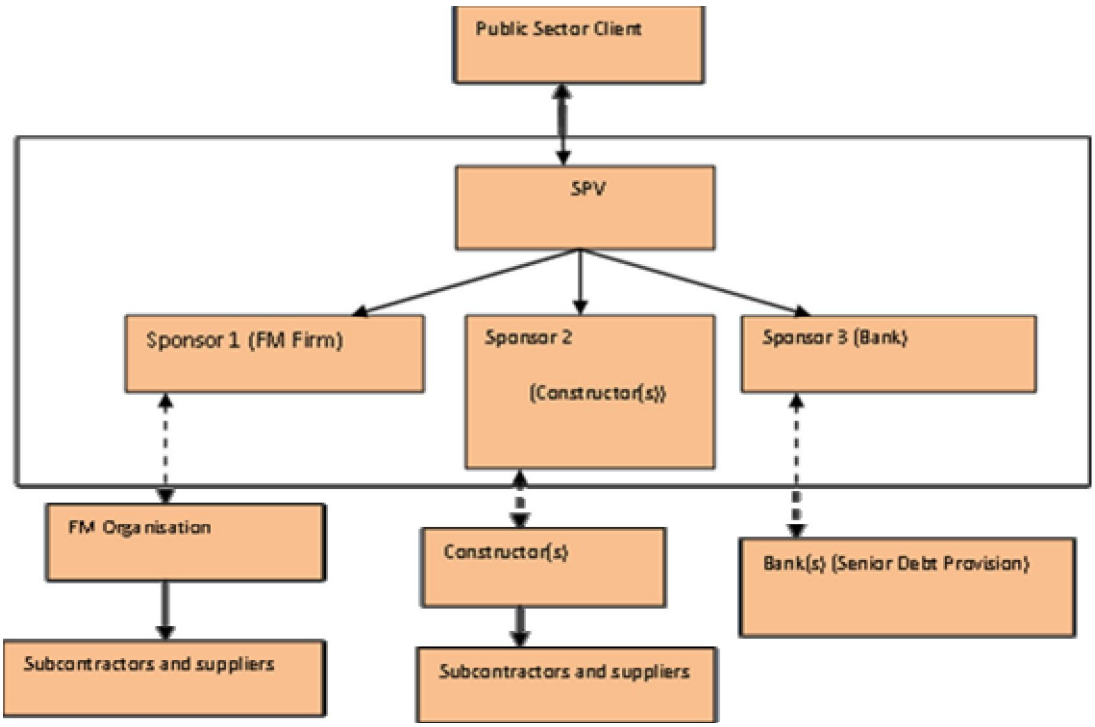
Table 1. : Effect of varying the discount rate on results of economical appraisal in Carlisle hospitals' PFI scheme

Discount Rate (%)	Public sector option (PSC) (£000s)	Private sector option PFI(£000s)	Economic advantage of PFI over PSC (£000s)
6	174 337	172 633	1 704
5.5	185 803	186 692	-889
5	198 884	202 043	-3 159
4.5	213 900	219 480	-5 580
4	231 247	239 388	-8 141
3	275 027	288 622	-13 595
0	549 882	577 048	-27 166

(Source: Gaffney et al., 1999)

2.1.1 PFI Model and the Special Purpose Vehicle (SPV)

The structure of a PFI model (Figure 1) comprises three main players: the public sector, the Special Purpose Vehicle (SPV) and the sponsors (Chinyio and Gameson, 2009). The SPV provides the design, construction, financing and operation of the project. The sponsors objectives are risk reduction and wealth creation hence the need of passing on risk to the various subcontractors under them to ascertain bankability of the project (World-Bank, 2009 and Dixon et al., 2005).



(Source: Chinyio and Gameson, 2009)

Critics (Cuthbert and Cuthbert, 2008a; Shaoul, 2005) have deplored the high dividend returns on equity capital provided by the SPV and further questions the rationale behind the SPV's objectives due to reaping of supernormal profits in PFI deals. Their findings indicate significant excess profits not only from equity capital but from all types of private finance injected into the projects.

2.1.2 Transaction Costs and Value for Money

Transaction costs for PFI deals are high to both the private and public sector due to the protracted bidding process which takes 26-35 months (Dixon et al., 2005; Hellowell and Pollock, 2009; Haran et al., 2013). It was observed that the resultant costs from such a lengthy process translate into exorbitant legal, financial and technical costs thus affecting VFM.

Although HM Treasury advocates for low transaction costs and a competitive procurement process, evidence from literature indicate that high bidding costs, barriers to market entry and lack of competition are prevalent in PFI deals hence promoting monopoly and defeating the VFM concept (Dixon et al., 2005; Hellowell and Pollock, 2009; Demirag et al., 2011; Fombad, 2013).

The focal point of PFI projects is the asserted achievement of VFM, however, several scholars (Gaffney et al., 1999; Ball et al., 2000; Shaoul, 2005; Hannah, 2008; Fombad, 2013) have criticised the high costs associated with equity financing, the protracted bidding process, lack of competition and the discounted cash-flow analysis whose significance on public sector's non-profit making objectives is

questionable. Ironically, regardless of the raised criticisms, Treasury Taskforce Private Finance (2000) maintains that private finance's increased costs are minimal to endanger the concept of VFM. Ball et al. (2000) contests the Treasury Taskforce's view and claim that even with small margins, the probability of affecting VFM is significant considering the 20-30 year period of PFI projects.

Exploring other methods of assessing viability should be considered as an option since the highlighted arguments seem to question if VFM should be the underpinning basis of PFI projects due to the manipulation of its assessment tools (Shaoul, 2005; Hellowell and Pollock, 2009).

2.1.3 Private Finance and its Cost efficiency

The concept of using private finance on public sector projects has generated skepticism regarding its feasibility and ability to achieve VFM due to high interest rates accompanying private sector borrowing. A combination of debt and equity is common in PFI deals with varying ratios of 70-90% debt and 10-30% equity (Ball et al., 2000; Scottish-Parliament, 2008; Hellowell and Pollock, 2009; Ye, 2009; Bovis, 2010). It is argued that the same amount of finance can be borrowed by governments at a lower cost since the risk of borrowing governments is relatively low (Hellowell and Pollock, 2009). Further to that, Gaffney et al. (1999) questions the effectiveness of private finance due to high annual rates of return ranging from 15-25% in NHS projects.

2.1.4 Risk transfer

PFI has been justified by the British government under the guise of being able to achieve VFM through risk transfer to the private sector (Pollock and Price, 2008). Nevertheless, Gaffney et al. (1999) has flawed the risk transfer methodology used and argues that adjusting the PSC's net present cost with risk masquerades the PFI as an economically viable option. They further assert that risk is double counted through use of the 6% discount rate and adjusting the PSC with a lump sum. They carried out a study of NHS Trusts to demonstrate and substantiate their claims (Table 2).

Table 2. Risk added to PSC: net present costs over 60 years

Trust	PFI net present cost(£m)	Before risk adjustment(£m)	Risk added(£m)	After risk adjustment(£m)
Calderdale	1221	1191	73	1264
Carlisle	173	152	22	174
Dartford	928	881	55	937
Durham	177	153	24	177
Wellhouse	1206	1210	20	1230

(Source: Gaffney et al., 1999)

It is observed that the PSC's cost after risk adjustment becomes high as compared to PFI. This suggests that PFI's comparison against a hypothetical model is not reliable as a basis for economic viability.

Addressing the raised criticisms, Shaoul (2005) states that the British government decreed that both risk cost and risk transfer should be ascertained and included in PFI's financial appraisal. Despite the issued decree, the concept of transferring risk to a party better placed to manage it and not with a lowest and affordable risk premium is a cause for concern. Further questions are raised on: discounting the interest rate in assessing risk cost which can result in double counting, failure to consider extra risk that can arise from failure of the Special Purpose Vehicle and failure to embrace main risks like technical obsolescence, changes in regulatory framework, government policy and demand. It was further revealed that the 6% discount rate deals with 'Systematic risks' related to inflation and recession while excluding demand risk (Shaoul, 2005; Pollock and Price, 2008; Hellowell and Pollock, 2009).

2.2 PPP Procurement in Malawi

There is paucity of literature on PPPs in Malawi hence the review of the available documentation thus the policy and Act. Malawi has signed three PPP deals in rail services, fibre optic for communication infrastructure and Malawi Airways (Mchulu, 2014; Msusa, 2014). Its PPP policy framework and Act was approved by cabinet in 2011. Although the policy advocates for PPP procurement of public projects, traditional procurement methods still dominate the infrastructure sector.

2.2.1 Value for Money and Risk Transfer

The underpinning basis for all PPP deals is Value for Money, affordability and risk transfer. Malawi's PPP setting lacks methodologies for assessing VFM and risk transfer thus posing limitations (Malawi-Gazette, 2011; PPP-Policy, 2011). The policy state that viability shall be assessed through use of 'quantitative factors' and comparison against a PSC, despite lack of a description of the said quantitative factors. Lack of key benchmarks for assessment is challenging in ascertaining viability of proposed PPP projects.

2.2.2 Cabinet Approval of Proposals

Submission of proposals to cabinet for approval is a limitation (Malawi-Gazette, 2011). The major drawback with this approach is the political nature of a cabinet composition and the challenges facing developing countries regarding distribution of development projects. Questions are posed on how far impartiality can be exercised in approving projects falling within the jurisdiction of an opposition party. Although such fears can be quashed as irrelevant in developed countries, they can have a big impact in developing countries where sitting governments would want to stamp their authority in every single aspect.

2.2.3 Structure of the Special Purpose Vehicle

Malawi-Gazette (2011) stipulates inclusion of a cabinet minister within the SPV. Such provisos are challenging due to differing objectives between the public and private sector. It was noted that the policy is silent as to the actual composition of the SPV (PPP-Policy, 2011). Evasiveness in composition of such a key component can hinder the success of PPPs.

2.2.4 Unsolicited Bids

The PPP-Policy (2011) discourages entertaining unsolicited bids, while the PPP Act state that such proposals should be referred to the Public Private Partnership Commission for assessment (Malawi-Gazette, 2011). The existing ambiguity in handling of unsolicited bids is challenging thus sending mixed signals to private investors and it can be regarded as a limitation to the smooth delivery of PPPs. Although unsolicited proposals can be beneficial in other aspects, they promote lack of transparency, corrupt practices, poor VFM and monopolistic competition (World-Bank, 2009). It is apparent that such bids should not be entertained.

3. RESEARCH METHODOLOGY

The study was based on an exploratory design due to the contemporary nature of the issues under investigation hence the choice of a qualitative phenomenological research. This type of study endeavors to understand commonality of people's insights and intuitions on a specific concept (Leedy and Ormrod, 2010; Creswell, 2013). The overarching objective was to review PPP procurement challenges from a Malawian perspective and propose a PPP methodology framework for best practice in infrastructure development from the findings.

Due to the phenomenological nature of the study, purposive sampling was used with the aim of generating a sample that represents a viewpoint and not a population, thus selection criteria was based on the participants' ability to provide insights on the studied phenomena (Smith et al., 2009). The participants constituted 5 high-level executives educated to post graduate level with relevant experience in PPPs either as public-private investment executives or members that can constitute a Special Purpose Vehicle. The selected sample satisfied Creswell (2013) recommendation of selecting a sample size in the range of 5 to 25 with suitable experience on the issues being explored.

Non-probability sampling was used though it is termed subjective and limits generalisation of the findings (Henry, 1990; Flick, 2014). However, probability samples could not be used either due to the need to gain insights on PPP challenges in Malawi. Flick (2014) contests the basis of the generalisation argument as it focuses on numerical factors not reflecting the underpinning philosophies behind qualitative research.

Data was drawn from literature and audio-recorded, in-depth semi-structured telephone interviews. The themes that emerged from the literature were used to

inform the interview process and inductive thematic analysis was used (Tranfield et al., 2005; Scuilli, 2008; Creswell, 2013).

4. FINDINGS AND DISCUSSION

4.1 PPP Procurement Challenges

4.1.1 Procurement Process

Procurement of PPPs in Malawi falls short of assessment tools to ascertain VFM, viability and affordability. Similar to stipulations in the PPP Policy and Act, the empirical results were silent on the exact tools to be used *"…now what is key is that value for money should be attained, this is how the procurement process should be done, you know a business case for having that PPP"*. The significance of the Business Case in a PPP deal cannot be overemphasized, however, Malawi's case is in contrast with literature findings where a 6% discount rate is used to underpin viability through comparison of a hypothetical PSC model against the actual PPP project (Grimsey and Lewis, 2005; Shaoul, 2005).

4.1.2 Structure of the Special Purpose Vehicle

The Special Purpose Vehicle (SPV) in Malawi's PPP model includes a Cabinet minister within its membership. The SPV is a project company responsible for designing, financing, operating and maintaining a proposed PPP project (Chinyio and Gameson, 2009). Thus the duties of the SPV are distinct from those of the public sector as the latter oversees and monitors the activities of the former. The results deplored the SPV's composition as lamented by a participant, *"…the involvement of cabinet is to approve, [….], that's when we go and advertise, so I think that will be conflict of interest"*. Inclusion of cabinet in the SPV can lead to conflicts, scare away potential investors or promote corruption.

4.1.3 Lack of Local Capacity

Participants indicated that local organisations and financial institutions are constrained to venture into PPPs due to huge capital requirements synonymous with such deals; *"Major PP projects are very expensive, when you look at the magnitude of investment it's massive, talking of $50m to $200m, local banks cannot finance such type of investment projects."*

"…It would be difficult for such firms to raise equity finance without actually borrowing due to the huge capital outlays that are involved. Further these firms have weak balance sheets, asset base and net worth which would not support such borrowings." Capacity is one of the underpinning basis upon which firms decide whether they can afford to participate in PPP projects. Literature attributed capacity

challenges among small firms to the lengthy procurement process because of high transaction costs (Dixon et al., 2005; Hellowell and Pollock, 2009), while the results underpins capacity on capital outlays and the inability of local organisations to meet borrowing requirements.

4.1.4 Unsolicited Bids

Differing views emerged from the results on how unsolicited bids should be handled. Some felt that they should be referred to the Public-Private Partnership Commission (PPPC) although it might promote corruption while others stated it could lead to lengthy court battles, *"…. unsolicited bids should be passed on to PPP Commission, who is going to investigate whether it is viable as a PPP project. […] if somebody has come up with an unsolicited bid and then not get the contract, it may create problems or it could even lead to corruption."*

"…if you just single source, you are going to run into problems because these are major projects. […] then it becomes a major litigation issue, then […] such issues they will take years and years."

The assertions in the results are reflective of the contradiction that exists between the PPP-Policy (2011) and the Act. The policy warns against entertaining such bids while the Act provides laid down procedures on how they should be handled. It advocates that PPPC should evaluate and proceed with advertisements if they are found viable. Nonetheless, World-Bank (2009) is of the view that entertaining unsolicited bids can promote corruption and monopolistic competition as well as challenge a transparent procurement process.

4.1.5 High Cost of Private Sector Finance

It was lamented that the prevailing high interest rates in Malawi make PPPs expensive, *"[…] PPPs are not cheap. If you are going to use private sector money, that money is not cheap because the private sector, bring in equity, […] and even if it's debt, bank interests are not cheap […] they are usually more expensive."* Scholars further bemoaned high interest rates synonymous with private capital as well as the reaping of excess profits by private investors in PPP deals. It was found that annual rates of return are high and range between 7-25% (Gaffney et al., 1999; Ball et al., 2000; Shaoul, 2005; Hannah, 2008; Hellowell and Pollock, 2009).

For Malawi's case there was silence on high rates of return in the findings mainly due to the upcoming nature of its PPP market and non-existence of information on such experiences.

4.1.6 Political Risk

In Malawi, political cycles are five years between elections. A participant questions if such a cycle cannot pose threats to the procurement and implementation of PPP

deals due to uncertainties that may arise in the event of a change in political regime, *"[…], then you look at political risk in Malawi, do we have the tendency that government awards […] PPP contracts to investors and when government changes, will they reverse those investment projects and chase away the investors?"* There is paucity of literature on political risk in PPP deals mainly due to the maturity of the World's leading PPP models as well as the maturity of politics in the economies they exist. The context of the literature on political risk, however, focused on implementation of politically motivated projects by self-seeking politicians and top government officials in the Nigerian PPP market (Essia and Yusuf, 2013). Although issues of political risk may not be manifested in mature Western PPP markets, they can have a huge impact on the success of developing markets like Malawi.

4.1.7 Risk Management and Transfer

There is no quantitative risk assessment procedure to ascertain the amount of risk cost transferred to the private PPP partner from the findings, *"[…]during negotiations, that's when we share the risks, […]e when we are doing the feasibility study that's when we discuss how much risk can we transfer to the private party, so you determine before-hand that this risk can go to the private party, at what cost, maybe at this cost. […] when you identify the risks, that's when you are able to see that this risk can be mitigated by this. […] it's a social science, it's not mathematics, qualitative risk assessment that's how you come up with the risk and whether that risk can be borne by government or can be borne by the private party, so, i don't think its mathematical something."*

Contrary to the findings, literature indicates that PPP's financial proposal should include ascertained amounts of risk cost and risk transfer signifying a quantitative risk assessment process (Shaoul, 2005; Pollock and Price, 2008). The results echo the Malawian PPP policy which falls short of a robust risk transfer methodology to underpin the basis of all PPP deals (PPP-Policy, 2011). Problems may arise however, as the asserted qualitative risk assessment may have limitations in ascertaining quantitative amounts.

4.1.8 Funding Restrictions

Funding restrictions outlined in the results were not found in literature due to the paucity of literature on role of financiers in PPP deals (Demirag et al., 2011). Notwithstanding the paucity of literature claims, contextual differences in existence of some global and Malawi's PPPs can also contribute to the lack of documentation on funding restrictions. Participants highlighted existing restrictions, *"… then the directive on foreign currency lending would also apply – this prohibits banks from lending Foreign Currency Denominated Accounts beyond 69% of average monthly FCDA balances."*

"[…] the Financial Services Act in Malawi would not allow banks to take up equity

in non-financial services."
Whilst the restrictions were concurred by both the Central and retail banks, it is worth evaluating negativities such restrictions can pose to the Malawian PPP market.

4.2 The PPP methodology framework for best practice in Infrastructure Development in Malawi

The findings emphasised the need for enabling environments if PPPs are to thrive. The global leading PPP model (PFI) has achieved significant strides due to mature policies and support from government. Such support is seen through mandatory PFI procurement of all central and local government projects (Bult-Spiering and Dewulf, 2006; Akintoye and Beck, 2009).

Whilst mandatory decrees may prove challenging to Malawi's upcoming market in the short term, long term plans should consider such provisions as well as firming up on monitoring of PPP deals to achieve fruitful results. The proposed recommended PPP methodology framework for best practice in infrastructure development was illustrated in Figure 2 detailing the expectations of the participants as well as identified gaps that require reinforcement to mitigate identified challenges for successful commissioning, implementation and operation of PPPs in Malawi.

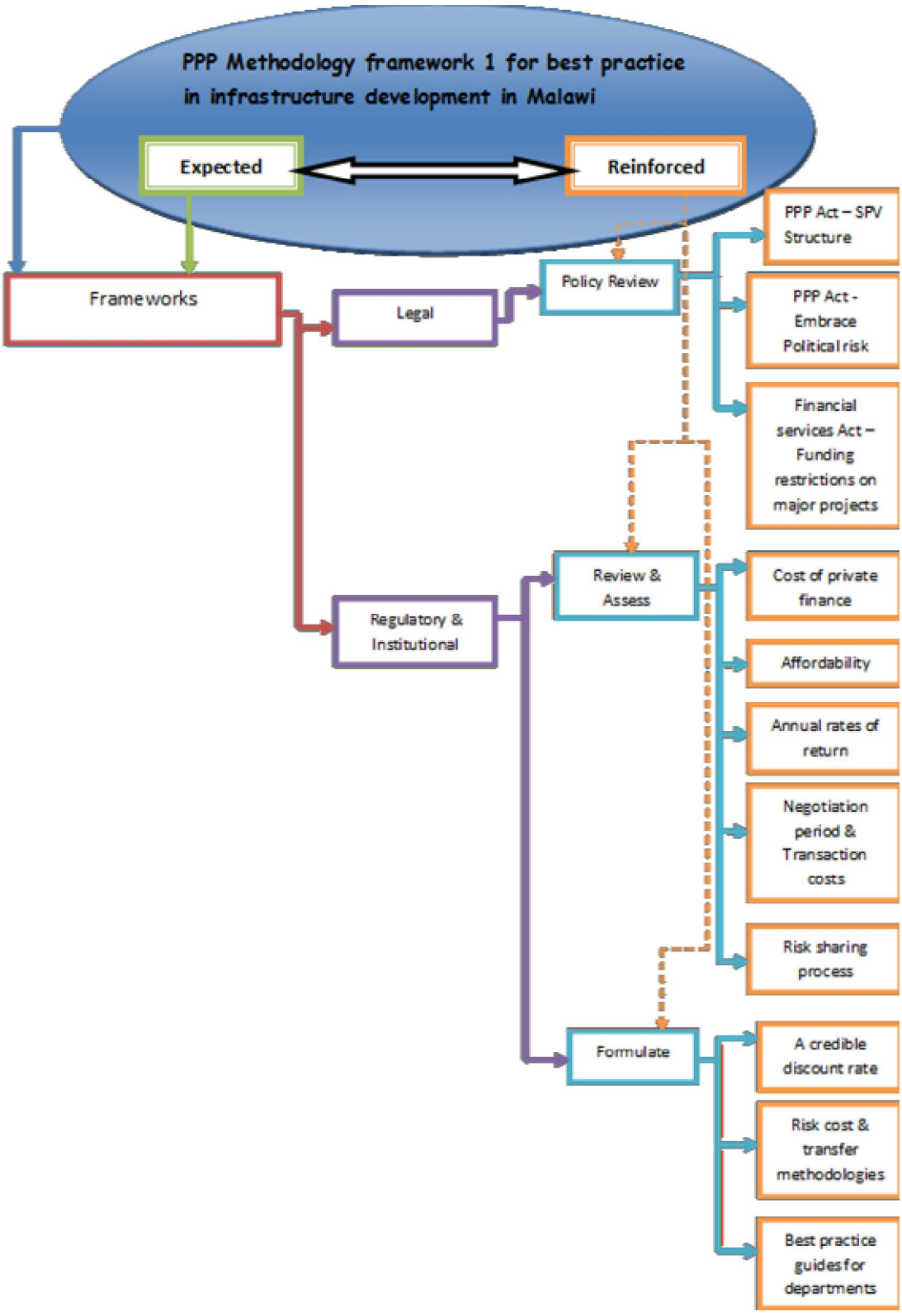


Figure 1: PPP methodology framework 1 for best practice in Malawi accentuating legal, regulatory and institutional frameworks

5. CONCLUSION AND RECOMMENDATION

Infrastructure development in Malawi faces a number of challenges such as a protracted procurement process, handling of unsolicited bids, structure of the Special Purpose Vehicle, lack of robust assessment tools to ascertain VfM and risk transfer, limited capacity of local firms to venture in PPP deals, high cost of private sector finance, funding restrictions and political risk. Considering the existing potential for PPPs in Malawi due to its annual infrastructure funding deficit (Foster and Shkaratan, 2011), the need to review the existing PPP frameworks cannot be overemphasized.

As such robust assessment tools should be formulated to underpin the foundational basis of PPP deals, stipulations in the policy and Act regarding handling of unsolicited bids should be reviewed to avoid promotion of corrupt practices as well as court cases that can emanate from entertaining the same, the structure of the Special Purpose Vehicle might also be a conduit for corrupt practices as well as a deterrent to potential investors hence the need to review its composition to promote best practice, political risk and funding restrictions should be dealt with at policy level to underpin government's commitment in fostering PPPs and government should negotiate competitive interest rates with private financiers to promote affordability.

The future of PPPs in Malawi depends on a need to adopt a holistic approach in addressing the highlighted challenges through evaluation of the recommended best practice PPP methodology framework for infrastructure development. It is vital to assess the benefits it can afford the overall procurement process from inception to implementation and operation. The proposed best practice guides should be as inclusive as possible encompassing all key elements for the successful delivery of Public-Private Partnerships. It is crucial to the successful procurement, implementation and operation of PPP deals.

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COMPARATIVE ANALYSIS OF THE IMPACTS OF RISKS ON BONDED AND UNBONDED CONSTRUCTION PROJECTS

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ABSTRACT

Despite the introduction and adoption of various techniques and innovative practices geared towards improving the delivery of construction projects, some notable problems of cost overrun, time delay, low quality, dissatisfied clients, etc. still persist. One of the notable practices in the construction industry is the use of bonds and guarantees. Construction bond was introduced as an instrument to protect or indemnify its recipients against risks and problems associated with construction projects but the challenge over the years lies in the practical enforcement of bonding conditions and its overall benefits to the construction industry. This research therefore evaluate the risks that are associated with bonded and unbonded projects with a view to ascertaining their effects on overall construction projects success. Primary data were collected through administration of questionnaires on identified construction bond stakeholders namely: clients of public projects: quantity surveying and architectural firms; and construction firms. Questionnaires were administered on 337 respondents out of which 242 were returned while 236 were certified fit for analysis. Mean item score was used for ranking the identified factors while Kruskal-Wallis and Mann-Whitney tests were employed to examine relationship and differences in sample means of different groups of respondents respectively. The study revealed that financial soundness of the issuer also known as credit risk has major effect on projects with bond while for projects without bond, liquidity risk requires the most attention. The identified bond risks are more inherent in bonded projects except for liquidity and volatility risk. In view of this, special attention should be accorded the activities of guarantors, that is banks and insurance companies, shouldered with the responsibilities of issuing bonds in an attempt to reduce their influence on construction bond process. This will enhance value for money for contractors seeking the bonds and eventually lead to success of construction project.

Keywords: Construction stakeholders, Construction bond, Guarantor, Principal, Surety.

1. INTRODUCTION

Construction bonds also known as guarantees are risk management tools for enhancing better performance of construction projects. Bond or guarantee in the context of construction projects, is an undertaking by a bank or other financial institution, to make payment to the employer up to a stated aggregate amount (the bond amount) in defined circumstances

(Ndekugri and Rycroft, 2009). A bond is a discretionary item in any contract and it is a matter for each individual client to decide whether a bond is required from a contractor. This decision is usually made pre-tender and all tenderers would be made aware of the requirement. The Contractor will need to satisfy the guarantor that it has the financial and technical resources and management capability to carry out and complete the contract in question. In a study on construction surety bonding, Kangari and Bakheet (2001) observed that a contract bond guarantees the construction contract and all its provision in which the prime contractor accepts two responsibilities which are to perform the objective of the contract; and to pay all costs associated with the work.

In the Chinese construction industry, Xianhai (2002) concluded that there has been a significant tendency for the default risk to increase in recent years and establishing a construction contract guarantee system therefore becomes a necessary choice to make both contractors and owners honour contracts and act in good faith. Surety bonds existed long ago when it was simply an honest hand shake between two or more parties. The parties agreed to a decision and gave their personal guarantees of following through by completing all work (Kangari and Bakheet, 2001). Construction bonds are effective tools for ensuring successful construction projects (Boswall, 2010). Like any tool, it requires an understanding of how it works, proper maintenance and proper use. A further problem according to Australian Constructors Association (2009) is that clients sometimes delay the cancellation or release of performance bonds following completion of construction at the end of the defects liability period. It was however opined that this delay may not be caused by concerns relating to the contractor's performance, but purely the result of administrative processes. For this study, projects that are executed with the use and application of bonds or guarantees are termed bonded projects while those without any of the bonds are referred to as unbonded projects.

A bond constitutes a legal guarantee that the project will be completed as expected. In instances where a bonded contractor fails to perform, the bonding company will provide some form of restitution to the owner. Huang (2008) observed that construction contracts require contractors to furnish performance securities that serve as fundamental financial management tools for project owners to transfer contractor default risks to security providers. According to Emily (2009), bonds are issued by organizations known as surety companies. It was further stated that once a contractor becomes aware of bid requirements on a job, he will contact a surety company to arrange a bond. The surety company will evaluate the contractor as well as the risks associated with the project before determining the bond rate. This leads to various risks in contrast to the purpose for which the process of bond was conceived to address, which is to ensure that projects are delivered to cost, time, quality and satisfaction of stakeholders. This study therefore examined the effect of risks associated with construction projects executed with and without bond and guarantee with a view to determine the difference in the two groups of projects.

2. CONSTRUCTION BOND, RISK AND CLAIMS

2.1 Risks Associated with Construction Bonds

A distinct characteristic of construction projects is risk (Xianhai, 2002) and one of the major ways of managing it is through the use of bonds. Deng, Ding and Tian (2004) observed that surety bonds and bank guarantees also known as letter of credit in the US, are the two major instruments to protect the owners of a construction project against the risk of non-performance of the contractor. In Nigeria, Ojo (2011) opined that bonds is to indemnify the oblige against the default of the principal. Primarily, the contractor (principal) is shoulder to bear most construction risks and this is mostly transferred to the surety for an amount (e.g. bank interest charge, etc.) for a particular period of time depending on the contractual obligations and requirements. A construction surety bond is a financial instrument used generally when the first party (owner) has an agreement with a second party (Construction Company). This financial instrument serves as a guarantee to the first party from a third party (surety company) that a construction job (obligation) will be completed according to the terms and conditions within a written contract. Construction bond is a risk sharing or transfer method and Lam, Chiang and Chan (2011) argued that though the conventional wisdom seems to regard bond investment as being safe, the level of risk varies with the bond structure and terms of use. Mehmet and Makarand (2010) concluded that the risky and hazardous nature of construction business makes the underwriting decisions crucial for sureties. One of the distinct characteristics of construction projects is that they are full of various risks and Xianhai (2002) opined that contract guarantee has proved to be an effective measure to defend against default risk.

On a general note, El-Diraby and Gill (2006) identified the significant construction project risks to include construction risk, performance/operating risks, economic and financial risk, privatized-infrastructure finance, environmental risks and political risks. There are four ways of addressing risks in construction and they are through risk transfer, risk sharing, risk acceptance and acting as if there is no risk (laissez-faire). In the US., Surety Information Office (2009) noted that construction bond is a risk transfer mechanisms regulated by state insurance departments in support, Kangari and Bakheet (2001) observed that a surety bond is a risk transfer mechanism that shifts the risk of contract default from the project owner to the surety. It further classified quantitative and qualitative risk factors impacting construction bond underwriting, to improve the quality of the evaluation analysis and to reduce the highly unstructured environment and the subjectivity of the bond evaluation in underwriting. Kangari and Bakheet (2001) identified major risk factors impacting construction bond administration to include education and experience of the company's key people, contractor's cashflow, etc. More so, Mehmet, *et al.* (2006) classified relative importance of different risk factors for warranty bonds into four characteristics which are project, warranty, design and contractor. The project characteristics includes such things as type of project, size of project, construction period and method of contract. warranty characteristics is concerned with amount of warranty bond, warranty period, warranty specifications and risk of innovation. Design characteristics

entails probability exceeding design traffic, pre-existing conditions and contractor control over design. Contractor characteristics is the fourth and it can be measured by the following factors: reputation, project experience, performance, credit history, capacity, financial strength as well as current workload.

Lam, *et al.* (2011) identified nine (9) types of risks associated with construction bond from literature. They include: credit risk, interest rate risk, liquidity risk, prepayment risk, reinvestment risk, currency risk, inflation risk, sovereign risk and volatility risk. Credit risk refers to financial soundness of issuer, that is, the ability of issuer to make interest payments and return principal on schedule. Typical credit risk involves credit spread risk, downgrade risk, and default risk. Interest rate risk refers to sensitivity of bond prices to changing market conditions. Bond values move in opposite direction from prevailing interest rates. Liquidity risk is the risk for not effecting immediate redemption of bond at market value. If investors want to redeem bond at once, selling price will most likely be below market value. Prepayment risk relates to redeeming bonds by issuer before maturity; usually investors will receive less cash flow than expected. Reinvestment risk is the risk that payment of interest and principal at specific time may be reinvested at lower interest rate than original bond yield.

Currency risk is the risk of receiving less domestic currency when investing in bond issue that makes payments in currency other than domestic. Inflation risk is the value of bond's cash flows (both interest and principal) declines because of inflation. Sovereign risk results from actions undertaken by a foreign government; usually associated with credit risk. There is high tendency that bond credit will deteriorate after governmental actions and poor credit rating will eventually drag down bond price. Volatility risk applies to bonds embedded with callable and putable options. Price reduction will be caused by change of expected yield volatility while increase in expected yield volatility will raise value of callable bond but reduce the value of putable bond, and vice versa

2.2 Construction Bonds and Claims

If the principal fails to perform the obligation stated in the bond, Powelson (2007) opined that both the principal and the surety are liable on the bond. When there is a default by the principal, the oblige has the right to contractual claim which will be shouldered by the guarantor. Most defaults do not occur overnight, they are the product of a number of causes over an extended period of time (The Associated General Contractors of America, 2006). It was recommended that parties to the default problem can greatly increase the likelihood of a good result by communicating promptly, factually and objectively. Heath (2004) claimed that the risk of losing contractor's surety resources in case of contractor's default are always substantial and ever present since the responsibility of the surety is to answer for the default of the contractor according to the specific provision of the construction contract. However, the surety's legal rights and responsibility in a default situation are determined by the provision of the bond.

Standard Bank (2010) noted that payment under guarantee is called for at the sole discretion of the beneficiary (oblige), who submits a written claim stating that the applicant

has failed to meet the obligations under the contract. The guarantor is liable to pay the beneficiary provided that the claims, together with the supporting documents are presented according to the requirements of the guarantee. A guarantee is irrevocable and can only be cancelled or amended provided that all parties are in agreement (Standard Bank, 2010). Hinchey (1986) opined that the essence of awarding damages is to place the aggrieved party (oblige) in as good position as it would have been but for the breach of the principal's default.

3. RESEARCH METHODOLOGY

The population of this study are construction stakeholders in the Nigerian construction industry that are directly involved with the management of risks emanating from administration of bonds. These includes: Contractors (and sub-contractors), Clients of public projects as well as Consultants (Architects and Quantity surveyors) in Lagos and Ondo states, Nigeria. Guarantors, that is, banks and insurance companies were not involved in this aspect of this research because they are not directly involved in managing the risks associated with construction bonds.

Various forms of validity and reliability tests were carried out. Content validity was achieved by ensuring that the survey carried out is based on factors identified from literatures which were modified to suit Nigeria situation. Face validity was achieved using pilot study. Pilot survey was carried out at the initial stage of the research in order to pre-test the instrument for data collection. In carrying out the pilot study, it was ensured that each of the group of respondents were contacted as appropriate using convenience sampling method. In order to ensure uniformity, four questionnaires each were administered on each group of respondents making a total of twelve. It was also expected that this diversity will provide for wide range of views. For contractors, it was ensured that quantity surveyors, architects, builders and engineers are the four respondents for the questionnaire administration in the selected construction firms. The same was also ensured for the clients in the selected government establishments. In the case of consultants, two respondents each from quantity surveying and architectural firms were selected. Nine PhD holders and PhD students from within and outside the country were also involved in the pilot study for necessary corrections and suggestions on way to improve the instrument. Their comments, observations, suggestions and corrections were noted and incorporated into the final draft of the instruments for final survey.

Interrater reliability was achieved by ensuring that questions in the research instruments for different categories of respondents are customized and adjusted based on the respondents' peculiarities but using the same set of factors and variables. For internal reliability, Cronbach's alpha (α) test was employed and the result in table 1 depict that the instrument used for the study is reliable since the values are close to 1.00. Test-retest reliability was achieved by examining the significance of the differences in the responses of respondents from Ondo and Lagos states using Mann-Whitney U-test (MW). The result in table 1 indicate that there is no significant difference in the opinion of respondents from the two states.

Table 1. Reliability test

Description	Asymptotic significance
Internal Reliability (Cronbach's alpha test)	
Effect of risk on projects with bond	0.866
Effect of risks on projects without bond	0.867
Test-retest reliability (Mann-Whitney)	
Effect of risk on projects with bond	0.825
Effect of risks on projects without bond	0.508
Parallel reliability (Kruskal-Wallis)	
Effect of risk on projects with bond	0.152
Effect of risks on projects without bond	0.682

* Significant at $p < 0.01$, ** Significant at $p < 0.05$.

Parallel reliability was achieved in this study by comparing and correlating the response of different group of respondents using Kruskal Wallis K-test since the respondents are more than two groups. The results indicate that there is no significant difference in the measured factors from the opinions of the groups of respondents.

Table 2. Population and sampling frame of respondents

	Population			Sampling frame		
Respondent	Lagos	Ondo	Total	Lagos	Ondo	Total
Clients of public projects	25	28	53	25	28	53
Quantity Surveying firms	39	19	58	39	17	56
Architectural firms	62	22	84	58	21	79
Contractors	83	119	202	78	71	149
Total			397			337

Out of 379 identified population, only 337 could be reached after conducting an initial survey as indicated in table 2. Questionnaires were administered on these stakeholders using census method but due to time constraints and lack of commitment from some of the respondents, 242 of these were returned out of which only 236 were certified fit for further analysis (the remaining 6 questionnaires were not completely and correctly filled by the respondents). The 236 figure represents about 59% and 70% of the population and sampling frame respectively. This response rate is considered sufficient base on the assertion of Moser and Kalton (1999) that the result of a survey could be considered as biased and of little significant if the return rate was lower than 20-30%.

4. FINDINGS AND DISCUSSION

4.1 Characteristics of Questionnaire Respondents

Table 3 revealed that of the 236 respondents for the study, 107 are from Ondo state while the remaining 129 are from Lagos state. Of these total figure, 118 are contracting firms representing about 50%, 72 are consultants, that is, architectural and quantity surveying firms while 46 are clients' organisation.

Table 3. Respondents and their location

	Ondo		Lagos		Overall	
Respondent	No	Percent	No	Percent	No	Percent
Contractors	53	49.53	65	50.39	118	50.00
Consultants	29	27.10	43	33.33	72	30.51
Clients	25	23.36	21	16.28	46	19.49
Total	107	100.00	129	100.00	236	100.00

4.2 Risks of Bonded Construction Project

In examining the effect of identified bonding risks, construction projects with and without bond were considered. Contractors, consultants and clients participated in the survey for this aspect of the study and table 1 revealed an asymptotic significance value of 0.152 and 0.682 for projects with and without bond respectively using Kruskal-Wallis K-test. It could be observed that the generated value is higher than 0.05 and 0.01 which therefore denote that the difference is not significant. It can thus be concluded that there is no significant difference in the opinions of respondents as regards effect of risks associated with project with and without bond in the construction industry. This is in line with the assertion of Oke *et al.,* (2016). It was stated that as much as the sampled stakeholders are experienced and knowledgeable of the practice of bonds and guarantees, there should be no difference in their opinions on issues relating to the process and administration.

Effect of identified risk on bonded construction projects is illustrated in table 4. Using ANOVA as the test statistics, generated p-value revealed that difference in mean values of seven of the risks variables are significant as their mean values are less than 0.01 and 0.05. This revealed that there is significant difference in the opinion of respondents regarding the seven variables which corroborate the earlier Kruskal-Wallis test result. The analysis further connote that there is significance agreement for the other two risk factors, that is, credit and inflation risk.

Consultants and clients unanimously agreed that risk factor with the most effect on bonded project is credit risk. The only difference is in the ranking of these two factors, that is prepayment and inflation risk, which are ranked second and third by both group of stakeholders. To contractors, interest rate and prepayment risks has the most effect on bonded

project followed by liquidity risk. It could also be observed that all stakeholders unanimously agree that volatility risk has the least effect on construction projects that are bonded.

Table 4. Risks of projects with bond

Risk factors	Contractors		Consultants		Clients		Overall		F-ratio	Sig. (p-value)
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank		
Credit risk (Financial soundness of issuer)	3.81	4	4.08	1	4.04	1	3.94	1	1.774	0.172
Interest rate risk (Bond sensitivity to changing market)	4.03	1	3.19	4	3.57	4	3.69	4	14.252	0.000*
Liquidity risk (Difference in market value and selling price)	3.89	3	3.06	5	3.26	5	3.51	5	12.409	0.000*
Prepayment risk (Bond redeemed by issuer before maturity)	4.03	1	3.75	2	3.59	3	3.86	2	5.078	0.007*
Reinvestment risk (Change of value of amount of bond)	3.55	6	2.57	8	2.82	8	3.11	8	35.930	0.000*
Currency risk (Difference in currency exchange rate)	3.34	8	2.87	7	3.00	7	3.14	7	3.172	0.044**
Inflation risk (Economy instability)	3.71	5	3.68	3	3.77	2	3.71	3	0.066	0.936
Sovereign risk (Action from foreign government)	3.53	7	2.96	6	3.04	6	3.25	6	7.283	0.001*
Volatility risk (Bonds with callable and putable option)	3.04	9	2.17	9	2.52	9	2.65	9	19.981	0.000*

* Significant at $p < 0.01$, ** Significant at $p < 0.05$.

On a general point of view, credit, prepayment, inflation and interest rate risk has the highest effect on bonded project while the effect of reinvestment and volatility risk are the lowest. It could be observed that all the identified risk factors have very high effect on bonded projects except volatility risk. This is reflected in the overall mean values of the variables in that the remaining eight factors are well above 3.00 from a possible score of 5.00.

4.3 Risks of Construction Project without Bond

Table 5 described the effect of identified risk factors on construction projects without bond. Generated p-value using ANOVA test statistics revealed that difference in mean values is only significant for three factors, that is, liquidity, currency and volatility risks. This implied that stakeholders differ significantly in responding to the itemised risks factors while they are in agreement for the remaining six.

Table 5. Risks in projects without bond

Risk factors	Contractors		Consultants		Clients		Overall		F-ratio	Sig. (p-value)
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank		
Credit risk	2.66	7	2.61	7	2.74	7	2.66	7	0.284	0.753
Interest rate risk	2.44	8	2.65	6	2.76	6	2.57	8	1.475	0.231
Liquidity risk	3.52	1	4.18	1	4.15	1	3.85	1	13.279	0.000*
Prepayment risk	2.38	9	2.18	9	2.63	8	2.37	9	2.307	0.102
Reinvestment risk	2.82	4	2.93	4	2.95	5	2.88	4	0.359	0.699
Currency risk	2.68	6	3.23	3	3.49	3	2.99	3	9.881	0.000*
Inflation risk	3.49	2	3.72	2	3.79	2	3.61	2	1.264	0.285
Sovereign risk	2.99	3	2.29	8	2.46	9	2.67	6	9.186	0.000*
Volatility risk	2.82	5	2.82	5	2.98	4	2.85	5	0.228	0.796

* Significant at $p < 0.01$, ** Significant at $p < 0.05$.

All the stakeholders are of the opinion that three risk factors, that is, liquidity, inflation and credit risk have the 1st, 2nd and 7th effect on non-bonded construction projects respectively. In contractors and consultants' view, prepayment risk has the least effect while it is sovereign risk from the opinion of clients. It could be observed that risk factors with the highest and lowest effect is from consultants' view and the factors are liquidity and prepayment risk.

Since Kruskal-Wallis K-test indicate that there is no significant difference in the response of stakeholders, it therefore mean that overall mean value can be relied upon as a true representative of respondents' opinions. Using the overall mean value, it could be observed that only the first two factors, that is, liquidity and inflation risk has high effect on construction projects that are not bonded. Six factors are have average effect while the last factors, that is, prepayment risk has a low effect on such type of construction projects.

4.4 Comparative Risks of Bonded and Unbonded Construction Projects

To examine the difference between effects of risks on construction project with and without bond, two methods were adopted, that is , mean gap and Mann-Whitney U-test. Using the mean gap value in table 6, the analysis revealed that risks associated with bonded projects are higher when compared with that of project not bonded except for liquidity and volatility risk with negative mean gap values. Risk factor with the highest difference is prepayment risk followed by credit risk. This connote that prepayment, credit and interest risks are more inherent in bonded construction projects, liquidity and volatility risks are more in project that are not bonded while currency and inflation risks are common to the two types of construction projects. On a general note, identified risk factors has a high effect on bonded projects as against average for projects without construction bond. Oke *et al.* (2015) observed that despite the age long introduction of construction bonds and guarantees to combat some challenges in the construction industry, issues relating to the management and administration of the bonds

have been a major concern for stakeholders. In support of the findings relating to credit risk, Oke *et al.* (2013) noted that a major issue with construction bonds is the insistence of clients on the choice of guarantors for the contractors which is linked to the financial soundness of the issuer of the bond.

Table 6. Risks and project with/without bond

Risk factors	With bond		Without bond		Mean Gap
	Mean	Rank	Mean	Rank	
Credit risk (Financial soundness of issuer)	3.94	1	2.66	7	1.28
Interest rate risk (Bond sensitivity to changing market)	3.69	4	2.57	8	1.12
Liquidity risk (Difference in market value and selling price)	3.51	5	3.85	1	-0.33
Prepayment risk (Bond redeemed by issuer before maturity)	3.86	2	2.37	9	1.49
Reinvestment risk (Change of value of amount of bond)	3.11	8	2.88	4	0.23
Currency risk (Difference in currency exchange rate)	3.14	7	2.99	3	0.15
Inflation risk (Economy instability)	3.71	3	3.61	2	0.11
Sovereign risk (Action from foreign government)	3.25	6	2.67	6	0.57
Volatility risk (Bonds with callable and putable option)	2.65	9	2.85	5	-0.20
Average	*3.43*		*2.94*		*0.49*

Mann-Whitney U-test statistics was also used in examining the difference. With asymptotic significance (2-tailed) value of 0.038 and Z value of -2.075, it could be deduced that the difference is not significant at 5% level. This implies that there is no significant difference in effect of risks on projects with and without bond. Against this finding, the identified risks are known as bond risks and they were expected to be inherent and have more effects on bonded projects. However, Oke (2013) as well as Oke *et al.* (2016) noted that most of construction risks, challenges and problems of construction bonds are more associated with projects without bonds including some bond risks. Ojo (2011) further noted that corruption and other negative practices have reduced the potency of construction bonds in the country and leading to persistence of the problems the bonds were meant to solve.

5. CONCLUSION AND RECOMMENDATION

This study has contributed to the body of knowledge by identifying various risks and problems that are inherent in construction projects that are executed with and without the use of bonds and guarantees. Opinions of clients, consultants and contractors were sought so as to gain an in-depth knowledge of the subject matter from the concerned and relevant stakeholders. The findings revealed that credit risk which is concerned with financial soundness of the guarantor, has the most effect on bonded construction projects while liquidity risk (difference in market value and selling price) is the most important for projects that are without bond. Except for liquidity and volatility risks, the generally finding revealed

that bond risks are more inherent in bonded projects and this can be attributed to the fact that the identified risks are bond related and are inherent in such type of project.

Overall, volatility risk has very low effect on project that are executed with bond while all except liquidity and inflation have low impact on projects without the use of project bond. Previous studies have stated the necessity to adopt the usage of bonds in all forms of projects either public or private against current practice where it is only mandated for public projects. However, it is important to understand various risks that may lead to ineffectiveness of the process. This can be achieve by identifying, measuring and highlighting various ways of combating the risks and their effects on overall project delivery. There is also a need for concerned stakeholders including clients, contractors and construction professionals to pay more attention to credit risk which is concerned with the financial soundness of the guarantor, that is , banks and insurance companies, issuing the bond. This will reduce delay in project start time as a result of delay in securing bonds by the project contractors and eventually help in achieving value for money for client of construction projects.

Using survey approach, the focus of the study is on effects of bonds' risks of public projects with emphasis on the views of concerned stakeholders. Further studies can be conducted using other research approach such as direct observation as well as historical and cost data of projects executed with and without construction bonds can also be collected for improved study and explanation. More so, research can be carried out using private projects especially the corporate ones and comparative analysis of the public and private projects can also be examined.

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CONCEPTUAL TRANSFORMATION PROCESS MODEL FOR SUSTAINABILITY IN THE INFRASTRUCTURE SECTOR

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ABSTRACT

Business as usual (BAU) model of infrastructure delivery is contrary to the needs of sustainability in the built environment. This difference necessitates a South African study that is focus on sustainability in the infrastructure sector. A review of the management corpus led to the discovery and review of a transformation process model, which was thereafter integrated with core lean and sustainability principles. Through the analysis and synthesis of collected data from a case study design approach, it was discovered that a transformation model could serve as a purposive vehicle for embedding sustainability in the delivery of infrastructure projects in South Africa. However, confirmatory evaluation of the proposed model is required to ascertain its applicability in the sector.

Keywords: Infrastructure, Lean, Transformation Model, Sustainability, South Africa

1.0 INTRODUCTION

The emergence of sustainability concerns in the built-environment calls for a more innovative approach to development for the world to survive within the present constrains of the global operating environment. Construction industry in several developing countries has undergone a lot of innovation and transformation in a bid to cope with their national economic goals to align production (and consumption) practices with the growing global sustainability trends (Mousa, 2015). Infrastructure sustainability has proved to be crucial for the development of the economy and improved living conditions of modern society. Achieving a resilient and sustainable infrastructure in developing nations is essential for the region continuous economic growth, international competitiveness, public health and overall quality of life. The current built-environment challenges such as worsening climate change and huge emission of greenhouse

gases (GHG), as a result of the continuous depletion of natural resources in meeting the needs for consumption has becomes a global reality (Mirza, 2006; Abidin and Pasquire, 2007; Isa and Emuze, 2016).

Infrastructure development globally has served as measure for societal growth, however, is a major contributor to the proliferation of greenhouse gases (GHG), waste generation as well as the depletion of the inert resources (Forbes and Ahmed, 2011; Banawia and Bileca, 2014). More so, the approach adopted in meeting the current needs for infrastructure does not always conform to sustainability requirements. Business as usual (BAU) model of construction practice and infrastructure delivery is contrary to the needs of sustainability in the built environment. Infrastructure projects delivery can no longer be viewed in isolation, as it affects all sectors of the economy and accounts for about 50% of energy use. Construction activities have a major impact on physical development, government policies, community activities and welfare programme. In the United States of America (USA), buildings alone account for 40% of municipal solid waste, 30% of raw material use, 12% of portable water use, 49% of all energy produced, 77% of electricity produced, and 46.9% of carbon dioxide (CO_2) emission. These indicators do not only deplete the earthly physical resources, the transformation from mining raw material into the finished enclosure also requires huge amounts of embodied energy, with a potential contribution to the current planetary adjustment (Floyed and Bilka, 2012; Novak, 2012).

Sustainability is a growing economic development model based on the knowledge that aims to address the interdependence of economic growth and natural ecosystems and the adverse impact economic activities can have on the environment (Bangdome-Dery and Kootin-Sanwu, 2013). The limited nature of non-renewable natural resources also exposes the symptoms in the ecosystem of the unsustainable manner in which these resources are depleted. Therefore, the construction industry is anxious for the introduction of proactive measures that can spur the desired innovation in technology and resource management that will minimise the environmental burdens caused by infrastructure development and related activities (Crowford-Brown, 2012). That is, SC that will meet sustainable built environment in terms of socio-economic and environment dimensions can only be achieved through stakeholders' effective and efficient deployment of both material and techniques in the industry. The available models for sustainable construction have not been able to move the development of construction industry policies to establish recognized practices of sustainable construction (SC) in South Africa. It has also been argued that less effort has been geared towards the adoption of modern framework that can enhance knowledge and understanding of the issues that could foster SC in a developing country (Mensah *et al*., 2015).

Lean practices have primarily targeted reducing wastes in production process. Through the use of tools and techniques, lean practices have evolve to engender continuous improvement in the production process and provision of enhanced value for stakeholders (Koskela, 1992). The

evolution of lean practices thus resonate with sustainable development goals. The relevance of creating an operational synergy between lean and sustainability for infrastructure development is evident. Such operation that can draw both tangible and intangible values of the broader concept accruing among stakeholders in construction organizations, especially when concentrated on the common 'waste' paradigm.

Increased advocacy for the adoption of transformative ways of moving away from the unsustainable, business as usual (BAU) model of traditional construction and practice has been observed (Novak, 2012; Campos *et al*., 2012). Such advocacies have led to the clamour by industry stakeholders for the paradigmatic shift towards lean-sustainable construction (LSC). However, effective adoption and utilization of this paradigm is dependent on the ability of stakeholders to critically access the impact of interactions between social and natural systems on project delivery. Industry stakeholders must therefore be equipped with the ability to evaluate their current practices in terms of LSC, and what is required to move towards the set target. Indeed, the development of an operational framework for enabling such synergy will be beneficial to the industry.

The society required new infrastructure that will exhibit lean-sustainable values. Such values should conserve material consumption, protect natural environment, eliminate pollution and toxic materials and create a balanced socio-economic environment, will be delivered for an overall sustainable development of the built environment (Kilbert, 2008; Corfe, 2013). However, despite the benefits of lean sustainable practices, the evolution of the right framework that can draw these values among stakeholders in construction organization have been a challenge. This gap necessitates a South African study that is focus on sustainability framework that could enhance balanced ecosphere and industry continuous improvement. In filling this gap, the next section of the paper presents the literature review, methodological choice, followed by a succinct account of the models used for sustainability studies. Thereafter, the paper presents the proposed model and concludes with preliminary findings to assess the robustness of the conceptual model.

2.0 AN OVERVIEW OF LEAN AND SUSTAINABILITY IN CONSTRUCTION

Creating a framework for operationalizing Sustainable Construction (SC) and Lean Construction (LC) concepts and practices in favour of continuous improvement and waste reduction would enhance positive environment and economic outcomes. Although lean and sustainability are capable of attaining significant socio-environmental and economic benefits, organizations are still experiencing difficulty regarding their integrative application (Abd Jamila and Fathia, 2016).

2.1 Sustainable Construction

Sustainable construction is comprehensive way of infrastructure delivery that meets sustainability three bottom line issues (TBL), of environmental quality, social equity and healthy economic. It can be seen as the adoption of sustainable thinking, practices and sustainable

development principles to the realisation of construction sector objectives. In order words, it is that holistic process aimed at restoring and maintain harmony between the natural and built environments, in creating settlements that affirm human dignity and encourage economic equity. Sustainable construction is a subset of sustainable development which focuses on delivering infrastructure that creates value for customer and enhances the well-being of the society. It offers flexibility and the potential for retrofitting in meeting customers' future needs; provides and supports desirable natural and social environments; and maximise the efficient use of finite resources. It is pertinent to note that the adoption and attainment of sustainable design and construction in itself does not eliminate environmental impacts, as construction operations would continue to have environmental impacts albeit at a reduced rate (Du Plessis *et al*., 2002; Ogunbiyi, Oladapo and Goulding, 2013).

Sustainable construction however extends the key projects performance indices (KPI) from the dated triple KPI of cost, time and quality to other criteria such as; minimization of resource depletion, minimization of environmental degradation, and creating a healthy built environment among other objectives. The shift to sustainability can then be seen as a new paradigm where sustainable objectives are within the building design and construction industry considered for decision making at all stages of the facility life cycle. Sustainable construction as a concept, if successfully practice in construction industry, will lead to an array of stakeholders' benefits in terms of; long term cost savings, project schedule compliance, reducing environmental risk and uncertainty, ensuring legislative compliance, improving relations with regulators, improving public image, enhancing employee productivity and improving market opportunity. Good construction practice offers both environmental and economic benefits: reduce health and safety impacts on staff and local community, reduced liability costs in connection with waste disposal, minimal rework and reduced construction delays. Contractors for demonstrating environmental responsibility will improved its opportunity to tender, reduced money waste on fines, eliminates fund for restoring environmental damage, less money lost through wasted resources, harmonious relationship with host community and the improved environmental profile (Houvila and Koskela, 1998; Madu and Kuei, 2012).

However, the journey towards sustainability in socio-natural system of infrastructure delivery requires system and cultural changes and working with stakeholders in creating the built environment by adopting cyclic processes which will promote the act of recycled, renewed and reused resources, and decrease in the use of energy and new mining for natural resources. The new cultural changes in thinking, behaving, producing and consuming in the sector. Whilst a clear sustainability strategy, depends of stakeholders' commitments and improved knowledge that can only be enhance through continuous and proper education and training towards improved knowledge at every level (Abdullah *et al*., 2009; Madu and Kuei, 2012).

2.2 Lean Construction

The discuss around lean construction has been anchored on a way of generating maximum possible value for the client through designed production systems that minimise wastes in term of materials, time and effort. The goal has often been pursued by critically assessing the value stream (VS), putting more effort into maximizing value added activities (VAAs) as against non-value added activities (NVAAs) in the production process (Pasquire and Connolly, 2002; Forbes and Ahmed, 2011; Inokuma *et al*., 2014). The scholarly work of Rybkowski, Abdelhamid and Forbes (2013) define lean construction as:

> "*The holistic pursuit of continuous improvement with a goal to deliver customer value, while minimizing waste and maximizing value to the customer throughout a project's delivery process and life cycle, and while respecting all stakeholders in the value chain (p84)".*

Lean construction sustains continuous improvement throughout project life cycle in pursuance of client satisfaction by creating a more effective, efficient and profitable construction industry. The lean concept effectively engendered value and risk managements into construction industry and in doing so, effectively challenge the dated belief that key performance indices (KPI) of cost, time and quality cannot be pursued simultaneously. In eliminating this barrier, the Construction Industry Institute (CII) in their study PT191 premised lean concept on five basic principles which are; 1) Customer focus, 2) Culture and people, 3) Workplace organization and standardization, 4) Elimination of waste, and 5) Continuous improvement and built-in quality. These principles can be achieved by critically exploring three connected opportunities of impeccable coordination, organizing projects as production system and seen project as collective enterprise in design and construction (Dulaimi and Tanamas, 2001; Salem and Zimmer, 2005; Forbes and Ahmed, 2011; Suresh, Bashir and Olomolaiye, 2012).

The seemingly connectedness between lean construction and sustainable construction on basic principles surrounding waste and value proffer the clear synergy that could be developed into a new paradigm in the industry.

2.3 Lean-Sustainable Construction

Researchers in the built environment have laid credence to the contributions of construction activities to total global energy use, GHG emission, and waste generation. Sustainability management (SM) on one hand has highlighted the need for 'system' and 'cultural' changes and working with stakeholders in the ways to pursue the societal need. The lean concept on the other hand has bring forth the predicted variable of efficiency and waste reduction through responsive variable of environmental benefits by; reducing construction wastes at source, minimizing resource depletion, and preventing environmental pollution. Integrating and operationalizing of

lean-sustainability within construction industry could therefore increase the pace of broader enhanced value (Larson and Greenwood, 2004; Ghosh *et al*., 2014; Madu and Kuei, 2012).

Lean practice as a catalyst for enhanced sustainability in construction practice impacts on a wide range of infrastructure delivery processes such as; planning and risk management, collaborative working within stakeholders, problem definition and solving, and value stream efficiency. The lean thinking demonstrates the value stream (benefits in terms of cost, time, and sustainability) for infrastructure sustainable development that span the project life cycle. It is on this premise that governments are urging the industry to leverage on lean thinking for real value delivery whilst simultaneously achieving improved competitiveness and the pre-set goals for sustainable construction towards some broader sustainability objectives (HM, 2009 cited in Corfe, 2013; Isa and Emuze, 2016).

Lean-sustainability concept in construction can therefore be hypothesized as 'a proactive approach to project delivery practice that meets a broader sustainability concerns of environmental, economic, social and technical perspectives by leveraging on available effective and efficient concepts to attain sustained productivity'. Sustained productivity here means to exceed the status quo of project delivery practice based on project schedules by achieving infrastructure beyond clients' specifications (Scanlon and Davis, 2011; Ahuja *et al*., 2014).

3.0 RESEARCH METHODOLOGY

Within the construction context, a sound model serves as a template for improved infrastructure and it is vital to the success of sustainability goals. To meet this target, the methodological choice was based on a qualitative research approach. The study relies on interpretative theoretical framework that is grounded in obtrusive measures and perspectives of industry experts (Creswell, 2013). Firstly, a comprehensive review of the management corpus in the fields of sustainability and organizational learning approaches were carried out to elicit an inform decision on a suitable model to meet the industry demands. This was followed by semi-structured interview of the industry experts in a selected case study to gain expert opinion on the modified model. Modification in this case means the infusion of core principles of lean and sustainability through the projects life cycle. Purposeful sampling in which the participants are selected according to a defining characteristic that makes them experts was utilized in the study (Nieuwenhuis, 2007; Leady and Ormrod, 2010). In particular, seven interviewees which include two each of project managers and consultants (of at least twelve years of industry experience), an academia, and two officials of government agency forms the panel of experts. The proposed model and it propositions guiding the logical linking of multiple sequential areas of inquiry was introduced and explained to the participants before the commencement of the interviews. This allows the interviewees to have a full grasps of the expected working of the transformation processes model.

4.0 HIGHLIGHTS OF SUSTAINABILITY CORPUS

The previous work on sustainability recognizes that the scope for possible futures is broader than BAU, which invites reconsideration of the current sustainability model and is a potential springboard for action. Multiple sustainability models are drawn upon to arrive at the proposed model for future South African sustainable infrastructure development. Some of the frameworks developed over time for achieving sustainability necessary for the industry's advancement, especially as relates to developing economy are presented.

4.1 Backcasting Model of Sustainable Development

The time lags between causes and symptoms of upstream and downstream activities explained the delay mechanism and complexity of the ecosphere. This characteristics running into decades, increases the complication for sound analysis and judgement of the ecosphere. Sometimes, this state reduces the concept to a matter of trade-offs in triple bottom line (TBL) of economy, environment and society. Dealing with this complexity in a comprehensive and systematic way requires an in-depth thinking into cause-effect chains of upstream activities by applying 'Backcasting' in the planning process (Holmberg and Robèrt, 2000; Cuginotti, Miller and Pluijm, 2008). Backcasting comprises of four basic steps, which are; awareness, baseline analysis of what the condition is, compelling vision of where to go, and series of action to get there. Cuginotti, Miller and Pluijm (2008) state that backcasting is particularly useful where there is a need for major change and a complex context, where dominant trends are part of the identified problem, when the problem to a great extent is a matter of externalities, and where the scope is wide enough and the time horizon long enough to leave considerable room for a deliberate choice that make sustainability a suitable context for backcasting. For holistic advancement in the industry to take place, industry management must be able to look ahead and set an achievable goal guided by the entities compelling vision. In doing this, a probable futuristic position can be envisioned and the means of attaining such milestone dynamically fashioned overtime. These make sustainability a suitable context for backcasting adoption as has been widely used, particularly in Asia and the Netherlands.

4.2 Relational Model of Sustainable Development

The relational sustainable development model is based on balancing of upstream activities (demand based) and the environmental limits of the eco-system for which human species depend for its survival. This delicate relationship between the natural and social system is determined by a number of intrinsic factors (Du Plessis, 2007). The first is 'needs' that have to be met by the society, which is usually dependent on the quality of life available within the immediate domain. This is followed by the preferred mode of technological, political, and economic considerations that guides the upstream activities of the mainstream society. These two factors are significantly linked to the inherent value system of the society. The manner in which constituents of a given society relates with one another vis-à-vis the biophysical environment has a strong correlation

with the prevailing value system in the society. The carrying capacity of the environment and the non-renewable nature of the biosphere, in turn, limit the choices available to the society (Figure 1).

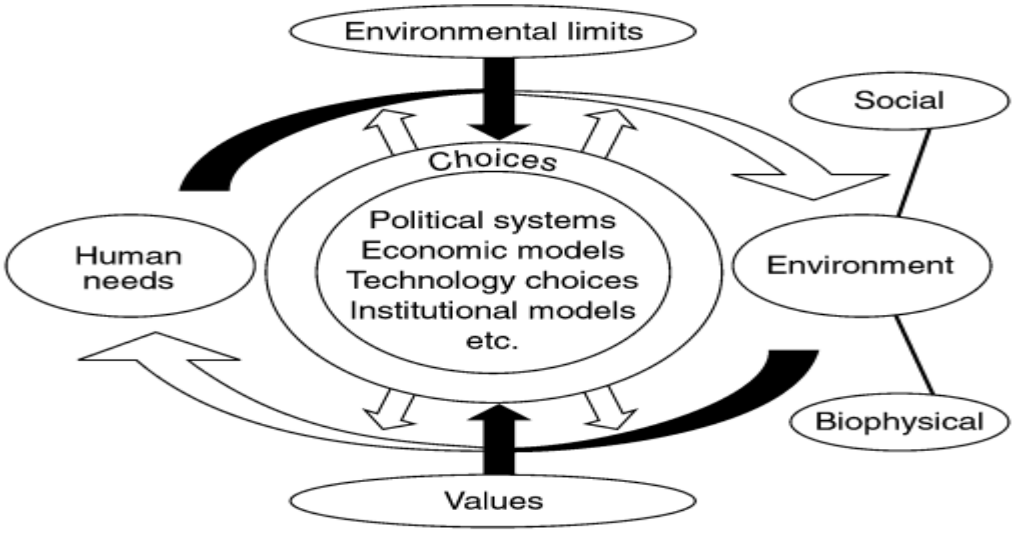

Figure 1: A relational model of sustainable development (Source: Du Plessis, 2007)

4.3 CIMO Model

CIMO model is a systems approach with a focus on the context-intervention-mechanism-outcome (CIMO) logic (Denyer and Tranfield, 2009). CIMO model is built around sustainable management (SM) in order to adopt a holistic perspective to sustainability. CIMO model consists of four basic components of SM, which include context (institutional/social/natural setting), intervention (behavioural/managerial/technical/structural), mechanism (process improvement/innovation (5W + 1H), and Outcomes (social/environmental/economical).

The robustness of CIMO model was established in the work of Esquer-Peralta *et al*. (2008), using 24 experts in the field of sustainability for the purpose of discovering concepts with respect to SM. The model was found desirable for any innovative organization to prosper.

4.4 Transformation Process Model

The transformation process model (TPM) is an organization-wide SM initiative for stakeholders' interactions between social and natural systems, as a response to the competitive landscape in the new global economy (Madu and Kuei, 2012). Sustainability strategies and capabilities are increasingly important and complex for innovative enterprises in competitive environments around the world. For an organization to simultaneously achieve excellence in sustainable development dimensions of economic, environmental, and social performance respectively, it must undergo a transformation process. Such a process would engender a change from the BAU

approach to SM. The TPM (Figure 2) is a theoretical framework for sustainability leaders and their value chain partners.

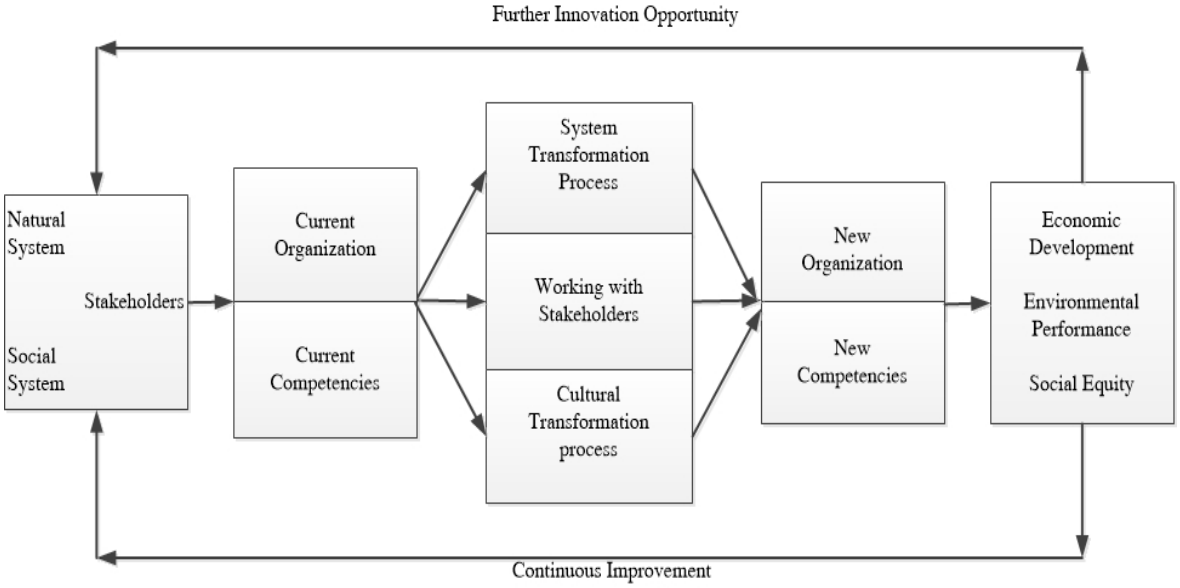

Figure 2: The transformation process model (Source: Madu and Kuei, 2012)

As illustrated in Figure 2, stakeholders interact with both natural and social systems. This interaction speaks to the all-inclusive nature of stakeholders' needs and requires a delicate balancing of sustainability requirements. For example, core competencies for sustainability need to be recognized and evaluated for interventions over time. The target here is to move the current situation into a more effective and efficient one. This transformation stage highlights the three main areas where the process of change will impact upon a system transformation process, working with stakeholders, and a cultural transformation process. These are the critical principles required to transform the current organization at a point of reflection to a competitive state. The community management involving leadership, employee fulfilment, conflict management, and cultural acceptance have economic, environmental, and social impacts (Epstein's, 2009). This implies that organizations must take into consideration these concerns throughout project whole life cycle and commit the necessary resources to ensure the attainment of sustainability. Once this transformation is achieved and a process for sustainability is mature, new competencies are attained leading to the birth of a new organization. However, the transformational process assumes a continuous cycle. The organization operates as an open system that evaluates the process maturity for sustainability at a point of reflection, receives feedback from its internal as well as external environments for further innovation and continuous improvement opportunities. This process involves evaluation of value creation relative to risks and costs.

For the purpose of this study, the approach to industry innovation and learning adopted for the delivery of sustainable public infrastructure is proposed to be situated in TPM. The choice of the TPM approach arises because TPM principles resonate with lean-sustainability philosophy and expectations. The TPM provides the rudiments for self-evaluation, cooperation, continuous improvement and opportunities for further innovation in all critical segments of transformation processes of system and culture, and working with stakeholders.

5.0 PROPOSED TRANSFORMATION PROCESS MODEL

Sustainability indicators have been widely reported (Shen *et al*., 2007; Edum-Fotwe and Price, 2009; Emuze, 2015) to encompass the natural and socio-economic aspects of infrastructure development and its effect on various stakeholders in the industry. These cut across the project value chain in relation to processes, resources, leadership, people, financial, environmental and the entire ecosphere through project lifecycle (Bilec, *et al*., 2010). Lean principles as a waste reduction tools, is effective ways of enhancing the various spheres of KPIs for infrastructure development. It can then be inferred that indicators for lean and sustainability (LSI) are those indices that can be seen as a standard of judgement by which lean and sustainable values can be measured. Value can be the template through which stakeholders navigate between natural and social systems to achieve a broader vision of sustainability. The challenges of global infrastructural issues can be untied, using value as an appropriate construct of change in the context of the construction process improvements (Du Plessis, 2007; Novak, 2012). It is on this premise that the TPM is infused with core principles of lean and sustainability using value as construct for industry transformation (Figure 3).

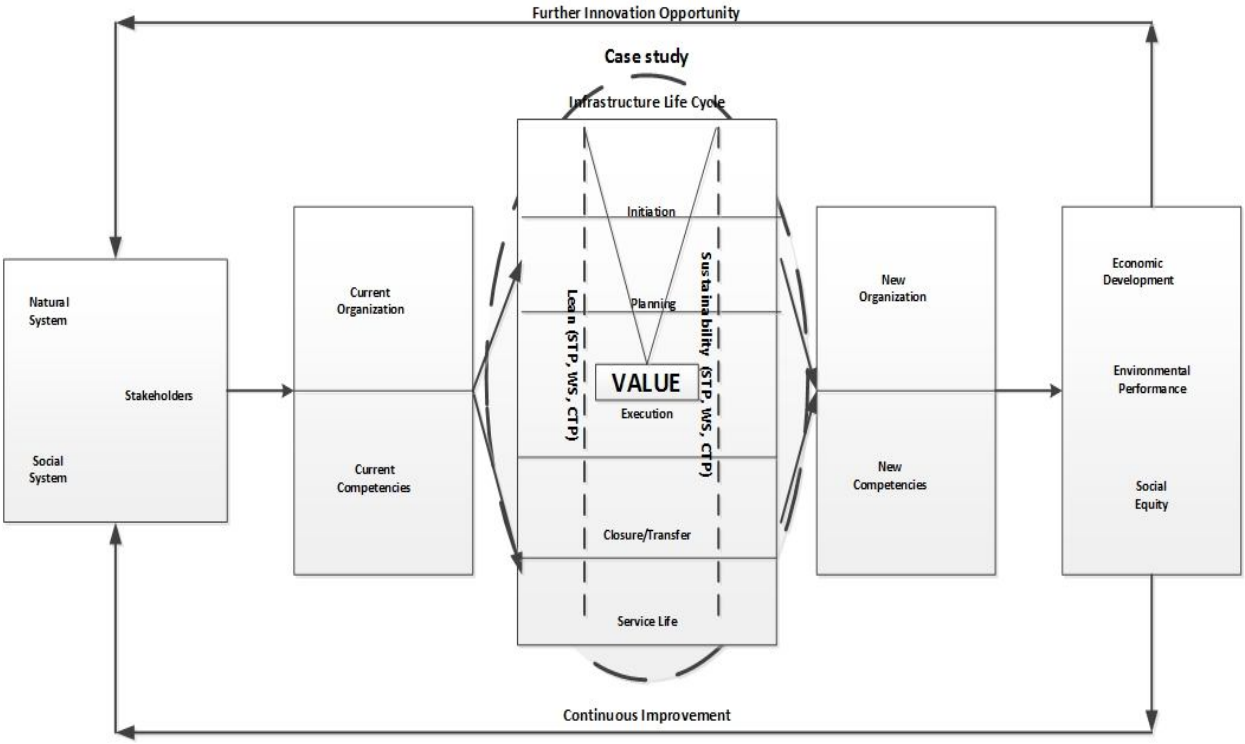

Figure 3: Transformation Model for Infrastructure Development (TMID) (Adapted from: Madu and Kuei, 2012; Novak, 2012).

Establishing value as an appropriate construct for industry transformation in the context of the infrastructural development provides a focal point for the built environment sustainable development. The proposition is that there can be a synergistic link between lean construction and sustainability expressed through the construct of value. Value creation through lean-sustainability paradigm in infrastructure life cycle could lead to new competences and new organizations for continuous improvement and further innovative opportunities. This is then presented for evaluation from expert opinion for preliminary findings.

6.0 INTERVIEW FINDINGS AND DISCUSSION

The transcribed interview data were analysed and inferences were drawn on the proposed transformation model. The outcomes of the semi-structured interviews are presented herewith.

Needs - the interviewees largely cohere in their agreement in recognising the need for a framework for transformative processes in the construction industry, especially in relation to sustainability targets. A framework that is holistic in its approach to transformative and collaborative actions towards meeting stakeholder's demands and future expectations of planetary order. The recent COP21 indicates that stakeholders crave for a framework that will guide the industry to attain the global goals of improved health and well-being, industry productivity, and attaining the target of reducing the global worming by 2^{o}C and building related

emissions by 80 gigatonnes by 2050 (Green Building Council South Africa (GBCSA), 2016). These can only be achieved by a holistic model that is all encompassing, well research, and adequate in creatively guiding / measuring of the interrelationship between natural and social sphere, in the construction context.

Requirements – for any model to be effective in meeting the construction industry need, it must be complete in revising the culture adopted by stakeholders in the fragmented industry. The interviewees emphasized that promoting sustainable construction in this culture would entail a significant collaborative effort on several fronts, namely: governmental, professional, academic, and the community. This should happen in the face of varying motives for industry collaboration. The model must also highlight the expected role of each stakeholder in a systematic manner to eliminate bureaucratic experience associated with a fragmented value chain. The interviewees affirmed that the model must have two distinguished characteristics: on one hand, the ability to address some fundamental sustainability barriers such as; culture - the flawed market practices, inadequate construction legislation, absence of the governmental role - lack of supervision and law enforcement, stakeholders' demands, and knowledge gap. On the other hand, promote sustainability enablers such as; education, competitiveness, demands, leadership, and legislation for sustainable development.

Suitability - in meeting the aforementioned requirements, the interviewees affirm the robustness of the transformation process model to address the ills militating against uptakes of sustainability practices in the infrastructure sector. They point at its potential to engender the needed efficiency and effectiveness of the industry and seem feasible for industry transformation. As the model draws from popular sustainable development concepts of looking at the world in a futuristic manner - a going-concern by;

- determining the future target – sustainability development,
- evaluating the present position – resources and stakeholders, and
- process of transforming the industry overtime – synchronising lean-sustainable principles with it inherent principles over the projects life cycle.

It is on these findings as demonstrated by the needs for framework, its requirements and industry suitability that a concluding thought is formed.

7.0 CONCLUSIONS AND FUTURE WORK

The aim of this paper is to present the preliminary findings of a case study used to assess the robustness of proposed Transformation Process Model for infrastructure development. The model is an attempt to respond to a need for a framework that will guide the industry towards

sustainability conscious systems to attain the global goals as exemplified by the recent COP21 in France. Various models have been developed and adopted to promote sustainability in the construction industry. Such models include backcasting model, relational model, and CIMO model. Whilst these aforesaid model have advantages, the transformation process model (TPM) appear to be more suitable regarding current competences in relation to social and natural interactions.

The proposed TPM model highlights core areas for industry transformation process; cultural, system and working with stakeholders that serves as a natural appeal for lean-sustainability principles. The core components of the transformation process model are: awareness - baseline analysis of interaction between natural, social and human resources; the compelling vision of future industry – sustainable infrastructure; and in between, is the series of action to reach the vision – composed of internal and external enablers that focuses on three main areas where the process of change will impact upon; a system transformation process, working with stakeholders, and a cultural transformation process (Figure 2). Human agency is at the centre of transformation in this model making it a perspective to be considered. Lean and sustainability concepts was infused through the projects life cycle to derive both tangible and intangible values used as a construct for stakeholders' benefits (Figure 3).

Through the analysis and synthesis of collected data, it was discovered that the model could serve as a purposive vehicle for embedding sustainability in the delivery of public sector projects. The study also notes the need for further research that will develop the segments of the model to a more usable mechanism for the industry and also serve as confirmatory purposes for the proposed model.

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ENABLING SUSTAINABLE PROCUREMENT OF BUILT ASSETS IN AFRICAN UNIVERSITIES: PERSPECTIVES OF FACILITIES' DIRECTORS

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ABSTRACT

The commitment of Higher Education Institutions (HEIs) to Sustainable Development (SD) seems to be yielding limited results. This is evident in the procurement and delivery of built assets within HEIs in Sub-Saharan Africa (SSA). This study reports on facilities directors' perceptions of the challenges to sustainable procurement in HEIs within SSA. The identification of such challenges would contribute, significantly, to the extant discourse on how to stem the drift. A qualitative phenomenological research design is utilised. Forty-Three HEIs across two different countries in SSA- Nigeria and South Africa were selected based on purposive and convenience sampling. Facilities directors in these HEIs were interviewed through face-to-face and telephone interview sessions. Documents and webpages concerning the procurement of such buildings were also reviewed. Emergent data from these sources were thematically analysed. Findings indicate that Business As Usual (BAU) mode of procurement has remained the norm in most of the HEIs in spite of their professed commitment to SD. Challenges identified include: the seeming obsession of HEIs, acting as clients, with low front-end cost of project delivery; poor awareness of what SP entails; absence of skills required to champion the cause of SP within such HEIs, and non-specification of SD based requirements in the contracts documents. It is expected that this study would contribute to deepening existing knowledge concerning implementation of SD in HEIs in SSA.

Keywords: Higher Education Institutions, Infrastructure, Sub-Saharan Africa, Sustainable Procurement

1. INTRODUCTION

Higher Education Institutions (HEIs) are expected to assume a critical position in driving society's quest for Sustainable Development (SD) (Cortese, 2003). Accordingly, several HEIs across the globe seem to have made concerted efforts to provide support for the attainment of the SD agenda (Escrigas et al., 2011, Sammalisto and Lindhqvist, 2008). However, whereas noticeable attempts have been made to report the efforts of HEIs in the United States, Europe, South America and even parts of Asia in turning their institutions into Sustainable Universities (SU), there is a clear lack of studies within the Sub-Saharan Africa (SSA) community of

HEIs (Escrigas et al., 2011, Ferrer-Balas et al., 2008).

In addition, it has been observed that aspects concerning sustainable procurement (SP), delivery and management of facilities within HEIs have continued to enjoy insufficient reportage within SD literature when compared to teaching and learning aspects (Awuzie et al., 2015). Also, studies have highlighted the need for this aspect of SD to be considered by any HEI with SU aspirations (McMillin and Dyball, 2009, Lukman and Glavič, 2007, Lozano-García et al., 2009). A systemic, whole-of-campus approach towards SU-oriented transformation has been advocated in these studies. Through this approach, HEIs are expected to integrate sustainable practices into their procurement strategies, undertake measures considered central to SD during the delivery of infrastructure on their premises, focus on the development of skill sets which are required for the next generation of sustainability experts through teaching and learning, etc.

Although HEIs within SSA have expressed their commitment towards the attainment of SD, adequate reportage of steps taken to ensure such transition has not been observed; thus, leading to an assumption that they may have recorded dismal performance. In the rare cases where SD performance has been reported, such as the case of the Central University of Technology (CUT), Bloemfontein, an overt concentration on the research, community engagement as well as teaching and learning facets was observed (Awuzie and Emuze, 2015). Business as usual (BAU) has continued to reign in the procurement of built assets on this HEI's campus, its strategic commitment to the attainment of SD by 2020 notwithstanding. Obviously, this implies that HEIs in SSA may not be 'walking the talk' after all. An HEI's bid to assume SU status should be anchored on its ability to mainstream SD ethos across every facet of its operations and to effectively report this (Holmberg et al., 2012, Ferrer-Balas et al., 2010).

One aspect that seems to have been neglected in the quest to attain SD is SP. Studies have described SP as the process wherein the attainment of SD objectives through a balancing of environmental, social and economic objectives is prioritised during purchase and supply of goods and services (Meehan and Bryde, 2011, Grandia et al., 2014, Walker and Brammer, 2012). Evidence from literature indicates that several organizations, governmental and non-governmental alike appear to be picking up the gauntlet in this regard, particularly in the developed nations (Walker and Preuss, 2008, Arrowsmith, 2010). HEIs are no different from the aforementioned organizations as they also wield a large purse. For instance, the delivery of facilities and other infrastructure on their respective campuses is a salient avenue to utilize SP (Willetts et al., 2010, Ofori, 2006).

Whereas the desire to achieve a whole-of-campus transformation toward SD requires the commitment of all stakeholders (Brinkhurst et al., 2011), a previous study confirmed that the facilities management directorates of HEIs are often left out of the decision-making process, in these HEIs (Awuzie et al., 2015). This observation makes this study an imperative one as it seeks to gain an understanding of the perceptions of facilities directors' for HEIs within SSA concerning the impediments to sustainable procurement of infrastructure in their respective institutions. It is expected that such an understanding would be a first step towards the development of a robust mechanism for engendering the SP of infrastructure within HEIs in SSA.

This expectation is premised on the purported importance of facilities directors in the delivery and maintenance of infrastructure on their respective campuses (Lozano-García et al., 2009).
To report the emergent findings from the research, this paper is divided into four sections: the review of extant relevant literature, the research methodology, presentation of findings and discussion, the conclusion and recommendations.

2. THEORETICAL PERSPECTIVE

2.1 Sustainable Procurement of Built Assets

Originally, the procurement process within organizations was primarily centred upon the attainment of efficiency and effectiveness in the purchase of goods and services (Hong and Kwon, 2012). However, a recent shift in the orientation of organizational and national procurement strategies from effectiveness and efficiency of purchasing activities to the use of procurement to champion the attainment of organizational goals has been noticed (Arrowsmith, 2010). This paradigmatic shift is prevalent in the public sector as scholars like Bratt et al. (2013), and Brammer and Walker (2011), have observed the potential of public procurement to serve as a medium for propelling state agenda. The SD discourse has assumed centre stage in global, national and regional contexts, with nations and organizations alike striving to contribute positively towards its attainment. A plethora of legislations have been enacted to this effect. Accordingly, SP has become a veritable tool for achieving SD objectives within national and organizational contexts. Whereas initial variants such as green procurement/green public procurement (GP/GPP) and green supply chains continue to be highlighted in relevant literature (Hensher and King, 2002, Bala et al., 2008, Ho et al., 2010, Wong et al., 2016, Pacheco-Blanco and Bastante-Ceca, 2016), the quest for SP remains predominant among potential procurers. This is occasioned by the limitations of GP/GPP which focus on environmental aspects of SD unlike SP which is primarily concerned with the triple bottom line (TBL) of SD (Elkington, 1999). SP has been described as the application of procurement activities in such a manner that the attainment of SD ethos as well as value for money on a whole life basis becomes realizable (Walker et al., 2012, Berry and McCarthy, 2011).
Furthermore, scholars have admitted to SP's potential in bringing about sustainable construction practices within the construction industry (Ruparathna and Hewage, 2015a, Ruparathna and Hewage, 2015b, Sourani and Sohail, 2011). The integration of SP into construction procurement has been heralded as a step in the right direction especially as it concerns the attainment of more sustainable construction practices (Sourani and Sohail, 2011; Ruparathna and Hewage, 2015b). These practices would inadvertently lead to a reduction in the adverse effects which the industry's activities has on the ecosystem. Yet, low levels of SP implementation have continued to prevail within the construction industry. Issues such as lack of awareness, lack of knowledge, lack of strategic support from organizational leadership/or owner commitment, funding constraints, have been adduced for the low uptake of SP across the global construction industry (Ruparathna and Hewage, 2015a; Sourani and Sohail, 2011). Also, SP in construction engenders the successful implementation of SD through various ways like the reduction in the quantity of natural resources utilized, reduction in the rate of harmful gas emissions, meeting the demands of extant and future

climate change oriented legislations, providing equal access to hitherto disadvantaged groups within the society, provision of a safe and conducive working environment for stakeholders within the construction industry, as well as upskilling of the workforce with futuristic competencies (Ruparathna and Hewage, 2015b).

Given the immense benefits accruable from effective implementation of SP in the construction industry, one cannot but be befuddled that it has not recorded significant uptake among construction industry clients, globally. The procurement of construction projects by public sector clients has mostly proceeded in a manner that is akin to business as usual (BAU) with less consideration being accorded to the attainment of SD through SP. In cases where attempts have been recorded to this effect, they have mostly centred on just the environmental aspects of SD, otherwise referred to as 'green'. Whilst this apathy towards SP may be attributed to the barriers mentioned previously, there is no gainsaying that HEIs should champion society's adoption of SP, given their time honoured roles in knowledge development and dissemination. One way of accomplishing this is through the adoption and effective implementation of SP during the procurement of built assets on their respective campuses.

Judging from a plethora of studies reporting on the greening of campuses (Sharp, 2009; Svanström et al., 2012; Pacheco-Blanco and Bastante-Ceca, 2016), it would appear that HEIs in the SSA region are either not doing enough in this regard or their efforts are underreported. This observation corroborated the findings of the study by Lozano et al. (2015) where they maintained that there was a stronger interest concerning SD integration in Europe when compared to other regions of the world. This study was borne out of these issues as there is need for the HEIs in the SSA region to commit to showing leadership in terms of SD through effective implementation of SP. It is expected that the elucidation of the barriers to SP of built university assets in these climes would further stimulate the discourse on SP, especially in construction and asset management, within and beyond the HEI environment.

2.2 Engendering Sustainable Development in HEIs through Sustainable Procurement

Over the past three decades, HEIs have signed onto various declarations, charters and initiatives (DCIs) adopting SD as a salient aspect of their institutional strategy (Lozano et al, 2015; Lozano et al., 2013). As such, HEIs are expected to integrate SD tenets into their core and non-core activities. In a nutshell, signing onto these DCIs implies their readiness to provide leadership for societal transformation towards SD (Pacheco-Blanco and Bastante-Ceca, 2016). Some studies have pointed out the compartmentalized nature of SD implementation in most HEIs (Lozano et al., 2015; Lozano-García et al., 2009; McMillin and Dyball, 2009). However, an aspect like the delivery and management of built assets within the HEI has not enjoyed adequate reportage. This is particularly the case in developing countries. Yet, this remains one of the critical aspects through which HEIs can showcase their SD aspirations.

It is a fact that HEIs play significant roles as public institutions and possess the capability to affect the manner in which society pursues its SD aspirations (Cortese, 2003). Also, HEIs are known to spend considerably in their efforts to upgrade their

built assets to cater for the every teeming population of prospective undergraduates. Accordingly, they can apply their expenditure through SP and subsequently engender SD, ultimately. As procurers of built assets, HEIs have to imbue the principles of SP behaviour to engender effective SP of built assets on their campuses. However, Grandia (2016) admitted that possessing such behaviour poses a major challenge for procuring entities like HEIs. She attributed this to the existence of two significant characteristics of procurers, namely; their willingness to adopt SP and their ability to show SP behaviour. According to her, the behaviour and characteristics of a procuring entity are essential for the application of SP in projects.

This observation makes this study, imperative. HEIs serving as procuring entities should overcome these challenges for them to actively implement SP during the procurement of built assets, especially in SSA where the rising population has necessitated the upgrade of campus infrastructure. This study shall proceed to identify the various factors inhibiting SP of such assets in SSA HEIs.

3. RESEARCH METHODOLOGY

This qualitative phenomenological study situates within the context of the Sub-Saharan Africa (SSA) region of Africa. It focuses only on HEIs domiciled within this area and is particularly interested in obtaining the views of FM directors of such institutions. An initial sample of Forty-three (43) HEIs within the SSA region were selected through a mix of purposive and convenience sampling (Flick, 2009). These HEIs were situated in Nigeria and South Africa. The email addresses and phone numbers of the facilities management departments/ facilities directorate/ physical planning units/works departments in these HEIs were obtained through the internet and snowballing. The initial sample selected consisted of a mix of publicly-owned and privately-owned HEIs and, conventional HEIs and Technology-centred HEIs. Emails were sent out to the addresses so obtained, intimating them of the research study and its importance to the achievement of the SD agenda. The recipients of these emails were asked to indicate their willingness to participate in the study. Recipients were assured of utmost confidentiality and anonymity in the reportage of their views on the phenomenon.

Out of this number, a total of thirty-seven responses were obtained over a three month period. Yet, only fourteen actually participated in the semi-structured interview sessions. Semi-structured interviews were used in the collection of data from this sample given its provenance as a great elicitation technique (Bryman, 2012). It enabled the researchers to obtain an insight into the phenomenon being understudied from the worldview of the respective facilities directors interviewed. The demographics of the interviewees are presented in Table 1.

Table 1. Interviewees demographics

Number	Code	Position	Country	Conventional HEI	Technology-centred HEI	Publicly-owned HEI	Privately-owned HEI
1	MM	Maintenance Manager	South Africa		X	X	
2	IDP	Infrastructure Delivery Partner	South Africa		X	X	
3	DPP1	Director, Physical Planning	Nigeria	X		X	
4	MM2	Maintenance Manager 2	Nigeria	X			X
5	DoF	Director, Facilities	South Africa		X	X	
6	DPP3	Director, Physical Planning 3	Nigeria	X		X	
7	CoW	Clerk of Works	South Africa		X	X	
8	ADW	Assistant Director Works	Nigeria	X			X
9	DPP4	Director, Physical Planning 4	Nigeria	X		X	
10	HoDW	Head of Department, Works	Nigeria	X		X	
11	DDPP	Deputy Director, Physical Planning	Nigeria		X	X	
12	DF	Director, Facilities	Nigeria		X	X	
13	TAF	Technical Assistant, Facilities	South Africa		X	X	
14	FM	Facilities Manager	Nigeria	X			X

Source: Authors' Fieldwork (2016).

From the demographics shown in Table 1, it can be seen that the representation of the

target audience is skewed towards Nigeria. This was not deliberate but rather occasioned by the inability of the researchers to secure interview slots with the individuals at the time of reporting this study. Accordingly, the findings from this study should be treated with caution as it does not emanate from a truly representative sample. Further efforts were made to elicit responses from the entire sample, albeit unsuccessful as emails sent to them on various occasions were not replied. However, this caveat does not nullify the veracity of the findings reported herein as high ethical standards were applied in the preparation of the data collection instrument as well as the data collection and analysis processes respectively. Also, data saturation was observed after the 10^{th} interview(O'Reilly and Parker, 2012, Guest et al., 2006). Also, certain documents relating to the delivery of recent buildings within the premises of these universities which were made available by some of the interviewees were analysed in the aftermath of the interviews. Furthermore, the authors relied on a host of tendering websites in Nigeria such as etenders.com.ng; tenders.nigeriang.com, and; naijacontracts.com.ng. These websites host various construction tender invitations. The authors selected a total of 69 calls for tenders by HEIs within the Nigerian context dating between January, 2008 and October, 2016. From this sample of 69 calls, 13 calls were screened out as they were silent on the pre-qualification criteria on the call, hence making it difficult for the authors to ascertain whether SP was adopted.

Prior to the conduct of the interviews, interviewees were sent copies of information which consisted of the interview guidelines, the aim of the study, definitions of basic terms as used in the context of the study, and the timeline required to complete the study. These interviews were carried out on a face-to-face basis as well as through telephone conversations. This was as a result of the distance between the interviewer and the interviewee in some instances and issues pertaining to the paucity of funds. Interviews were conducted over a four month period, between December, 2015 and March, 2016. The interviews were tape recorded, having obtained the permission of the interviewees to do so. The interviews were tape recorded with the permission of the interviewees. Significant questions asked during the interviews were structured according to pre-set themes which had evolved from the researchers' review of the relevant literature on the barriers to the successful implementation of SP. These themes consist of barriers relating to:

- Low level of awareness and understanding what constitutes SP;
- Lack of commitment from organizational leadership in support of SP, and
- Lack of expertise required to carry out Sustainable Procurement.
- Lack of Funding/Funding related issues.

These themes emanated from a review of the scholarly works of Sourani and Sohail (2011), Ruparathna and Hewage (2015a) and Grandia (2016) pertaining to obstacles to SP implementation. The interviews lasted for an average of forty-five minutes, each. Whereas ten interviews were conducted on a face-to face basis, four were

conducted through telephones. Transcripts were transcribed, verbatim. The transcripts were then analysed through Qualitative Content Analysis techniques (QCA), thematically (Bernard and Ryan, 2010). Steps taken in the analysis included the reading and re-reading of the transcripts, the development of preliminary categories using the aforementioned pre-set themes (Taylor-Powell and Renner, 2003). The responses contained in the transcripts were then coded according to the established themes. In the aftermath of this, the themes were then reviewed to ensure the suitable nature of the categorization applied. Also, the manner in which the analysis was conducted left room for the recognition of other themes which could not easily be categorised according to the pre-set themes. Themes of such nature are referred to as emergent themes.

4. FINDINGS AND DISCUSSION

In this section, the findings observed from the data are discussed in accordance with the pre-set themes.

4.1 Low level of awareness and understanding of what constitutes SP

An optimal level of awareness and understanding about transformational concepts such as SP, and SD is required to effectively embed them into an organizational fabric. This analogy remains the same for HEIs (Gisela et al., 2013). So it was indeed surprising to observe the low levels of awareness and understanding among the facilities staff at SSA HEIs, concerning these concepts, especially SP. As members of staff responsible for the delivery and maintenance of infrastructure in HEIs, they occupy a pivotal position in the advocacy for the adoption of SP principles. When asked if they were aware of any policy, declaration or agreement at regional, national or organizational level to which their respective institutions were signed onto with respect to the SD and SP, 9 interviewees answered in the affirmative. However, when asked to disclose the contents of any of these declarations, particularly as it impacted on the discharge of their duties, all but one of the interviewees feigned ignorance. It is pertinent to note that a survey report carried out in 2010 indicated that HEIs within this region unanimously signed up to a declaration titled 'Sustainable Development in Africa-The Role of Higher Education' at the 12th General Conference of the Association of African Universities (AAU). This conference took place in Abuja, Nigeria in May 2009 (Escrigas et al., 2011). By signing unto this declaration, HEIs in SSA undertook to integrate SD and sustainability ethos into their institutions' curricula and daily campus operations. One can argue that the facet of infrastructure procurement, delivery and management features prominently under campus operations.

Even in an instance where a certain HEI had espoused a vision to attain an 'SU' status and provided a seemingly appropriate implementation mechanism for that vision to be implemented (CUT, 2012), four interviewees (MM, IDP, CoW, and TAF) from that HEI stated that whilst they were aware of the HEI's sustainability agenda, they were not aware of the existence of the framework for implementation. This implies the lack of effective communication among stakeholders to the implementation exercise. Also, it was surprising to discern that there was higher level of awareness among the interviewees about what SD and sustainability were all

about but none as to what SP was. The researchers had to refer them to the 'definition of terms' document sent to the interviewees before the interviews to enable that understanding. Though, most interviewees were of the opinion that achieving financial sustainability within the HEI was of paramount importance.

Also, the review of 56 calls for tender from HEI for the provision of tender websites within the Nigerian HEI context further confirmed the low level of SP awareness and knowledge. Only one call from a sample of 56 calls made reference to the tenets of SP; more or less, green procurement in their pre-qualification criteria. This lack of or low level of awareness or knowledge will surely inhibit the successful implementation of SP within these institutions, going by the assertions of Grandia (2016) concerning the SP behaviour of procurers and the criticality of knowledge in enabling effective SP behaviour.

4.2 Lack of commitment from organizational leadership in support of SP

Top management support is critical to the successful implementation of any organizational agenda (Grandia et al., 2014). The adoption of SP in any organization does not fare any different, either. However, the interviewees from publicly-owned HEIs unanimously maintained that they had not received any support from the top management of their respective organizations concerning the adoption of SP as a strategic objective in the conduct of their daily activities, particularly regarding infrastructure delivery and management. But interviewees from the privately-owned institutions (MM2, ADW, and FM) mentioned that they had received support from their top management to explore ways through which SP in infrastructure delivery and management can be utilized for the benefit of the institution and its immediate environs, respectively. Yet, they reiterated that this support was only on face value. In one instance, an interviewee, (ADW) explained how his attempts to engage local suppliers, was rebuffed by the management as a result of cost implications. He proceeded to state that there was a commonly held notion in his institution that SP was associated with increased capital cost. When other respondents were asked if they thought that this was the case; they all acquiesced. This emphasis on cost by the management was also observed during a review of the project documents for recent projects carried out some of the HEIs under focus. The tender specifications did not detail the use of the sustainable materials in the delivery of the assets, neither did it state that suppliers should be sourced from local environs; two aspects of SP. Furthermore, there was no incentive for bringing in sustainability related innovation into the delivery process but rather there was an incentive for reduced delivery cost. In one instance, the case of a Lecture Theatre in one of the publicly-owned HEIs in Nigeria, the contractors won tenders on the basis of lowest cost. No consideration was given to innovations which may bring about overall lifecycle savings on such projects. And this appears to be the norm in several HEIs within SSA. Surely, this negates the principles of SP. Considering the dire financial status of several countries in the SSA, the perception that the adoption of SP will lead to increased production costs stands to act as a hindrance to the increased uptake of this phenomenon amongst various organizations situated with the region.

4.3 Lack of expert required to carry out SP

Another daunting challenge confronting these interviewees in the adoption of SP was the lack of expertise required to carry out SP on their campuses (Grandia et al., 2014).

Extant literature has sought to highlight the significance of a SP advisor in organizations willing to adopt it as a strategic objective (Scanlon and Davis, 2011). This sustainability advisor, they insist, should be absorbed into procurement teams to generate the desired level of awareness and understanding among the members of such teams. When asked if they had any persons currently advising them on SP or other aspects of sustainability/SD, all but three of the interviewees stated that they did not. The three interviewees who laid claim to having a sustainability advisor in their HEI all came from one of the HEIs. But, interviewee (IDP) who played the role of an infrastructure delivery partner to the HEI observed that the job scope of the sustainability advisor in this regard was not properly defined as she did not have any role to play in the strategic procurement of infrastructure on the HEI's campus. Continuing, he maintained that she was rather saddled with the responsibility of monitoring energy usage trends in the HEI's premises among other ancillary duties. This indicates the lack of sustainability advisors for infrastructure projects in the HEIs. The importance of such a sustainability champion in the HEI engenders a shift towards SP of not only infrastructure assets but other items being used in the day to day operations of the HEI.

4.4 Lack of funding/funding related issues

Another critical issue which was raised during the interview sessions concerned funding arrangements and availability. Interviewees from the publicly–owned HEIs in Nigeria maintained that an agency of the Federal government bore responsibility for financing most of the infrastructure projects being delivered on their respective campuses. This responsibility is merely interventionist as the HEIs are expected to use their Internally Generated Revenue (IGR) and government grants to deliver essential infrastructure on their campuses. However, with the dwindling allocation from government in recent times, the interviewees acknowledged that the agency had almost taken up the provision of such infrastructure as its sole mandate. In line with this new development, the ability of the Physical Planning Directorates in these HEIs to influence the procurement of these projects in such a manner that is akin to the attainment of SP principles is steadily diminishing. Similarly, some interviewees stated that the patterns through which funds were released to them for the maintenance of the HEI's infrastructure stock made planning for SP purposes, difficult if not impossible. They maintained that they have to draw up a budget at the commencement of the fiscal year and then only get allocated the approved sums towards the middle of the fiscal year. As such, they are always in a haste to exhaust this budget within the stipulated time so as not to get it withdrawn at the end of the year. Such haste, they admit, has always placed them in a tight position especially in the area of local supplier development. They use readily available suppliers to deliver on the approved projects. Agreeably, this type of funding arrangement is not favourable to SP. For other interviewees, the idea of engendering lower costs still resonates within their respective HEIs. They argue that lowering costs was a way of engendering financial sustainability for the HEI. However, when asked if they consider overall lifecycle savings as being integral aspects of the much sought after 'financial sustainability of the HEI', they replied in the negative. For them the future savings are not a major consideration for increasing the initial capital outlay for their infrastructure projects.

4.5 Type of contracting strategy adopted for project delivery

The ability to procure infrastructure projects in a sustainable manner (SP) is often affected by the type of contract strategy used by clients (Awuzie and McDermott, 2016). This view was corroborated by Ruparathna and Hewage (2015b) as they maintained that key elements of the competitive dialogue procedure (CDP) and procurement, engineering, procurement and construction (PEpC) were capable of promoting SP if adopted by the client. This was discovered in the data emerging from the interview sessions. There was a consensus among the interviewees on the salient effect, which the contracting strategy adopted had on their ability to influence project outcomes through SP. Of particular interest was the prevalence of the traditional procurement route in the delivery of infrastructure projects in most of the HEIs. In the Nigerian context, the clients appoint consultants to develop a design for the proposed infrastructure project. Often times, there is no input from the physical planning directorate, and even where there is, it is limited to identification of areas of need. As such, representation from the physical planning directorate where available is confined to the identification of priority projects but does not pertain to the mode of delivery. Interviewees from the affected HEIs opined that the adoption of more innovative strategies to the delivery of infrastructure would allow for the engendering of SP ethos into the procurement process. When asked to recommend any innovative strategy, they could only suggest the Design and Build (D&B) strategy. It remains to be seen how the concession of D&B rights to a contractor would engender SP on HEIs. Further inquiry into the facet was not carried out as it was the beyond the study's scope. It was easy to discern from the responses obtained that the interviewees were not happy with their limited involvement in the processes preceding the actual delivery of the projects on their campuses.

4.5 Absence of institutional commitment to SP/SD within these HEIs

An HEI's inability to sign onto a DCI poses another barrier to SP of built assets. Being a signatory to the variety of DCIs signals an HEI's aspiration towards SP and SD. Buttressing this assertion further, results emanating from the study conducted by Lozano et al., (2015) highlight the existence of a strong relationship between SD commitment, adoption, implementation and signing of DCIs. All interviewees were not certain on whether the HEIs they were representing had signed any DCI. Arguably, this posed a significant barrier to the implementation of SP for built assets within these institutions. Wong et al (2016) concurred with this as they observed that the presence of requirements, legislation and standards (DCIs) were essential for the adoption of green procurement (SP) in construction projects. Conversely, their absence would bring about abysmal SP implementation performance in construction projects.

5. CONCLUSION AND RECOMMENDATION

This study set out to identify challenges hindering the adoption of SP practices among HEIs in SSA. From the analysis of the data, the authors are able to discern the existence of six challenges confronting the adoption of SP practices in the procurement of infrastructure in SSA HEIs. These barriers consist of: low level of awareness and understanding of what constitutes SP; lack of commitment from organizational leadership in support of SP; lack of expertise required to carry out

Sustainable Procurement; lack of funds/funding-related issues; type of contracting strategy, and finally; the absence of an enabling legislation/DCI stipulating an institutional commitment of the HEIs to SD. It is expected that more barriers will be identified from data from the pending interviews.

Excerpts from the data being reported in this study affirm an existing commitment to embed ethos of the SD by HEIs in SSA into various facets of their activities such as curricula and daily operations. However, there is notable neglect of the need to embed these principles into areas concerning the purchase and supply of goods and services. This is especially so in the case of purchases requiring large capital outlays such as infrastructure delivery and management. The quest to attain SU by integrating SD practices into their activities cannot be successful if this salient aspect of SP is left out.

For SP to be engendered in the procurement of built assets in these HEIs efforts should be made to create more awareness about the immense benefits of SP and SD. Attempts should also be made to adopt Life Cycle Costing models for building projects as they make a stronger case for the adoption of SP in such contexts. HEIs as procurers should also sign onto DCIs as this would enable them benefit from benchmarking among peer institutions in areas such as appropriate procurement/contracting strategies, etc.

This study sought to explore ways through which HEIs in SSA can achieve SD through effective utilization of SP principles in the delivery and management of infrastructure on their respective campuses. No doubt, the study will contribute immensely to the attainment of this stated objective by providing decision-makers and other influential stakeholders in these HEIs with an insight into some of the barriers which may negate their intentions to attain SU status.

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RESOLVING CONTRACTOR COMMITMENT CHALLENGES IN PROJECT DELIVERY BY USING CONCETPUAL SYSTEM DYNAMICS MODELS

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Abstract

Contractors play a vital role in construction projects. However, their lack of commitment is argued to be one of the major barriers against successful project delivery. This investigation was aimed at to explore how contractor commitment challenges can be resolved to improve their performance in the project delivery. A survey research method was used to collect data, and Likert scale was applied to evaluate the relative importance of the contractor commitment challenges. Followed by conceptual System Dynamics (SD) modelling principle was used to develop causal feedback relationships among the variables influencing contractor commitment and to develop mechanisms to resolve the challenges. Findings suggest that lack of experience, skill, inadequate supervision, and lack of control over the subcontractors lead to contractor's inefficiency. Poor planning and scheduling, poor professional management, poor execution of projects, ineffective/outdated equipment, and inefficiency of labour force result in poor quality of work and delay. In addition, design and documentation challenges disrupt the contractors' schedule. The interlinkage among these variables hinders contractor commitment. However, policy/strategic interventions based on the causal feedback relationships among contractor efficiency, and (1) capacity building; (2) professional management; (3) construction methods; and (4) involvement of the contractor and client in the design process would enable the contractors to overcome their challenges to meet their commitment and improve efficiency in project delivery.

Keywords: Contractor, Commitment, Delay, Performance, Project, System Dynamics

1 INTRODUCTION

Performance of participants on a contract is important for its successful delivery. It is an indication of competency, measure of productivity and quality levels of the project. Contractors' are crucial participants' of a contract and they play significant roles in successful project delivery. Their commitment through signing and accepting a contract form a vital stepping stone for project delivery within scheduled time and resources. In other words contractor commitment is a pledge, which makes contractors to deliver the projects successfully relative to key performance criteria. In this context a number of contractor related attributes such as availability resources, skill and competency, attitude, experience essential assist the contractors to successfully honour their commitments. Although, it is of interest to all parties in a contract that a

project is delivered within the initial stipulated time, cost and specifications, there is always certain amount of risk that remains inherent in the award of construction of a project to a contractor notwithstanding the availability of various attributes such as positive attitudes, ability and experiences because of the commitment variability on account of emergence specific scenarios and context. There are several uncontrollable factors that influence project delivery time. These factors although can be broadly attributed to client related factors, contractor related factors, consultant and design related factors, material and equipment related factors (Al-Moumani, 2000; Andawei, 2002; Dainty et al. 2002; Odeh and Battaineh, 2002; Lim and Ling, 2002; Frimpong et al. 2003; Fox, Marsh, and Cockerham, 2003; Griffith and Watson, 2004; Mbamali, Aiyetan, and Kehinde, 2005; Tam and Tam, 2006; Sambasivan and Soon, 2007; Doloi, 2009a), some of these factors independently or in combination can directly or indirectly impact contractors' attributes influencing their commitments. The adverse impacts of the cause and effect relationships of these factors influencing contractors' commitment consequently, cause delay in successful realisation of the projects and make cost overruns. Therefore, it is essential to identify these factors, understand their causal feedback relationship and mechanisms to resolve contractor commitment challenges in projects. Thus, the objectives of the investigation are (1) to identify the relative influence of the various factors that adversely impact contactor commitments in a project, (2) explore causal feedback relationships among the major influential factors hampering contractor commitment and (3) develop regenerative mechanisms to resolve the contractor commitment challenges. For this purpose a survey was conducted among the stakeholders engaged in constructed projects in various cities of South Africa to collect data. Liker scale was used to evaluate the relative importance of various factors influencing contractor commitments. System Dynamics (SD) modelling principle was used to develop the causal feedback relationships among the variables and evolve regenerative mechanisms that would assist to resolve the challenges. The evaluation suggests that lack of experience, skill, inadequate supervision, and lack of control over the subcontractors are the major parameters which lead to contractor's inefficiency. Poor quality of work and delay are caused by poor planning and scheduling, poor professional management, poor execution of projects, ineffective/outdated equipment, and inefficiency of labour force. Furthermore, design and documentation challenges disrupt the contractors' schedule. The inter-linkage among these factors adversely impact contractor commitment. It is also found that policy/strategic interventions based on the causal feedback relationships among contractor efficiency, and (1) capacity building; (2) professional management; (3) construction methods; and (4) involvement of the contractor and client in the design process would enable the contractors to overcome their challenges to meet their commitment and improve efficiency in project delivery.

2 LITERATURE REVIEW

Contractors are essentially responsible for the actual construction activities. Honouring of contractual agreements by contractors plays a major role in the successful

project delivery (Ndekugri, Braimah, and Gameson, 2008). However, according to Chan and Kumaraswamy (1997) and Satyanarayana and Iyer (1996) lack of contractor commitment may lead to project delays and other unwarranted consequences such as, cost escalation and poor quality of work.

Evidence from literature shows that a number of factors contribute to the lack of commitment of the contractors. For example, Alwi and Hampson (2003) and Sweis, Sweis, Hammad, Abu (2008) observed that contractor's inability and inefficiency cause delay and influence project delivery, which was corroborated by other scholars. According to Olawale and Sun (2010), non-performance of contractors/subcontractors within four key principles of construction management such as preventive, predictive, corrective and organizational support is one of the major impediments against successful project delivery. Besides, a common set of contractor ability criteria, which includes engineering/construction, procurement/contract, project management, human resources, quality management systems, health and safety, plant/equipment, financial strength, and public relations also influence project delivery (Pongpeng, and Liston, 2003). Inadequate experience of contractors, contractors' inability and inefficiency, poor labour productivity, lack of control over subcontractor and financial difficulties faced by the contractors, contribute to the commitment challenges faced by the contractors and adversely impact the project delivery (Sweis, Sweis, Hammad, Abu, 2008). Lack of trades' skill, poor distribution of labour, inadequate number of supervisors/foremen, inexperienced inspectors, late supervision, and shortage of manpower (skilled, semi-skilled, unskilled labour) are the factors that adversely influence delivery of projects on time (Satyanarayana and Iyer, 1996; Odeh and Battaineh, 2002; Alwi and Hampson, 2003; Sambasivan and Soon, 2007; Sweis et al., 2008). Furthermore, lack of skill and competency of human resource in their disposal, such as subcontractor or labourers are some of the major factors that adversely affect project delivery time (Satyanarayana and Iyer, 1996; Odeh and Battaineh, 2002; Alwi and Hampson, 2003;; Sambasivan and Soon, 2007; Sweis et al. 2008).

Satyanarayana and Iyer (1996), Odeh and Battaineh (2002), Sambasivan and Soon (2007), and Sweis, et al. (2008) observe that professional management challenges faced by contractors hamper their commitment, and consequently contribute to delay in the delivery of projects. The professional management factors, which contribute to delay in project delivery are poor site management and supervision, delay in material delivery by vendors, and site accidents due to lack of safety measures. Similarly, according to Alwi Hampson (2003), Odeh and Battaineh (2002) and Sweis et al. (2008) project execution could negatively impact the contractor commitment on project delivery. According to them, too much overtime for labour, inappropriate construction methods and mistake during construction, equipment shortage, poor equipment choice/ ineffective equipment, outdated equipment and poor site layout do not allow the contractors to honour their commitments for successful project delivery (Odeh and Battaineh, 2002; Alwi and Hampson, 2003; Sweis *et al.*, 2008).

Design and documentation is also a factor mentioned in the literature which significantly influences contractor commitment and in turn influence project delivery (Odeh and Battaineh, 2002; Alwi and Hampson, 2003; Sweis *et al.*, 2008). Poor quality

site documentation, unclear site drawings supplied, slow drawing revision and distribution, design changes, poor designs, and too many change orders from owners/clients are some of the design and documentation related factors, which impact on the contractor commitment and cause delay in project delivery (Odeh and Battaineh, 2002; Alwi and Hampson, 2003; Sweis et al., 2008).

Besides, improper and inadequate material supply impedes the speed of construction of a project relative to on time delivery. Poor quality of the material, poor material handling on site, poorly scheduled delivery of material to site, inappropriateness/misuse of material, poor storage, etc., do not allow the contractor to keep the project on schedule and thus fail in his commitment to deliver the project in time and within the estimated budget (Alwi and Hampson, 2003). Thus, it is seen that factors relating to contactors inability and inefficiency, professional management, project execution and design and documentation influence contactors commitment and consequent project delivery significantly.

However, it is also found that although many of these factors are interlinked and have cause and effect relationships (Assaf and Al-Hejji, 2006; Sambasivan and Soon, 2007), explicit studies relating to causal feedback relations and their influence on construction delay are found to be limited. So, the importance of early identification of contractor commitment challenges and establishing of inter-linkage among the factors and development of mechanism for resolving contractor commitment issues and major delay reducing remedies that have been stressed by a number of scholars are highly essential (Alaghbari, Razali, Kadir, Ernawat, 2007; Das, 2015; Sweis et al., 2008).

3 RESEARCH METHODS

The investigation follows a survey research method and qualitative System Dynamics (SD) modelling approach. A survey was conducted by using the perception of professionals in organisations, relative to construction projects in four major cities in South Africa namely, Bloemfontein, Cape Town, Durban, and Port Elizabeth. Initially a questionnaire was prepared and pre-tested through a pilot survey among 10 professionals and based on the responses and a feedback obtained through the pilot survey informed the final questionnaire preparation. The final questionnaire included factors which impact contactors commitment under various attributes such as contractors' ability and efficiency, professional management, execution, and design and documentation. The sampling frame consist architects 346 (SAIA); master builders 513 (MBA); clients 91 SAPOA); structural engineers 39 (CESA - East Cape), and *quantity surveyors 420 (ASAQS). From these* the sample sizes *were calculated and the questionnaire response rate according to professional is given as:* architects (9), master builders (18), quantity surveyors (23), and structural engineers (23), clients (12) and others (3), which equates a total of 88 (6.1%) responses were obtained.

Sample selection was done by using probability sampling technique. Random sampling was used for the group of respondents that include architects, master builders, and clients. For quantity surveyors, and structural engineers, systematic stratified random sampling technique was used and for project managers convenient sampling

technique was adopted. The survey was administered by asking the respondents to complete and return a questionnaire through post or e-mail.

Table 1 Profile of respondents

Respondents	Number	Share in %
Architect	9	10.23
Master Builder/ Contractors	18	20.45
Quantity surveyor	23	26.14
Structural Engineer	23	26.14
Clients	12	13.64
Project managers	3	3.40
Total	88	100.00

The sample size and response rate was considered fairly adequate for the statistical analysis because (1) the professionals concerned are from the middle and higher level in the hierarchy in the projects and they are limited in numbers and (2) the response rate is quite significant (more than 40%) which eliminated bias if any (Kothari, 2004). Further, as seen from Table 1 the respondents belong to a heterogeneous and diverse group. This implied that the information provided by the respondents can be relied upon for the purposes of the analyses.

The contractor commitment challenge variables were evaluated by using five point Likert scale in which 1 represents lowest influence and 5 represents maximum influence (Gravetter and Wallnau 2008). The evaluation was conducted by using the mean score from the responses obtained from the respondents. Cronbach's coefficient test and validity test were performed and were found satisfactory. Cronbach's alpha of $\geq .97$ and factor loading of >.60 for samples sizes 85-89 were obtained.

Followed by SD principle based on System thinking approach (Forrester, 1968; Stermann, 2000) was adopted to extract the causal feedback mechanisms that cause contractor commitment challenges, and to evolve plausible policy interventions to resolve the challenges. SD principle was adopted because its rigorous structural framework assists in eliciting and displaying information used to build a conceptual model (Forrester, 1994; Han, Love, Peña-Mora , 2013; Kim and Reinschmidt, 2006; Lane and Oliva, 1998; Lyneis, and Ford, 2007; Rahmandad, and Hu, 2010; Wolstenholme, 1992).

For developing causal feedback relationships, initially the variables were categorized into four variables such as information, decision and action and environment (system) variables (Olaya, 2012). Then variables are then connected with simple one way causality in terms of one way linkages of information – decisions – actions – impact on the environment. In other words the variable are linked in a manner that information assists in evolving decisions (policy interventions), decisions lead to appropriate actions, and actions influence the environment (system)) and (Veniix 1996

and El Halabi et al., 2012) with their influence on one another (Fig. 1). Once the one way causality is established, feedback relationships among the variables are checked and established (Aiyetan and Das 2015). However, the causal feedback relationships developed were with professionals and experts to check the validity of the causal diagrams. Appropriate modifications with regards to variable names, their polarity and causal relations are made as per the feedbacks from the expert discussion. Conceptual SD models and regenerative mechanisms were then developed from the valid causal feedback diagrams (causal loop diagrams).

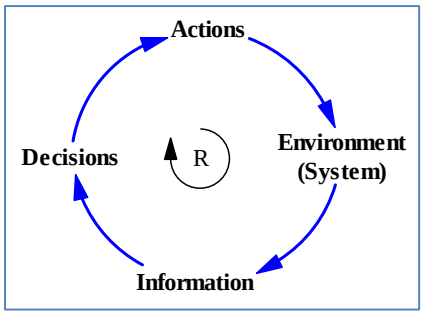

Fig. 1. Methods adopted for construction of causal feedback relations (Adopted from Olaya, 2012; Aiyetan and Das, 2015)

4 RESULTS, CONCEPTUAL MODELS AND DISCUSSIONS

4.1 Factors Influencing Contactor Commitment

Table 2 presents the mean score of the of the various factors under different attributes like contractor ability, professional management by the contactor, design documentation, and project execution that influence contractor commitment in a five point Likert scale (1 indicates least influential and 5 indicates most influential). It is noteworthy that all the factors have a mean score greater than 3, which indicates that all the parameters have positive influence on contractor's commitment in construction projects delivery. Among these, it is seen that under Contractor's inability and inefficiency attribute: lack of skill, late supervision, availability of too few supervisors, delay caused by subcontractors, lack of control over subcontractors, and poor labour productivity are the major factors which significantly hamper contractor commitment in the projects. Similarly under professional management attribute poor site management and supervision, delay in material delivery by vendors, poor planning and scheduling and Site accidents due to lack of safety measures are the major factors, which reduce contractor commitment. Besides, under project execution attribute: equipment shortage, outdate equipment and too much overtime for labour significantly prompt contractor

commitment challenges. Furthermore, it is also found that under design and documentation attribute the major factors which cause contractor commitment challenges include, poor design, poor quality site documentation, unclear site drawings and too many change orders from owner/client. However, since all the parameters contribute to contactors commitment challenges to certain extent and are vital in construction process they have been considered for developing the causal feedback relationships and examining their implication on the project delivery. The causal feedback relationships among the factors and development of mechanisms to resolve the challenges are considered separately under each attribute. The conceptual SD models and resolving mechanisms were developed by using SD modelling principles.

Table 2. Factors influencing Contractors lack of commitment

Factors influencing lack of contractor commitment	**Index based on Likert scale mean value**	**Sources**
Contractor's inability and inefficiency		
Lack of trades' skill	3.98	Alwi, and Hampson, (2003); Sweis et al., (2008)
Poor distribution of labour	3.62	
Supervision too late	4.01	
Too few supervisors/foremen	4.25	
Lack of subcontractor's skill	3.52	
Inexperienced inspectors	3.03	
Shortage of manpower (skilled, semi-skilled, unskilled labour)	3.45	
Ambiguity in estimations	3.76	Satyanarayana and Iyer (1996); Odeh and Battaineh (2002); Sambasivan and Soon (2007); Sweis et al., (2008)
Inadequate experience of contractor	3.15	
Poor labour productivity	3.76	
Lack of control over subcontractor	3.85	
Delay caused by subcontractors	3.91	
Financial difficulties faced by the contractor	3.18	
Professional Management		
Poor site management and supervision	3.92	Odeh, Battaine (2002);Alwi, and Hampson, (2003); Sweis et al., (2008); Satyanarayana and Iyer (1996);Chan and Kumaraswamy (1997); Odeh, Battaine (2002); Sweis et al., (2008)
Delay in material delivery by vendors	3.73	
Site accidents due to lack of safety measures	3.54	
Lack of motivation for contractor	3.40	
Poor planning and scheduling	3.73	
Poor provision of information to project participants	3.21	
Poor coordination among project participants	3.33	
Slow in making decisions	3.46	
Execution		
Too much overtime for labour	3.87	Odeh, Battaine (2002); Alwi, and Hampson, (2003); Sweis et al.,
Inappropriate construction methods and mistake during construction	3.05	
Equipment shortage	3.91	

Poor equipment choice/ineffective equipment	3.27	(2008)
Outdated equipment	3.74	
Poor site layout	3.28	
Design and Documentation		
Poor quality site documentation	3.37	Odeh, Battaine (2002);
Unclear specifications	3.12	Alwi, and Hampson,
Unclear site drawings supplied	3.37	(2003); Sweis et al.,
Slow drawing revision and distribution	3.37	(2008)
Design changes	3.12	
Poor Design	3.37	
Too many change orders from owner/clients	3.37	

4.2 Causal Feedback Relations Causing Contractor Commitment Challenges and Mechanisms to Resolve the Challenges

4.2.1 *Contractor ability and efficiency*

Contractor ability significantly influences contractor commitment. The survey findings suggest that with mean score higher than 3.5; various contractors ability related factors as shown in Table 1, significantly influence contractor commitment and cause the contactor to weaver from his commitments. Besides, the factors develop a chain of causality and feedback relationships among themselves. As seen in Figure 2 (a) and 2 (b) lack of experience leads to inadequate supervision and lack of control over the subcontractors. Delay is caused because of the lack of control of the contractor over the subcontractors and lack of skill availability with the subcontractor. Besides, lack of experience contributes to lack of availability of skill with the contractor through a disruptive causal feedback mechanism IB1. Poor skill and poor financial management in addition to inaccurate or ambiguous estimate make the contractor face financial difficulties (IB1A), which contributes to the inefficiency of the contractor. Similarly, shortage of skilled manpower is a key challenge faced by the contractor. Due to shortage of man power, the contractor fails to appropriately apportion labour in the project, which essentially leads to poor labour productivity as shown by causal feedback mechanism IB2.

However, as revealed from causal feedback diagram in Figure 1(a) and reinforcing mechanism in Figure 2 (c), skill and competency building can assist in reducing the inefficiency of the contractor. Skill training, financial management training will enhance the finance management capacity of the contractor, which may assist to find ways to reduce financial difficulties faced by the contractor (IR1A). Skill training and internship will make the contractor more competent to handle shortage of manpower by recruiting adequate manpower (IR1B). It will also assist in enhancing labour productivity. Besides, capacity building will also assist the contractor to gain from experience and use the experience gained effectively (Figure 2 (c)). Subcontracting experience before handling jobs as a contractor is expected to deal with the challenges related to subcontractors such as control, delay and lack of skill (IR1C). All the three aspects will enhance the capacity and competence of the contractor eventually leading to increase in efficiency of contractor.

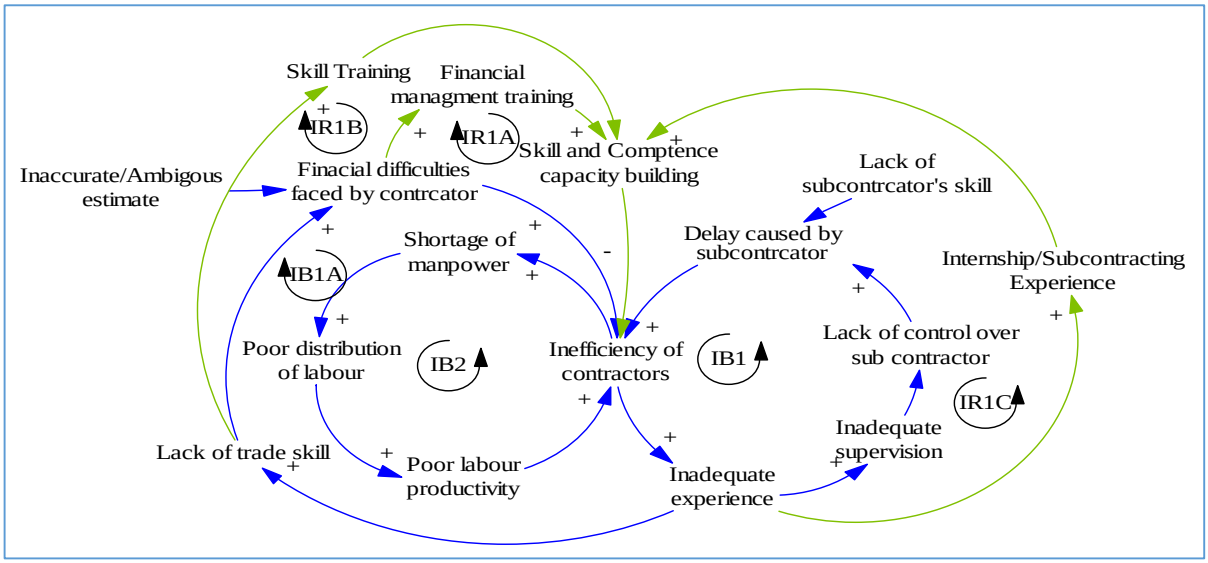

Figure 2 (a) . Causal feedback relationship for contractor efficiency in projects *(Blue lines show the challenges and green lines show the interventions)*

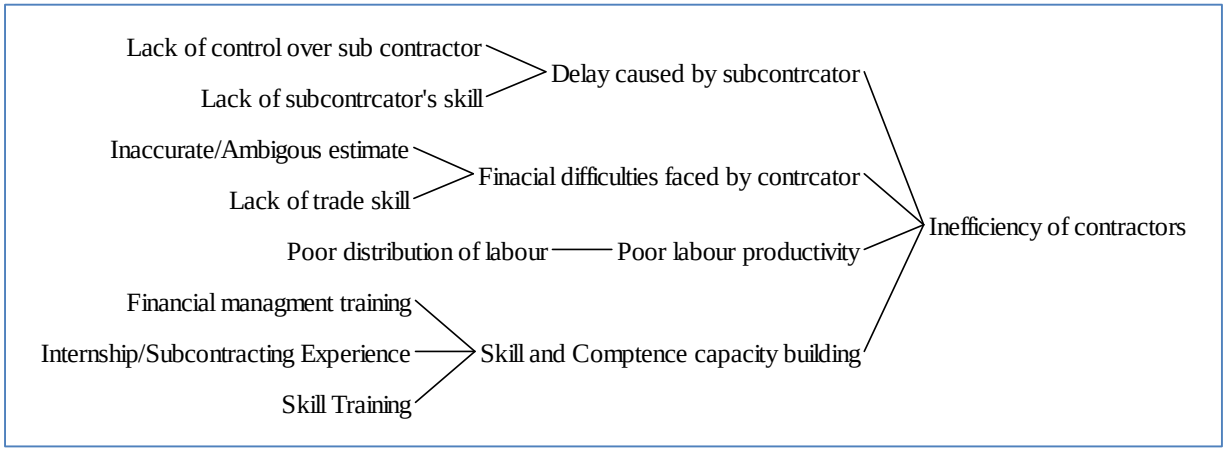

Figure 2 (b). Disrupting mechanism causing contractor efficiency in projects and poor contractor commitment

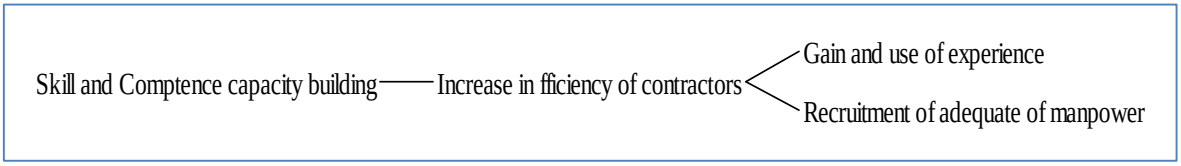

Figure 2 (c): Reinforcing mechanism increasing contractor efficiency in projects

4.2.2 *Professional management*

Professional management is one of major elements in the contractor commitment. Poor professional management is influenced by two important mechanisms. First, poor planning and scheduling in project in addition to lack of proper facilities for information transfer lead to poor communication and coordination, and essentially create delay in decision making. Consequently, the project is not managed as it is envisaged. This phenomenon is presented by a disruptive mechanism PB1 (Figures3 (a) and 3 (b)). Similarly, on the other hand lack of professionalism lead to lower morale and motivation of the contractor. The lack of motivation may lead to poor management of site (as shown by feedback mechanism PB2), which in fact can be exacerbated by the delay in material delivery due to poor planning and scheduling and consequent poor coordination and communication (feedback mechanism PB1A). Thus, these two major disruptive feedback mechanisms bolster poor professional management of the projects and force the contractors to fail to keep their commitments. However, if the capacity of the contractors is enhanced through capacity building as discussed in earlier sections (cf4.1.1), it will assist the contractors to adept in project management skill and techniques to prepare appropriate plans and schedules. Besides, available information communication transfer facilities in addition to capacity building will reduce poor coordination and communication and enhance decision making. The net result shall be enhancement in professional management of the projects (PR1). Again, appropriate coordination and communication facilities will enable reduction in delay in material delivery leading to better site management through reinforcing mechanism PR1A. Similarly, capacity building of contractors will act as incentives and rewards for the contractors that will boost the morale and motivate the contractors. The increase in motivation will cause better site management and consequently lead to professional management of the projects through feedback mechanism as shown by PR2, which will further bolster by the increase in the health and safety measures through feedback mechanism PR2A. Thus, the poor professional management of projects by contractors, which are essentially augmented by disruptive mechanisms PB1 and PB2 can be countered by feedback mechanisms PR1and PR2. Overall as shown in the reinforcing mechanism (Figure 3 (c)), capacity building will engender knowledge and skill in project management, assist in provision for incentives and awards to contractors and improve health and safety aspects in projects, which consequently will lead to proper planning and scheduling, improve motivation of contractors, and reduce accidents in

site respectively, thus reducing delay in projects. Therefore, if the capacity of the contractors is enhanced in addition to improvement in information and communication facilities, then the projects would be managed more professionally; that will enable the contractors to keep their commitments.

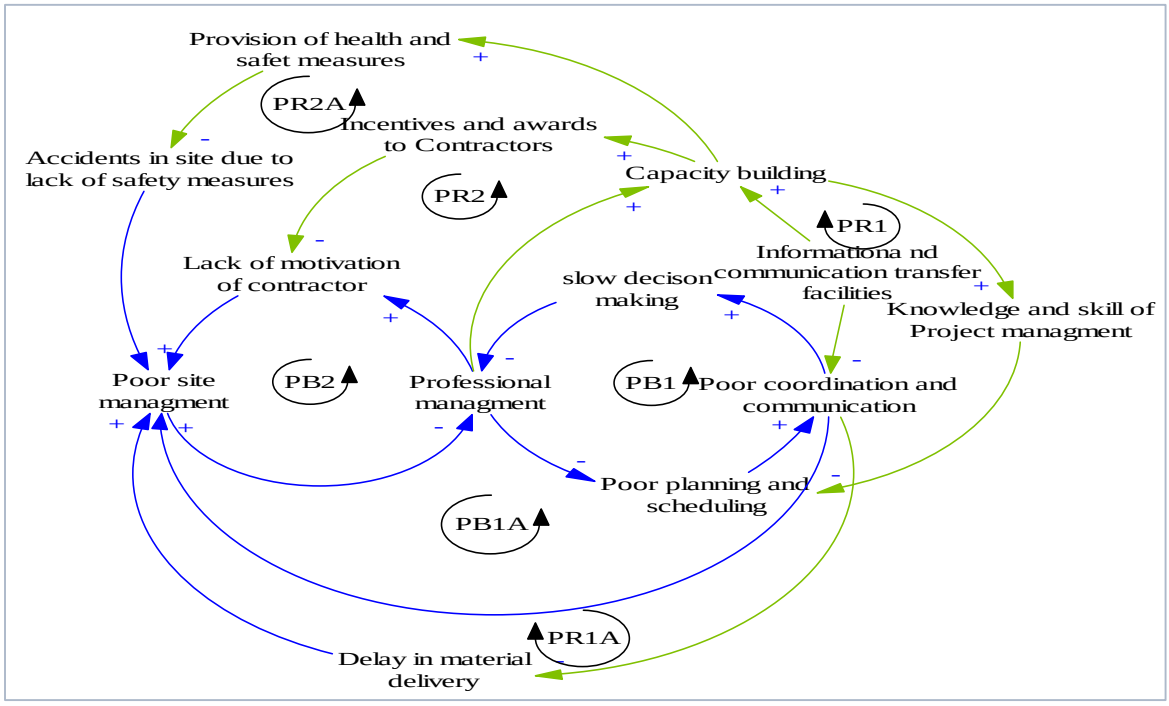

Figure 3 (a). Causal feedback relationship for professional management of projects by the contractors

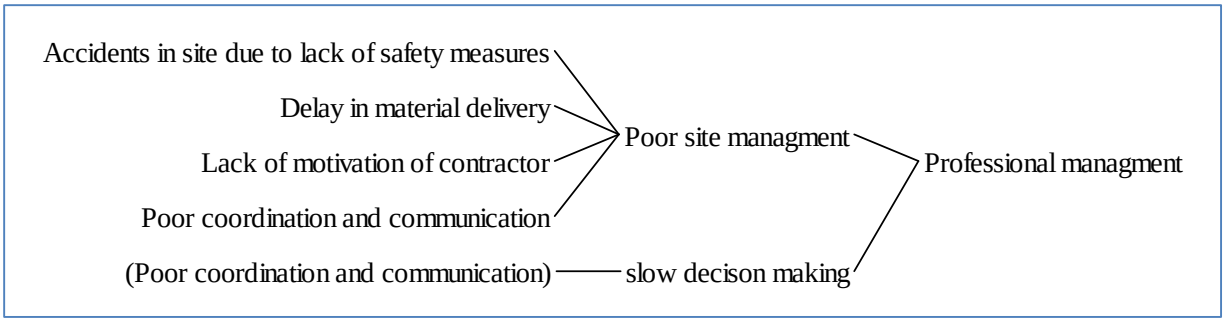

Figure 3 (b). Disrupting mechanism causing poor professional management in projects leading to poor contractor commitment

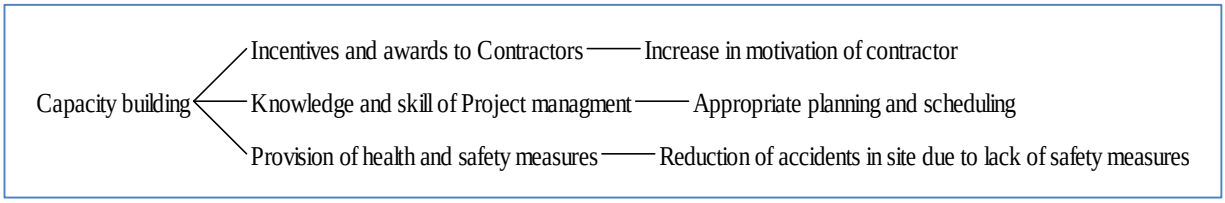

Figure 3 (c): Reinforcing mechanism increasing professional management by contractors in projects

4.2.3 *Project execution*

Challenges in execution of project significantly influence the contractor commitment in project. As indicated in Figure 4 (a and b), poor execution of projects is caused by ineffective/out-dated equipment's, inefficiency of labour force and poor planning and scheduling and site planning. Ineffective or outdate equipment if used along with the excessive overtime of labourers lead to efficiency of labourers resulting in poor execution of the project through a disruptive mechanism EB1. Similarly, poor planning cause shortage of equipment that hampers the smooth execution of the projects (feedback mechanism EB2). Poor planning also cause poor site layout, which reduces the outputs of labour force and aggravate the challenges of project execution through a feedback mechanism shown by EB3. The situation gets exacerbated further if appropriate construction methods are not used in construction, which essentially create errors and delay in the projects (EB4). Thus, as observed, because of the dominant disruptive mechanisms, (1) inappropriate construction methods leading to error and delay in construction, (2) ineffective and out-dated equipment, excessive overtime of labourers and poor site layout leading to inefficiency of labour force, (3) and unavailability of proper equipment and poor planning leading to shortage of equipment make the project execution to suffer forcing the contractors to waver away from their commitments (Figure 4 (b)).

However, strong professional management of the projects and knowledge about the appropriate construction methods, appropriate technology and equipment could assist in resolving the challenge. Professional management generally assists in proper planning and scheduling. Proper planning and scheduling alleviates the challenges of project execution in three ways. First, it makes provision for availability of adequate and appropriate equipment's via availability of finance, which neutralizes the negative effect of the ineffective and out-dated of equipment and improves the execution process (Feedback mechanism ER1A). Second, the availability of equipment also reduces the effects of shortage of equipment (ER1B). Third, proper planning improves the site planning scenario, which essentially enhances the efficiencies of the labour force (feedback mechanism ER1C) and also saves the additional expenditure because of the excessive overtime by labourers'. Besides, if the capacity of the contractors is build,

which essentially enhances the knowledge and competency of the contractors about the equipment, technology and construction methods, then contractor will be able to reduce the errors and delay caused by the challenges of use of improper construction methods. Essentially, this mechanism neutralizes the negative effects of the disruptive mechanism EB4. Also, such a mechanism reinforces the mechanism ER1B and counteracts the challenges of poor execution of projects. Therefore, as presented in Figure 4 (c), professional management, appropriate planning and scheduling in addition to knowledge and competency of the contractor remain at the core to improve project execution, which consequently will ease the challenges of contractor commitment in the projects.

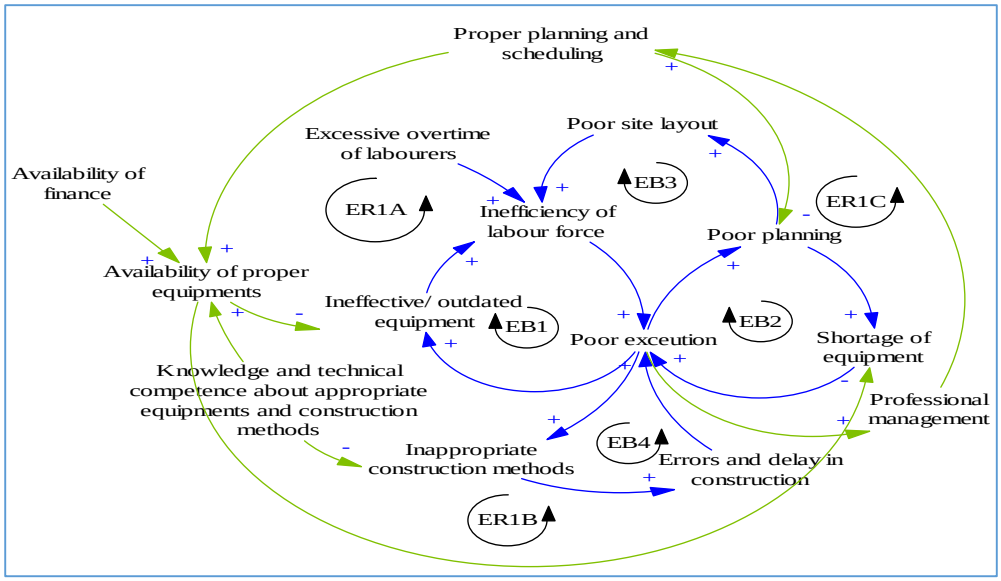

Figure 4 (a). Causal feedback relationship for Execution of projects by the contractors

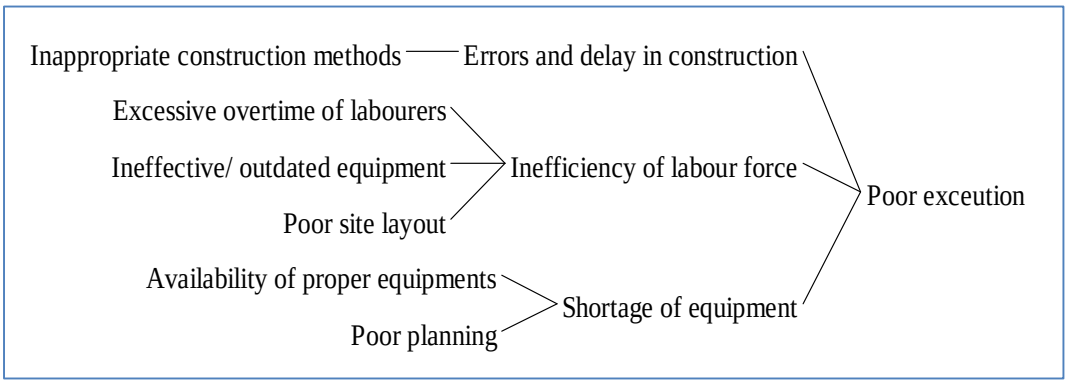

Figure 4 (b). Disrupting mechanism causing poor execution in projects leading to poor contractor commitment

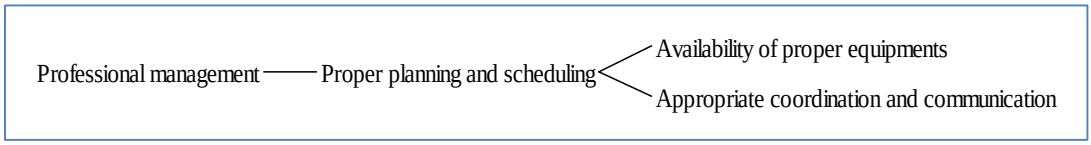

Figure 4 (c). Reinforcing mechanism to improve project execution by contractors in projects

4.2.4 *Design and documentation*

Design and documentation are essentially the responsibilities of the consultants and designers. However, client has significant influence on them. Poor design can create all sorts of challenges in the construction including influencing contractor commitment as reflected in different mechanisms in Figure (5 a and b). Poor design can result, because of the in-competency of the consultants. However, more often design changes at the client's behest are the major causes of poor design. The reason being, the client's uncertainty or lack of clarity on the final outcome may make the consultant unsure about the design. So, design changes lead to poor design and consequently there will be lack of appropriate details in design, drawings and material specification, which essentially disrupts the contactor's work schedule and commitment through a feedback mechanism DB1. Simultaneously, lack of details in design, drawing and material specification on account of poor design leads to unclear site drawing and poor documentation. The slow revision of design and drawing and their slow distribution also aggravates the poor documentation scenario. Poor quality design, drawing and specification documents generally make the contractor lose clarity in construction and consequently the construction work gets interrupted through a feedback mechanism DB2. In summary, as shown in the disruptive mechanism in Figure 5 (b) lack of contractor's involvement in design and documentation process causes lack of clarity in the design changes, site drawings and specifications. In addition to the factors such as slow in revision and distribution of design and drawings, which may lead to poor quality documentation and poor design engendered from design changes prompt for inadequacy in detailed design, drawings and materials specification to be provided to contractors through proper documentation process. In the absence of such detailed documents, the contractor may not be able to handle the project effectively and weaver from the commitments made for the project.

However, conversely involvement of the contractor and client in the design process, and coordination and communication among the client, consultant and contractor could ease the challenge. The clients' involvement in the design process shall lead to the consultant(s) to understand the clients demands and consequently the number of changes that can occur from clients side will be minimized and thus resulting in improvement on the design through feedback mechanism DR1. Similarly the

contractors, involvement in the design process particularly with regards to detailing in design, drawings and specifications will enhance the clarity in the specifications in the site drawings and materials use (DR2). Clarity in the drawings and specification in other words good quality documentation enable the contractors to work without much interruption. Besides, coordination and communication among the clients, consultants and contactors assists in minimizing the design changes as well as enhances the progress in revision and distributions of designs, drawings and other changes that may occur. In other words coordination and communication among the three stakeholders also strengthens the feedback mechanisms DR1 and DR2. Thus, it is seen that disruptive feedback mechanisms DB1 and DB2, which make the contactors to fail to keep their commitments are balanced by reinforcing mechanisms DR1 and DR2, which enable them to honour their commitments because of design related challenges. In other words as envisaged from the reinforcing mechanism as presented in Figure 5 (c), contractor's involvement in design and documentation remain pivotal to improve contractor commitment as the contractor would be aware of the details of the design, drawings, specifications and the changes if any in any of these aspects. Furthermore, because of his engagement in the process and awareness of the various aspects, there would be reduction in design changes (from contactors point of view) and lesser confusion on the drawings and material specification. As a result the contractor could able to execute the projects more efficiently contributing significant improvement in contractor commitments.

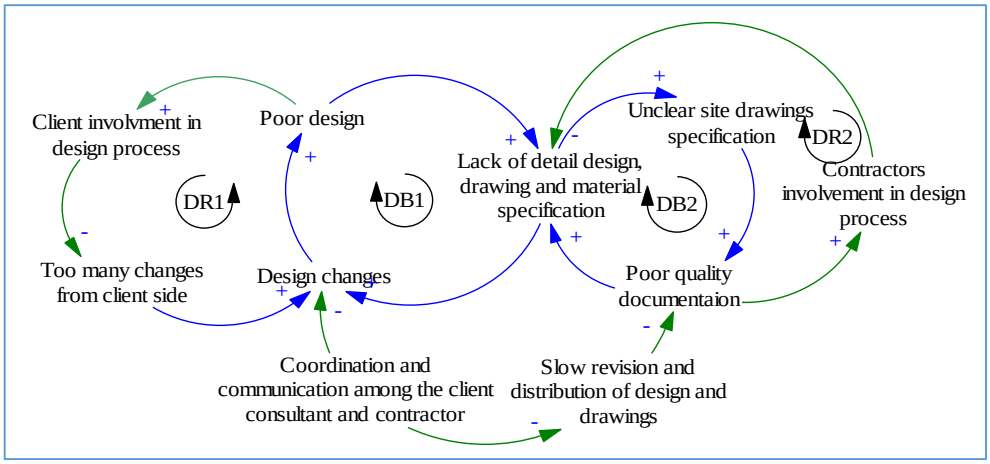

Figure 5 (a) . Causal feedback relationship for contractor commitments because of design and documentation challenges

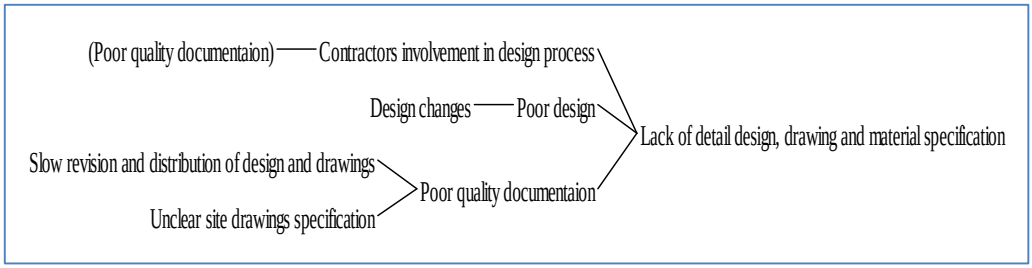

Figure 5 (b). Disrupting mechanism leading to lack of detail design, drawings and material specification contributing to poor contractor commitment

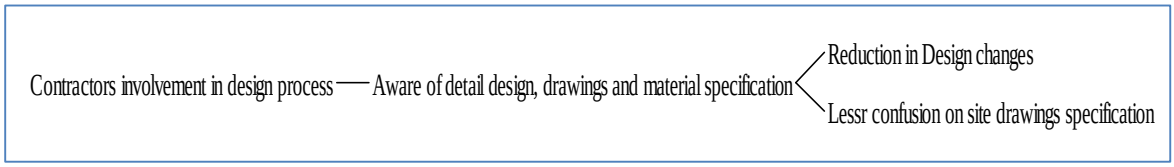

Figure 5 (c). Reinforcing mechanism to improve design and documentation by contractor's involvement in design and documentation process leading to enhanced contractor commitment

4.3 Discussions

Contractor commitment is at risk because of various contractor ability and efficiency, professional management, project execution and design and cementation related factors. It is found that almost all the factors under these attributes as mentioned in Table 2, essentially influence contractor commitment. However, identification of factors does not suffice to how these factors influence contractor commitment, what kind of causal feedback mechanisms do they develop to create contractor commitment challenges and how the challenges can be resolved. As suggested by Assaf and Al-Hejji (2006) and Sambasivan and Soon (2007), there is a necessity to establish the inter-linkage among these factors. In this regard, development of conceptual models and consequent mechanisms by using SD modelling principles (Stermann, 2000) is found to be useful and relevant. As suggested by Montibeller and Belton (2006), Robinson (2008), Das (2015) and Aiyetan and Das (2015), use of conceptual models to understand the inter-linkage among the factors influencing contactor commitment and development of the contractor commitment disrupting and reinforcing mechanisms will assist in development of policy interventions to alleviate contractor commitment challenges in construction. Such mechanisms would enable the contractors and other related stakeholders to take steps to resolve contractor commitment challenges through qualitative understanding in a cost effective way and without making elaborate quantitative investigation that could be time consuming and expensive. Consequently, it is found that conceptual SD models engender a set of disruptive mechanisms, which reduce contractor commitments, and reinforcing mechanisms that would resolve the

challenges. The mechanisms are established based on the inter-linkage among various contractor commitment related factors and their cause and effect as well as feedback relationships. The findings of the conceptual SD models reveals that the influence of various disruptive mechanisms caused because of different contractor linked factors suggested by various investigators (Odeh and Battaineh, 2002; Alwi and Hampson, 2003; Sweis *et al.*, 2008) can be negated by the policy interventions that can be developed based on the reinforcing mechanisms extracted through the SD Conceptual models. In this regard, attributes such as contractors' ability and efficiency, professional management, project execution and design documentation are found to be pivotal for the contractor to adhere to commitments. For example, skill and competency building, which can be attained through skill training, project management training, financial management training, etc., would engender knowledge and skill in construction, finance management, labour management, project management, etc., consequently enable the contractors to reduce inefficiency. Similarly, capacity building will motivate for higher incentives and awards to contractors. Furthermore, professional management skill will allow the contractors to the plans and schedules of the projects, enable proper project execution and improve health and safety aspects in projects, and reduce accidents in site, thus reducing delay in projects. Moreover, contractor's involvement in design and documentation will make them aware of the details of the design, drawings, specifications and the changes if any in any of these aspects, which would lead to reduction in design changes and lesser confusion on the drawings and material specification. Consequently the cumulative effect would result in higher efficiency, execution as per contract and schedule and reduction in delay, thus contributing significantly to improve contractor commitments.

5 CONCLUSIONS

Contractor commitment in construction projects is a major issue faced in the construction industry. A number of attributes and factors are responsible for reduced contractor commitments, which adversely influence successful project delivery within the stipulated time and budget. Several studies have been conducted to understand the causes of lack of contractor commitments; however the studies related to the inter-linkage and causal relationship among the factors influencing contractors' commitment are limited. Therefore the , objectives of the investigation were to identify the relative influence of the various factors that adversely impact contactor commitments in a project; to explore causal feedback relationships among the major influential factors hampering contractor commitment; and to develop regenerative mechanisms to resolve the contractor commitment challenges. To realise the aims a survey research method and application of conceptual SD modelling principles were adopted by considering construction projects in important cities of South Africa. The findings suggest that a number of factors (Table 2) under different attributes such as ability and efficiency of the contractors, professional management, project execution and design and documentation of projects influence contractor commitment significantly. The inter-linkage among the factors under each attribute and their feedback relationships cause

disruptive mechanisms which essentially cause contractor commitment challenges in the projects, which warrants policy interventions. The conceptual SD models also indicates that reinforcing mechanisms can be engendered based on the factors, which can act as antidotes to the disruptive mechanism and improve contractor commitment. Furthermore, this investigation reveals that the causal feedback mechanisms among the factors can make the contractors and other stakeholders understand the contractor commitment challenges and engender strategic interventions to resolve these challenges qualitatively. As found from this investigation, the challenges and resolution mechanisms seem to work in a chain of causality and isolated policy interventions may not achieve the desired results, i.e., improve contractors' commitment and successful project delivery. The study has some limitations such as it is carried with limited data acquired from survey and only conceptual modelling was done. Availability of statistical data as well as a comprehensive computational model could have provided more insights to the problem, which is the further scope of the research. However, in the current state, the findings of the evaluations regarding the factors causing contractor commitment challenges and conceptual models based on inter-linkage of the factors can allow the stakeholders in a project to foresee the causal effects, understand the mechanisms that cause contractor commitment challenges and develop appropriate strategy interventions to make the contractors to adhere to commitments and execute the projects within schedules and resources.

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STEMMING QUACKERY ON CONSTRUCTION SITES IN ABUJA-NIGERIA: SUPERVISION AND PRODUCTIVITY NEXUS

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ABSTRACT

Productivity being a major concern to production and operation managers, higher productivity can be achieved through better utilization of available resources. Effective supervision of construction workers is one of the processes through which high productivity can be achieved. Hence, a combination of methods were used to compare the productivity and level of adherence to quality on 20 active construction sites through the use of direct measurement of productivity, personal un-obstructive observations and 10 structured interviews among construction professionals in Abuja-Nigeria. Findings showed that there was no difference between the sites supervised by professionals and non-professionals in terms of labour productivity. In a related development, there was also no difference in terms of adherence to quality between the sites supervised by professionals and non-professionals except in blocklaying due to the perceived "proficiency" by the non-professionals (masons as foremen). Quackery may continue to plague the Nigerian construction industry if clients held belief is not changed and construction foremen are not trained to meet up with the demands of the industry. Non-professionals such as foremen should be trained and certificated by Council of Registered Builders of Nigeria (CORBON) in order to improve supervision and by extension productivity on construction sites.

Keywords: Foremen, Non-professional, Productivity, Professional, Quality, Supervision

1. INTRODUCTION

Construction is the world largest and most challenging industry but human resources today have a strategic role to play for productivity increase of any organization and with the effective and optimum use of them, all the advantages supplied by the productivity growth can be obtained (Attar *et al*., 2013). Construction is labour intensive and relies heavily on the skills of the workforce. This workforce is the industry's most valuable asset, which can significantly influence the cost, schedule, and quality of the construction project (Han *et al.*, 2008).

Construction industry occupies a vital position in the economy of any country because of its important contribution to the process of development (Oyewobi *et al*., 2011). In Nigeria, construction industry is of paramount importance for employment and economic growth (Ogunsami and Jabgoro, 2006). Therefore, Construction is a key sector of the national economy for the countries all around the world, as traditionally it took up a big portion in nation's total employment and its significant contribution to a nation's revenue as a whole. However, until today construction industries are still facing a number of problems, regarding the low productivity, poor safety, and in sufficient quality of work (Attar *et al*., 2013).

Productivity is one of the most important factors that affect overall performance of any small or medium or large construction firm, and there are number of factors that affect the productivity of labour, and it is important for organizations to identify and study those factors in order to take appropriate action for improving them (Attar *et al.*, 2013). These factors include absenteeism of gang members, instruction delays, supervisory incompetence, lack of materials, an unfriendly working atmosphere, and lack of proper tools (Odesola & Idoro, 2014). If productivity is improved, it ultimately decreases the unit cost of project and gives overall best performance of the project (Attar *et al*., 2013). Lawal (2008) posited that construction workers in Nigerian public service have almost zero productivity.

Site supervision may affect the overall performance and efficiency of construction projects (Alwi *et al*., 2001). Frimpong *et al*. (2011) asserted that inadequate supervision practices can lead to improper planning and poor management of tools, equipment, materials, and labour which affect the productivity. Alumbugu *et al*. (2014) stated that the inefficient method, lack of appropriate tools, poor supervision and training contribute to the low productivity in the Nigerian construction industry. United States Agency for International Development (USAID) (2005) added that project supervisors/engineers are supposed to be jack of all trades because the success or failure of a project depends largely on their knowledge and experiences.

Therefore, inability of supervisor to plan work, communicate with workers and direct activities adequately is fundamentally linked to increase

amount of cost of rework (Alwi *et al.,* 2001). Eckles *et al.* (1975) (cited in Alwi *et al.,* 2001) established that supervisors are managers whose major activities focus on leading, coordinating and directing the work of others in order to achieve organizational goals. For project objectives to be met, supervisor needs several skills such as management skills, human relation skills and skills in leadership, motivation and communication (Aqua Group, 2002).

2. LITERATURE REVIEW

2.1 Productivity

Productivity is one of the key components of every company's success and competitiveness in the market. A construction contractor stands to gain or lose, depending on how well company's productivity responds to competition. Construction companies may gain advantage over their competitors by improving upon productivity to build projects at lower costs; yet, most contractors do not systematically and properly address this strategic issue or evaluate its impact on the project's profit (Hammad *et al.,* 2011).

Successful construction project is one that is completed on time, within budget, meets specified standards of quality and strictly conforms to safety policies and precautions. This is feasible only if the premeditated levels of productivity can be achieved. All the same, productivity, or lack thereof, is one of the construction industry's most prevalent problems. Due to the nature of construction projects, its importance to society and the existing economic resources, more emphasis should be given to improving productivity (Kuykendall, 2007). Contractors must strive to improve productivity continuously or risk losing important contracts. A company has the ability to increase its competitiveness through enhanced productivity by raising the level of value-added content in products and services more rapidly than competitors. The concept of productivity is importantly linked to the quality of input, output, and process. Productivity is also key to long-term growth. A sustainable improvement in productivity, when associated with economic growth and development, generates non-inflationary increases in wages and salary (Hammad *et al.,* 2011).

However, sometimes the nature of construction industry makes the productivity concept a complex one, due to some variables such as small firm sizes, low profit margins, industry fragmentation, environmental issues, limitations on the supply of skilled labour, and other resources (Abd-El-Hamied, 2014). Despite the importance of productivity, productivity enhancement in construction has been overlooked for decades, while the manufacturing industry drew benefits from production management techniques (Neumann *et al*., 2003). The construction industry lagged due to insufficient research in the area of productivity. One of the methods of improving construction productivity

according to Hammad *et al.* (2011) is to assist managers to identifying productivity barriers and offer solutions. In contrast, enhancement of productivity in construction site leads to the following:

1. Projects are completed more quickly.
2. Project cost is lowered.
3. The contractor can submit more competitive bids.
4. And the project can be more profitable.

2.2 Site Supervision

Researchers have assigned several definitions and interpretations to supervision, but almost all of them centre on a common aim or objective. The main objective of supervision is to help the workers to realize their full potential in their respective careers and has a lot to do with the communication and leadership. Workers are groomed by their superiors through discursive interaction to carry out tasks in line with the professional codes of conduct (Chika and Chijioke, 2013). In a similar vein, Pierce cited in Baffour-awuah (2011) established that supervision is a developmental process designed to support and enhance an individual's acquisition of the motivation, autonomy, self-awareness, and skills necessary to effectively accomplish the job at hand. Chika *et al.* (2013) added that supervision deals with guiding, advising, encouraging, refreshing, motivating and ascertaining the stated goals of the organization. Site supervision according to Aqua Group (2002) is the activities designed primarily to ensure that the employer's requirements as expressed in the contract documents are correctly integrated and that the problems which are bound to arise even on the smallest jobs are resolved.

To achieve an effective site management with focus on attainment of quality, cost, and building within the pre-set time frame and client satisfaction, certain actions becomes necessary: Among this item is the site management team which include consultants, Project Builder, Building supervisors and Trade foremen (Council of Registered Builders of Nigeria [CORBON], 2011).

CORBON (2011) opined that Consultants in the building environment are expected to perform their supervisory roles according to their inputs at the pre design stage and among them those that have role to play in the effective site management practice are: Architect, Engineers (Civil, Structure, Mechanical and Electrical) Quantity Surveyor, Surveyors, and Consultant builder.

Ogbiti (2015) further revealed that the major task of contractors is to assemble and allocate the resources of labour, equipment and materials to the project in order to achieve completion at a maximum efficiency in terms of time, quality, and cost.

Project builder is the overall construction personnel in charge of building production management. He coordinates and manages the trades men and artisans in site execution process. He is empowered by the national building code to carry out all the function of building production process through management of both artisans and tradesmen on site (CORBON, 2011).

Similarly, Ekundayo *et al*., (2013) discussed further that a project manager is one trained in one of the construction-related disciplines include architecture, quantity surveying, building and civil engineering, and qualify with either a degree or diploma (or both) from a recognized institution of learning.

Trades foremen are the next to the supervisors who had acquired all the required trade test 1, 2, 3 and reasonable length of experience in their trade before so appointed as trade foremen in their organization, and they are leaders of their respective trade such as: Masonry, Carpentry and joinery, Steel Bending, Painting and interior Decorations, Plumbing and Electrical works (CORBON & Nigerian Institute of Building [NIOB], 2010).

2.3 Impact of Supervision on Workers' Productivity on Construction Sites

Construction productivity largely depends on the performance of construction workers (Jergeas, 2009). In practice, most supervisory visits may be focused on inspection and fault-finding rather than providing workers the opportunity to improve their performance and solve problems during service delivery. This 'traditional' form of supervision may be detrimental to worker motivation. Instead, supervisors should encourage discussion of problems, provide immediate feedback and establish goals to assist workers in maximizing performance (Frimpong *et al*., 2011). Willis-Shattuck *et al.* (2008) opined that the impact of supervision on construction workers outputs is felt particularly through improvements in motivation and job satisfaction.

The labour force plays a vital role in the construction process. Therefore, improvement in construction productivity needs to be achieved through greater resource allocation, human resource efficiency, supervision, increased innovation and technology diffusion (Jergeas, 2009). However, Construction labour productivity improves as construction supervision is provided. The additional supervision has the effect of reducing the construction gang sizes and is usually associated with defined construction packages to be executed (Merrow *et al*., 2009). Frimpong *et al.*, (2011) stressed that supervision increases workers empowerment, time management, fewer complaints and more positive feedback. Supervisors encourage workers to adopt good practices in order to achieve a high level of performance. Such 'supportive' supervision is significant and more beneficial to productivity of construction workers. The benefits of supervision on construction workers using limited resources remain largely uncertain, even though the quality of supervision may be a key determinant of its impact on productivity (Merrow *et al*., 2009). Fischer (2009) concluded that the impact of management styles and techniques on worker productivity is significant. It is through exercising power that leaders (supervisors) are able to influence others, this power can lead to one of the following reactions: commitment, compliance or resistance which affects productivity.

2.4 Supervisors roles in Achieving Construction Project Objectives

Projects success is basically to gain the project objectives that are

classically defined by the need to complete a project on time, within the budget, and with appropriate quality. Hence any disruptions to the project objectives will certainly contribute to project delays with its specified adverse effects on project objectives (Abedi *et al*., 2011). Centeno (2004) implied that successful construction project is one that achieves the intended objectives in terms of cost, time, quality and safety. Construction workers must be closely monitored to achieve the desired levels of productivity (Hickson and Ellis, 2014). Productivity improvement is reduction in the non-productive time spend each day by the workers and a transfer of those man-hours to the direct productive work (Centeno, 2004).

Good planning, scheduling, and controlling can improve productivity on construction project (Centeno, 2004). According to Fisk (2000), several other factors must be considered by construction manager in other to achieve project objective. Some of these factors include the following: Conduct productivity/ performance study at the activity/ operational level to create benchmark, always adopt simple and efficient communication among labour as well as with link parties, ensure efficient and effective tools, equipment, and materials in order to continuous task performance so as to reduce joblessness of labour force, adopt motivational or personnel management measure to increase workers morale. For instance tie compensation to performance, allocate or recruit the right people to undertake a job, provide training to improve workers capability and skills, involve workers in making decisions that affect their jobs such as technique improvement, utilization of dataset from the construction industry.

3. RESEARCH METHODOLOGY

In an attempt to determine the relationship between supervision and construction workers productivity in the study area, mixed methods approach was adopted. Johnson *et al*. (2007) described a mixed methods approach as a class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study for the purpose of breadth and depth of understanding. Twenty construction sites were visited for the on-site un-obstructive observations and measurements of activities of workers. Observation is a method where data is collected by direct contact with real life situations and by behaviours that occur naturally (Sanoff cited in Okolie, 2009). The observation method involves the researcher in watching, recording and analysing events of interest (Blaxter *et al*., 2006). In addition to this, ten construction professionals were interviewed. Interview is a method used to assess people's reactions to physical settings. It can be structured, where the type and order of questions are decided in advance or unstructured where the interviewer asks questions of interest while visiting a site. Semi-structured interviews lie between these two positions (Sanoff cited in

Okolie, 2009). The research employed the use of structured interview with ten project managers /site supervisors. This approach enhances the reliability of the results and the conclusions that were reached, due to the standardisation of questions asked (Haigh, 2008). In a related development, Hesse-Biber and Leavy (2011) are of the opinion that standardising the interviews ensures comparisons to be made between the interviewees. All interviews were conducted in English language and each lasted for about 35 minutes per project supervisor and was recorded using sound recorder.

For the purpose of this research, small and medium sized construction firm with staff strength between 10 to 199 employees were considered (SMEDAN Abuja, 2007). Site supervisors and sites workers were observed on twenty (20) selected construction sites. The first ten (10) sites were observed with professional supervision while the second ten (10) sites were observed with non-professional supervision (foremen). The study considered duplex structure of four and five residential buildings with Gross Floor Area GFA ranging from $200m^2$ to $470m^2$.

Professional supervision in this context refers to supervision carried out by people who had attended tertiary education in construction related courses such as Architecture, Building, Quantity Surveying, or Civil Engineering and have attained corporate membership of their bodies with at least 5 years of working experience in the construction industry. Non-professional supervision (trades foremen) are supervision carried out by those who had acquired all the required trade test 1, 2, 3 and reasonable length of experience in their trades before being so appointed as trade foremen in their organizations, and they are leaders of their respective trades such masonry, carpentry and joinery, steel bending, painting and interior decorations, plumbing and electrical works (CORBON & NIOB, 2010).

The construction activities observed were foundation excavation, block laying, casting of columns and beams which were achieved 100% for the ten sites with professional supervision and ten sites without professional supervision observation, plastering was achieved 50% for the two categories of supervision observed, while painting only 30% was achieved in terms of completion. Checklist from CORBON (2011) was modified and used to determine the adherence level of quality of the activities observed. Paired samples T-test (this is applicable to sample size that is less than 30) at 95% confidence interval was used in analysing the results obtained from the observations and measurements that formed the basis for the conclusion reached and the recommendations made.

4. FINDINGS AND DISCUSSION

In this section, authors should discuss all the findings emerging from conducting the investigation so far. Even for early stages of research (e.g. the article may only aim to report an initial literature study), what have been

synthesised from the literature should be discussed. This may be done by highlighting the similarities and/or differences from a variety of literature sources on the issues being investigated and the contextual nature of the similarities / differences (such as geographical locations, culture or many other factors that may influence the discussion in those different literature sources).
The results and discussion are as presented in the following section.

Table 1: Observed productivity per labour with professional supervision in 8 hour per day

Activities	Unit	Mean	Site I	II	III	IV	V	VI	VII	VIII	IX	X
Foundation	M^3	0.886	0.842	0.866	0.876	0.847	0.904	0.933	0.837	0.866	0.958	0.928
Blocklaying	M^2	0.899	0.963	0.850	0.875	0.825	0.913	1.013	0.938	0.900	0.863	0.850
Column &beam	M^3	0.116	0.117	0.117	0.117	0.111	0.117	0.117	0.117	0.111	0.117	0.117
Plastering	M^2	2.732	-	2.734	-	-	2.715		2.726	-	2.738	2.749
Painting	M^2	7.685	-	7.856	-	-	7.020		8.100	-	-	7.763

Table 2: Observed productivity per labour with non-professional supervision in 8 hour per day

Activities	Unit	Mean	Site XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
Foundation	M^3	0.883	0.838	0.923	0.829	0.876	0.933	0.848	0.895	0.904	0.866	0.914
Blocklaying	M^2	0.887	0.913	0.775	0.838	0.863	0.888	0.963	0.925	0.850	1.013	0.837
Column &beam	M^3	0.115	0.117	0.117	0.117	0.117	0.111	0.117	0.111	0.117	0.111	0.111
Plastering	M^2	2.723	2.730	-	-	2.708	-	2.736	-	2.719	-	-
Painting	M^2	7.470	8.370	-	-	6.615	-	-	-	7.425	-	-

The results of the site observations and measurements are shown in Tables 1 and 2. When compared across sites, it was discovered that the mean observed productivity of blocklayers in sites I to X were higher than that of sites XI to XX. In the laying of 225mm sandcrete blocks for example, the mean productivity in

sites I to X (Table 1) was 0.899 m^2 per man-hour while it was 0.887 m^2 per man-hour for sites XI to XX (Table 4.1). For the plastering the mean productivity was 2.732 m^2 per man-hour and 2.723 m^2 per man-hour for site I to X and sites XI to XX respectively. While casting of columns and beams, the mean productivity was 0.116 m^3 per man-hour and 0.115 m^3 per man-hour for sites I to X and sites XI to XX respectively. The significantly higher level of productivity achieved in sites I to X could be attributed to the observed professional supervision impact on the sites workers (sites I to X). The supervision was assumed to have established close monitoring, training programmes, simple and efficient communication among employee as well as with link parties and adopted motivational measures to increase workers morale. The result corroborated Ameh, and Osegbo, (2011) study which stated that contractors and subcontractors should ensure adequate training and supervision of the operatives on construction sites as it would improve on the quality of output as well as minimize the chances of doing wrong work or even application of wrong construction method by the workers. It also lends credence to Fischer (2009) study which implied that effective delegation of responsibilities and management of required number of workers by the supervisors will give better performance and increase in productivity. Construction labour productivity improves as construction supervision is provided. The additional supervision has the effect of reducing the construction gang sizes, idle time and is usually associated with defined construction packages to be executed (Merrow *et al*., 2009).

Table 3: Paired samples T-test of labour productivity with professional supervision and non-professional supervision

Variable		Correlation	Degree of freedom	P-value	Remark
X (Professional)	Y (Non-professional)	1.00	4	0.315	NS

Key SS = Statistically Significant NS= Not Significant

Inference drawn from these observations was that, no significant difference existed between the labour productivity with professional supervision and non-professional supervision at 95% confidence level**.** The inferential statistics lay credence to the opinion held by many clients in that the same results will be obtained when non-professionals are given construction projects to handle as supervisors. This may be the reason why quackery may be difficult to eradicate any time soon with the attendant consequence of incessant building collapse within the construction industry if this held belief is not changed.

Table 4: Adherence level on foundation excavation with professional supervision

Variable	Site I	II	III	IV	V	VI	VII	VIII	IX	X	Mean	Ranking
Are Anti termite treatment apply on the excavated surfaces of foundation?	4	1	3	5	1	3	3	5	4	3	3.2	3rd
Are the levelling and compaction of bottom of excavation done?	5	4	4	4	3	3	4	4	5	5	4.1	2nd
Are the foundation width of 225mm thick block work appropriate (675mm)?	5	5	5	5	4	5	5	5	5	5	4.9	1st

Rating scale used: High adherence-5; adhere-4; moderately adhere-3; slightly adhere-2; no adherence-1

Table 5: Adherence level on foundation excavation with non-professional supervision

Variable	Site XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	Mean	Ranking
Are Anti termite treatment apply on the excavated surfaces of foundation?	1	3	4	3	1	2	1	3	1	2	2.1	3rd
Are the	4	3	2	3	4	4	3	4	3	5	3.5	2nd

levelling and compaction of bottom of excavation done?												
Are the foundation width of 225mm thick block work appropriate (675mm)?	5	4	5	5	4	5	5	4	4	5	4.6	1st

Rating scale used: High adherence-5; adhere-4; moderately adhere-3; slightly adhere-2; no adherence-1

The results of the foundation observation adherence to quality are shown in Tables 4 and 5. When compared across sites, it was discovered that the mean adherence to quality of foundation excavation in sites I to X are higher than that of sites XI to XX. For example, the mean of adherence to quality for foundation width of 225mm block (675mm) with professional supervision in sites I to X (Table 4) was 4.9 while it was 4.6 for sites XI to XX (Table 5). For anti-termite treatment applied on the excavated surfaces of foundation, the means adherence to quality were 3.2 and 2.1 for sites I to X and sites XI to XX respectively. The same trend was observed in other activities as contained in the 2 Tables. Raji and Firas (2011) stated that quality management of works means checking and judging site works against the required specifications; before, during and after the completion of the works.

Table 6: Paired samples T-test of adherence level of quality in foundation excavation with professional supervision and non-professional supervision

Variable		Correlation	Degree of freedom	P-value	Remark
X (Professional)	Y (Non-professional)	0.999	3	0.104	NS

Key SS = Statistically Significant NS= Not Significant

Based on the paired samples T-test above, it shows that no significant difference existed between adherence level of quality in foundation excavation with professional supervision and non-professional supervision.

Table 7: Adherence level of quality in 225mm blocklaying with professional supervision

Variable	Site I	II	III	IV	V	VI	VII	VIII	IX	X	Mean	Ranking
Are the bonding adequate up to 12.5mm thick?	5	5	5	4	5	4	4	5	4	4	4.5	3rd
Do they form Stretcher bond or just stack arrangement?	5	5	5	5	5	5	5	5	4	5	4.9	1st
Are the mix ratio of mortar uniform?	4	5	5	5	4	4	4	5	5	4	4.5	3rd
Are the masons using wall range and builders levels to check against bulging?	5	4	5	5	5	5	4	5	5	5	4.8	2nd

Rating scale used: High adherence-5; adhere-4; moderately adhere-3; slightly adhere-2; no adherence-

Table 8: Adherence level of quality in 225mm blocklaying with non-professional supervision

Variable	Site XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	Mean	Ranking
Are the bonding adequate up to 12.5mm thick?	4	5	4	3	3	4	5	5	3	4	4.2	2nd
Do they form Stretcher bond or just stack arrangement?	5	5	5	4	5	4	5	5	4	5	4.7	1st
Are the mix ratio of mortar uniform?	4	5	4	3	4	5	3	4	3	4	3.9	3rd
Are the masons using wall range and builders levels to check against bulging?	4	4	3	4	3	5	4	5	3	4	3.9	3rd

Rating scale used: High adherence-5; adhere-4; moderately adhere-3; slightly adhere-2; no adherence-1

Comparing the results across sites, it was discovered that the mean adherence to quality of 225mm block laying in sites I to X are higher than that of sites XI to XX. For example, the mean of adherence level of forming stretcher bond on sites I to X (Table 7) was 4.9 while it was 4.7 for sites XI to XX (Table 8). For the uniformity in mix ratio of the mortar used, the mean adherence levels were 4.5 and 3.9 for sites I to X and sites XI to XX respectively. The same trend was observed in other activities as contained in the two Tables.

Table 9: Paired samples T-test of adherence level of 225mm blocklaying with professional supervision and non-professional supervision

Variable		Correlation	Degree of freedom	P-value	Remark
X (Professional)	Y (Non-professional)	0.456	3	0.051	SS

Key SS = Statistically Significant NS= Not Significant

Since the calculated p-value of 0.051 is equal to critical p-value of 0.05, it can be concluded that significant difference existed between adherence level of 225mm in blocklaying with professional supervision and non-professional supervision. From the authors' personal experiences, many foremen serving as supervisors had masonry background in most cases. Due to the supposed 'proficiency' they have acquired over the years, they might lower their guard during supervision thereby compromising adherence to quality.

Table 10: Site Control

Interviewees	**Site control to achieve effective labour output**
Supervisor one	Ensure good relationship with workers and apply factors of motivation.
Supervisor two	Ensure proper coordination of work and control of the use of materials and equipment.
Supervisors three	Involvement of experienced professionals, have a proper planning and good division of work schedule.
Supervisor four	Friendliness, good supervisor-workers relationship, and motivation were necessary.
Supervisor five	Assigning duties to workers and ensure close monitoring.
Supervisor six	Site should be well secured through fencing
Supervisor seven	Always work with competent labour on the site.
Supervisor eight	Ensure regular payment of workers, work breakdown schedule and close monitoring.
Supervisor nine	Good skill labour should be employed. Specialised work should be assigned to the right people.
Supervisor ten	Keep careful checking of project activities over a period of time and principle of division of labour

The responses of the interviewees' corroborated Fagbenle *et al*., (2012) findings

that training/retraining is not the only factor that has positive contribution on productivity, equal attention should be paid to other factors such as monetary and non-monetary incentives, organizational procedures and planning, scheduling, control and supervision of workers as well as general management. It also lends credence to Hammad *et al*. (2011)'s study on ways to improve productivity in the construction industry.

Table 11: Decision Making

Interviewees	**Involvement of workers in making decision**
Supervisor one	Through meeting with their heads.
Supervisor two	Sharing ideas with workers during work.
Supervisors three	Inviting their foremen for meetings and allow for freedom of expression.
Supervisor four	Through training.
Supervisor five	By explaining and showing workers what to do.
Supervisor six	Assigning responsibility to every worker and their heads should be involved in meetings, while sometimes, seek for their opinions.
Supervisor seven	Attaching the less experience worker with the more experience ones to share ideas.
Supervisor eight	Through training on how to carry out some specialty work.
Supervisor nine	Through site meeting, by interacting with workers at the process of the work, and through training.
Supervisor ten	Through good communication and meetings.

The result corroborates the findings of Hammad *et al*. (2011) that the key to improving productivity is to train the crew. This is especially for construction supervisors, whose knowledge and skills can make or break a project in sound management principles and techniques. Equally, weekly staff meeting is recommended among the project manager, the project superintendent and their assistants.

5. CONCLUSION AND RECOMMENDATION

The paper examined professional and non-professional supervision in relation to labour productivity and adherence to quality on construction sites in Abuja. Findings showed that there was no difference between the sites supervised by professionals and non-professionals in terms of labour productivity. In a related development, there

was also no difference in terms of adherence to quality between the sites supervised by professionals and non-professionals. However, adherence level to quality when laying 225mm blocks on sites supervised by professionals and non-professionals was found to be different using paired samples T-test at 95% confidence level. Based on these results, quackery may continue to plague the Nigerian construction industry if clients held belief is not changed and construction foremen are not trained to meet up with the demands of the industry. Non-professionals such as foremen should be trained and certificated by Council of Registered Builders of Nigeria (CORBON) in order to improve supervision and by extension productivity on construction sites. This will to a large extent bring the incidences of building collapse under check and the industry will become better sanitised. In addition to this, clients should be enlightened on the dangers inherent in patronising quacks since it is at times difficult to identify the professionals by the clients.

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Residential Property Value and Security Features in Gated Communities

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Abstract

In recent times, the fear of crime is growing globally including Nigeria. The more the fear grows the greater the reaction to address it. People are becoming more security conscious in their choice of residence. Some are turning to high walls and fences around residential areas. This has brought about the concept of gated community which is becoming the order of the day. If security is one cardinal reason for the gate, no single study has been able to look at the quantum of value contribution of this variable in gated communities (GCs). The study therefore examined the value contribution of security features on residential properties using the willingness to pay (WTP) and willingness to accept payment (WTA) models. The study adopted a survey method using snowball and captive sampling method to collect data that were analyzed with descriptive and inferential tools. A total of 124 questionnaires were administered on the resident households. Major finding showed that high security arrangements/features are ranked first & second as the determinant of the rental value paid in both gated communities observed. The conclusion is that security determines the willingness of consumers to pay and the decision of the investors to invest in gated community. The study therefore recommends that adequate security arrangements should be made available in gated community in order to ensure virile residential estate property value. .

Keywords: Gated community, Lagos, Nigeria, Residential property value, Security features, Willingness to pay

1.0 INTRODUCTION

The major goal aimed at in the provision of housing/dwelling unit is to give the user of the apartment value for money. This is not derived from the internal fabric of the apartment alone but also the level of presence of infrastructure in the neighborhood. Tse and Love (2000) viewed a residential property as a commodity that is multi-dimensional as they defined a house as a commodity that represents not only a collection of structural characteristics but also location-specific characteristics. Thus, a residential property is a combination of various variables and characteristics that produces value. While some consumers

look at accessibility to work, others look at amenities, yet some look at structural characteristics and environmental quality and some are interested in the neighborhood quality with emphasis on safety and security and so on. Usually, these preferences arises due to taste and experiences of would be consumer in previous other apartment or generally the prevailing public. These attributes usually sum up to become consumers' preference and investors takes them into consideration when they are to develop properties for investment purpose.

Our homes are the centers of our lives, where we are supposed to feel safe the most. As crime becomes more of a threat to that feeling of safety, people are becoming more security conscious in their choice of residence. Some are turning to high walls and fences as residential abode. Grant & Mittelsteadt (2004) citing Blakely and Snyder (1997); and Newman, (1995); asserted to this reality when they stated that Older neighborhoods in some cities are closing off streets to enhance local security and reduce traffic. In general, post modern cities are becoming more defended, and more defensible, than were industrial cities. What Ellin (1997) calls an ``architecture of fear'' is turning the urban environment into an enclosed and privatized realm. Those who can afford them are prime proponents of the latest methods to keep crime and criminals out. This however does not seem to be enough to curb the growing fear of crime. The need to prevent crime has become a dominant factor in our everyday living and choice of residence as people are reaching out to find additional ways not only to prevent crime but also to secure themselves if it occurs and one such a way is the enclosure of an entire neighborhood. This has resulted in most recent residential developments adopting the gated community style and even previously existing ones which were not gated became gated when threatened by incessant crime.

Golby (2011) however asserted that the current fast growth of this phenomenon has been predicated on the tripod of the desire for prestige, community organization and safety. This type of dwelling in the sub-urban and urban area has been in the mirror eyes of recent research work in urban design and a good number of researchers Mahgoub & Khalfani, (2012); Vesselinov, (2009); Grant & Mittelsteadt, (2004); Ajibola, Oloke and Ogungbemi, (2011); Le Goix & Webster (2008) are unanimous in their position concerning the cardinal reason for 'the gate' as being a value scoring point which gives the residents some sense of security whether real or perceived. Matloff (1995) citing an article in the *Christian Science Monitor,* corroborated this view when he intoned that "many suburban whites live in jail-like homes guarded by vicious dogs, razor wire, and armed security guards summoned by panic buttons." No matter how new this seems to be in terms of form, frame and sophistication, gated

community or enclave or fortress as it is variously referred to, is not a new phenomenon.

While its growth and popularity remains a global trend, there is no doubt about the growing spate of crime and insecurity in Nigeria including kidnapping and guerilla warfare being experienced in the country which has resulted in loss of lives and properties. Aderogba (2010) citing Mackay (2005) stated that people can be daunted by the "big picture" hence, choosing to bring their horizons (the family, the balcony, the street, the school, the weekend, the holiday) up closest to them as much as possible, mainly because the society is disengaged from politics, current affairs and social issues. The only alternative they have going for them to have control to some degree especially in terms of security of their lives and properties is achieved through the "gates" and "walls". This factor has become one of the selling point and marketing strategy of most developers as they build to meet up consumer needs especially in the residential real estate market.

The introduction of security checks in the form of gates comes with its own advantages and disadvantages in the overall property value index. This singular variable may not be the major reason why certain consumers prefer a neighborhood with a gate as a good number of authors (Ajibola et al, 2011; Aderogba 2010; Sanchez 2005 and Blakely & Snyder 1997) have also adduced motivations for residing in gates to include: fear of crime and desire for security; the need to live in an environment where people of like mind and status are; exclusivity; need for high quality living environment with recreational/leisure facilities; search for community; retreat from failing public government neighborhood; identity and social homogeneity. It was the submission of Ajibola et al, that the development and growth of GCs in Nigeria is more in response to the security challenges in urban centers in the country. If security is one cardinal reason for the gate, no single study has been able to look at the quantum of value contribution of this variable in GCs.

Arising from this background, the study examined the extent to which security features contributes to the determination of residential property values in gated communities, using Badore, in Ajah area of Lagos state, in Nigeria as a casestudy. To achieve this, the study adopted a survey method using snowball and captive sampling methods to collect data that were analyzed with descriptive and inferential methods. However, strict access to the communities is a major limitation in conducting the research. Finding revealed that high security arrangements/features are major determinant of rental value paid in the gated communities. It is expected that the finding would be beneficial to consumers in making choice and the investors in deciding to invest.

2.0 CONCEPTUAL AND EMPIRICAL ISSUES

The term value means different things to different people. This infinitude of meaning is the basic problem to the question "what is value?" However, as a general concept, value signifies the capacity of a commodity to satisfy some want or need. It defines utility (or satisfaction), among other things. Suffice it to say that a thing has value if it is useful or serves a purpose (Ifediora, 2005). Value is an enigmatic concept with infinitude of nuisances of meaning. Since the number of wants, needs or purposes is infinite, so also are the number of types of value is also infinite and also the variables that add up to command value in a good or service. For instance, the term value in economics has a precise definition – it is the price individuals are willing to pay in order to obtain a good or service. The basic economic concepts of supply and demand are employed to estimate willingness to-pay. Broadly speaking, value depends on the expectations and inputs of the human mind. The value of a property for instance to a particular purchaser or renter is therefore a function of many variables among which are the person's motive, expectation and estimate of the future benefits that would be derived from the property. (Ifediora, 2005). The determination of property value is a process that has been described as being more subjective than objective. This is because value of a property is subjected to a multitude of complicated influences. These influences according to Mackmin (1985) can be classified into those that are external and those that are internal to the property. External influences relate to the general state of the economy, population, employment, immigration, finance, location, transportation and neighborhood amenities. Internal influences are essentially the specific details of the property such as the size, accommodation, condition, design, layout, age, type and plot size (Adair et al, 1982).Generally, it is believed that individuals hold certain things dear to themselves and these things form their value bias which is reflected in their willingness to pay certain amount for a particular property in a particular location and/or neighborhood.

However, to a large extent, the determination of value have been hinged on such environmental factors as closeness to water body, amenities such as hospitals, schools, recreational parks and good roads amongst others. (Brown & Pollakowski, 1977). These however do not exhaustively represent all the variables there are to determining value. Hence the ability to know consumers' preference for residential property is prime in any property, especially new developments. Miles et al (2007) as quoted in Otegbulu, Osagie and Famuyiwa (2010) asserted that the excitement of identifying an unfilled human need and creating a product to fill it in a project is the stimulus that drives development. The best idea is the one that results in a product, which serves the user better, adds value to the community and does so at a profit. Whatever the type of development being proposed, several fundamental questions are basic for any

market research effort, which may include trends in the type of development, depth of the market and market perceived value as they sum up to become marketing points for most investors. Housing products evolve in response to market and consumer demands. A property is a commodity that is heterogeneous and distinguished by a wide variety of attributes.

A couple of studies have looked at the relationship between security and residential property value coming up with split opinion as to its effect on property value. In South Africa, Standish et al (2005) regressed 11 variables as major influencers of residential property value over a 10year period, security and crime was reported as the top 3 influencers that can lead to severe drop in residential property prices. Marco's study of New York's Bronx city however looked at the relationship between crime rate and residential rental value. The study revealed that in the city of Bronx, New York, crime rate is often high in prime location that commands high rental values. The criminals are well of the opinion that only the rich in the society would be able to afford the high rent. This further shows that there have to be some way of securing those prospects that would eventually reside in such locations.

In Ghana, Owusu-Ansa (2012) studied the determinants of housing values in urban area of Kumasi over a 6 year period, excluding security as a variable, the study revealed that housing characteristics such as number of rooms, floors, property age, location of the property, availability of garage, fence wall, swimming pool and land registration together account for 49% increase in residential property value in the study area. These variables were however lumped up without a clear demarcation as to those features that appear based on security reason.

Also, in a another study carried out in Onistha in the eastern part of Nigeria, Emoh, Oni and Egolum (2013) adopted 31 variables including security as determinants of residential land values in the study area. The outcome of the factor analysis found 18 variables as not being significant including security. The top five were accessibility, neighborhood quality, land title, zoning regulation and transportation. The outcome of this result can however be explained especially as to why security was not significant in the 15 locations used for the study. The explanation will not fall short of the fact that security may not be prime in mind of purchasers as at the time of purchase as it is just the land and what is uppermost in their mind is the title or the interest that exists in the land and then accessibility or location of the land. Security can become significant only when the land is developed and is put to use.

While the studies of Owusu-Ansa (2012) and Emoh et al (2013) seem to have played down the importance of security as a significant contributor to residential

property value, some other indigenous studies Aderogba (2010) and Ajibola et al (2011) however were unanimous in their position about the importance of security as a value contributory variable in residential property

2.1 Meaning and Historical Background of Gated Community (GC)

Whilst the name given to a GC differs from country to country, so also is its form and characteristics and according to Mahgoub & Khalfani (2012), there are different reasons for their development in relation to security, ethnicity and prestige. The nomenclatures given to this residential development type is as varied as the definitions offered by various authors. These nomenclatures include: "doors" as referred to by Shimmel (1994), "bridge and door" and "enclaves" as defined by Wetering (2002); Low (2003) called them Gated Residential Development (GRDs); Giglia (2003) viewed the phenomenon as "closed spaces"; Grant and Mittelsteadt (2004) refers to it as "gated community"; Ajibola et al (2011) referred to it as either "security village" or "enclosed neighbourhood" and Golby (n.d) calls it "fortification" regardless of the nomenclature, the concept remains the same and the gate is a common feature hence, this study adopts the term "gated community" and subsequently (GC).

Grant & Mittelsteadt (2004) viewed GCs as a spatially defined residential community with some shared amenities and thus the potential for developing social networks. Furthermore, Quintal & Thompson (2007) in their study defined GC as a residential development characterized by a focus on physical security measures such as gates, walls, guards and closed-circuit television cameras. A common feature is a perimeter fencing which encloses the development. Other devices such as vehicular and human access restriction by use of gate, booms are further put in place and access controlled by use of access card or pin code, car sticker, resident's identification and security personnel. Also the use of patrol guards, alarm systems and panic buttons; trained dogs; electric fencing and spikes amongst others. Sanchez, Lang & Dhavale (2008) further describe them as a community entirely surrounded by physical walls with gates, and sometimes restricted entry with guards or other means of access control.

What however is constant in the various definitions offered in previous studies is the fact that GCs are residential developments characterized by perimeter fence with a major access gate. This is meant to control entry and exit of persons; especially non-residents and characterized with the presence of shared amenities.

In time past, settlements were usually close to mountains, valleys or mot, rivers and the likes which serve as natural barrier from the invasion of enemies especially during periods of war. Aderogba (2010) commented that there is little

doubt from archaeological evidence that the early human settlements in the Nile river valleys were walled against hunter-gatherer tribes that roamed the deserts foraging for food. History has it also that the Roman Empire popularized the trend due to the several territories she conquered. The wealthiest Romans built compounds for their families and entourage outside the polyglot city. The walls were built to protect the Romans from potential dangers of those they perceived as lower classes who inhabited the city that kidnapped and stole from the wealthy. Furthermore, as mirrored by Christensen & Levinson (2010) during wars fought outside an originally conquered territory, the Roman government found it increasingly difficult to gather all her warriors back. This was because most of the warriors were treated as third class citizens and slaves thus after war they preferred to otherwise remain in conquered territories. They are eventually rewarded with land and some amount of other resources including slaves that would serve them. There, they build and establish themselves, but because they were the minority group, they fortify themselves by walling up their compound to make access difficult to external wards. This trend was first noticed in England were retired Roman soldiers built gated/walled communities as early as 300BC (Blakely & Snyder, 1997). This eventually became a trend for both the Royal and wealthy English families even after the exit of the Romans. It is now a global trend, although with little modifications from country to country based on a country's social, political, legal and architectural/cultural inclination.

2.2 Study *Area*

Badore in Ajah was adopted as the study area. Two gated estates the Cooperative Villa estate and Unity Estate which are two estates standing side by side each other were used including the streets abutting the two estates were also used. Badore is one of the fastest growing locations in the Lekki-Epe axis of Lagos state a region that is reputed for large concentration of housing estate as the area is opening up.

Historically, the Cooperatives Villa estate gave birth to the Unity estate as the neighborhood was not originally designed to be a GC but due to her proximity to Cooperatives Villa and the problem of flooding the residents were having which they felt was caused by the residents of Cooperatives Villa, the residents association came together and chartered a new cause and identity for themselves. They constructed their drainage and also road and then built a gate at the major entrance of the neighborhood which is manned 24 hours by corporate security guards. It have lesser security features vis a vis Cooperatives Villa and while there is only one access way in and out of Cooperatives Villa, the same cannot be said of Unity estate which have more than one exit points.

The abutting streets or neighborhood are characterized by free entry and exit both by residents and non-residents. This is so since they are without gates

which are supposed to restrict movement. Their roads are not tarred and there is also the absence of drainages.

3.0 RESEARCH METHOD

The research adopted the survey method. The study population comprised of the resident households of Cooperatives Villa Estate and Unity Estate (both of them are gated estates) and the two streets in the neigbouring community abutting both estates. 250 questionnaires were prepared for the resident households of the study area and 50, 100 and 100 questionnaires were distributed to residents in Cooperatives Villa, Unity Estate and Neighbouring community and the following were retrieved 32, 41 and 51 residing in Cooperative Villa Estate, Unity Estate and the neighboring community.

Two sampling methods were adopted in the administration of the questionnaire namely the snowball sampling method and the captive sampling method. The snowball sampling method was used to gather information from those households in Cooperatives Villa because of the difficulty in accessing them in hence referrals were needed to access the residents. For Unity Estate and the abutting streets, the captive sampling method was employed and this was achieved by visiting the residents on their residents' meeting day which happens to be on sanitation Saturday and questionnaires were administered on the households' heads/representatives that were present during the association meeting. Data collected include socio-economic characteristics, factors that determine rental value, factors that attract residents to the estates, crime incidence, crime preventive measures, security responsiveness, rent paid and neighbourhood satisfaction level. Descriptive (such as frequency, percentages, mean) and inferential statistics (ANOVA) were used for the data analysis.

4.0 RESULT AND DISCUSSION

Table1 below descriptively looked at the characteristics of the respondents. The table reveals that varying degree in the employment sectors of the respondents across the three study locations. In Cooperatives Villa there are more of Oil & Gas sector workers residing there while Unity Estate have more of self employed and others as residents and the abutting streets have more of Finance/Insurance workers. with respect to duration of stay the statistics reveals that the two estates are newer compared to the abutting streets as majority of the respondents from the abutting streets have lived there an upward of 21 years while majority of the respondents in Unity estate have lived there for less than 5 years and the majority in Cooperatives Villa estate have lived there for between

5 and 10 years. Furthermore, more of the respondents in the estates live in detached houses (for majority in Cooperatives Villa) and duplex/semi detached (for majority in Unity Estate) but an evenly split percentage of those in the abutting streets live in flats and bungalows. Lastly, there are more tenants than property owners in both Unity Estate and the abutting streets while there are more property owners as respondents in Cooperatives Villa than tenants.

Table 1. Respondents' Characteristics

	Cooperative Estate		Unity Estate		Abutting street	
	Freq.	%	Freq.	%	Freq.	%
Employment sector						
Military/Para-Military					8	15.7
Finance/Insurance	5	15.6	6	14.6	14	27.5
Oil & Gas sector	12	37.5	5	12.2	8	15.7
Telecommunications	5	15.6	-	-	11	21.5
Federal/state ministry	-	-	6	14.6	-	-
Self Employed	9	28.2	12	29.3	8	15.7
Others	1	3.1	12	29.3	2	3.9
Duration of stay in the estate						
< 5 years	5	15.6	22	53.7	5	9.8
5-10 years	17	53.1	13	31.7	10	19.6
11-15 years	10	31.3	6	14.6	2	3.9
16-20 years	-	-	-	-	4	7.8
21 years and above	-	-	-	-	30	58.9
House type						
Flat	-	-	5	12.1	24	47.1.8
Duplex/Semi Detached house	7	21.9	22	53.7	3	5.8
Bungalows and semi/detached bungalow	11	34.4	10	24.4	24	47.1
Terrace house	1	3.1	-	-	-	-
Detached house	13	40.6	3	7.3	-	-
Others	-	-	1	2.5	-	-
Resident's status						
Tenant	3	9.4	26	63.4	45	88.2
Owner	29	90.6	15	36.6	6	11.8

Osagie and Ilechukwu, 2015

Table 2 below, looked at the factors that determine value. The table revealed that a high security arrangement in the estate (with average score of 4.57) is the

major value determinants of residents to Cooperative estate. Serenity of the estate and quality of accommodation and its services were ranked second (3.93) and third (3.92) respectively. Similarly, security was placed on the important scale in Unity Estate. In this particular estate, high security arrangements was scored 4.13 and ranked second to location (with 4.15). The third in the ranking is the quality of accommodation and its services. On the other hand, respondents from abutting streets ranked high security arrangements lowest in rental determination with a mean rating of 1.00. Location was ranked the most important factor that determines rental value in the abutting streets with a mean rating of 4.88. An important trend in the result shows that the level of infrastructural facilities also enjoyed appreciable consideration across the three study locations as it ranked 4th in cooperative villa and abutting streets (with mean of 3.64 and 2.35 respectively) but a distant 6th (3.08) in unity estate.

As a means of confirming the responses of respondents in the previous question, the research also asked rank major motivating factor responsible for their choice of residence. Security of estate was a major motivating factor in cooperative villa (6.36 ranking 1st) as against the low scores it recorded in unity estate (3.35 ranking 7th) and abutting street (2.77 ranking 6th). The low score recorded in unity estate can be explained because the estate did not start as a GC but it metamorphosed after sometime. However, the outcome of the responses validated the objectivity of the responses in the previous question. (See Table 3) Furthermore, the level of crime incidence in the study areas was sought (Table 4). The low scores from cooperative villa and unity estates suggests rare occurrence of any of the listed crimes, while relatively high scores obtained from the abutting streets is an indication of frequent incidence of crime most especially car vandalism, armed robbery, car theft and burglary.

Table 2. Factors that determine rental value

	Cooperative		Unit		Abutting street	
	Mean	Rank	Mean	Rank	Mean	Rank
The location where the estate is situated	2.85	7	4.15	1	4.88	1
Quality of accommodation and its services	3.92	3	4.04	3	4.37	2
Quality of the cleaning services of common parts	3.46	5	2.65	7	4.00	3
Level of infrastructural	3.64	4	3.08	6	2.35	4

facilities						
Serenity of the estate	3.93	2	3.23	5	2.05	5
Aesthetics/beauty of the estate	3.36	6	3.35	4	1.92	6
High security arrangements of the estate	4.57	1	4.13	2	1.00	7

Osagie and Ilechukwu, 2015

Table 3. Factors that attract residents to the estates

	Cooperative		Unity		Abutting street	
	Mean	Rank	Mean	Rank	Mean	Rank
Security of the estate	6.36	1	3.35	7	2.77	6
The social status of the residents	3.38	7	4.20	5	4.17	5
The prestige that comes with living in the estate	3.69	5	4.56	2	5.71	3
The level of infrastructural facilities in the estate	3.86	4	4.46	3	2.23	7
Closeness of the estate to children school	6.28	2	4.43	4	4.95	4
It was the only option open at the moment	1.86	8	5.68	1	6.62	2
It was the best option financially	3.43	6	3.88	6	7.85	1
Closeness of the estate to work	5.31	3	2.85	8	1.45	8

Osagie and Ilechukwu, 2015

Table 4. Crime incidence in the study location

	Cooperative		Unity		Abutting street	
	Mean	Rank	Mean	Rank	Mean	Rank
Car vandalism	1.43	2	1.76	3	3.83	1
Armed robbery	1.07	10	1.85	2	3.57	2
Car theft	1.14	8	1.64	6	3.17	3

Burglary	1.79	1	1.88	1	3.07	4
Physical assault	1.36	3	1.72	4	2.90	5
Pick pocketing	1.14	8	1.72	4	2.90	5
Kidnapping	1.29	5	1.16	10	2.29	7
Vandalization of infrastructure	1.36	3	1.42	7	2.02	8
Rape	1.29	5	1.20	9	1.10	9
Assassination	1.21	7	1.24	8	1.05	10

Osagie and Ilechukwu, 2015

Table 5 records the provision of preventive measures that are in place in the study locations in order to forestall the activities of criminals. In the abutting streets, all the measures enumerated were 100% not provided except "installation of security alarm" which have a low 2.2% in provision and other forms of security arrangement was 95.6% provided; no security check-points; no security patrols; no CCTV; no vehicle checking; no policing. On the other hand, the two estates to some level made provision of these measures. cooperative villa has 100% level of provision for security check-points, security patrols and prevention of unauthorized persons and vehicles, while unity estate has 100%, 55.6% and 44.4% level of provision for the similar preventive measures as cooperative villa, accordingly. CCTV and policing were provided at 50% and 57.1% in cooperative estate while they are at 11.1% and 37% in unity estate.

The study further sought the perception of residents with respect to the relationship of security and rental value; and crime prevention. Table 6 revealed that there is high level of agreement to the three assertions in both cooperative villa and unity state showing a good relationship between the gate and rental value and effectiveness of the gate in curbing crime and by extension affecting the surrounding neighborhood. On the other hand, none of the assertions were agreed with by residents of the abutting streets.

In table 7, a one-way analysis of variance conducted to examine if there is significant difference in the crime incidence among the three locations is reported above. The test gives test statistics (F) significant at 5% level. Hence, crime incidences in Cooperative villa (M = 1.31, SD = 0.281), Unity estate (M = 1.56, SD = 0.318) and Abutting streets (M = 2.03, SD = 0.161) are statistically significantly different. This, tallies with the outcome of table 6.

Response was only provided by respondents in Cooperative villa and Unity estate on the effectiveness of security measure provided. The analysis of the data gathered gives the outcome provided in table 8. In the two estates, five security measures are provided namely security guard (corporate), security guards (private), CCTV, Vigilante groups and the Nigerian Police. From the aforementioned, CCTV and corporate security guards are the most effective.

The CCTV with average effective score of 3.67 is ranked second most effective while corporate security guard with 3.93 is ranked first in the ranking, in Cooperative estate.

Table 5. Preventive measure to forestall criminal activities

	Cooperative		Unity		Abutting street	
	Provided	Not provided	Provided	Not provided	Provided	Not provided
Security check-points	100.0	-	100.0	-	-	100
Security patrols	100.0	-	55.6	44.4	-	100
Installation of security alarm	100.0	-	33.3	66.7	2.2	97.8
Use of CCTV	50	50	11.1	88.9	-	100
Prevention of unauthorized persons and vehicles	100	-	44.4	55.6	-	100
Policing	57.1	42.9	37	63	-	100
Others	14.3	85.7	18.5	81.5	95.6	4.4

Osagie and Ilechukwu, 2015

Table 6. Response as regards some security assertions

	Estate	Strongly disagreed	Disagreed	Indifferent	Agreed	Strongly Agreed
The cost of effective security in the estates is high and has led to high rental value	**Cooperative**	-	16.7	16.7	33.3	33.3
	Unity	-	3.7	22.2	59.3	14.8
	Abuting	69.0	31.0	-	-	-
Gating of the estate has proved effective in crime prevention	**Cooperative**	-	-	-	41.7	58.3
	Unity	-	3.7	3.7	55.6	37.0
	Abuting	63.2	36.8	-	-	-

There is less crime in this estate compared to surrounding neighborhood as a resulting of gating	**Cooperative**	-	-	7.7	53.8	38.5
	Unity	3.7	3.7	3.7	25.9	63.0
	Abuting	74.4	25.6	-	-	-

Osagie and Ilechukwu, 2015

Table 7 Variance test (ANOVA) on crime incidence

	N	Value	Std. Dev.	Degree of freedom	F-statistic	Sig
Cooperative Villa	14	1.31	0.281	2	214.015	0.000
Unity Estate	25	1.56	0.318	74		
Abutting streets	38	2.03	0.161			

Osagie and Ilechukwu, 2015

Table 8 Effectiveness of security measures in the study location

	Cooperative			Unity		
	Mean	Rank	Level of Effectiveness	Mean	Rank	Level of Effectiveness
CCTV	3.67	2	Effective	3.78	1	Effective
Security guards (corporate)	3.93	1	Effective	3.70	2	Effective
Vigilante group	2.85	5	Fair	3.54	3	Effective
Nigerian police	2.86	4	Fair	2.63	4	Fair
Security guards (private Maiguard)	3.00	3	Fair	2.58	5	Fair

Osagie and Ilechukwu, 2015

Table 9 Variance test (T-test) on effectiveness of security measures

	N	Value	Std. Dev.	Degree of freedom	t-statistic	Sig
Cooperative Villa	31	3.11	0.373	32	-0.587	0.562
Unity Estate	43	3.21	0.499			

Osagie and Ilechukwu, 2015

An independent sample t-test that examined significant difference in the level of effectiveness of security measures in place in the two estates is given above. The test statistic gives a very low value ($t_{(32)}$ = -0.587) that is statistically insignificant, p > 0.05. Thus, implying no significant difference in the effectiveness of security measures between Cooperative villa (M = 3.11, SD = 0.373) and Unity estate (M = 3.21, SD = 0.499).

Table 10 Estimated average rent and willingness to pay for improved security measures (in Naira)

	Cooperative Villa	Unity Estate	Abutting Streets
Average rental payment by tenant	800,000	920,000	1,237,500
Estimated average rental payment by owner	2,375,000	2,166,650	920,000
Willingness to pay for additional rent for improved security measures	16,249	14,999	25,951.50

Osagie and Ilechukwu, 2015

There is an inverse relationship between the average rent paid by tenants and landlords in the three study locations. Average rent paid by tenants experience increase from Cooperatives Villa, Unity Estate to the abutting streets increased. This is shocking however but on further enquiry, residents in abutting streets pay more in rent because they have to pay for their individual security on a monthly basis and also take care of other infrastructural needs not provided as against those in the gated communities where all these are collectively provided, hence reducing the cost. The relationship is inverse for the landlords where the perceived rent paid by them increases from cooperatives villa thru unity estate and then the abutting streets.

Statistically, respondents in abutting streets are willing to pay rent that is 59.7% higher when compared to those in the cooperative villa and 73.02% more in comparison to those staying unity estate.

Finally, with regards to willingness to pay for additional rent for improved security measures the respondents in the abutting streets are willing to pay more for security features vis a vis the other two estates that are gated and which have security features in them.

Table 11 Level of satisfaction for living in the estate (Neighbourhood)

	Cooperative		Unity		Abutting street	
	Frequency	%	Frequency	%	Frequency	%
Disappointed	-	-	2	4.9	-	-
Not satisfied	-	-	-	-	25	49.0
Fairly satisfied	-	-	10	24.4	15	29.4
Satisfied	8	25.0	10	24.4	9	17.7
Very satisfied	24	75.0	19	46.3	2	3.9

Osagie and Ilechukwu, 2015

With regards to the satisfaction level of the respondents, from table 11, it is evidently clear that more respondents from the GCs are very satisfied residing in the estate compared to those residing in the abutting streets of whom majority are not satisfied. Security may not be the major factor behind this the study however have shown that residents in GCs have a higher level of satisfaction vis a vis those in non-gated communities.

5.0 CONCLUSION AND RECOMMENDATION

This paper has examined the contribution of security arrangements to residential property value in gated communities (GCs). The research adopted a survey method whereby snowball and captive sampling methods were used to collect data. The results gotten from the data analysis showed that security arrangement factor is of high priority for the residents in determining the rental value paid. However, there are other factors such as location of children's school and closeness to work place that motivate the residents in the gated estates to pay. This is at variance with the estate that was not planned to be GCs from inception. This goes to show that there are actually a class of the residential property market that is concerned with security of their lives and property whilst considering other factors. Therefore, security issue is of great importance for the consumers to make their choice and the investors to make decision to invest.

The purpose for which GCs came to be in the founding days appears to still be same and the "gate" still serves as key marketing point for investors who are into residential property development. Whilst investors especially along the lekki-Ajah corridor (where there is a very high concentration of housing estates spring up) continue to look at this residential property development model, it is also important for them to note that the quality of infrastructure provided is key to alongside the security measures put in place. Also basic amenities should also be factored in as this is also a major selling point but it is also one which is

almost a missing feature in most GCs such as the ones examined in this study and it makes residents drive out of the estate on school run or hire a drive for that which becomes an additional cost to them on the long or pay for school bus that would be picking and dropping the children at home.

Be that as it may, the degree of security measures put in place goes a long way in determining the level of effectiveness of the gates and hence rental value. It is against this background that the paper recommends that security measures should be improved through adequate provision of CCTV, security guards, corporate guards, private security (known as mallams) and of course, Nigerian Police in the GCs. Such improvement will lessen crime but will lead to high rental value due to the cost of ensuring these security measures. Further studies, however, should be extended to commercial property value to see if security is a major determinant also.

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STRATEGIES FOR HOUSING AFFORDABILITY IN NIGERIA

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ABSTRACT

Population in urban areas are growing at a rapid rate, thus recycling of land becomes necessary despite that fact that land is a finite resource. The gap between supply and demand for housing is an issue for the government to address in order to provide housing at a cheaper rate which is the basic need of man. The purpose of this study is to assess the strategies for affordable housing in Nigeria. Research design was used and the population of the study was Architects, Quantity Surveyors, Engineers, Contractors and project managers. Random sampling technique was adopted for this study. A total of 70 questionnaires were distributed and 51 were returned. This represents a response rate of 73%. Statistical Package for Social Sciences (SPSS) was used for analysis via descriptive and inferential statistics. The study showed that problem of land inaccessibility, stunted financial and mortgage system were the factors affecting housing delivery. Challenges of housing delivery were high cost of acquiring land, social miscreants ("Omo Onile") and affordability. Anti-corruption measures and a responsive judiciary, Cost – saving house design, Land reforms/reviews of land use act and review of fiscal and monetary policies to reduce inflation and interest rate were the strategies to be used to ensure affordable housing. In conclusion, the Government should create an enabling environment for private sector by reducing the interest rate, taxes collected and creation of a viable housing mortgage sector to cater for the need of interested mortgage loan applicants. The use of the land should be constrained to affordable housing.
Keywords: Affordable, Housing, Land, Mortgage, Urbanization

1. INTRODUCTION

Nigeria population at the era of independence (1960) was 45,211,614 with an urbanization of 6, 967, 110. It gives an urban population of 15.4%. In the year 2016, the population had increased to 189, 139, 124 with an urban population of 49%

(Nigeria Population, 2016). The total land area of 910, 802km^2 could not take care of the increased in population. The United Nations estimates that Nigeria's population in 2005 stands at 141 million, and predicted that it would reach 289 million by 2050 (Campbell, 2012). Over 40% of Nigerians lived in urban areas, thus rapid growth in population creates demand pressure towards shelter and efficient supply and distribution of basic utilities such as transportation, water supply, health facilities, electricity and other services for the city dwellers which are provided by the Government (Enisan and Ogundiran, 2013).. With the recession period, Nigeria is experiencing, the Government is faced with challenges to provide housing for the masses especially for those in the urban areas. The effort had been made by the Government in the past (Mabogunje, 2002) but they are not adequate especially for the middle earners. However, the purpose had not been successful because those that need these housings could not afford it. Thus they tend to live in semi – urban areas, slum, and substandard accommodation.

The private sector had contributed about 90% of urban housing (Omole, 2001) to assist the government as a result of rapid growth in the urban areas. Despite this, the private sector is faced with the constraints of meeting up the supply of housing (Nubi, 2008). This is due to the cost of building materials, deficiency of housing finance arrangement, inflexible loan conditions from mortgage banks and government policies (Raji, 2008; Enisan and Ogundiran, 2013). According to Nubi (2008), land value and rents had increased ahead of inflation especially with this recessed economy of Nigeria where diversification is into infrastructure, mining and agriculture. Therefore there is a need to manage macroeconomic stability and pro – cyclical government expenditure pattern by improving non – oil growth performance and saving Nigeria's oil revenues for future use (Ayodele, 2013). As a result of inadequate housing, the sale of land and rentage is very high (Nubi, 2008).

Housing plays an important role in the development of any nation. It had been ascertaining as the basic need of a man (Makinde, 2013; Akinyode and Tareef, 2014). The challenges faced by Nigeria government in providing for housing is not peculiar to Nigeria alone, many developing countries are also faced with these challenges. Thus various strategies had been developed io help in providing housing at a cheaper rate. Previous studies on strategies are on cooperative housing model (Fasakin, 1998), land allocation system (Oduwaye, 1998) and financial model (Omole, 2001). This study intends to assess the significant strategies for housing affordability in Nigeria.

2. REVIEWS ON STRATEGIES FOR AFFORDABLE HOUSING DELIVERY

To address the myriad problems confronting sustainable housing provision, the following strategies are review from literature:

2.1 Public-Private Partnership (PPP)

The PPP housing model in Nigeria is largely similar to that of Malaysia, (AbdulAziz and Kassim, 2011), Australia (Thomas, 2009), South Korea (Choe, 2002) and India (Awil and Abdul-Aziz, 2006; Segpunta, 2005). Its emergence can be traced to the broader Nigeria National Privatization Policy (NNPP) and shift towards structural adjustment in the national economy. However, public-private partnership (PPP), allows the private sector to participate in the provision of affordable housing, It has been a notable feature in the recent past in terms of housing delivery mechanisms. PPP, a form of procurement originally entails the provision of public assets and services through collaboration between the government and the private sector. Grimsey and Lewis (2005) expressed the view that PPP will generally fill the space between traditionally procured government projects and full privatization. Akintoye et al. (2006) noted that this joint venture can assist in developing a project more quickly and efficiently than the government (public) would accomplish on its own. The collaborative effort between this sector and the government is generally believed to be beneficial as Li and Akintoye (2003) noted. It enhances government capacity to develop integrated solutions, facilitates creative and innovative approaches thus reducing the cost and time spent to implement the project, transfers certain risk to the private project partner, attracts larger productivity and more sophisticated bidders to projects while providing an avenue to access better skills, expertise and technology and also to produce an effective housing delivery to its citizens.

2.2 Site and Service Scheme

Site and services scheme is a programme carried out either by the government or private organization which involves facilitating a particular area with the essential infrastructural amenities so that private individuals or corporate bodies can carry out developments in such area at affordable cost. Site and service scheme basically relates to the need of establishing the dwellers as an active participant, in the total process of housing. It is one of the housing scheme requirements carried out mostly by governmental bodies as municipal services because in nature it is not more capital intensive compared with other schemes. Plots of land (or sites) with infrastructure on it (or services) were provided, and the beneficiaries had to, in most of the schemes build their own houses, ranging from the subdivided plots only to a serviced plots of land with a “core” house built on it. Site service scheme allows the owner of land to construct the house with a variety of building materials depending on his desires and preference as well as his income. In this scheme, residential plots are laid out with major infrastructural facilities such as road, schools, open spaces, health centers etc incorporated into the layout. It offers landless housing aspirants the

opportunity and hope of a services plot of land with prospect of home ownership as incentive towards house building. Site and service scheme are the provision of plots of land either ownership or land lease tenure along with a bare minimum of essential infrastructure needed for habitation (Oniyike, 2011). The legal framework for site and services scheme in Nigeria is in the National Housing Policy (NHP, 1991 cited in Magobunje, 2002). This policy document spelt it out as one of the strategies for assisting low income group; Provide sites and services to facilitate home ownership and orderly urban and rural development page 11 section 2.4 (ix) and for all income groups with emphasis on the low income group in the major cities in Nigeria page 16 section 3.7.2. (The National housing policy of 2004 cited in Magobunje, 2002). In the schedule of housing functions to public authorities, The National housing policy of 2004 (section 3.4.1a) assigned the responsibility of production of residential sites and services to the Local Governments (but this responsibility was pursued by majority of local government authority in Nigeria). This is however expected to be complemented by private sector that is expected to participate in the development of estates and houses for sale or for rent, or shared ownership. The philosophy behind the site and services facilities hinged on the fact that the medium and high income earners could easily source for funds and construct their own houses whereas the low income group may not find this easy. It was hoped that if the government develop sites and provide essential services, low income group could get allocation after paying some fees to cover what has been spent on the land and service provided and it will now be the task of the allottees to complete the houses at their pace and financial capability.

2.3 Land Reform/Review of Land Use Act

It is generally believed that the Government has abused the trust of the people as far as the Land Use Act cap 202 LFN 1990 was concerned (Oniyike, 2011). The Act has become an obstacle rather than an enablement to development and therefore needs to be reviewed to improve the availability of land for housing development. Nationalization of land should be reversed. The Land Use Act or any future land reform legislation should not form part of the Nigerian constitution; this will make any necessary amendment of the law easier to achieve thereby making the law responsive to the needs of the times. Apart from the problem of corruption and abuse of trust which has bedeviled the application of the Act, There is the ownership issue which rendered the use of bare land as security for loans very unattractive and risky to the financial institutions. The Act provides for compensation for unexhausted improvements. Revocation of the right of occupancy over undeveloped land technically does not attract any compensation except for the ground rent paid in the year of the revocation; The Government which graciously permitted you to occupy her land will not pay compensation when she takes back what

was hers in the first place. This, therefore, rendered bare land an unsafe and unacceptable security for a mortgage loan, thereby reducing the potential for raising funds for additional housing development. The requirement of governor's consent should be expunged from the Land Use Act to facilitate easy transfer, assignment and foreclosure of mortgages which are essential for the efficiency of the mortgage market. A new land reform which guarantees private ownership of property without compromising government's right of eminent domain is hereby proposed, to increase land availability and improve accessibility of funds for housing development.

2.4 Review of Fiscal and Monetary Policies

High inflation and high interest rates constitute a disincentive to property development and investment. With inflation rate at 7.7% and maximum lending rate at 12%, housing would be unaffordable to most Nigerians (Nubi, 2008). Inflation and interest rates must be reduced to single digits. The Government should work hard to achieve low inflation and low interest rates.

2.5 Creation of a Viable Secondary Mortgage Market

It is impossible to provide adequate and affordable housing without viable long-term lending arrangements, which can only be achievable if there is a viable secondary mortgage market. The secondary mortgage market is therefore a sine qua non for mass improvement in the availability of housing. Sustainable secondary market development cannot proceed unless and until the primary market is able to produce a sufficient volume of high quality mortgages to meet the servicing and performance requirements of investors (Li & Akintoye, 2000). There is need however to firstly amend all laws critical to housing investment to facilitate the issuance of housing-related instruments such as Mortgage-Backed Securities (MBS) and Real Estate Investment Trusts (REIT) which will be traded on the secondary mortgage market. The laws include the Land Use Act (Decree 6, 1978), the National Housing Fund Act 1992, the Federal Mortgage Bank Act (Decree 82, 1993), the Mortgage Institutions Act (Decree 53, 1989), the Trustees Investment Act 1962, the Nigeria Social Insurance Trust Act 1993, The Insurance Act 2002, The Investment and Securities Act 1999, the Federal Housing Authority Act 1990, Land Instrument Registration Act, and Conveyance (Mabogunje, 2002).

A new FMBN law should give legal backing to the bank to operate as a secondary mortgage institution with the right to issue mortgage securities. A new FMBN law should give the bank the authority to prosecute any defaulters, for non-payment, non-remittance, underpayment or under-remittance of NHF contributions. As observed by Omole (2001), the NHF contributions can be integrated into the personal income taxation system such that "a defined proportion of taxes paid are allocated to the housing fund pool, as is done in Singapore. The absence of a clear-cut foreclosure law

scares some investors and funding institutions from the housing sector. The very long delays in the disposal of cases in our law courts make property investment a nightmare to many investors. The adoption of the non-judicial foreclosure process in cases of mortgage contracts, as practiced in some countries, is essential for proper functioning of a secondary mortgage market in Nigeria (Akeju, 2007). The use of lands tribunals for such matters is hereby recommended. It is necessary to sound a note of warning that one of the causes of the subprime mortgage crisis in the USA was that due to securitization, mortgage loans with high risk of default could be originated, packaged and the risk readily transferred to investors in securities. The secondary mortgage market in Nigeria must be strictly regulated to avoid catastrophic consequences.

2.6 Creation of a National Credit Database

A nationwide credit database that can provide credit information of all individuals that enjoy financial services in Nigeria is not available (Akeju, 2007). As a result, the financial institutions in trying to establish the financial background and creditworthiness of the loan applicants, take several days or weeks to process most loan applications. A development of a nationwide credit database which will make credit scoring of prospective loan applicants possible has the potential to reduce the loan processing period to a matter of hours. It will also encourage the financial institutions to extend their loan facilities beyond the few well-known rich people the building up of the required databank and the associated networking in Nigeria will take some time. In the interim and until the national credit database is in place, the government should provide guarantees in form of mortgage insurance to lenders to encourage lending to the lower income people.

2.7 Cost-saving house designs.

A cost-to-design approach is necessary for low-cost housing to be achieved. Affordability must guide the designing of houses in the 21st century. According to Alao (2008), the starting point for the design of affordable housing unit is to establish the affordable rent for the area in which the project is to be located. Affordability through design also entails the determination of the best property development methods available to achieve cost reduction without compromising quality. The design must also be sympathetic to both the physical and cultural environment. A good design should aim at achieving affordability, marketability and durability of the finished product.

2.8 Cooperative Housing

An idea to housing development efforts in the African traditional setting is the pooling of resources to develop houses by members of a given social group for the benefit of their 3members. Members contribute into a common

pool for a pre-arranged order of housing development for members; this form of development strategy is most applicable among low-income earners for cheap, notwithstanding adequate low-cost housing.

2.9 Social Housing

Social housing refers to rental housing which may be owned and managed either by the State or non-profit organizations, or a combination of the two, with the aim of providing affordable housing. For majority of the low income earners rented accommodation, subsidized or non-profit, will provide the adequate and affordable accommodation. The Government should through direct funding provisions or negotiated tax waivers assist the housing corporations and certain private developers to provide social housing to alleviate the housing problems of majority of the urban low income earners.

2.10 Government Funded Infrastructural Development.

The Government should encourage increased housing development by providing access roads, power, and water and drainage facilities to proposed housing development areas. The developers will then channel available funds to provide the house's proper and thus quickly realize the houses.

2.11 Strict Development Control

The inability of the Government to enforce development control is one of the major reasons for the deterioration of housing and housing infrastructure in most urban areas in Nigeria. Development control should be implemented devoid of adverse vested interest, to ensure that good housing quality is maintained.

2.12 Research on Building Materials

Readily available local building materials should be studied and improved to render them suitable for producing cost-effective and durable houses. Such improved local materials will significantly reduce the cost of housing.

2.13 **Anti-Corruption Measures and a Responsive Judiciary**

Corruption militates against the success of housing delivery, The Nigerian nation has suffered greatly from corruption; best thought-out policies and projects have collapsed as a result of this national malaise, Contract costs are fraudulently inflated, Incompetent contractors are favored over and above experienced and capable hands, projects are sabotaged for narrow personal gains, etc. Bribery in whatever name is not good for the system. Badly-executed projects are certified satisfactory by corrupt Government and company officials. Whatever we are proposing for housing in the 21st century can only succeed as planned if corruption is kept under control (Oniyike,2011).The judiciary should be up and doing. Justice delayed is justice denied. Delays in the courts have turned profit-making projects to loss-making ones. The long arms of the law must be made to reach both the rich and poor alike. Justice in the housing industry must be quick and right because of the enormous cost implications of unnecessary

delays and injustice.

3. RESEARCH METHODOLOGY

Research methods are the various procedures, schemes and algorithms used in research while research methodology is a science of studying how research is to be carried out (Rajasekar, Philominathan & Chinnathambi, 2013). Research design entails the methods and procedures used to conduct scientific research. The study is a survey research, which involves the usage of cross – sectional survey design. Because data used in the study was made up of variables of the same sample observed at one point in time. The population of this study includes all stakeholders in construction industry sector of the economy in Lagos State especially, the Architects, Quantity Surveyors, Contractors, Project Managers, Estate Surveyors, Civil Engineers and Builders. The sampling techniques adopted for this study is random sampling method. This method was used because all the elements of the population have equal chance of been selected. A total of 70 questionnaires were distributed and 51 were returned. This represents a response rate of 73%. Data realized from the administration of the research instruments were analyzed and processed with the aid of Statistical Packages for Social Science (SPSS 17th). Data measured on the nominal scale were analyzed using descriptive statistics such as frequency distribution and percentages. The levels of importance of identified factors were determined by the magnitude of their frequency counts with the greatest frequency representing the most important factor.

4. FINDINGS AND DISCUSSION

4.1 Factors Affecting Housing Delivery

Table 1 shows the factors affecting housing delivery as rated by the respondents. The most important factors were problem of land inaccessibility (RII = 0.82), stunted financial mortgage system (RII = 0.79) and high cost of construction (RII = 0.78). It was followed by poverty level (RII = 0.77), government policies and slow bureaucratic procedures (RII = 0.76) and exorbitant prices of building material (RII = 0.76). The least important factors were statutory and bye-law (RII = 0.73) and developmental control (RII = 0.71).

Table 1: Factors affecting housing delivery

FACTORS	RII	Rank
Problem of land inaccessibility	0.82	1
Stunted financial and mortgage system	0.79	2
High cost of construction	0.78	3
Poverty level	0.77	4
Government policies and slow bureaucratic procedures	0.76	5
Exorbitant prices of building material	0.76	5
High population growth	0.75	7
Inadequate physical planning	0.74	8
Statutory regulation and bye-laws	0.73	9
Developmental control	0.71	10

RII = Relative Importance Index

4.2 Challenges of Housing Delivery

Table 2 indicates the challenges of housing delivery in Lagos state. The respondents were told to rate the challenges in order of level of importance. From the result, it reveals that high cost of acquiring land (RII = 0.85) as the most important challenges of housing delivery. It was followed by youth harassment of developers ("Omo – Onile") (RII = 0.81), affordability (RII = 0.81) and high cost of land registration titling (RII = 0.80). The least challenging factors affecting housing delivery were lack of government support in terms of infrastructural facilities to bring down the high cost of housing construction (RII = 0.70), lack of proper coordination of public agencies and law (RII = 0.70) and limited skilled worker (RII = 0.67).

Table 2: Challenges Of Housing Delivery in Lagos state.

Challenges of housing delivery	RII	Rank
High cost of acquiring land	0.85	1
Youth harassment of developers ("Omo - Onile')	0.81	2
Affordability	0.81	2
High cost of land registration titling	0.80	4
Lack of critical infrastructures in urban and rural area of the state	0.78	5
Lack of effective implementation strategies	0.76	6
Dependency on imported building materials which increases the overall construction cost	0.76	6
Lack of government support in terms of infrastructural facilities to bring down	0.70	8

the high cost of housing construction		
Lack of proper co-ordination of public agencies and laws	0.70	8
Limited skilled manpower	0.67	10

4.3 Strategies for ensuring Affordable Housing Delivery

Table 3 presents the strategies for ensuring affordable housing. From the table, Anti- corruption measures and a responsive judiciary (RII = 0.90) was ranks first. It was followed cost – saving house design (RII = 0.87), land reforms/reviews of land use act (RII = 0.83), review of fiscal and monetary policies to reduce inflation and interest rate (RII = 0.83) and Public Private Partnership (RII = 0.82). The least strategies for ensuring affordable housing were site and service schemes (RII = 0.79), strict developmental control (RII = 0.77) and creation of a national credit database (RII = 0.75).

Table 3: strategies for ensuring affordable housing delivery

Strategies	**RII**	**Rank**
Anti- corruption measures and a responsive judiciary	0.90	1
Cost – saving house design	0,87	2
Land reforms/reviews of land use act	0,83	3
Review of fiscal and monetary policies to reduce inflation and interest rate	0,83	3
Public Private Partnership (PPP)	0,82	5
Creation of viable secondary mortgage market	0.81	6
Research on building material	0.80	7
Co-operative housing	0.80	7
Site and service schemes	0.79	9
Strict developmental control	0.77	10
Creation of a national credit database	0.75	11

4.4 Discussion of findings

For National development of any nation, the government should be able to provide for housing which is an importance necessity next to food and clothing. Though from this study, land inaccessibility, stunted financial and mortgage system, high cost of construction, poverty level, government policies and slow bureaucratic procedures, exorbitant prices of building material and high population growth has been seen as the major factors affecting housing delivery. High cost of acquiring land, youth harassment of developers ("omo-onile"), affordability, and high cost of land registration titling, lack of critical infrastructure in the urban and rural area of the state is

described as the fundamental challenges affecting housing delivery. The studies of Daramola (2004) and Raji (2008) identified high cost of building materials as a major factor affecting housing delivery. The strategies for ensuring an effective housing delivery are anti- corruption measures and a responsive judiciary, cost saving house design, land reforms/reviews of land use act, review of fiscal and monetary policies to reduce inflation and interest rate, Public Private Partnership (PPP) and research on building material among others.

5 CONCLUSION AND RECOMMENDATIONS

As a result of people relocating from rural to urban areas, limited availability of land are available to accommodate the increased population of urbanization, thus the government and the private sectors need to strategize to meet the increased demand for housing. Some of the challenges to housing delivery are related to the economic and political environment, problem of high cost of acquiring land, youth harassment of developers (omo - onile), affordability, poor remuneration and low minimum wages of workers resulting in low purchasing power that unattractive to developers, escalating high cost of building material, high profit driven attitudes of the private developers arising from high cost of fund or finance among others. To redress this problem the government must create an enabling environment for the private sector to act as the engine of growth in the housing sector. Such enabling environment as pointed out in the body of the research must necessarily include the reduction of interest rates and the creation of a viable secondary mortgage sector to cater for the need of interested mortgage loan applicants amongst other steps needed to be taking by government to tackle the problem of housing delivery in the state. In addition, the government should create a bye-law to eradicate the social miscreants ("omo – onille") and anti- corruption practices on the land approval documents.

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URBAN SUSTAINABILITY TRANSFORMATIVE EFFECTS OF GREEN ENERGY INFRASTRUCTURAL TECHNOLOGIES IN THE AFRICAN CONTINENT

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The African continent just like others has joined a band wagon in the adoption and use of technologies that promote the production of green energy. Among the renewable energy infrastructure technologies worth noting is the landfill-gas to electricity investments that have been embraced by a few African countries since the advent of the new millennium. The technologies have been adopted not only to improve economic performances of the African continent but also to realise social and environmental benefits that accrue from the innovations. This article assesses the urban sustainability benefits that have been realised in South Africa and Cote D'lvoire as a result of the transformations that have taken place in green energy infrastructural technologies. Specifically, the study applies case study research designs and mixed method approaches to understand the socio-economic and environmental benefits that have been realised through the adoption and application of landfill gas to electricity generation and supply infrastructural technologies in two cities of eThekwini (South Africa) and Bingerville (Cote D'lvoire). Interviews, photographic surveys and focus group discussions helped to reveal that innovative projects have resulted not only in improved municipal solid waste management but more importantly urban environmental conservation, social and economic and improvements particularly of the urban and impoverished families that participate in the projects. To this end, the paper recommends the adoption and scaling up of innovative infrastructural technologies in renewable energy projects. Lessons that are being learnt from the best practices need to be replicated in other African countries and similar projects need to be encouraged, initiated and supported.

Keywords: Climate change, green economy, innovation, renewable energy, sustainability.

1 INTRODUCTION

The relentless decline of traditional energy sources; related price volatilities and environmental impacts associated with the heavy utilisation of oil and coal for industrial and domestic purposes have imperatively raised the need for the search, development, adoption and use of alternative energy sources (Hall *et al*., 2014). Consequently, the world over, there has been a gradual shift to embrace renewable energy sources to improve energy efficiency and security, reduce the cost of energy and environmental impacts such as global warming and climate change. Whilst the study acknowledges the myriad potential of various renewable energy technologies for Africa spanning from Wind, Solar, Nuclear, Bioenergy, and Hydro and landfill gas, specific attention is placed on landfill gas to electricity projects in the African continent. The paper in particular discusses the urban socio-economic and environmental benefits directly emanating from the development, adoption and application of innovative technologies that generate renewable energy from landfill gas in eThekwini, South Africa and Bingerville, Cote D'lvoire. It starts by highlighting the conceptual and theoretical aspects that build up this work and goes on to outline the research methodological approaches that were adopted to operationalize this work. The research findings are then presented and discussed in detail highlighting the various benefits that accrue to urban centres in the African continent as a result of the adoption and use of green energy infrastructural technologies. The novel insights suggest ways of improving management systems and processes to improve benefits and reduce or recover costs of modern and innovative renewable energy technologies in the African continent, to emulate the levels that have been reached in developed countries.

2 BACKGOUND

Just like in other continents that make up the developing World, African countries have joined the band wagon in the adoption and use of technologies that promote the production of green energy and also improve the access to energy and energy security within the continent (Barry et al., 2011). Although the contributions of African countries to global greenhouse gas emissions are much smaller than that of industrialized and transitional countries, there is a growing realisation that Africa is likely to be disproportionately affected by the impacts of climate change (Karekezi *et al*., 2003). Consequently, the current challenge faced by the African continent is to transform the energy mix by decreasing the continents' heavy dependence on fossil fuels; hence the need for

rapid and widespread applications and use of low-carbon energy technologies (Barnsley & Ahn, 2014). According to Gillingham and Sweeney (2012), efforts to adopt new technologies and to improve the efficiency and efficacy of existing technologies are central to resolving the impasse in non-renewable energy production and use. Accordingly, the adoption and use of technologies that promote the production of green energy come as a direct result of a decline in traditional energy sources, price volatilities and associated environmental impacts associated with the heavy utilisation of oil and coal for industrial and domestic uses (Mathew & Lave, 2000). According to Uyigue and Archibong (2010), green energy technologies give rise to renewable energy sources and environmental conservation. There is also no doubt that such a development result in improved social, economic, human and technological development in developing countries.

The availability of affordable and renewable energy enables spectacular growth of economies and humans in the continent. Thus assuming new economic equilibriums; there is need to take into consideration eccentric sources of renewable energy such as hydro power, solar, landfill gas and biofuels that are renewable. Currently, there is over reliance on non-renewable energy resources in the African continent, although there is a realisation that there is great potential for renewable energy sources since most developing countries are endowed with the resources (Bhattacharya & Jana, 2009). According to Tall (2010) the common energy mix in the African continent consists of natural gas, coal and oil energy and the energy is generated mainly from coal (46%), gas (23%), hydro (18%), oil (11%) and nuclear (2%). However, these energy resources are unevenly distributed throughout the continent, for example oil is mostly found within Nigeria, Algeria, Egypt and Libya, whilst coal is commonly found in South Africa. The very limited availability of electricity combined with affordability issues to electricity services in most countries in the African continent has made access to electricity by most Africans elusive (commission on sustainable development-14, undated). As a result of scarcity of energy resources in the African continent, very few countries are energy exporters; while the majority is net energy importer. The reliance on energy imports results in poor energy security in most African countries (Economic commission for Africa, undated), hence the continent has increasingly been developing more interest in renewable energy technology investments not only as a way of dealing with global environmental concerns but also to improve energy provision and security.

3. CONCEPTUAL ISSUES

Green energy sources are derived from resources that are replaceable. They include energy such as wind, hydropower, photosynthetic energy that is found within biomass and these are generated indirectly from the sun. They also include sources that are directly derived from the sun such as solar energy and also those that are generated from natural movements such as geothermal and marine energy. Green energy sources have the potential to supply more than 3000times the world's current needs, with solar topping the list with more than 2000times, wind over 200 times, biomass more than 20 times, geothermal 5 times, marine 2 times and hydro times 1.

The generation and use of green energy sources have promoted the development and management of urban centres lending them the sustainability that is fundamental.

3.1 Biomass power technologies

Bioenergy is generated when organic materials such as plants, trees, crops that store the energy from the sun through the process of photosynthesis are converted into electricity, heat and liquid fuels. Besides they promote social and economic development particularly for agro based nations many of which are developing. The technology keeps rising and the future looks bright, with European countries, the United States of America, China, India and very recently the African countries expanding the generation and use of bioenergy.

Landfill gas to electricity

Municipal solid waste that is disposed on landfill sites emit greenhouse gases such as methane, carbon dioxide when they decompose, thus contributing to global warming and climate change (Jaramillo & Mathews, 2005). Traditional, landfill gases have been captured and flared to reduce methane emissions, odours and improve air quality around landfill sites (Ruiz et al., 2013). This has been practised to observe commitments and requirements of the Kyoto Protocol and subsequent COP meetings, with the just ended COP 21 in Paris, in France. In the past few decades innovative infrastructural technologies have been adopted to generate electricity from landfill gas rather than flaring it (Hall & Scrase ,1998). Besides the environmental benefits of flaring gas, generating renewable energy from landfill gas give rise to economic and social benefits. Anaerobic decomposition of the organic component that is found within municipal solid waste disposed at landfill sites gives out methane, carbon dioxide and nitrogen gases (Qin *et al*., 2001). The promotion of landfill gas to energy projects results in the reduction of

methane gas emissions and the captured gas is used to support economic activities, as it is used in industrial processes and the operations of electricity generating equipment (Bove & Lunghi, 2006). As soon as landfill starts operating, the infrastructural technologies have been designed and the site receives municipal solid waste, landfill gas begins to be captured (Demirbas, 2009a). The capturing of gas take place for about 30 years after the landfill site has been decommissioned in terms of receiving waste.

3.2 Hydroelectric power technologies

Hydroelectric power is generated using the system of turbines that convert the energy of water moving due to gravity from higher to lower elevations in sources such as dams and lakes (Ellabban *et al*., 2014). The technology is well established and flexible hence it is applicable in small projects that generate few watts that are commonly found in the African continent to mega hydropower projects that produce several thousands of watts for example those found in Brazil, Russia, Canada, China and the USA (Wang & Yang, 2011).

3.3 Solar energy

Solar power technology uses the sun to generate either electricity or heat through photovoltaic (PV), concentrating solar power systems (CSPS) or solar thermal systems respectively (Ellabban *et al.,* 2014). The PV systems use a modular system where PV cells, inverters, batteries, electrical components, and mounting systems are connected to convert solar energy directly into electricity. Silicon systems are the commonly established solar PV technologies, however thin film modules with non-silicon semiconductor materials have also entered the market (Brankera *et al.,* 2011). The CSP technologies generates electricity by directing sunlight through reflection to a medium that is used in the process of generating electricity for example liquid, gas or solid is heat and used in the process of power generation. According to Singh (2016), solar funding for solar infrastructural technological projects is still a great challenge in most developing countries as governments support is either still very little or hard to get, whilst private financial institutions such as banks still view solar technology as very risk and the majority poor households that need to use solar technology as small scales are considered unbankable.

3.4 Wind Energy

Wind power technology uses wind turbines to convert the kinetic energy of moving wind into mechanical first and then electricity (Eltamaly, 2013). The technology has been improving over the years, particularly the turbine designs and shape to maximise the capture of kinetic wind. Onshore wind turbines have been in existence for a long time and relatively large wind power plants have been established giving rise to what is commonly known as wind farms (Kaygusuz, 2009). On the other hand, offshore wind turbines have come on board recently leading to massive wind power plants using large turbines to generate high quality and reliability electrical conversion systems (Islam *et al*., 2013).

3.5 Marine power technology

Renewable energy from oceans is generated from several sources such as tidal range and currents, waves, ocean thermal energy and currents (Ben elghali et al., 2007).The marine technologies are still in their infancy in terms of implementation hence a lot of research and development in the technology and infrastructure are in progress, particularly in the United Kingdom and the United States of America and if successful the potential of these technologies will exceed the current and future energy needs.

3.6 Geothermal power technology

Geothermal power technology generates green heat and electrical energy through the use of heat pumps and power plants to extract thermal energy stored within rocks, steam and liquid water stored within the earth's interior with high temperatures. Hydrothermal systems that are dominated by liquid and vapour, conductive systems that include rock and magma as well as deep aquifers with circulating fluids make up geothermal energy sources (Ellabban et al., 2014). The commonly used form of geothermal energy source in countries such as the United States of America, Indonesia, Mexico, Philippines is hydrothermal and its application and effectiveness is set to increase in the near future.

4 OPERATIONALISING THE STUDY

This work applied a coterie of research tools to gather, process and analyze data (Rossman & Rallis, 1998) on the impact of green energy infrastructural technologies in transforming and sustaining environmental, social and economic situations of South African and Cote D'lvoire urban communities. A Mixed-method research paradigm was adopted to facilitate the gathering of

quantitative, qualitative and spatial data from the two cases; eThekwini and Bingerville municipalities. According to Barbie and Mouton (2010), case study research designs assist in identifying the target population, data collection, analysis, interpretation and reporting. Primary data was largely gathered from the two cities was gathered using interviews of key informants and relevant stakeholders (Leedy & Ormrod, 2010) that were identified from government ministries/departments, private sector organisations, the central government, non-governmental organisations and also community based organisations that are involved in the landfill gas to electricity projects. Field work data was also gathered through the use of geographic positioning system surveys that revealed the spatial existence and distribution of landfill gas to electricity projects within the two countries. Data was also collected through observations and photographic surveys which assisted in generating fresh data from the field.

Qualitative, quantitative and spatial data gathered from the field was analysed using appropriate tools and techniques. Quantitative data was analyzed through the use of statistical software packages that include excel whilst qualitative data was analyzed through content analysis. Spatial data captured using a GPS was analyzed through the use of ArcGIS software package to reveal the locational characteristics and relationships of components of the landfill gas to electrical energy technologies.

5 GREEN LANDFILL GAS TO ELECTRICAL ENERGY INFRASTRUCTURE AND THE TRANSFORMATIONS IN AFRICAN CITIES

Most African countries are facing fuel deficits that is resulting in costly energy imports (Frost & Sullivan, 2009). Landfill gas to electricity projects may greatly assist the African continent to reduce energy import bills. There are a number of factors that are considered when designing and establishing landfill gas to electricity projects that include the years of operation of the landfill site that determines the volume of waste disposed and the likely amount of gas to be captured from the site (Jaramillo & Mathews 2005). The configuration of the landfill site is very important in the design of the landfill gas to electricity projects as wells and a system of vertical and horizontal pipes that capture and transport the gas to the engines need to be installed and these depend on the depth of the landfill site (Escobar et al., 2009). Choices are made on the appropriate engines that should be used to convert the gas to heat and electrical energy, since they have different costs and efficiencies (Ravindranath & Balachandra, 2009). The commonly used are the reciprocating internal combustion engines the so called IC engines that burn

the gas by combining it with oxygen in the process running the engines connected to crankshafts that triggers the turning of generators that in turn produces electricity. In some circumstances, gas and steam turbines burn landfill gas that is used to heat up compressed air that powers turbines that drive generators that, as in IC engines, produce electricity.

Benefits of Green Landfill gas to electricity in South Africa and Cote D'lvoire

Green energy infrastructural technologies result in massive transformations in urban centres that among others include environmental, economic, social and institutional. The article unpacks the overarching essential and imperative impact of renewable energy technologies in shaping the social and economic wellbeing of the ordinary people within African communities that are being implemented. The work specifically investigated the selected innovative renewable energy technologies where landfill gas is converted to electricity technologies in generating employment and improving livelihoods, fighting poverty, reducing inequalities in Bingerville, Cote D'lvoire and EThekwini, South Africa beyond their primary objectives of reducing global warming and mitigating climate change and pollution. It assesses the urban transformative benefits that have accrued in South Africa and Cote D'Ivoire as a result of the adoption and use of green energy infrastructural technologies. The cases under discussion offer a grand opportunity to consolidate the results of studies that have been conducted in Ethekwini, South Africa; the first country to implement the municipal solid waste to energy in the African continent (Gumbo, 2014). The studies push the frontiers of knowledge generation to greater lengths, as it focuses not only on the impact of the eccentric technologies to environmental conservation and preservation but also on socio-economic transformation of communities. The current cases are unique in that the projects are part of the first striking examples of approved clean development mechanism projects on municipal solid waste to energy in the African continent. Since the inception of the projects there has been limited evidence on how they have been contributing to socio-economic and environmental benefits.

In South Africa the Bisasar road project which is the largest registered CDM project in the waste handling and disposal space (Frost & Sullivan, 2009). The objective of these projects is to extract land fill gas and combust it by flaring. Other CDM projects based in EThekwini are the Marian and La Mercy landfill sites. The landfill sites have a combined capacity of 7.5 MW (see Table 1). The projects have gas extraction wells installed, vertical and horizontal gas pipes, flare systems and gas generators installed.

Table 1: Landfill Gas to Electricity in South Africa and Cote D'lvoire

Name of country	Name of Landfill site	Landfill gas to electricity	Total
1.South Africa	a. Marianhill	1 MW	
	b. Bisasar Road	6.5 MW	**7.5 MW**
2.Cote D'lvoire	a. Bingerville	1.5 MW	
	b. Akouédo	0.5 MW	**2 MW**

(Source: Field Studies 2013)

Gas collector wells are drilled in the landfill to suck the gas that is transported to all the pipes to the gas pump and flare station. The gas is converted into electrical energy by the turbines and a step up transformer is used to assist in feeding the electricity of the same voltage into the municipality's grid (Gumbo, 2014).

In Cote D'Ivoire the main CDM projects are the Akouédo landfill rehabilitation and electricity generation project and the Bingerville CDM project .The Akouédo-Abidjan Landfill Rehabilitation and Electricity Generation Project is a natural ravine where urban and industrial waste have been dumped since 1965 with no suitable environmental measures(Tall, 2010). The Abidjan Municipal Waste-to-Energy Project located in Bingerville, North of Abidjan commenced in 2009. It was developed under the Kyoto Protocol's Clean Development Mechanism and approve by the United Nations Framework Convention on Climate Change (UNFCCC). The project is owned by the Société Ivoirienne de Traitement des Déchets (SITRADE), with project funding structured and arranged by Ecosur Afrique and the African Biofuel and Renewable Energy Fund (ABREF) whilst the Economic Community of West African States Bank for Investment and Development (EBID) is the major project sponsor. The project seeks to collect and treat 200 000 tons of urban waste per year using anaerobic digesters, using the resulting biogas to produce electricity and the residual waste being transformed into compost. A number of stakeholders are involved with the project, and the list includes the Abidjan Municipal Waste-To-Energy Project team; the Abidjan and Bingerville cities,

The Clean Development Mechanism National Authority (AN-MDP); The Ministry of Mines, Petroleum and Energy; Office for the Promotion of Energy Efficiency (Bureau des Économies d'Énergie); the Sub-Directorate of Energy Control and Renewable Energies (Sous-Direction de la Maîtrise de l'Énergie et des Énergies Renouvelables); Energie Electrique de Côte d'Ivoire (EECI); Société d'Aménagement Urbain et Rural (SAUR) and Electricité de France (EDF); Compagnie Ivoirienne d'Electricité (CIE); the National Authority for the Regulation of the Electricity Sector (L'Autorité Nationale de Régulation du secteur de l'Electricité de Côte d'Ivoire, ANARE). Also the Ministry of Higher Education and Research; Research Institute on Renewable Energies (IREN); Société de Gestion du Patrimoine du Secteur de l'Electricité (SOGEPE); Société d'Opération Ivoirienne d'Electricité (SOPIE); Autorité Nationale de Regulation (ANARE) are involved. The Ecosur Afrique; African Biofuel and Renewable Energy Fund (ABREF) and the Economic Community of West African States Bank for Investment and Development (EBID) are the project planners and sponsors; Project owner Société Ivoirienne de Traitement des Déchets (SITRADE). Bingerville has an energy mix of biomass at 50%, oil at 35%, gas at 14% and hydroelectricity at 1%. The waste is collected and treated; after collection and sorting the waste is treated through anaerobic digesters. Resulting biogas is used to produce electricity while residual waste is transformed into compost (Tall, 2010). The landfill gas to electricity projects have several benefits (See Figure 1). These among others include economic, social, environmental, institutional and physical.

Figure 1: Strands of Urban Transformative Effects of Landfill Gas Projects

Economically, the landfill gas to electricity projects in South Africa generate a total of 7.5 MW of electricity and that is supplied to 3 750 houses in the city at a rate of 500 houses per 1 MW. This has gone a long way in generating income of the municipality. Specifically, the projects have generated R 48 million through the selling of certified carbon credits which have put the province at an economic advantage. The CDM project is estimated to generate a total of R400 million during its life (Gumbo, 2014). It is no doubt evident that the CDM is indeed economical beneficial as the project assist in reaching the economic pillar of sustainability. The same has been experienced in Cote D'lvoire where the generated electricity has gone a long way in generating revenue for the municipalities and helped to reduce their costs of accessing energy. The lower economic benefits are offset by government incentives and also support from international organisations and private sector companies that invest in the projects thus making the landfill gas to electricity projects attractive, as they have higher environmental and social benefits

Social benefits of landfill gas to electricity are also realised as the incomes that are generated and the improved health of citizens, as emission

and flaring offsets set in, hence the benefits to society justify the involvement of governments in subsidising the landfill gas to electricity projects (Shin et al., 2005).

Socially, the standard of living of the urban poor situated around the Bisasar road landfill site in particular has been changed as they are now benefiting from the proceeds of the landfill gas to electricity projects. The projects have also led to employment creation particularly during the construction of the plant, 57 unskilled labourers, 38 semi-skilled people were employed, and 11 skilled were also engaged during the construction phase of the project. At project inception about 14 skilled associates were employed. Education support to previously disadvantaged black students was given as about 3 male black students were given bursaries and 1 female black student to study civil engineering at UKZN. Recycling of materials at Bisasar road landfill site has created employment for some local poor residents as reclaimers are able to sell collected waste to the informal recycling market**.** Cote D'lvoire has also recorded the same social benefits as poverty levels to those that are directly and indirectly involved in the projects have been reduced.

It has long been observed that landfill gas to electricity projects yield higher environmental benefits than any financial costs and revenues. The costs of setting and establishing the technology and running the project is normally very high such that economic benefits are lower than expected due to in most cases the low prices of electricity, hence reductions in emissions become very worthwhile (Demirbas, 2009b). Environmentally, the quality of air has improved, there is now clean water, clean land which has led to environmentally safe, socially inclusive and economically productive cities (Lia & Tiberiu, 2010). The projects have chiefly led to the reduction of greenhouse gas emissions by the equivalent of more than 71 000 tons of CO2 per year. Specifically, the South African projects have led to over 200 000 carbon emissions reductions every year. To date the landfill gas to electricity projects have generated in excess of 600 000 carbon credits. The projects have also reduced the burning of coal by 80 000 tons every year and decrease the amount of methane and carbon dioxide in the atmosphere that are the main contributors of climate change. Leachate treatments at the landfill sites and also conservancy and plant rescue units (PRUNIT) have helped to reduce contamination of land and underground water as water purification that is recycled is used to irrigate plants at the sites**.** The same can be said about efforts to preserve the environment in Cote D'lvoire as a direct result of these landfill gas to electricity projects.

Physically, there have been massive developments of infrastructure within the cities emanating from huge investments within the landfill gas to electricity

projects. Such investments in physically infrastructure lend the cities beautiful and sound development outlook.

Institutionally, several organizations that are efficient and innovative in their approaches have been set up to run the projects in their different capacities hence giving rise to reliable and effective institutions within the cities. The developments of strong partnerships among public, private and non-governmental organisations have also created strong capacities within the cities, as tackling the serious energy shortages becomes manageable.

5 RECOMMENDATIONS

Urban centres in the African continent, particularly the capital cities are experiencing high urbanisation as they continue to receive millions of migrants every year, giving rise to high concentrations of the urban population that consume more energy sources and generate high volumes of waste (de Ligneris, 2013). In the world over, efficient and proper disposal of waste that is generated by urban centres is a great challenge (Simelane & Mohee, 2012). Besides, improperly disposed wastes on landfills contribute to global warming as greenhouse gases such as methane are released in the atmosphere as the waste decomposes (Basura et al., 2012). Clarion calls to seriously consider increasing financial, technological and human resources mobilisation for the purposes of generating value and beneficiation from municipal solid waste are relentlessly being made in academic discourses and debates. One of the uses that solid waste has been put to use successfully, particularly in developed countries is to generate renewable energy. This work has demonstrated the importance of generating electricity from landfill gas, particularly its contribution to the improvement of the management of municipal solid waste more so in African countries. Even though African cities face serious challenges, they still remain centres of prosperity and places where human beings find satisfaction of basic needs and access to essential public goods. Efforts need to be made to tackle the challenges currently being experienced, such as the haphazard disposal of MSW; in order to improve well-being and prosperity and expanding on the prospects. This can only be achieved through green energy technological innovations in approaches and adopting flexible initiatives. There is a need to strengthen the capacity of relevant institutions through improving human, technical and financial resources and ineffective institutional arrangements. This involves the strict observation of rules and regulations, formulating relevant policies and implementing them to their letter and essence. There have also been initiatives to promote the participation of local as well as international players in the management of MSW.

6 CONCLUSIONS

The African continent just like others has joined a band wagon in the adoption and use of technologies that promote the production of green energy. Among the renewable energy infrastructures worth noting is the landfill-gas to electricity technologies that have been embraced by a few African countries since the advent of the new millennium. The continuous decline of traditional energy sources; related price volatilities and environmental impacts associated with the heavy utilisation of oil and coal for industrial and domestic purposes have imperatively triggered the drive to search for the development, adoption and use of alternative energy sources. It is a fact that the global production of conventional oil has declined and prices remain unstable as they always shift unreliably. On the other hand, coal that can be sometimes be regarded as a possible alternative has its own serious shortcoming of contributing significantly to global warming and climate change. This has led to the realization that the majority of systems upon which modern civilization depends on are not sustainable and therefore need to be changed to avoid self-destruction. In the quest to ameliorate the negative developments emanating from the heavy reliance on fossil fuels, there has been a surge in the development, adoption and utilisation of renewable energy technologies and investment policies in both the developed and developing worlds. Adopting a case study and phenomenological research design and applying mixed-methods approaches, this study focuses on the socio-economic and environmental benefits directly emanating from the development, adoption and application of innovative technologies in renewable energy generation and supply. The article in particular assesses the experiences of municipal solid waste to energy innovative technologies in two African countries; South Africa in the Southern African region and Cote D'lvoire in the western region of the continent. It specifically evaluates the direct and indirect benefits of electricity that is generated from gas projects being run in the two cities of eThekwini and Bingerville that are found within these two countries. Findings have revealed that the innovative projects have resulted not only in improved municipal solid waste management but more importantly urban environmental conservation, social and economic and improvements particularly of the urban and impoverished families that participate in the projects.

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PERSONNEL MANAGEMENT PRACTICES IN NIGERIAN QUANTITY SURVEYING FIRMS

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Abstract

One of the basic responsibilities of top managers of an organisation is the ability to manage, supervise and control other members of staff in the best possible way to ensure optimum performance and high productivity. Failure to understand, acknowledge and meet the expectation and requirement of staff members by an organisation may lead to deterioration in commitment, loyalty to the values of the organisation, lack of motivation and eventually, low productivity. In this study, personnel management (PM) practices in Nigerian quantity surveying firms were examined by evaluating various human resource management (HRM) approach and techniques. The aspects considered are staff strength, welfare, training and development, mentoring and succession rate. Questionnaires were adopted for the study and it was administered on quantity surveying firms using convenient sampling method. Quantity surveying firms are not providing their members of staff with the necessary and expected welfare and mentoring and level of staff training is below average. In view of this, managers, directors and other top management staff of quantity surveying firms should ensure proper recruitment and selection process at the initial stage of personnel management; improve on staff training and development strategies; be concerned about staff welfare and mentoring; maintain a strong, stable, and increasing staff strength; and prioritise staff mentoring and succession in order to enhance productivity of staff and general performance of the firms. This will not only improve their innovativeness in delivering better to clients but will also enhance better competition in both local and international market.

Keywords: Human Resource Management (HRM), Mentoring, Quantity surveying firms (QSFs), Quantity surveyors, Recruitment, Training.

1. INTRODUCTION

The management of personnel, also refer to human or human resources, engaged and employed in an organisation has become an important element of the development of any organizational. According to Quresh *et al.* (2010), human resource management (HRM) practices is a determining factor for organizational enhancement and staff performance. Anthony, Obiamaka and Onwumere (2014) defined HRM as the process of hiring and developing staffs so that they can become more valuable to the organization. This implies that the practice goes beyond recruitment but continuously improving the skills and competencies. According to Ayanda, Lawal and Ben-Bernard (2014) personnel management (PM) are the procedures and practices needed to carry out the human resource aspect of a management position, including advertisement,

selection, job definition, training, performance appraisal, compensation, career planning, encouraging employee participation in decision making as well as mentoring the staff to rise to the point of becoming partners or directors. HRM can therefore be seen as a determining factor for a firm growth and its knowledge, a powerful tool for a firm competitiveness and firm innovation practices.

Quantity surveying firms (QSFs) are oriented organizations that provide services that cover all aspects of project procurement, contractual and cost management in infrastructural development. Anyadike (2013) pointed out that knowledge management processes interaction in QSFs has become a powerful tool for sustaining firms' competitiveness and robust innovation practices. It was however stated that there is a decline in HRM aspect of most QSFs as more attention is given to the financial aspect of the organization that the development of staffs. Francis, Cyril and Samuel (2011) observed that the inefficiency of manpower, lack of performance evaluation, human relation problem which may include planning management, management not based on established merit, lack of technological experience, remuneration and motivation hinders the performance of personnel in QSFs. The management of increased workforce might create new problems and challenges as the workers are becoming more conscious of their rights.

Wilkinson, Johnstone and Townsend (2012) observed that HRM has the complicated responsibility of balancing the needs and interests of staffs against the needs and interests of the firm. More so, Daud (2006) posited that HRM faces a lot of problems because of the continuous changing socio-economic, technological and political condition of the construction industry. Due to the changes in their environment and complexity of the construction industry, it is important for managers of firms to be concerned with issues relating to the management of personnel and the firm in general. In view of this, HRM practices in QSFs were examined with a view to improving personnel performance and the overall productivity of the firm. In achieving this, staff welfare and various staff training activities in the firms as well as the various ways of staff mentoring and succession were identified and evaluated.

2 LITERATURE REVIEW

2.1 Personnel Management

According to Loosemore, Dianti and Lingard, (2003), the development of personnel management can be traced to the Industrial Revolution in England in the late 18th. It was further affirmed that the political and economic conditions prevalent after the 2nd world war increased the demand for workmen and personnel specialists and this led to the current era of HRM where personnel or staffs are viewed as resources. Agbodjah (2008) noted that these was due to the fact that after the end of the second world war, people were urgently needed to work in factories, industries, etc. hence specialists were contacted to ensure good HRM practices. Daud (2006) observed that the concept of HRM became prevalent in the early 80s due to increasing academic interest and researches in the concept.

HRM concept is concerned with the management of what most researchers describes as the most valued assets of an organisation, that is, the people in order to provide a competitive advantage (Agbodjah, 2008). According to Armstrong (2003) and Matthew, Paul and Patrick (2003), the main features of HRM includes: emphasis on the strategic management of personnel, that is, personnel asset of the organization, which achieves integration between the business and the HRM approach; logical and comprehensive approach to the provision of mutually supporting employment practices and policies; development of integrated HRM and policies; importance

placed on gaining commitment to the goals and values of organization; and the treatment of personnel as assets rather than costs.

According to Fitz-enz (2000), staffs of a given firm are seen as personnel or human capital by virtue of the role they participate in the firm and because of how they add to the productivity of the firm. It was further stated that human resource is the most bothersome assets to manage. Apart from helping an organisation to achieve high performance by advocating for appropriate integration of people and processes, HRM also enhance motivation, commitment and job engagements (Agbodjah, 2008).

2.2 Personnel Management Practices in QSFs

The origins of quantity surveying is traced to the ancient Egyptian civilization who used dedicated personnel to carry out estimates and costing of their structures and buildings. However, it developed into an occupation during the 17th century restoration of London after the Great Fire (Said, Shafiei and Omran, 2010). In 1836, Royal Institute of Chartered Surveyors (2014) noted that the profession entered its new age when the Houses of Parliament of Great Britain, became the first major public contract to be fully measured and tendered using detailed bills of quantities for cost and financial accountability.

In the early Twentieth century, Royal Institute of Chartered Surveyors (RICS) developed the early modalities of becoming a quantity surveyor which later gained global recognition. Foreign members later established similar professional bodies in their countries and one of these is the Nigerian Institute of Quantity Surveyors (NIQS) founded in 1969 as a parallel body to RICS (Said *et al.,* 2010). In 1986, Onwusonye (2013) stated that the Federal Government of Nigeria recognized the NIQS through the Quantity Surveyors Registration Board of Nigeria (QSRBN) decree No. 31 of December 1986.

In general, there are services offered quantity surveying firms (NIQS, 2004; Said *et al.,* 2010; Oke and Ogunsemi, 2013; Olanipekun, Aje and Abiola, 2013; Olatunji, Oke, Aghimien and Ogunwoye, 2016), these are: preliminary cost advice and feasibility studies; cost planning and advising on contractual methods; advising on selection contractor and other consultants; tender documents preparation and other tendering activities; evaluating and estimating of construction works; preparing and agreeing accounts for or with contractors; preparing expenditure statements for tax accounting purposes; periodic financial reporting and technical auditing; replacement value for insurance; project management related services; giving expert evidence in arbitrations; value management related services and other cost, procurement and contractual responsibilities.

The challenge to the management of quantity surveying firms is not only to focus on devising strategies for driving performance but to ensure sustainability by giving consideration that influences performance (Olanipekun, *et al.,* 2013). HRM is a social phenomenon that enhances performance of an organization and its staffs when its practices are rightly utilized. This implies that QSFs can be more efficient and achieve better performance if necessary attention are directed at personnel management elements as staff welfare, training and development, mentoring and succession procedures.

According to Olanipekun *et al.,*(2013), QSFs have not been able to adapt to the general HRM principles due to peculiar challenges that have the potential to challenge the applicability and usefulness of the principles. These challenges accounted by Loosemore *et al.,* (2003); Abidin, Yusof, Hassan and Andros (2010); and Ogunsemi, Awodele and Oke (2013) include: nature of QSFs and their products and services;

nature of construction activity and the centralization of HRM function to other professionals; changing demand for construction products and service; labour market and image of the construction sector; personnel turnover and retention; subcontracting and self-employment in QSFs; training, development and knowledge creation; communication and employee relations; equal opportunity and diversity; and health, safety and welfare of personnel. More so, most QSFs are small in size with low capacity, little training, poor personnel motivation and inability to retain specialists and experienced members (Olanipekun *et al.,* 2013). Ogunsemi, Awodele and Oke (2013) opined that virtually all the QSFs in Nigeria are structured as either sole proprietorship or partnership which no longer satisfies the present day business environment.

3 RESEARCH METHODOLOGY

In this study, personnel management practices in QSFs was examined. In view of the nature of the study, survey method was adopted. Quantitative technique was employed through questionnaires distributed to quantity surveying firms in Lagos State, Nigeria. The actual population of these firms as at the time of the study is 57. This was obtained from the directory of Nigerian Institute of Quantity Surveyors (NIQS), Lagos state chapter, a body recognised by law for certification and monitoring of the firms in the country. In view of the small size of the population, census sampling was adopted whereby all the firms were contacted. It was ensured that a questionnaire was administered to a firm to eliminate double entry of information.

In designing the questionnaire, multiple-choice answers were adopted for various highlighted questions. The first part of the instrument was structured to solicit information regarding general characteristics of the firm while the second part was planned to obtain relevant data relating to the objectives of the study. The latter deals with staff strength, welfare, training, as well as mentoring and succession plans of the firms. For ethical consideration, a cover letter was provided highlighting relevant information for the study. It was stated that the data will solely be used for academic purpose and respondents are free to opt out of the study at any time. Confidentiality of the respondents were guarantee and questions that may reveal the firms such as name, address, registration number, etc. were avoided. Prior to the actual data collection, pilot study was carried out to test the suitability of the research instrument. Academia and professional quantity surveyors were involved and their comments and suggestions were considered in drafting the final instrument.

4 RESULTS AND DISCUSSION

From the administered 57 questionnaires, 49 were retrieved while 5 were found unworthy of analysis. Vital information were missing and some provided more than required number of answers for questions posted. In view of this, data contained in the 44 workable instruments were analysed.

4.1 Characteristics of the respondents

Result in table 1 indicate that about 66% of the QSFs have been operating for over 10 years, thus their response can be relied upon. Their ownership status revealed that 24 are sole proprietorship, 18 are partnership while the remaining 2 are consortium. Result also shows that QSFs are involved in substantial number of construction projects, ranging from building, civil and heavy engineering construction. However, the annual turnover of some of the firms seems inadequate and this may affect strength and salary of organisation's personnel.

Table 1: Background information

	Variables	Frequency	Percent
Years of existence of firm	1-5years	4	9.0
	6-10years	10	22.7
	11-15years	11	25.0
	16-20years	12	27.3
	21-25years	6	13.6
	26years above	1	2.4
	Total	**44**	**100**
Nature of firms' ownership	Sole proprietorship	24	54.5
	Partnership	18	41.0
	Consortium	2	4.5
	Total	**44**	**100.000**
Nature of jobs undertaken by firm	Building works	14	31.9
	Civil Engineering & Building Works	26	59.0
	Others	4	9.1
	Total	**44**	**100.000**
Firms' minimum turnover in current value (annual)	1-10million	10	22.7
	11-20million	11	25.0
	21-30million	6	13.6
	31-40million	2	4.6
	over 41million	2	4.6
	Not sure	13	29.5
	Total	**44**	**100**

4.2 Human Resource Management

Result in table 2 indicates that almost half of the quantity surveying firms have no department responsible for human management and relations. Also, less than one third of the firms that have a department responsible for human relations named such department as HRM or PM. This department is responsible for recruitment and further improvement of the productivity of the staff and the firm in general. Result further shows that less than half of the firms have this department managed by a managing director directly responsible for the running of the firm, while less than one third are headed by Human resource manager. This indicates that human resource manager are rarely employed by quantity surveying firms to oversee their personnel management.

Table 2: Human resource management

	Classification	Frequency	Percentage
Department for human relations	Yes	13	29.6
	No	21	47.8
	Not sure	10	22.6
	Total	**44**	**100.0**
Name of this department	Human Resource Department	7	16.0
	Personnel Department	3	6.8
	Others	9	20.5
	Not sure	25	56.7
	Total	**44**	**100.0**
Person in charge	Human Resource Manager	5	11.4
	Personnel Manager	4	9.1
	Managing Director	17	38.6
	General Manager	1	2.3
	Others	4	10.0
	Not sure	13	29.6
	Total	**44**	**100.0**

4.3 Staff Strength

For this aspect, some respondents responding on behalf of the firm left some questions unanswered. However, result in table 3 shows that the average number of overall staff strength in a quantity surveying firms are about 14 which is on a high side considering the number of firms under survey. Average number of industrial training students are about 7, while graduate/probationer has an average number of 5 personnel. An average of about 6 members of staff are members of NIQS and registered with Quantity Surveyors Registration Board of Nigeria (QSRBN), the two bodies recognised for registration and administration of quantity surveying firms in the country. Other members of staff that do work in Qs firms such as cleaners, secretaries, drivers, etc. average about 9 in the firms.

Table 3: Staff strength

	Classification	Frequency	Percentage
Overall Staff Members	1-10	14	31.8
	11-20	26	59.1
	21-30	4	9.1
	Average	**14.14**	
Industrial Training Students	1-10	39	88.6
	31 above	1	2.3
	Not sure	4	9.1
	Average	**7.14**	
Graduate/Probationer	1-10	37	84.1
	11-20	1	2.3
	Not sure	6	13.6
	Average	**5.76**	
Registered Staffs (NIQS)	1-10	42	95.5
	Not sure	2	4.5
	Average	**5.50**	

Registered Staffs (QSRBN)	1-10	41	93.2
	Not sure	3	6.8
	Average	**5.50**	
Others	1-10	32	72.7
	31 above	4	9.1
	Not sure	8	18.2
	Average	**8.83**	

4.4 Staff Welfare

On staff welfare provided by QSFs, it could be observed from table 4 that the adequate payment of staffs' salaries in quantity surveying firms is on a high side with more than half of the firms indicating that is very adequate. For staff pay increment, less than half of the firms indicated that it is satisfactory, indicating that quantity surveying firms increases salaries of their staffs only when necessary. Also, less than half of the firms has no idea if the firm matches their pay with performance which is on a high side, less than one-third of the firms indicates that increment of pay does not match with performance, while less than one quarter of the firms indicated that matching pay with the performance of their staffs is carried out.

Table 4: Staff Welfare

	Classification	**Frequency**	**Percent**
Adequacy of staff payment	Very adequate	28	63.6
	Adequate	14	31.8
	Once in a while	2	4.6
	Total	**44**	**100.0**
Staff pay increment	Very satisfactory	1	2.3
	Satisfactory	19	43.2
	Sometimes	9	20.5
	Once in a while	13	29.5
	Never	2	4.5
	Total	**44**	**100.0**
With performance	Yes	8	18.1
	No	11	25.0
	No idea	20	45.5
	Not sure	5	11.4
	Total	**44**	**100.0**

On the support provided by quantity surveying firms for their members of staff, it could be observed from table 5 that almost half of the firms distribute rewards and incentives once in a while among staffs, while some firms strictly linked the rewards with performance, others have no idea of the matter. In the area of providing health/medical insurance for members of staff, more than one third of firms sometimes carry out such act which is encouraging. However, less than one third of the firms ensures a better welfare package for their personnel in the area of transportation and allowances.

Table 5: Rewards and Incentives

	Classification	Frequency	Percentage
Rewards and incentives to the staffs	Satisfactory	8	18.2
	Sometimes	11	25.0
	Once in a while	21	47.7
	Never	4	9.`1
	Total	**44**	**100.000**
Rewards linked to staff performance	YES	12	28.0
	NO	12	28.0
	NO IDEA	20	44.0
	Total	**44**	**100.0**
Staff health/medical insurance	Very often	6	13.5
	Often	9	20.5
	Sometimes	19	43.2
	Once in a while	5	11.4
	Never	5	11.4
	Total	**44**	**100.0**
Staff transportation/allowances	Very often	7	16.0
	Often	13	29.5
	Sometimes	6	13.6
	Once in a while	12	27.3
	Never	6	13.6
	Total	**44**	**100.0**

Table 6 indicates that close to half of quantity surveying firms do not provide housing for their staff. Also, less than half of quantity surveying firms sometimes provide for the welfare of their staff in case of their involvement in accident.

Table 6: Housing and Accident

	Classification	Frequency	Percentage
Staff welfare in the area of housing	Very often	3	6.8
	Often	8	18.2
	Sometimes	8	18.2
	Once in a while	7	15.9
	Never	18	40.9
	Total	**44**	**100.0**
Welfare in occurrences such as accident	Often	8	18.2
	Sometimes	17	38.6
	Once in a while	15	34.1
	Never	4	9.1
	Total	**44**	**100.0**

4.5 Staff Training and methods

Result in table 7 indicates that 55% of quantity surveying firms assess their staffs based on performance appraisal so as to provide for their training needs, 32% of has no idea while for the reaming firms, training needs of their staffs are not assessed. 41% of quantity surveying firms provide social training for their staffs once in a while, 32% sometimes provide an environment for the socialization of their staffs, while 23% never carry out such training for their personnel. More so, 41% of these firms

sometimes provide training for the general problem solving skills of their staffs, 30% provide such training once in a while and 16% does not carry out any of such training.

Table 7: Staff Training

	Classification	**Frequency**	**Percentage**
Training performance appraisal	Yes	24	54.545
	No	6	13.636
	No idea	14	31.818
	Total	**44**	**100.000**
Social training skills of the staff	Satisfactory	2	14.500
	Sometimes	14	31.818
	Once in a while	18	40.909
	Never	10	22.727
	Total	**44**	**100.000**
General problem solving skills	Satisfactory	7	15.909
	Sometimes	18	40.909
	Once in a while	13	29.545
	Never	6	13.636
	Total	**44**	**100.000**
Training within/outside country	Very often	5	11.364
	Often	4	9.091
	Sometimes	3	6.818
	Once in a while	9	20.455
	Never	23	52.300
	Total	**44**	**100.000**
Firm aims and objectives	Very often	1	2.273
	Often	8	18.182
	Sometimes	15	34.091
	Once in a while	14	31.818
	Never	6	13.636
	Total	**44**	**100.000**

Result further shows that 50% of quantity surveying firms never provide for professional training of their staffs within or outside the country which is on a high side, 21% do it once in a while and it is done often by more than 21% of the firms. 34% of quantity surveying firms provide training for their staff for the broader knowledge of the aims and objectives of the firms sometimes, 32% do it once in a while and 14% never provide for such training.

Table 8: Staff training methods

	Classification	**Frequency**	**Percentage**
Changing needs of the firm	Very satisfactory	1	2.3
	Satisfactory	7	15.8
	Sometimes	9	20.5
	Once in a while	19	43.2
	Never	8	18.2
	Total	**44**	**100.0**
Seminars and workshops etc.	Yes	31	70.6
	No	6	13.6
	No idea	6	15.8
	Total	**44**	**100.0**

Result in table 8 indicate more than one third of QSFs organizes training programs relevant to the changing needs of the firm once in a while, less than one quarter sometimes organize such programs while only one of the firms organize such training programs. More than half of the firms encourage their staffs to participate in various seminars, workshops, conferences, etc. to broaden the knowledge of their personnel.

4.6 Staff Mentoring and Succession in QSFs

On opportunity for personnel to rise to the position of partners and directors in the firm as described in table 9, only 50% provides such opportunity. Despite agreeing that mentoring offers benefits to the mentor, mentee and the firm, it could be observed that more than half of quantity surveying firms does not have any personnel that rose to become partners or directors of the firm. On the average, only about 1 of the personnel rise to become partners of their firm.

Table 9: Mentoring and Succession

	Classification	Frequency	Percentage
Staffs to rise to partner or director	Yes	22	50.0
	No	22	50.0
	Total	**44**	**100.0**
Staffs that rose to partners or directors	None	24	54.5
	1-2	12	27.3
	3-4	3	6.8
	5-6	2	4.6
	Not sure	3	6.8
	Average	**0.960**	
Benefits of mentoring	Yes	32	72.7
	No	2	4.6
	No idea	10	22.7
	Total	**44**	**100.0**

4.7 Discussion of Findings

Staff strength of quantity surveying firms is below average as staffs tend to seek opportunities elsewhere due to the fact that their needs are not satisfactorily met by their firm. Anakwe (2002) observed that traditional human resource management functions, are very much practiced by human resource professionals which seems to be missing in about 50% of the identified firms. The training of personnel in QSFs is on the average as some firms provide training in areas of social skills, general problem solving skills, professional skills and training for the broader knowledge of the firm. According to Aliyu (2011), staffs in quantity surveying firms are poorly trained, resulting to the inability of firms to retain specialist knowledge and potentials there by weakening the strength of the firm. Training programmes increases personnel skills, which in turn, increases staff productivity and reduces job dissatisfaction that results in staff turnover (Obisi, 2011). However, QSFs rarely send their staffs for such training programs.

Personnel welfare covers a wide range of facilities that are essential for the well-being of a personnel and are offered by an employer, firm or organisation. From the research, some of the QSFs pay their staffs adequately so as to make them feel secured

with a satisfactory pay increase, but majority of these firms don't match the payment with performance. This may affect competitiveness of the personnel and their overall productivity (John and Pamela, 2008). QSFs distribute rewards/incentives once in a while depending on the financial strength of the firm and some firms does not link their rewards to staff performance. However, staffs in QSFs rarely rise to become partners or directors. Succession which involves identifying staffs within an organization who possess the skills necessary to move into positions of greater responsibility is another area of challenge for QSFs and mentoring is an essential tool to achieve the practice.

5 CONCLUSSION AND RECOMMENDATION

Generally, QSFs are performing below average on issues relating to welfare, training, mentoring and development of their members of staff. This leads to personnel moving jobs thereby affect the growth, stability and productivity of the firm. Some of these personnel are denied basic welfare package and benefits that will motivate them, improve their work and enhance the productivity of the firms. The fact that there is an improvement in the level of staff performance is not indicative of an effective staff management system. In most cases, personnel perform to their optimum because of the fear of not able to secure better job elsewhere.

Lack of adequate attention to factors of productivity of personnel such as promotion and succession; incentives, rewards and awards; health/medical insurance; transportation allowance and housing allowance; etc. invariably affects the productivity and performance of firms. To guarantee optimum and effective performance of personnel in QSFs, it is necessary to ensure that the selection and recruitment process of staffs takes into cognisance skills, abilities, potentials and other traits of the applicants. After their engagement, continuous professional training and development should be a fundamental and regular activities for personnel's innovativeness, relevance and better performance. More so, human resources or personnel managers should be employed by the firms so as to understand the potentials, abilities and motivational requirements of each members of staff. This will ensure that adequate attention are paid to personnel welfare, thereby reduce dissatisfaction and improve performance. **S**taff strength of most quantity surveying firms seems to be adequate but there is need to develop a benchmark for size and mix of categories of quantity surveyors required for QSFs.

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