JCBM

ISSN 2521-0165

Volume 5, Number 1, June 2021

JOURNAL OF CONSTRUCTION BUSINESS & MANAGEMENT

http://journals.uct.ac.za/index.php/jcbm/index

JCBM

Table of Contents
Volume 5, Number 1, June 2021

ABOUT JCBM

The **Journal of Construction Business and Management (JCBM)** is an open access journal published bi-annually by the University of Cape Town Libraries, South Africa. The Journal is hosted by the Construction Business and Management Research Group of the University of Cape Town. The journal aims to explore the experience of construction industry stakeholders and trends in the global system. It aims to publish peer reviewed and highly quality papers emanating from original theoretical based research, rigorous review of literature, conceptual papers and development of theories, case studies and practical notes. The journal also welcomes papers with diverse methodological research approaches including qualitative, quantitative and mixed methods. Contributions are expected from academia, public administrators, professionals in the public sector and private practice (such as contracting organizations and consulting firms) and other related bodies and institutions (such as financial, legal and NGOs).

The scope of **Journal of Construction Business and Management (JCBM)** covers, but is not limited to construction management and project delivery, strategic management, decision making, skills development, organizational practices and procedures in construction business. The specific areas in construction management, sustainability in construction and project delivery include project planning/feasibility studies, procurement, resource management, international construction, ethical issues, industrial relations, legislative requirements and regulations, construction education, information and communication technologies, housing policies, and urban design and development. Strategic management in construction covers risk management, quality management, resilience and disaster management, cultural and societal management, project life cycle management, and knowledge creation and management. Among issues in construction organizational practices and procedures covered are business development strategies, human resources and career development, continuous professional development, leadership systems, marketing strategies, gender issues and corporate social responsibility.

Journal of Construction Business and Management (JCBM) is a peer reviewed journal. All research articles in this journal undergo rigorous peer review, based on initial editor and anonymised refereeing by at least two anonymous referees.

Journal of Construction Business and Management (JCBM) Partners:

University of Cape Town

Obafemi Awolowo University

The UCT Library takes no responsibility for the content published within journals that are hosted on OpenUCT: open journals, and does not accept any liability arising out of the use of or the inability to use the information contained herein. The library, on behalf of itself and the University, assumes no responsibility, and shall not be liable for any breaches of agreement with other publishes/hosts.

Editorial

Welcome to the ninth issue of the Journal of Construction Business and Management. Globally, poor project performance has become an area of concern to researchers, construction practitioners and policymakers. The lack of understanding of the factors causing poor project performance is responsible for developing appropriate management strategies to address the problem. Achieving the successful completion of construction projects remain a pressing goal. Several approaches have emerged proposed to construct quicker, greener, sustainable, affordable buildings and infrastructure with better quality and low environmental impact. However, the problem of poor project performance persists.

This journal edition presents scholarly discussions on theoretical and empirical challenges confronting practitioners and enterprises in the construction industry. The intention is to understand the practice and theoretical lens used in its explanation or interpretation. This journal edition covers the following subjects: quality management practices, environmental waste management practices, unethical practices, positive organisational behaviour, occupational eustress, theft and vandalism. The issue contains five articles written by twelve scholars based in Malawi, Nigeria, South Africa and the United Kingdom.

The first article by Odiba, Demain and Ruikar (2021) develops a contextual model for improving the culture of quality that can facilitate effective quality management practices in construction organisations. The designed model is a quality system that construction organisations can use in identifying some typical barriers hindering effective Quality Management System (QMS) implementation; assisting in the development of cultural values that can drive effective QMS implementation; undertaking effective QMS practices as they relate to construction and recognising the potential results and longer-term benefits obtainable from implementing effective QMS. The second article by Oladiran, Bayewun and Aderogba (2021) investigates the environmental waste management practices (EWMPs) of contractors on construction sites. Construction wastes pose challenges to contractors and clients on construction projects globally, with significant consequences on the environment. Contractors were aware of material storage strategies, ordering the exact amount of materials and checking deliveries properly. Based on these findings, the study recommends that construction firms, governments, and institutions involved in regulating the sector should sponsor the training of professionals on the various EWMPs towards improving their awareness.

The causes of quackery in quantity surveying practice are examined in the paper by Dada and Bamigboye (2021). The article highlights that the reasons for quackery in quantity surveying practice are multidimensional and can be narrowed down to unethical practices, client engagement, job security, regulatory and issues related to corruption. The fourth paper by Ogwueleka and Ikediashi (2021) assesses the effects of positive organisational behaviour (POB) constructs on eustress amongst construction employees based on the rationale that organisational behaviour has been characterised by negativity than positively. The study focuses on identifying the areas that can propel positive mental health among construction employees to improve their performances and increase work productivity. Five constructs of POB models and five parameters of eustress that have a significant influence on eustress were identified and outlined in the paper.

The phenomenon of theft and vandalism on construction job sites in Sub-Saharan Africa has not been fully explored to guarantee the implementation of evidence-based security

management practices to minimise losses and improve projects' profitability margins. The fifth paper by Simukonda and Kamwela (2021) investigated the management of theft and vandalism by large contractors to identify implementation issues that need improvement. The study found that the key security management practices used on construction sites include inventorying construction materials, tools and equipment, termination of employment for offenders, and reporting theft and vandalism to enforcement agencies.

I thank all authors who submitted papers for consideration. I also value the contributions and unrelenting efforts of the JCBM editorial board members and panel of reviewers in ensuring that manuscripts are of high quality and keeping the journal on the path to attaining the expected standard and quality. Finally, these articles should help inspire new ethical, waste and security management practices. As ever, if there is something you would like to share with us, compliments, criticisms, feedback and suggestions on how to improve the quality of the journal, don't hesitate to get in touch.

Abimbola Windapo *PhD*
Editor-in-chief

References:

Odiba, E., Demain, P. & Ruikar, K. (2021). Development of a conceptual framework for effective quality management practices in construction organisations: the Case of Nigeria. *Journal of Construction Business and Management*, *5*(1), 1-16.

Oladiran, O. J., Bayewun, A. A. & Aderogba, A. M. (2021). Awareness and usage of Environmental Waste Management Practices (EWMP) of contractors on construction sites. *Journal of Construction Business and Management*, *5*(1), 17-27.

Dada, J. O. & Bamigboye, G. O. (2021). Diagnosing the causes of quackery in Quantity Surveying practice in Lagos State, Nigeria. *Journal of Construction Business and Management*, *5*(1), 28-37.

Ogwueleka, A. C. & Ikediashi, D. I. (2021). Exploring the effects of Positive Organizational Behaviour (POB) Models on occupational eustress amongst construction employees. *Journal of Construction Business and Management*, *5*(1), 38-46.

Simukonda, W. & Kamwela, N. (2021). The management of theft and vandalism on construction job sites in the Southern Region of Malawi. *Journal of Construction Business and Management*, *4*(2), 46-54.

JCBM (2020) 5(1).1-16.

University of Cape Town

Journal of Construction Business and Management

http://journals.uct.ac.za/index.php/jcbm

Development of a Conceptual Model for Effective Quality Management Practices in Construction Organisations: the Case of Nigeria

E. Odiba[1], P. Demain[2] and K. Ruikar[3]

[1,] The Knowledge Academy, London, United Kingdom
[2 & 3] School of Architecture, Building, and Civil Engineering, Loughborough University,Loughborough,United Kingdom

Received 18 June 2020; received in revised form 11 November 2020, 17 March 2021 and 17 April 2021; accepted 20 April 2021.
https://doi.org/10.15641/jcbm.5.1.922

Abstract

Effective quality management practices are critical to successful project delivery. However, the quality challenges in developing countries such as Nigeria, which is the focus of this research, have been a concern to construction practitioners and other interested parties such as clients and regulatory bodies. Some scholars suggest that part of these challenges can be attributed to ineffective quality management systems; thus, leading to consequences such as building collapse, poor organisational/industry reputation, poor/lack of traceability, poor documentation process, and lack of planned audit. This research aims to develop a contextual model that is intended to improve the culture of quality that can facilitate effective quality management practices in construction organisations in Nigeria. A mixed (quantitative and qualitative) methodological approach was deployed based on a pragmatic research philosophy paradigm. A questionnaire (quantitative) survey was adopted to gather data and results from the data analysis and reviewed literature were discussed, and the findings supported the development of a conceptual quality management model in construction as the outcome of this research. The designed model comprises eight integrated components. The model is a quality system that construction organisations can use: to identify some typical barriers hindering effective QMSs implementation; to assist them to develop cultural values that can drive effective QMSs implementation; to undertake effective QMSs practices as they relate to construction, and to recognise the potential results and longer-term benefits obtainable from implementing effective QMSs. The model was evaluated and validated by professional construction practitioners and academic experts for its usefulness and applicability. Future study should focus on the practical validation of the model.

Keywords: ISO 9001; Quality Management Practices; Quality Management System.

1. Introduction

Quality management practices, according to Watson and Howarth (2011) and Ofori et al. (2002), can speed up projects and increase profitability, help to satisfy clients, reduce the number of defects, reduce inspection costs, enhance workmanship efficiency, and improve construction repute; however, quality management practices have evolved dramatically since they first emerged. Initially, quality management in construction was primarily by inspection; the faulty goods were scrapped or transferred to the customers. This was followed by quality control. Subsequent attempts ensured quality assurance by considering quality cost, reliable technology, and eliminating defects (Winch, 2002). Nowadays, the emphasis is on quality management systems; they may be adopted, or organisations can develop their own. However, many construction organisations, especially in the developed countries, have adopted ISO 9001 (Quality Management System Requirements). As a result, ISO 9001 is the most widely used quality management system globally (ISO 9001, 2015).

According to Harris et al. (2013), management of quality in construction is an area of specialisation that has been growing over the past four to five decades to

[2] Corresponding Author.
Email address: ofolaj73@yahoo.com

embrace aspects of company activities and projects that are often seen as isolated from the physical product. They further identified aspects of quality (for example, quality planning and quality control) that influence the quality of the construction projects. Quality management in construction is a distinct feature that needs to be given the utmost attention in any construction work. It is a holistic approach to managing a project and delivering value for money and fitness for purpose. Dada, Obiegbu, and Kunya (2016) stated that quality management covers all processes, procedures, and responsibilities to achieve quality objectives. According to Agbenyega (2014), quality is aimed at standardisation, while Bala, Keftin, and Adamu (2012) perceived quality management as a wide-scale failure prevention program. However, the quality of construction projects in Nigeria is not given the desired attention.

Nwabueze (2001) lamented that one of the major reasons for clients' dissatisfaction with most construction projects is poor quality, and Nigeria is not an exception. The construction industry in Nigeria has been reportedly maligned with quality issues such as building collapse, construction delays, project abandonment, and cost overrun (Nwachukwu et al., 2010, Windapo and Rotimi 2012). Similarly, in Ghana, the delivery of construction projects is still characterised by poor quality (Government of Ghana, 2007). This has been partly attributed to technical incapacity, poor materials, and a general lack of competence and capacity (technical and human resource) within both client and contractor organisations (Government of Ghana, 2007). In addition, previous research identified quality consequences such as poor company/industry reputation, poor/lack of traceability, conflicts due to customer dissatisfaction, poor documentation process, and lack of planned audit in some organisations. According to the Federal Ministry of Power, Works, and Housing (2016), 54 buildings collapsed across Nigeria between 2012 and 2016. Furthermore, National Emergency Management Agency (NEMA; 2019) reported that twenty people were killed on March 13th, 2019, when a four-storey building containing a primary school in Nigeria's commercial capital, Lagos, collapsed, and forty-five others survived. The investigation showed that the reasons for the building collapse include poor enforcement of building regulations and substandard construction materials.

In a previous study, Ibrahim and Sodangi (2007) attributed low-quality project deliveries in Nigeria to ineffective quality management practices. Olatunji et al. (2012) emphasised the need for effective quality management practices in Nigerian construction organisations to reduce the effects of pertinent quality issues. Many construction organisations in developed countries such as the United Kingdom and Germany have adopted ISO 9001 (Quality Management System Requirements) for improved organisational effectiveness. On the other hand, most construction companies in Nigeria mainly practice an inspection-based quality management system, and only a few companies (240 in 2016) embrace ISO 9001 (Oludare and Olugboyega, 2016). Iwaro and Mwasha (2012) concluded in their research that ISO 9001 certification is important to an organisation because it can be used to improve workmanship performance, improve systemic factors, and improve the organisation's quality substantially. However, getting certified to ISO 9001 cannot guarantee quality projects; instead, it is the organisation's willingness to create the right culture for effective quality management practices.

For the Nigerian construction industry to realise the full benefits of quality management practices, Zubairu (2016) recommended that a framework needs to be developed that suits building construction projects in Nigeria. This need formed the foundation of this research to develop a contextual, conceptual model for construction organisations in Nigeria. The model is expected to nurture an appropriate culture of quality (organisational pattern of habits and behaviour) that will, in turn, improve the quality of construction projects in Nigeria and promote competitiveness between the local and foreign contractors..

2. Literature Review

It is widely acknowledged that the construction industry is a great contributor to the economic growth of any nation. Willar (2012) reported that the construction industry globally is one of the largest contributors to the Gross Domestic Product (GDP) and plays an important role in determining a country's economic growth. To this end, the Nigerian construction industry plays an important role in meeting the needs of the nation's infrastructural and economic development; thus, making it one of the main economic indicators that determine the growth of the Nigerian economy, according to the National Bureau of Statistics (2017). However, the quality of construction projects in Nigeria has been described as 'poor' by many scholars. For example, Hughes and Williams (1991) asserted that factors such as the subjective nature of quality, project uniqueness, the transient nature of construction projects, and several teams with different skills and interests all make quality particularly challenging to attain in the construction industry. It is, however, noteworthy that many other industries also have several teams with different skills and interest and yet do not suffer from the same quality issues. Therefore, to address quality challenges in the construction industry, quality management practices need to become a key part of management functions. Many have claimed that effective quality management practices in the construction industry can improve quality and productivity, according to Arditi and Gunaydin (1997). This can be true when an organisation has the right culture regarding leadership commitment and an effective quality management system.

2.1 Quality Management System

A survey of firms in Lagos, Oludare and Olugboyega (2016) found that quality management systems used among construction organisations are not applied in a standardised manner as organisations indicated different quality management systems. According to them, supervision of workmanship is the most used quality control tool among construction companies in Nigeria. This suggests that supervisors are relied upon to ensure the quality of work undertaken. The level of quality of

projects, therefore, depends on the expertise of the supervisors.

Oludare and Olugboyega (2016) pointed out that only a few construction firms in Nigeria use ISO 9001 standards. However, this does not mean that quality projects cannot be delivered without ISO 9001 certification; the most important factor is the organisational commitment to quality and the right culture. They further reported that only 11% of questionnaire respondents expressed commitment to quality management, and less than 16% and 3% of the construction firms relied on project managers and architects to handle quality management. Furthermore, over 45% of the respondents did not indicate the department handling quality management in their companies. This suggests that these companies did not have a specific department handling quality. In addition, the Nigerian Institute of Building (2009) summarised the factors affecting the implementation of quality management systems, and these are lack of quality culture, lack of top management commitment, lack of adequate resources, resistance to change, and corruption.

To achieve quality project objectives, it is important to have an appropriate and well-implemented quality management system. Hoyle (1997) warned that the production of required quality products does not happen by chance, but rather it must rely on the use of a quality management system to meet all the established quality goals. Therefore, construction organisations need a structured and systematic approach to implement a quality management system's practices, principles, and techniques. Hence, the adoption of a formal quality management system (QMS) is important in construction organisations. Thorpe and Sumner (2004) defined a QMS as a formal statement of an organisation's policy, management responsibilities, processes, procedures, and controls that reflect the most effective and efficient ways to meet (or exceed) the expectations of those it serves whilst achieving its prime business objectives.

2.2 ISO 9001 (Quality Management System Requirements)

Although there are many ways to develop a quality management system, many organisations (including in construction) adopt the ISO 9000 family of standards, a set of standards and guidelines for quality management systems that represent an international consensus on the most acceptable and effective quality management practices. The standards provide a comprehensive framework for designing and managing a quality management system and can help organisations establish a process orientation and the discipline to establish, implement, maintain, document and control key processes (Watson and Howarth, 2011). Winch (2010) emphasised that ISO 9000 is not a product standard but a standard for quality management systems. However, ISO 9001 (2015) is the international standard that sets out the requirements for a quality management system (QMS). It helps organisations (including in construction) to demonstrate their ability to consistently provide projects and services that meet clients and relevant stakeholders' requirements.

According to Willar (2012), the ISO 9001 series has become the QMS model recommended by followers of the quality movement as a benchmark for implementing good management and process control in a variety of industries and sectors. However, the weakness of ISO 9001 is its generic nature. For a quality system to produce the desired outcome, it needs to consider the context of the environment within which it is to be implemented. The context includes the national, vocational, and organisational culture. Unfortunately, the organisational culture in Nigeria makes it difficult for local companies in Nigeria to adopt ISO 9001 because of the country's low level of quality culture (Ibrahim and Sodangi, 2007). They added that the indigenous contractors lament the high cost of ISO 9001 implementation and the daunting documentation process of its certification. There is, therefore, a need to bridge the gap between the current quality practices and ISO 9001. Hence, a new model needs to be developed to promote the expected culture of quality for effective quality management practices in construction organisations in Nigeria. However, the prominence of ISO 9001 makes it a useful foundation for the development of the proposed model in this study. Figure 1 presents the ISO 9001 QMS model.

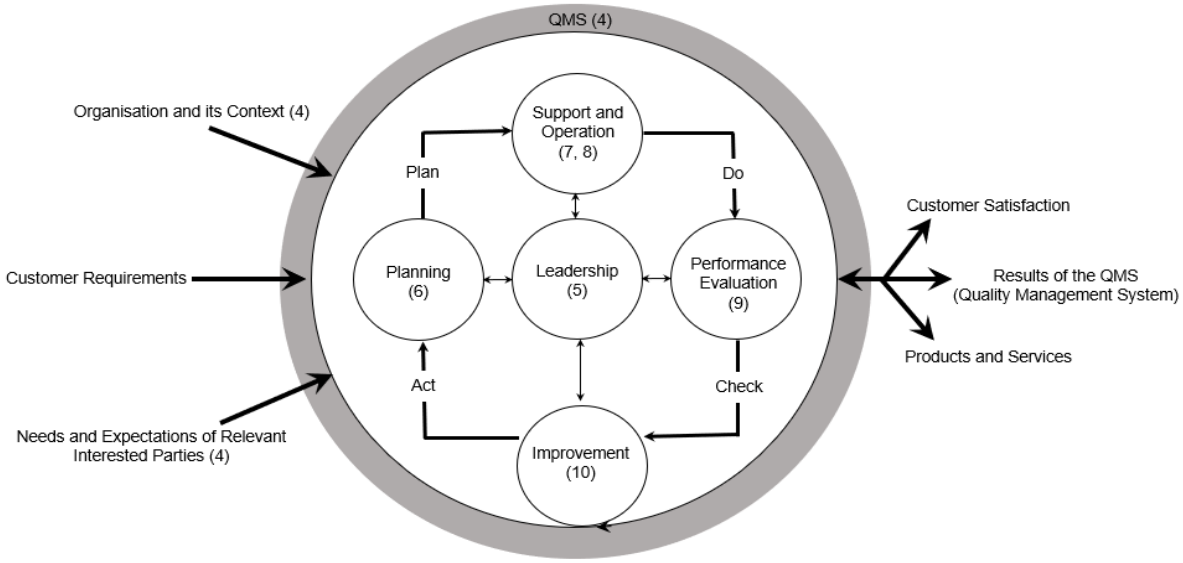


Figure 1: ISO 9001 Model (Source: Figure generated by authors based on ISO 9001: 2015)

Furthermore, successful implementation of a QMS requires effective planning, operation, and review and continuous improvement of the system at all levels of an organisation. ISO 9001 (2015) reinforced that quality management principles (MPs) are required to implement the model successfully. The MPs (fundamental beliefs) can be used as a foundation to guide an organisation's performance improvement. The following section provides a brief description of each of the principles or theories.

2.2.1 ISO 9001 Principles

- Customer focus: The primary focus of quality management is meeting customer expectations and striving to exceed them. Other interested parties should be considered as well. This calls for the identification of all relevant stakeholders in a project.
- Leadership: Leaders at all levels give direction and create conditions in which people are engaged in achieving the organisation's quality objectives.
- Engagement of People: Competent, empowered, and engaged people throughout the organisation are essential to enhance its capability to create and deliver value.
- Process-based Approach: Consistent and predictable results are achieved more effectively and efficiently when activities are understood and managed as interrelated processes that function as a coherent system.
- Improvement: Successful organisations have an ongoing focus on improvement. Improvement is essential for an organisation to maintain current performance levels, react to changes in its internal and external conditions, and create new opportunities.
- Evidence-based Decision Making: Decisions based on the analysis and evaluation of data and information are more likely to produce desired results. Facts, evidence, and data analysis can lead to greater objectivity and confidence in decision making. An example of this is the data analysis in this study that is expected to assist in developing the proposed model.
- Relationship Management: For improved performance, an organisation manages its relationships with interested parties, such as suppliers. Interested parties can influence the performance of an organisation.

Furthermore, ISO 9001 has some requirements (clauses) to be met by organisations seeking to get certified to it. However, meeting these requirements depends on each organisation's operational activities and their policy towards quality improvement.

2.2.2 ISO 9001 Clauses

In total, ISO 9001 is made up of 10 clauses, and to successfully implement it, an organisation must satisfy clauses 4-10. The first three clauses are scope, normative references, and terms and definitions. Clauses 4-10 are briefly explained below:

Clause 4. Context of the Organisation: This clause sets out the requirements for an organisation to review the business and the environment, considering the key internal and external factors that impact it and how a defined management system can address these factors.

Clause 5. Leadership: This clause encompasses a range of key activities to demonstrate leadership and commitment concerning the quality management system.

Clause 6. Planning: This clause is based on the organisation's actions to address risk and opportunities and assess whether the organisation manages risks effectively.

Clause 7. Resources: An effective quality management system cannot be maintained or improved without adequate resources. This clause sets out planning activities for determining and providing such resources, including contract or project-specific resources.

Clause 8. Operation: This clause represents the core production and operational control parts of the organisation.

Clause 9. Performance Evaluation: Collection and analysis of relevant data are necessary to measure the management system's suitability and effectiveness and identify opportunities for improvement.

Clause 10. Improvement: This section requires reviewing processes, projects and services and quality management systems for continual improvement.

In the context of quality management implementation in organisations, culture cannot be ignored.

2.2.3 Quality Culture

Coffey (2010) and Gryna et al. (2007) defined quality culture as "the pattern of habits, beliefs and behaviour concerning quality". There are varieties of cultural influences on individuals and stakeholders which shape their expectations. These are referred to as the frames of reference, which include national culture, vocational culture (industry, institutional and professional culture) and organisational culture (Gryna et al., 2007). Hence, the development of quality culture in an organisation can be influenced by these frames of reference. Arguably, organisational culture appears to have a stronger influence than professional (vocational) and national culture in developing a quality culture in construction firms. The foundations for quality orientation or culture of an organisation are defined at the corporate level. The corporate quality culture is the organisational value system that encourages a quality-conscious work environment. It establishes and promotes quality and continuous improvement through values, traditions, and procedures (Goetsch and Davis 2006). According to Evans and Lindsay (1996), quality-conscious companies adopt quality management systems that focus not only on delivering high-quality products but also on creating performance improvement in the internal and external services generated by the company. Therefore, the existence of a strong quality culture can lead to organisational effectiveness. Therefore, it is suggested that organisations need to pay more attention to the development of appropriate quality culture for effective quality management practices.

3. Methodology and Sampling

Based on pragmatic philosophical assumptions, a mixed-method approach was adopted to explore the quality management systems used in construction organisations in Nigeria and the factors affecting the implementation of

organisations' QMSs. According to Mahamadu et al. (2015), pragmatism is an approach that works in between the interpretive and positivist paradigms. This approach is more appropriate for this study because it is pinned on both interpretive (qualitative) and positivist (quantitative) tenets. Therefore, a questionnaire survey (quantitative) was used to collect data from construction professionals on using QMSs in their respective organisations. On the other hand, qualitative interviews were used to validate the model and assess its applicability.

Drawing a suitable sample for data collection is an obvious necessity since it is rarely possible to investigate an entire population due to source restrictions in most research. The three most used types of random sampling are simple random sampling, stratified random sampling and cluster random sampling (Kumar, 2011). Simple random sampling is the most used method of selecting a probability sample. Under simple random sampling, each element in the population is given an equal and independent chance of selection, whereas the stratified random sampling is a method employed to randomly choose a few samples representing each stratum of a population (Kumar, 2011); "it has advantages of high generalisability of findings and is the most efficient among all probability designs" (Sekaran and Bougie 2009). This method was used to select respondents representing a typical construction practitioner, including Quality/Project Managers, Architects, Quantity Surveyors, Site Engineers, and General Managers. Finally, cluster sampling was used primarily to choose the location of designated construction companies. The population of the study was mainly construction professionals across the six geo-political zones in Nigeria. Nigeria's construction sector is estimated to employ about 1% of the country's labour force (Idrus and Sodangi 2010), giving a population for this research of the order of magnitude of about 600,000 construction professionals.

The following cities were chosen based on the six geo-political zones in Nigeria for the data collection; Abuja, the Federal Capital of Nigeria and Lokoja representing North-Central; Kaduna representing North-West, Lagos State representing the South-West, Enugu represents South East, and Port Harcourt representing South-South. However, the North-Eastern part could not be reached due to an insurgency attack in that region. The sampling across different regions reflected the view of Sekaran and Bougie (2009) that the sampling design is most useful when studying a heterogeneous group at one time.

To avoid response bias, the questionnaire was designed to be anonymous, and leading questions were avoided. Furthermore, ethical norms such as integrity of data and the exact representation of data were adhered to in this research by following the ethical research procedures of Loughborough University (including formal approval of all data collection plans).

4. Data Collection, Analysis and Model Development

The distribution and collection of the questionnaires were conducted from February 2018 - July 2018 in Nigeria. The questionnaires were delivered personally by the researcher. Three hundred questionnaires were distributed amongst three different groups of construction organisations in Nigeria, 150 were distributed to the public sector, and 75 each to foreign and local contractors. This distribution covers the scope of this study; the public sector acts as clients on behalf of the government, while the contractors, both foreign and local, are the project constructors. Descriptive statistical analysis was first undertaken after reliability testing to establish the demographic profile of the participants and the construction organisations involved in the survey.

This research adopted both closed-ended and open-ended questions to draw on the strengths of each type of question and minimise bias arising from similar questions. Since most of the questions sought opinions or subjective perceptions, the formats of some questions were based on an even itemised rating scale of 4=Strongly Agree, 3=Agree, 2=Disagree, 1=Strongly Disagree. According to Coffey (2010), findings of previous research (Hofstede et al. 1990) revealed that there had been a significant experience that managers tend to select the mid-point of an odd-number based rating scale in a questionnaire. Many researchers have different views of the use of the 'middle-way' response. There is no consensus on the optimum choice of scale (Bernard 2000).

The collected data were analysed with the aid of statistical software (SPSS), and the results from the data analysis and reviewed literature supported the development of a conceptual quality management model in construction as the outcome of this research. In addition, parametric testing was further conducted using Factor Analysis (Appendix 4) to reduce a large number of QMS variables into a subset of more meaningful QMS variables used in the model formulation.

Having developed and presented the proposed conceptual Quality Management Model, it was necessary to evaluate its validity, usefulness, and applicability to the Nigerian construction industry. This was achieved by the involvement of academic experts, policymakers and construction practitioners in Nigeria through focus group and semi-structured interviews. The interviews and focus groups were audio-recorded, and the data collected were analysed qualitatively through thematic analysis. The participants comprised 17 participants, including academic experts, policymakers, and construction contractors. The participants' experiences span from 10 to 30 years within the built environment, and their contributions assisted greatly in the refinement of the model. The participants all confirmed the suitability of the model for the construction industry in Nigeria.

4.1 Data Analysis

Of the 300 questionnaires sent, 46 were returned undelivered, bringing the questionnaires distributed to 254. Therefore, the completed questionnaires returned were 124, which is equivalent to a 48% response rate. The response rate of 48% is considered satisfactory for the survey purpose according to Fellows and Liu (2008); the sample size of 100 with a response rate between 35-40% is adequate for questionnaires in construction-related studies.

The first step of the analysis was to subject the data to a reliability test. Cronbach's Alpha was used to assess the reliability of the questionnaire. According to Pallant (2007), "Cronbach's Alpha coefficient of 0.70 or above is

considered adequate". Table 1 shows a Cronbach's Alpha test result of 0.87; this provides evidence of the data's reliability for further analysis.

Table 1: Reliability Test

Cronbach's Alpha Test	Number of Items
0.87	54

4.1.1 Demographic Information of Respondents

The analysis of this data begins with the demographic information of the respondents and their respective construction organisations. Then, Table 2 shows the distribution between the public sector, domestic contractor, and foreign contractor organisations to assist in comparing the performance of those three categories. The involvement of foreign contractors has introduced fierce competition in the construction industry in Nigeria.

The Table also reveals that 94% (59+21+14) of all the respondents have professional qualification within the construction industry. The project types were limited to two: civil and building projects. Some of the major projects include infrastructure such as roads, bridges, rail lines, hospitals, and schools.

Table 2: Background Information of Respondents

Category	Frequency
Construction Organisations' Involvement	
Foreign-based Contractors	19%
Public Sector	49%
Local Contractors	32%
Professional Qualifications	
Civil and Building Engineering	59%
Architecture	21%
Quantity/Land Surveying	14%
Other	6%
Project Types	
Building	12%
Civil	20%
Both	68%

4.1.1 Current Quality Management Practice

This section summarises the use of current quality management systems in construction organisations in Nigeria. Regarding ISO 9001 certification in Table 3, the result shows a higher mean of 1.7 and a standard deviation of 0.47. This indicates that only 30% of construction organisations are certified to ISO 9001 or another system standard. On the validity of the quality management system certificate, the response rate of 1.7 was recorded, and a standard deviation of 0.46. This means that 70% of their organisation's QMS certificate were invalid at the time of the data collection, and only 30% recorded valid certificates. However, the result finally shows an effective reporting structure with a mean of 1.4 and a standard deviation of 0.5. This reflects 56% of an effective reporting structure within construction organisations in Nigeria. Table 3 further shows respondents' indication of the quality standards or quality management systems used in their organisations or projects. Standards or systems were felt to be an important indicator of quality practices in Nigeria.

Table 3: Formal Quality Management System or Standard

Elements	N	Mean	S.D
Formal quality management system	124	1.30	0.46
Quality policy and quality objectives	124	1.44	0.50
ISO 9001 Certification or other Standards	124	1.69	0.46
Valid QMS certificate	124	1.71	0.46
Effective Quality Reporting Structure	124	1.44	0.50
Total	124	1.52	0.48

Overall, the result shows a mean of 1.5 and a standard deviation of 0.5 across all QMSs or standards. This indicates that 60% of construction companies in Nigeria have formal quality management systems in place. However, the challenges lie mainly with their implementation.

The analysis shows that all the construction organisations represented in this research use inspection and flowcharts to manage quality on the current quality tools used in Nigeria. The flowchart shows the responsibilities of employees for operations. The analysis unveils that other quality tools such as Quality Function Deployment (QFD), Lean, Total Quality Management (TQM), and European Foundation for Quality Management are not commonly used in construction companies in Nigeria.

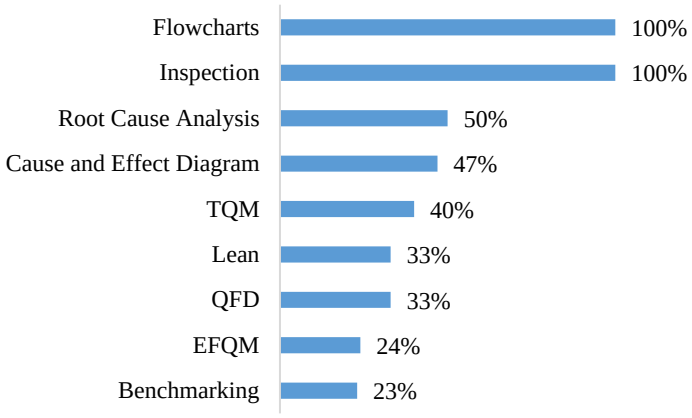


Figure 2: Quality Management Tools

Figure 2 shows respondents' use of ISO 9001 or other standards among the three groups established for this data collection. The graph shows that six out of 60 respondents from the public sector are certified, while 8 out of 40 respondents of local contractors are certified to ISO 9001 or other standards. This is relatively low compared to the foreign-based contractors.

In identifying factors affecting quality management system implementation in construction organisations in Nigeria, as shown in Appendix 1, the respondents revealed the following:

- lack of top management commitment to quality policy and quality objectives,
- provision of inadequate resources,
- lack of quality training and culture, and

corruption within and outside construction organisations.

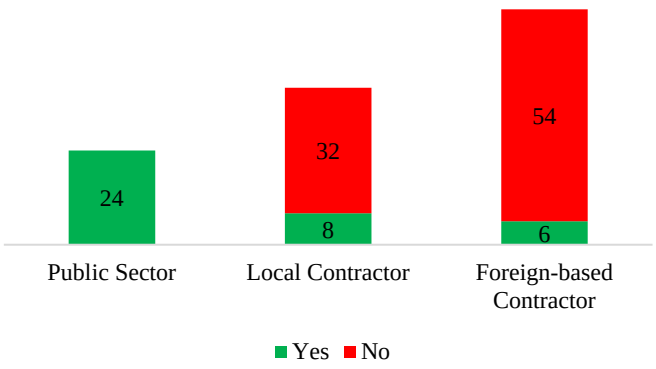


Figure 3: ISO 9001 Certification

The respondents added other challenges that were not listed in the questionnaire: client's focus on cost rather than quality, no enforcement of standards, poor understanding of quality, use of substandard building materials, poor understanding of building codes, and use of unqualified engineers and tradesmen (Appendix 1). However, suggestions for improvement on quality management system implementation were made in Appendix 2 by various respondents, and the result shows the promotion of quality training and culture as the most significant factors for quality improvement in construction organisations in Nigeria.

The last part of the questionnaire evaluated the implementation of the quality management systems used by construction organisations in Nigeria. The key elements of this section are based on quality principles of ISO 9001 (2015), as explained in the literature review. Respondents were asked to indicate their agreement with statements of the importance of these factors, as shown in Table 4.

Table 4: Implementation of Quality Management System

Key Elements of the Questionnaire	Strongly Disagree (%)	Disagree (%)	Agree (%)	Strongly Agree (%)	Mean Score*
Customer Focus	0.66	4.89	57.31	37.14	1.25
Leadership	13.71	38.71	27.42	20.16	0.02
Engagement of People	16.33	43.75	28.43	11.49	-0.25
Process-based Approach	5.05	61.49	11.49	21.97	-0.16
Improvement	23.59	20.36	42.14	13.91	0.02
Evidence-based Decision Making	23.64	20.41	42.04	13.91	0.02
Relationship Management	16.73	31.25	41.73	10.29	-0.02

** From -2 for Strongly Disagree to +2 for Strongly Agree*

Furthermore, based on the relatively large number of dependent variables (45) from data analysis (Appendix 3), factor analysis was deemed necessary to identify the most important variables. The results of the factor analysis show variables that are grouped into six factors. However, Factors 2 and 3 represent the same concept (leadership commitment); the factors were therefore regrouped into five components. These are:

Factor 1 Quality management system challenges
Factor 2 Leadership Commitment
Factor 3 Performance Measurement
Factor 4 Construction Processes (Demographic Information)
Factor 5 Quality Management System Improvement.

The data were subjected to further analysis. The factors were revised based on this further data analysis and following reflections from the literature review. The resulting factors form the fundamental components of the proposed conceptual quality management model in construction for this study. The factors are:

Factor 1: Quality Drivers
Factor 2: Quality Management Implementation Challenges
Factor 3: Leadership Commitment
Factor 4: Performance Evaluation Indicators
Factor 5: Construction Activities and Processes
Factor 6: Quality Improvement Controls
Factor 7: Quality Management Practice Outcomes
Factor 8: Quality Improvement

5. Discussion

The demographic data captured in the questionnaire form the basis for data analysis because the first step in data analysis is to determine the respondents' background and ensure that the information obtained can be considered 'fit for purpose.

The reviewed literature reveals that quality has been a problem in the Nigerian construction industry for decades. Olugboyega (2000) observed a general decline in quality performance in the Nigerian construction industry, leading to the prevalence of abandoned projects, high maintenance cost, and loss of lives. This low-quality performance led to the dominance of foreign-based companies over the local contractors in Nigeria. It can be observed that foreign-based contractors handle major construction and special projects in Nigeria. Idrus and Sodangi (2010) asserted that most expatriate contractors adopt ISO 9001, which has distinguished their buildings in terms of quality and time of project delivery but at a higher cost than the indigenous contractors. However, this does not mean that no local contractors are doing it right in Nigeria. It is good to emphasise that getting certified to ISO 9001 cannot guarantee quality projects, rather the organisations' willingness to create the right culture for effective quality management practices. Many companies in Nigeria without ISO 9001 certification have delivered projects successfully within the project constraints of time, cost, and objectives.

Olatunji et al. (2012) maintained a need for effective quality management practices in Nigerian construction organisations to reduce the adverse effects of quality issues. Abdulsalam (2016) added that a framework (model) needs to be developed for quality management practices that suit building construction proects in Nigeria.

The results from data analysis show that the following factors affect quality management system implementation in construction organisations in Nigeria: lack of top management commitment to quality policy and quality objectives, provision of inadequate resources, lack of quality training and culture, and corruption within and outside construction organisations. It is noteworthy that corruption emerged as the main factor affecting QMS implementation in Nigeria in the reviewed literature. However, if corruption is this high, why are some organisations still able to operate ethically in Nigeria? This question led to further analysis to determine the major challenges through principal component analysis. The results show a factor loading of below 0.6; this indicates that corruption is not one of the major factors affecting the quality delivery of construction projects in Nigeria, as shown in Appendix 3. The findings further highlight some quality controls to overcome these challenges, and these are: adopting or establishing a formal QMS, promoting a culture of documentation as well as establishing, implementing, and maintaining quality policy and quality objectives. The following sub-section gives an account of the development of a conceptual quality management model.

5.1 The Conceptual Framework

Based on the global acceptance of ISO 9001 with its associated benefits, the structure of the proposed model in this research is largely based on it. One of the core principles of quality management is continual improvement; therefore, the proposed model in this research is expected to improve ISO 9001, but specifically designed in the context of construction organisations in Nigeria. The findings show that 60% of construction organisations have formal quality management systems, but quality awareness and QMS implementation remain low. Based on these, a new model that can easily be implemented needs to be created in the context of cultural practices in the Nigerian construction market. The framework consists of 8 integrated components, as displayed in Figure 4.

This research highlighted the difficulties in implementing ISO 9001 by Nigerian contractors. The difficulties include the high cost of its implementation and the daunting documentation process, and this is reflected in the low certification of ISO 9001 in Nigeria. Another challenge with ISO implementation is its generic nature; the construction industry has its peculiar characteristics such as site variations, the transient nature of projects and their uniqueness, and different construction processes compared with other industries. In addition, the ISO as an organisation has developed other industry-specific model for oil and gas, automotive, and medical devices, but they are yet to develop a construction-specific QMS standard. This led to Zubairu's (2016) recommendation that a new framework that is cheaper and easy to implement is needed to improve the quality of construction projects in Nigeria.

Furthermore, this research highlights an apparent lack of consistent performance evaluation of quality management systems in Nigeria. The findings revealed that few construction companies in Nigeria have never performed an organised or planned quality audits to check the effectiveness of their QMSs. Figure 4 presents the conceptual Odiba quality management model for construction organisations in Nigeria based on the findings in this study. The model can be used by both clients (mainly the public sector) and contractors to bridge the gap between the current quality management practices and ISO 9001.

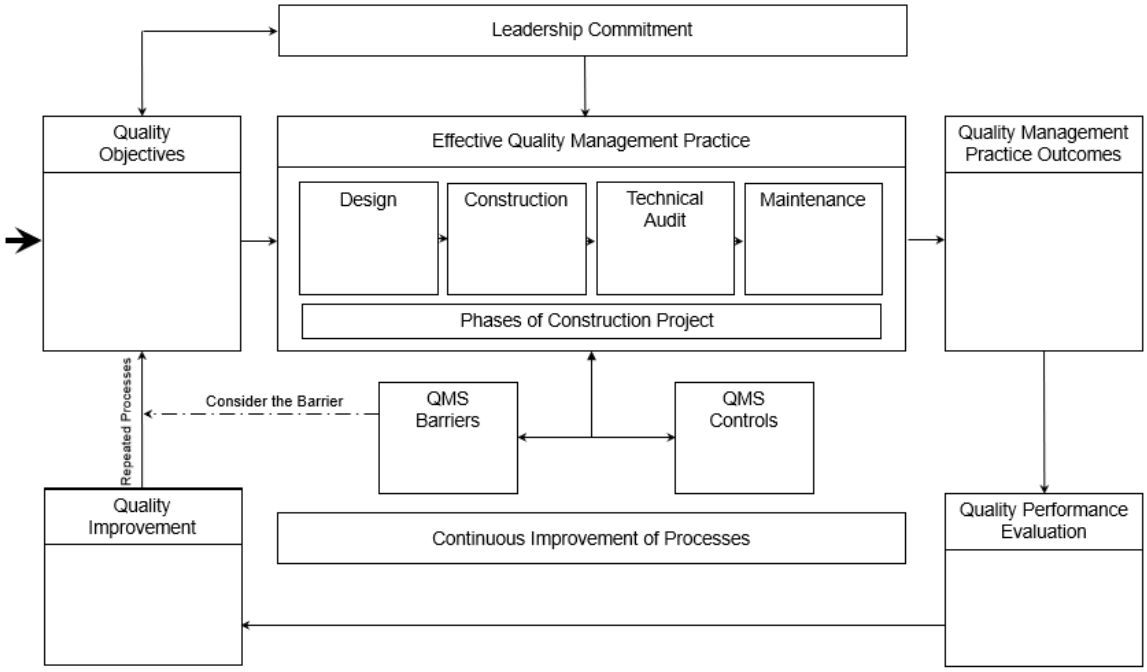


Figure 4: Proposed Odiba Model for Quality Management in Construction

A brief description of each model component is as follows:

- Quality Objectives: Quality objectives are goals set by organisations to meet the needs and expectations of clients and other relevant interested parties. The elements of the components as deduced from the analysis shown in Appendix 4 include customer requirements, employee needs/well-being; functional requirements; statutory and regulatory requirements, and organisational requirements.
- Leadership: Excellent leaders demonstrate commitment concerning QMS by ensuring that the resources needed for its implementation are available. The elements of leadership from the findings in this study include action plans to address risks and opportunities, establish quality policy and quality objectives, provision of adequate resources and infrastructure, establish the context of the quality management system, and continually improve processes.
- QMS Implementation Barriers: The elements include: faulty communication system, lack of consistent quality performance measurement; lack of quality training; resistance to change; and poor documentation of quality management systems.
- QMS Improvement Control: They serve as guidelines for QMS implementation. The elements of the components include a formal quality management system; and quality management system documentation.
- Effective Quality Management Practice: Quality is essential for all construction projects and needs to be managed effectively at all stages.
- Quality Management Practice Outcomes: Knowledge of expected outcomes can motive quality performance. The elements of the components include customer satisfaction, employee satisfaction; enhanced organisation's reputation; organisation's increased profit and growth, and safety of lives and properties.
- Quality Performance Evaluation: Construction organisations are required to evaluate the effective performance of their QMSs. It is essential to identify key performance indicators (KPIs) critical to the successful implementation of their QMSs. The KPIs identified in this study include leadership commitment level, engagement of people, customer focus and evidence-based decision making.
- QMS Improvement: Improvement is essential for any organisation to remain competitive and meet the future needs of clients and interested parties. The elements of the components include quality training, top management commitment, transparent procurement process and staff well-being.

5.2 The Distinctiveness of the Developed Model

There are similarities between the developed model and components of other models, such as ISO 9001, because this was the foundation for developing this model. However, unique aspects of the developed model can still be identified:

The distinctiveness of this model begins with the primary data collected in the geographical location of Nigeria to establish the current quality management practices and the major barriers affecting QMS implementation.

- Construction Processes: ISO 9001 is generic, but this model is specific to construction organisations.
- Employee satisfaction and well-being: The element of this model caught the attention of one of the focus group participants, one of whom stated, "what makes your model unique is the inclusion of employee satisfaction and well-being. In Nigeria here, most employers do not pay attention to workers' welfare".

QMS Barriers: This research shows an apparent lack of consistent performance evaluation of quality management systems in Nigeria. Understanding the barriers will assist project managers to plan for ways to mitigate them.

Quality Improvement: One of the key components of quality improvement is Corrective and Preventive Action (CAPA); an approach that investigates and solves problems, identifies causes, takes corrective action, and prevents recurrence of the root causes of any issue or quality failures as relating to construction processes or projects. The inclusion of CAPA in the model makes it unique in the context of the Nigerian construction industry.

This research focuses on the conceptual development of the model. However, further study will present the full model and how construction organisations can use it. The model is a repeated process that begins with establishing the quality objectives with top leadership involvement. In establishing the quality objectives, QMS barriers and control should be considered during the project's construction phases as reflected in the model.

The proposed model is a guideline, and the sub-components can be adopted selectively depending on the context of the project, but it is suggested to apply all the components of the model for improved quality delivery of projects, especially in Nigeria.

This research aimed to develop a conceptual quality management model that can drive a culture of quality, which can facilitate effective quality management practices in the construction industry in Nigeria. Figure 5 shows the components of the model that can create the right culture of quality for effective quality management practices, which in turn can facilitate the benefits realisation of a structured QMS such as customer satisfaction, reduced construction failures, profits to the organisation, and meeting applicable regulatory requirements as revealed in Appendix 6.

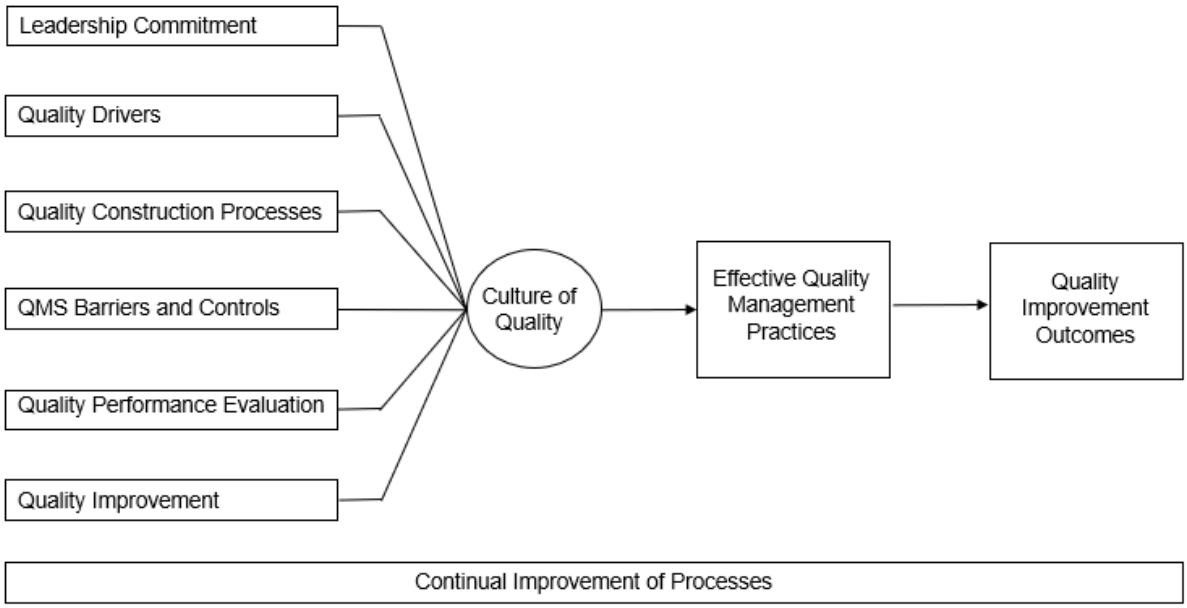


Figure 5: Components of Proposed Odiba Quality Management Model in Construction

6. Conclusions and Recommendations

The developed model in this study was designed to bridge the gap between the current management practices in Nigeria and ISO 9001. The findings show that 60% of construction organisations have a formal quality management system, but the quality awareness and QMS implementation remain low.

Based on the findings from data analysis and the information from the literature, it can be observed that there is a clear need for an improved quality management system standard in the construction industry in Nigeria. Although the result of the analysis showed that 60% of construction organisations have formal quality management systems in place, but the implementation remains low. This indicates that having a quality management system in place does not translate to quality project delivery. Further results show that most construction companies in Nigeria mainly practice inspection-based quality management, and only a few companies embrace ISO 9001 in construction in Nigeria. This validates the claim that inspection is the most used quality control tool among construction companies in Nigeria. It is noteworthy that the previous research from which inspection emerged was conducted in Lagos. However, the information from the research was used in the development of the questionnaire instrument. The research discussion concluded that inspection is the most widely used quality monitoring tool by construction organisations in Nigeria. The results also show flowcharts as a commonly used quality tool, but it is mostly used at the corporate level compared to the site level.

To improve the image of the Nigerian construction organisations in terms of quality project delivery, this research developed a new quality model in the context of cultural practices in the Nigerian construction market. The structure of the proposed model in this research is largely based on ISO 9001 because of its worldwide acceptance and associated benefits. The framework consists of eight integrated components inferred from data collection and analysis. In addition, the model contains some elements within the components, as displayed in Appendix 6. This will be expanded in further research.

Significant factors were identified in the implementation of quality management systems, and these are lack of top management commitment, lack of quality training, no consistent quality performance evaluation. In addition, the literature identified corruption as the main factor affecting construction quality in Nigeria, but this research, through the principal component analysis, unveiled an interesting contrary view. It shows that corruption is not among the main factors affecting construction quality in Nigeria, as recorded in the literature.

The proposed Odiba model is expected to facilitate effective quality management practices through managed and controlled processes to achieve improved quality performance outcomes in meeting functional, customer, regulatory, and statutory needs and requirements. The model is expected to improve projects quality delivery and the organisation's overall business performance.

Although this study provides insights into effective quality management practices in construction organisations in Nigeria, it has some limitations.

- The first major limitation was a lack of adequate literature in quality management practices related to construction organisations in Nigeria.
- Secondly, the data used in the development of the model was based on sampling and may not be an exact representation of the population of construction organisations in Nigeria.
- Appropriate professionals only validated the developed model. However, the model has not been used at the site level due to time constraints.

This paper recommends top management commitment to establishing and implementing quality policy and quality objectives in the Nigerian construction industry.

Quality awareness should also be promoted through statutory bodies at both local and national levels.

Construction organisations should institute periodic quality training to improve the quality knowledge of employees.

Further study should concentrate on the detailed operationalisation of the model and the guide for its implementation.

It can be concluded that the Proposed Odiba Quality Management Model in Construction is intended to improve the quality management practices both at corporate and project levels, and this will, in turn, facilitate quality project delivery in the construction industry in Nigeria and other countries with a similar culture. However, it is recommended for any country to examine its context before adopting this model. The expected benefits include improved competitiveness in national, regional, and international markets, organisational capability to meet clients and regulatory requirements, increased profit, and improved employee well-being and satisfaction, and ultimately clients' satisfaction.

References

Arditi, D., and Gunaydin, H.M. (1997). Total Quality Management in the Construction Process. International Journal of Project Management, 15(4), 235-243.

Cameron, K.S., and Quinn, R.E. (1999), Diagnosing and Changing Organizational Culture Based on the Competing Values Framework, Addison Wesley, Reading.

Cartwright, J. (1999). Cultural Transformation, Financial Times, Prentice-Hall, London.

Coffey, W, V. (2010). Understanding organisational culture in the construction industry. London: Spon Press.

Fellows, R., and Liu, A. (2008). Research methods for Construction, Oxford: Blackwell Publishing Ltd.

Government of Ghana. (2007). Road Sector Development Programme: Review. (2007). Transport a Catalyst for Growth and Development. Accra, Ghana: Ministry of Transport.

Goetsch, D, L., and Davis, S.B. (1997). Introduction to Total Quality: Quality management for production, processing and services. 2nd Edition. USA: Prentice-Hall.

Gryna, F, M., Chua, R.C.H., and Defeo, J.A. (2007). Juran's quality planning and analysis. New York: The McGraw-Hill.

Harris, F, C., McCaffer, R., and Edum-Fotwe, F. (2013). Modern Construction Management, 2nd ed., Blackwell, Oxford.

Hofstede, G., and Minkov, M. (2010). Cultures and Organisations: Software of the Mind. New York: McGraw-Hill.

Hoyle, D., (2001). ISO 9000: Quality System Handbook.4th edition, Butterworth-Heinemann, Oxford, UK.

Hughes, T., and Williams T. (1991). Quality Assurance: A Framework to Build On. Cambridge: University Press.

Ibrahim, A, D., and Sodangi, M. (2007). An Assessment of Quality Performance in Construction Using Client Project-Level Quality Performance. The Information Manager Journal, 7(1), 22-31.

Idrus, A, B., and Sodangi, M. (2010). Framework for Evaluating Quality Performance of Contractors in Nigeria. International Journal of Civil and Environmental Engineering, Vol.10, No. 1, pp.34-39.

ISO 9001. (2015). Viewed (25/04/2020). Available at: https://www.iso.org/standard/62085.html

Mahamadu, A. M., Mahdjoubi, L., Booth, C., and Fewings, P. (2015): Integrated Delivery of Quality, Safety and Environment Through Road Sector Procurement: The Case of Public Sector Agencies in Ghana, Journal of Construction in Developing Countries, 20(1):1–24.

National Bureau of Statics, Nigeria. (2018). Viewed (12/03/2020). National Budget: Available at https://www.nigerianstat.gov.ng

NEMA., (2019). Building Collapse in Lagos. Viewed (15/02/2020). Available at: https://www.google.co.uk/search?q=NEMA+LAGOS+SCHOOL+BUILDING+COLLAPSE&tbm=isch&source=iu&ictx=1&fir=NjIf0DMNha

Nigerian Institute of Building. (2010). Professional Builders and the Construction Industry. Daily Independent newspaper, March 21st 2002.

Nwabueze, U. (2001). How the Mighty Have Fallen: The Naked Truth about TQM. Managerial Auditing Journal, 16(9), 504-513.

Nwachukwu, C. C., and Nzotta, S, M. (2010). Quality Factors Indexes: A Measure of Project Success Constraints in a Developing Economy. Interdisciplinary Journal of Contemporary Research in Business, 2(2), 505.

Ofori, G., Gang, G., and C. Briffet. (2002). Implementing environmental management systems in construction: Lessons from quality systems. Building and Environment 37 (12):1397-1407.

Olatunji, A., Windapo, A., and Nureni, F. (2012). Examining the effect of quality management practices used on construction project performance, in Laryea, S., Agyepong,

Oludare, O. S., and Olugboyega, O. (2016). Quality management practices among construction firms in Lagos State, Nigeria. PM World J., 5(6), 1-13.

Pallant, J. (2007). SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows. 3rd Edition, McGraw Hill Open University Press, New York.

Sekaran, U. and Bougie, R. (2009) Research Methods for Business A Skill-Building Approach. 5th Edition, John Wiley and Sons Inc., Hoboken.

Standards Organisation of Nigeria. (2016). Management System Certification. Viewed (12/02/2020). Available at: http://son.gov.ng/management-system-certification

Thorpe, B., and Sumner, P. (2004). Quality Management in Construction, Gower Publishing Ltd, Hants, UK.

Watson, P., and Howarth, T. (2011). Construction Quality Management: Principles and Practice. 120 – 155.

Willar, D., (2012). Improving Quality Management System Implementation in Indonesian Construction Companies. Viewed (12/02/2020). Available at: http://eprints.qut.edu.au/59202/1/Debby_Willar_Thesis.pdf.

Winch, G. M. (2002). Managing Construction Projects. Oxford: Blackwell, 294-298.

Windapo, A. O., and Rotimi, J, O. (2012). Contemporary Issues in Building Collapse and Its Implications for Sustainable Development, Buildings, 2, 283-299.

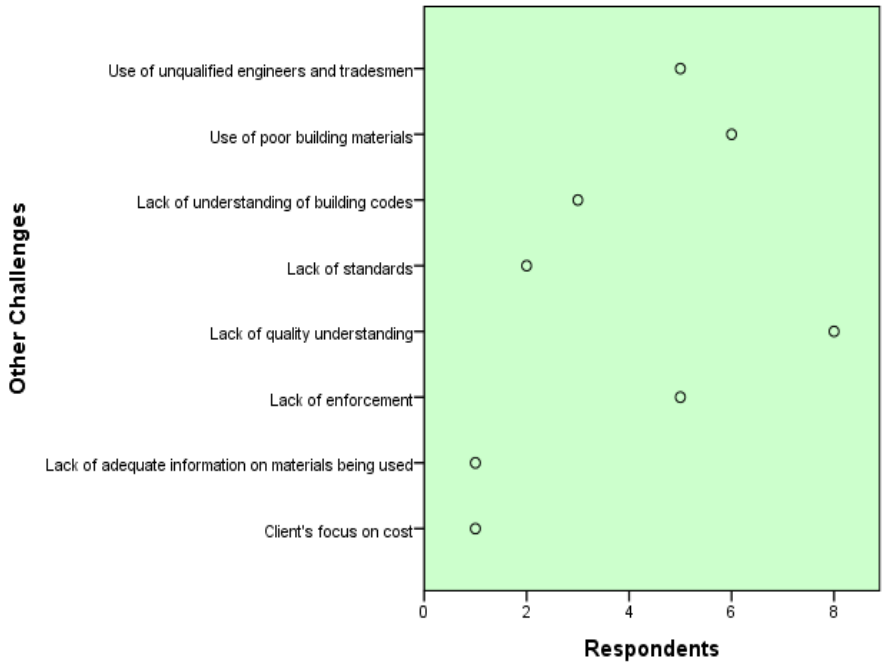
Yasamis, F., Arditi, D., and Mohammed, J. (2002). Assessing Contractors' Quality Performance. Journal of Construction Management and Economics, 20(4), 211-223.

Zubairu, A., B. (2016). Assessment of Quality Management Practices of Building Construction Firms, Appendix 1: Other QMS Implementation Challenges Abuja: MSc Dissertation, ABU, Zaria. Viewed (21/03/2020). Available at: http://kubanni.abu.edu.ng/jspui/bitstream/123456789/9571/1/ASSESSMENT%20OF%20QUALITY%20MANAGEMENT%20PRACTICES%20OF%20BUILDING%20CONSTRUCTION%20FIRMS%20IN%20ABUJA%2C%20NIGERIA.pdf.

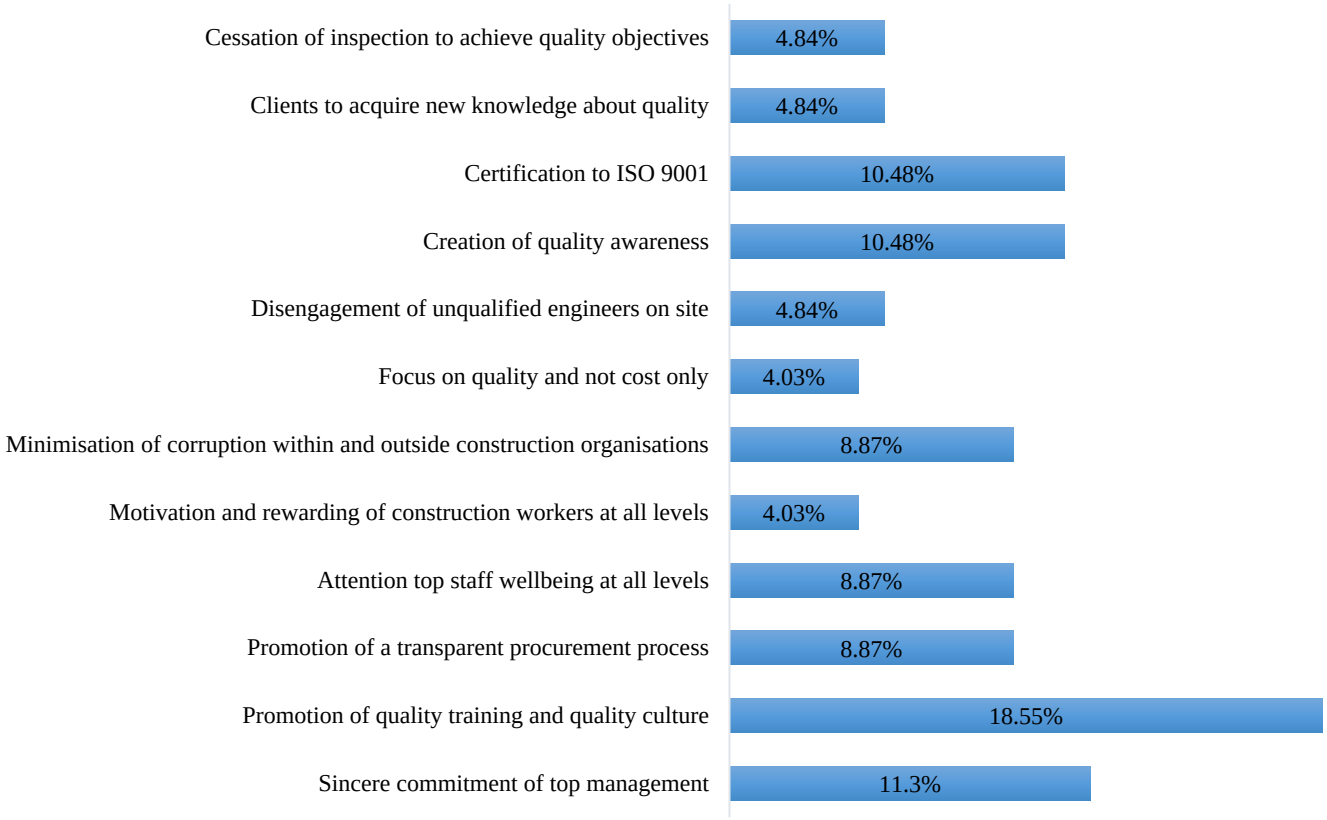
Appendix 1: Other QMS Implementation Challenges

	QMS Implementation Challenges	N	Mean	S.D
	Lack of top management's commitment to quality policy and quality objectives	124	2.6532	1.05956
2	Provision of inadequate resources	124	2.6290	1.06281
3	Resistance to change by the employees and sub-contractors	124	2.3629	.93125
4	Lack of quality culture within the organisation	124	2.3387	1.18175
5	Lack of quality training within the organisation	124	2.6532	1.13370
6	Faulty communication system	124	2.4274	1.10559
7	No consistent quality performance evaluation of the organisation's QMS	124	2.4919	1.16519
8	Poor documentation of the organisation's QMS.	124	2.3710	1.13673
9	Corruption within and outside the organisation.	124	2.7984	1.12604
	Total	124		

The results in the Table above fall mainly into two categories. The first category are the items that fall between the mean score of 2.6-2.8, and this reveals that numbers 1, 2, 5, and 9 strongly agreed and agreed with their respective numbers. Secondly, numbers 3, 4, 6, 7, and 8 revealed a mean of 2.4 approximately, and this signifies strongly disagreed and disagreed with their respective statements. Thus, the results confirm that the following factors affect quality management system implementation in construction organisations in Nigeria; lack of top management's commitment to quality policy and quality objectives, provision of inadequate resources, lack of quality training and culture, and corruption within and outside construction organisations. It is noteworthy that corruption emerged as the factor most affecting QMS implementation in Nigeria. However, if corruption is this high, why are some organisations still doing it right in Nigeria?



Appendix 2: Suggestions for Quality Improvement



Appendix 3: 45 Initial Variables, Extraction Method: Principal Component Analysis.

Variables	Initial	Extraction
Work Experience	1.000	.709
Types of Business Organisation	1.000	.871
Primary Business Activity/(ies)	1.000	.895
Project Types	1.000	.882
Formal quality management system	1.000	.837
Quality policy and quality objectives	1.000	.757
ISO 9001 Certification or other Standards	1.000	.775
Valid QMS certificate	1.000	.758
Effective Quality Reporting Structure	1.000	.564
Up to date QMS Manual	1.000	.824
Work Instructions	1.000	.782
QMS Documentation	1.000	.800
Effectiveness of QMS Documentation	1.000	.861
Procedure for Control of Quality Documents?	1.000	.824
Records of Previous Work	1.000	.827
EFQM	1.000	.748
TQM	1.000	.652
Internal Quality Audit	1.000	.752
External Quality Audi	1.000	.883
Control of Non-conforming Products or Services	1.000	.753
Corrective Action Plan	1.000	.787
Preventive Action plan	1.000	.830
Context of the QMS	1.000	.732
Quality policy and Quality Objectives	1.000	.792
Action Plans to Address Risks and Opportunities	1.000	.736
Provision of Resources and Appropriate Infrastructure	1.000	.742
Execution of Plans and Processes of QMS	1.000	.649

Periodic Quality Audit	1.000	.742
Continual Improvement of Processes	1.000	.786
Lack of Top Management's Commitment to Quality Policy and Quality Objectives	1.000	.704
Provision of Inadequate Resources	1.000	.688
Resistance to Change by the Employees and Subcontractors	1.000	.654
Lack of Quality Culture	1.000	.758
Lack of Quality Training	1.000	.731
Faulty Communication System	1.000	.757
Lack of Consistent quality performance evaluation	1.000	.669
Poor Documentation QMS.	1.000	.725
Corruption	1.000	.618
Customer Focus	1.000	.672
Leadership Commitment	1.000	.669
Process Approach	1.000	.833
Engagement of People	1.000	.669
Improvement	1.000	.687
Evidence-based Decision Making	1.000	.735
Relationship Management	1.000	.705

Appendix 4: Principal Component Analysis Result, Rotation Method: Promax with Kaiser Normalization

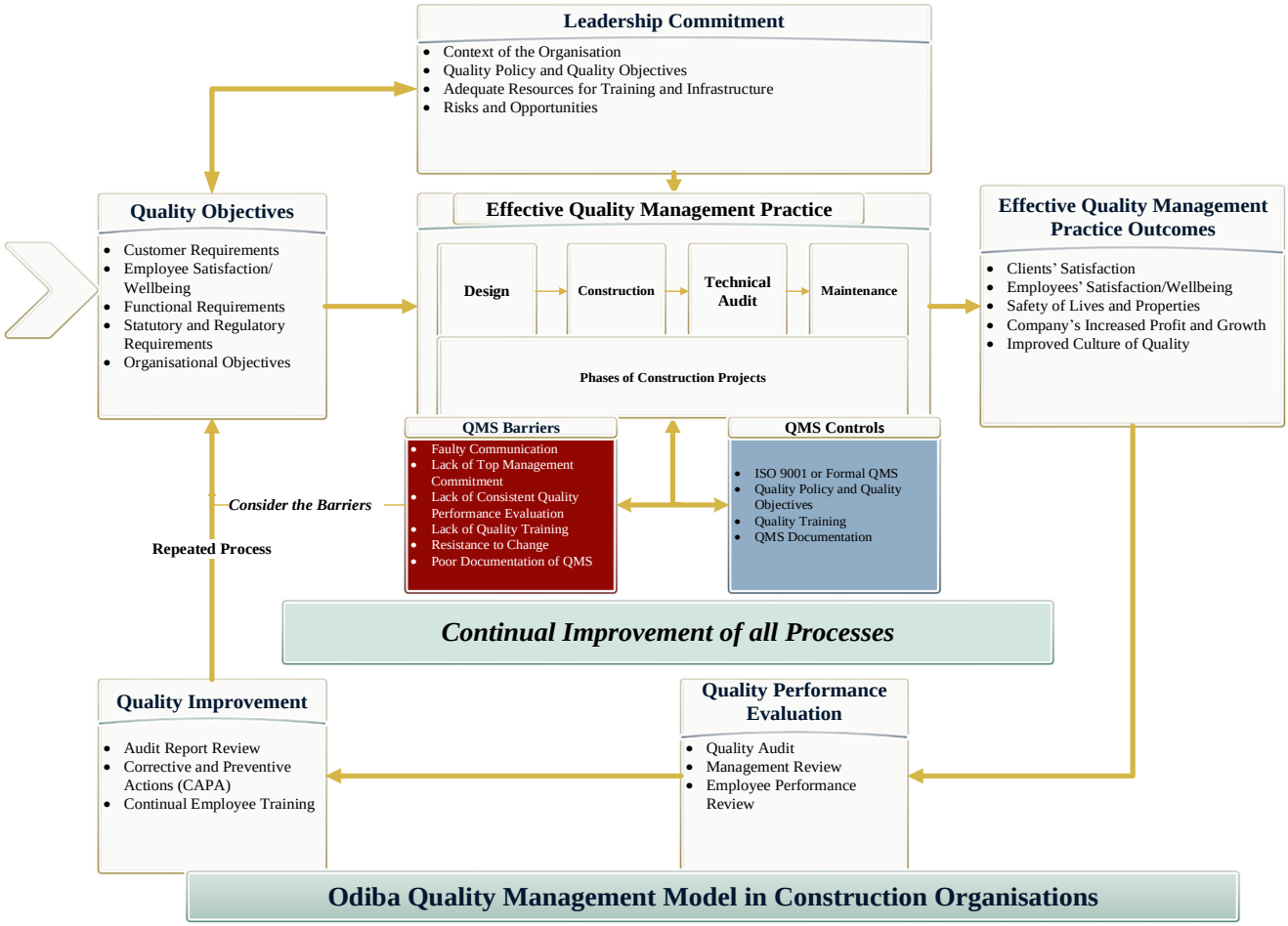
	Component					
	1	**2**	**3**	**4**	**5**	**6**
Faulty Communication System	.830					
Lack of Consistent quality performance evaluation	.740					
TQM	.719					
Lack of Quality Culture	.695					
Lack of Quality Training	.689					
Resistance to Change by Employees and Subcontractors	.642					
Poor Documentation QMS.	.618					
Action Plans to Address Risks and Opportunities		-.849				
Quality policy and Quality Objectives		-.830				
Provision of Resources and Appropriate Infrastructure		-.677				
Context of the QMS		-.664				
Continual Improvement of Processes		-.650				
Preventive Action plan		.640				
Provision of Inadequate Resources			.766			
Leadership Commitment			-.626			
Engagement of People			-.618			
Customer Focus			-.614			
Primary Business Activity/(ies)				-.941		
Project Types				-.930		
Types of Business Organisation				-.819		
Corrective Action Plan				.708		
Evidence-based Decision Making					-.790	
External Quality Audi					.643	
Periodic Quality Audit					-.617	
QMS Documentation						-791
Formal quality management system						.728

Quality policy and quality objectives	.673

Appendix 5: Extracted Components and Variables

Factor 1: Quality Drivers	
1	Customer requirements
2	Employee needs/well-being
3	Functional requirements
4	Statutory and regulatory requirements
5	Organisational requirements
Factor 2: Quality Management Implementation Challenges	
1	Faulty communication system
2	Lack of consistent quality performance measurement
3	Lack of quality training
4	Resistance to change
5	Poor documentation of quality management systems
Factor 3: Leadership Commitment	
1	Action plans to address risks and opportunities
2	Establishment of quality policy and quality objectives
3	Provision of adequate resources and infrastructure
4	Establishing the context of the quality management system
5	Continual improvement processes
Factor 4: Performance Evaluation Indicators	
1	Resources
2	Leadership Commitment
3	Engagement of People
4	Customer Focus
5	Evidence-based Decision Making
Factor 5: Construction Activities and Processes	
1	Primary business activities
2	Project types
3	Business organisation types
4	Corrective action plan
Factor 6: Quality Improvement Controls	
1	Formal quality management system
2	Quality management system documentation
3	Quality policy and quality objectives
Factor 7: Quality Management Practice Outcomes	
1	Customer satisfaction
2	Employee satisfaction
3	Enhanced organisation’s reputation
4	Organisation’s increased profit and growth
5	Safety of lives and properties
Factor 8: Quality Improvement	
1	Quality training and quality culture
2	Top management commitment
3	Transparent procurement process
4	Staff well-being

Appendix 6: Model with components and elements



JCBM (2021) 5(1).17-27.

University of Cape Town

Journal of Construction Business and Management

http://journals.uct.ac.za/index.php/jcbm

Awareness and Usage of Environmental Waste Management Practices (EWMP) of Contractors on construction sites

O. J. Oladiran[1], A. A. Bayewun[2] and A. M. Aderogba[3]

[1, 2 & 3] Department of Building, Faculty of Environmental Sciences, University of Lagos, Nigeria.

Received 18 June 2020; received in revised form 4 October 2020, 27 Feburary 2021 and 10 May 2021; accepted 15 May 2021.
https://doi.org/10.15641/jcbm.5.1.924

Abstract

Construction wastes pose challenges to contractors and clients of construction projects globally, with significant negative consequences on the environment. This study, therefore, investigates the environmental waste management practices (EWMPs) of contractors on construction sites. The objectives are to determine the level of awareness and adoption of MPs. The population of the study was construction professionals on sites in Lagos State, Nigeria. The random sampling technique was used to select 63 companies out of the 126 construction companies in categories C, D and E of firms registered with Lagos State Public Procurement Agency. The targeted respondents were construction professionals in the selected companies. The questionnaire was used to collect data from respondents. Descriptive statistics tools, including mean, percentage and frequency, were used for analysis. The study's findings reveal that contractors are aware of about 28 out of the 47 EWMPs identified from the literature. These include good site materials storage, ordering an exact amount of materials and checking deliveries properly. It also reveals the strategies that are not used as belonging to material exchange/recyclers' association; polluter pays principle, usage of self-contained mini or mobile concrete crusher. It is concluded that although contractors are aware of 28 EWMPs, 26 EWMPs are used on construction sites which are 60% and 55%, respectively. It implies that awareness determines the usage of the MPs. The implications are that if the awareness of EWMPs is increased, the implementation among construction contractors will be improved. It is therefore recommended that professionals should increase their awareness and usage of the neglected EWMPs. This can be achieved through construction firms, governments and institutions sponsoring the training of professionals on MPs. Also, polluter pays principle and recyclers' association should be enforced in project implementations. This can be achieved through government legislation and government regulatory policies for project procurements.

Keywords: Awareness; Best practices; Construction sites; Nigeria; Waste management.

1. Introduction

Advancement in the use of machinery has depleted certain natural resources. Additionally, air and water pollution, greenhouse gas emissions, global warming, and deforestation are few severe industrialisation threats to humanity (Grimms, 2014). The continual growth of inhabitants and industrialisation in developing countries necessitates more homes and offices (Ishola, Ojo & Olaoluwa, 2015). As a result, waste generation has increased in developing countries due to a wide range of construction projects to provide additional infrastructure (Kareem, Asa & Lawal, 2014; Kolawole, 2002 cited in Jimoh, 2012). Waste generation has serious negative environmental impacts making its management necessary to have a healthy environment (Kofoworola, 2006; Chandrakanthi, Hettiaratchi, Prado & Ruwanpura, 2002 cited in Oladiran, 2008; Kareem et al., 2014; Musa, Ashiru & Jibrin, 2015). Construction wastes (CW) are useless materials from construction activities and sites. Environmental wastes (EW) are unfit substances that are discarded or disposed to the environment. Environmental waste management practices (EWMP) in construction projects are methods and strategies engaged by

[2] Corresponding Author.
Email address: ooladiran@unilag.edu.ng

construction organisations to minimise the generation and disposal of waste from projects to the environment. Waste Management (WM) engages processes to reduce construction waste volume at landfill through potential waste streams identification, setting goals for materials recovery and ensuring that a range of benefits is met (Kareem et al., 2014). However, environmental waste management practices (MPs) are not uniform; different waste management concepts vary between countries or regions, urban to rural (Tam & Lu, 2016; Demirbas, 2010). Construction waste minimisation (CWM) is a part of sustainable growth and stimulation from the rising concern for the effect of man's actions on the environment (Dania, Kehinde & Bala, 2007). However, in developing countries such as Nigeria, site practices are loose and environmental control is weak, which results in negative environmental consequences (Ishola et al., 2015). Therefore, it is opined that the awareness of EWMPs among professionals is key to their implementation on a construction project. Previous studies focused on a different specific category of EWMP and not holistic (Oladiran, 2009; Kareem et al., 2014; Ishola et al., 2015). Thus, this study seeks to encompass more EWMPs categories for a comprehensive investigation. The problem this study seeks to solve is the environmental hazard of the waste generated from construction activities. The study aims to investigate the EWMPs of contractors on construction sites in Lagos State, Nigeria, to minimise the negative effects of waste on the environment. The specific objectives are to determine the awareness of EWMPs by construction professionals and to ascertain the extent of usage on construction sites in Nigeria. The significance of this study is that it will bring to light the extent of awareness and usage of environmental waste practices by contractors to minimise the environmental impacts of waste from their site.

2. Environmental Waste Management Practices in Construction Projects

Previous studies have investigated several EWMPs that construction contractors can use. Some of them include:

Zero waste: Best waste management practice ensures 'no waste', but construction production is complex; hence designing out waste is affected by many variables and restraints (Andy et al., 2002 cited in Oladiran, 2008). Zero waste philosophy ensures that products are designed to be repaired, refurbished, remanufactured and reused (Zafar, 2018). In addition, zero-waste guides waste elimination (Snow and Dickinson, 2001 cited in Davidson, 2011). There are five zero-waste design principles, including efficient procurement, materials optimisation, offsite construction, reuse and recycling, and deconstruction and flexibility (Zero Waste Scotland, n.d.)

ISO 14001: 1S014001 is a worldwide agreed standard that sets out the requirements for the environmental management system (EMS) (International Standard Organisation (ISO), 2015). The first 1S014001 standards were published in 1996 (Christini et al., 2004). An EMS that separates quality, environmental, health and safety management will lead to redundancy of tasks and information collection, but 1S014001 is an EMS that can possibly integrate policies, documentation, data collection, audit, environmental, and health and safety management system, which saves time with an improvement on risk assessment (Griffith, 2000 cited in Christini et al., 2004). ISO14001 makes firms advance their environmental performance voluntarily (Shen and Tam, 2001), and construction companies can mitigate the negative impacts associated with site activities (Christini et al., 2004; Ishola et al., 2015). Dania et al. (2007.) revealed no specific government legislation on wastes for construction sites in Nigeria and that respondents considered project goals of timely project delivery, quality and cost as more important than the impact of the project on the environment. Ishola et al. (2015) revealed that Nigerian contractors are not 1S014001 compliant. Similarly, Chen et al. (2004) found that construction firms in China do not use 1S014001. Christini et al. (2004), Kofoworola (2006), Ishola et al. (2015) recommend that construction companies in Nigeria should be mandated to develop environmental management policy and embrace implementing complete EMS. Similarly, Chen et al. (2004) recommend adopting IS014001-based EMSs for major construction firms in China and that waste minimisation is achievable using the ISO family's standards, policies, and regulations. 1S014001 implementation requires organisational objectives, greater commitment from the principals, stakeholders along the construction supply chain, designated waste management officer, staff training (ISO, 2015). The benefits of using 1S014001 are but not limited to improvement on firms' environmental performance voluntarily (Shen and Tam, 2001). 1S014001 can be integrated into existing the ISO family such as ISO9001 and ISO45001.

Waste Management Plans (WMPs): Site Waste Management Plans (SWMPs) are legal and compulsory requirements in some parts of the UK for projects with a worth of £300,000 and above (NetRegs, n.d.; Waste and Resource Action Programme (WRAP), n.d.; Papargyropoulou et al., 2011). In Southern Wales and Northern Ireland, the employment of an SWMP specialist for effective management of materials is legally mandatory (NetRegs, n.d.); with this law in the UK, clients must produce Site Waste Management Plans before the commencement of the project. In Nigeria, the findings of Oladiran (2009); Wahab and Lawal (2011) revealed that Waste Management Plan is not a tender document; the studies recommend the inclusion of Waste Management Plan among tendering documents. Oladiran (2009) examined the rate of use of Waste Management Plans and the effects of WMP on construction projects in Nigeria. Oladiran (2009) revealed that WMPs are averagely applied on Nigerian construction projects and that the effects of WMP on materials, labour and time waste minimisation is average but high on equipment waste minimisation. Papargyropoulou et al. (2011) conducted a preliminary exploratory exercise to weigh the Malaysia Construction Industry's level of awareness and commitment to sustainable waste management; the study found that the levels of awareness and adoption of SWMPs are low in Malaysia.

A typical SWMP contains detailed information of the licensed waste carrier, the waste types, quantities and

actions taken on the waste, completion of consignment and transfer papers and licensed disposal sites (NetRegs, n.d.). In the UK, the completion of transfer notes before waste leaves the site and the use of waste carriers with valid waste carrier registration certification is a way of staying on the right side of the law (NetRegs, n.d.; Papargyropoulou et al., 2011; Cox, 2016). Scottish Environmental Protection Agency (SEPA) must be notified if waste is hazardous or if waste is dumped indiscriminately (NetRegs, n.d.). In Lagos, wastes, including construction wastes, are dumped around streetlight poles and roads embankments (Ajayi et al., 2008). Kofoworola (2006) concluded that inhabitants dump waste indiscriminately because there are no distinct waste collection points. Papargyropoulou et al. (2011) reported a lack of practical tools and relevant infrastructures as among the barriers to adopting SWMPs. Sapuay (2016) found that construction waste or materials finish up as dumps in the surrounding due to inadequate supervision. On the other hand, Gangolells and Macarulla (2014) revealed that in Catalonia, Spain, the designed waste infrastructure is five times more than waste generated. However, Gangolells and Macarulla (2014) found that one of the least widespread practices of the Catalonian construction companies was disseminating the SWMP contents to workers to help them meet the plan's requirements. Papargyropoulou et al. (2011) recommend an investigation into practices for adoption and the development of National standard SWMPs for Malaysia.

Waste sorting: Identification of waste composition is also essential for an efficient waste management process due to the amount of reusable waste (Oladiran, 2008). Waste is characterised as solid, liquid and air pollutants, each typically managed, regulated differently (Woodward and Curran Inc., 2006 cited in Davidson, 2011). Each group has different methods of disposal and management, hence the need for sorting ("waste management", n.d.). For instance, site waste composition includes asphalt, concrete, metal, wood, claystone paper, cement, concrete and woodpile (Heltiaratchi et al., 1997 cited in Oladiran, 2008). The construction process of a 13 storey office building project in the UK emitted 651 tons of CO_2 with 73% from electricity and 27% from fuel usage (Skanska, 2010 cited Ishola et al., 2015). There is also construction dust from stone, cement, bricks, wood or concrete (Health & Safety Executive (HSE), n.d.). The five largest toxic air emissions from construction are Sulphur dioxide (SO_2), nitric dioxide (NO_2), volatile organic compounds (VOC), toxic releases to air and hazardous waste generated (Hendrickson and Horvath, 2000). Chen et al. (2004) posit that sources of pollution and hazard from construction activities in China could be sorted into seven major types, dust, harmful gases, noises, solid and liquid wastes, falling objects and ground movement. Solid waste types from construction and demolition works are wood, steel, concrete, dirt, bricks and tiles (Hoornweg and Bhada-Tata, 2012). Kofoworola (2006), Wahab and Lawal (2011), Kareem et al. (2014) revealed that sorting is not done on construction sites in Nigeria. Scavengers sort waste on dumpsites (Kofoworola, 2006); sorting is not done as a result of non-availability of space on-site (Wahab and Lawal, 2011), operatives perceive waste management issues as an extra burden (Kareem et al., 2014).

Waste recycling and recovery: Kofoworola (2006) and Ajayi et al. (2008) revealed that most construction waste in Lagos State is not recycled. Ajayi et al. (2008) confirm that little attention is given to recycling and that most construction waste from demolition and renovation works are disposed of aimlessly in dumpsites and landfills. Kareem et al. (2014) also revealed that contractors or operatives lack the practice of reuse or recycling materials on site. Sapuay (2016) concludes that most construction sites concentrate on sanitary maintenance within their sites with no EWMPs that consider reuse, recycling and resource recovery. Excess materials from the construction process or residual from demolition can still be useable should the contractor exert efforts in finding ways to use them rather than dispose of them. Though appearing the cheapest, landfills are practically expensive and can be impossible because areas with the largest solid waste generation are also the areas with serious land scarcity problem (Kofoworola, 2006). Waste landfills or dumps occupy valuable land; worse still, landfills are hideous and sources of environmental hazards (Ajayi et al., 2008). Ajayi et al. (2008) opine that reuse and recycling prevent pollution and environmental impacts of waste. Reducing, reusing and recycling waste are profitable alternatives that will increase the lifetime of landfills and reduce the exploitation of natural resources. Compact self-contained mini or mobile crusher for demolished concrete can be used on-site; the advent of crusher attachments allows the connection of concrete crushers to various construction equipment such as excavators. Kareem et al. (2014) found that metal was the only material worth recycling on-site; comparatively, little income is generated from recycling most other building materials. Reclaimed materials sold on landfills are metals, copper, aluminium, lead, blast iron paper, plastic, polyvinyl, plastic bottles, glass and so on (Kofoworola, 2006). Kofoworola (2006) reports were on landfills while Kareem et al. (2014) were on construction sites; this suggests that fewer materials are recovered or recycled on the construction sites.

Revitalisation: Revitalisation is a waste management practice that assures that there are no leftover waste on-site. It involves neutralising chemically harmful materials on-site, then replanting trees and vegetation. For example, certain construction waste materials usually contain leads, asbestos and other hazardous substances. In addition, certain components of construction waste, such as plasterboard once landfilled, are hazardous because it increases hydrogen sulfide, a toxic gas.

Waste Material Recovery Facility (WMRF): WMRF is a specialised plant that accepts, separates and prepares recyclable materials for marketing for end-user manufacturers (Zafar, 2018). The two main MRF types are the dirty type which accepts mixed waste, and the clean type, which does not. Hong Kong has a WMRF since 1998 (Ming-Zhi and Gao, 2006) cited in (Wahi et al., 2015). After launching the offsite construction waste sorting (CWS) program, the Hong Kong government built two waste sorting facilities in TuenMun and Tuseng Kwano areas in 2006 (Lu and Yuan, 2012 cited in Wahi et al., 2015). Wahi et al. (2015) reported that the practice of waste sorting has improved after the construction of the

recycling facilities and the enforcement of polluters pay policy; this implies that there is a need for structures to be brought nearer to the people and government initiatives to ensure the adoption of environmental friendly WMPs. Kofoworola (2006) reported that there was no single official waste WMRF in Nigeria; the study recommends the development of environmental policies for recovery and recycling promotion in Lagos state and the recovery of landfill gas (LFG) for energy generation. A former Lagos State Governor, Mr Babatunde Fashola SAN, commissioned a N1.3 billion Solid Waste MRF in Alimosho Local Government Area, in Lagos State on 12th of May 2015 ("Fashola commissions N1bn recycling plant in Igando", 2015). The facility is the first of its kind in Nigeria; in the 1st phase, the facility will require about130 trucks of waste on a daily basis to process different waste types into raw materials for plastic and rubber industries ("Fashola commissions N1bn recycling plant in Igando", 2015). In the 2nd, electricity will be produced from heat energy of more tons of waste, and the 3rd will include the production of composts for fertilisers to maintain gardens (Lagos State Governor's Office, 2015). Ex. Governor Mr Babatunde Fashola said that the facility is a conservation strategy to tackle the climate change threats and demonstrate the State Government's commitment to improving the environment and creating economic benefits ("Fashola commissions N1bn recycling plant in Igando", 2015). Dubanowitz (2000) investigated the design and operation of a 150tons/day (876000tons/yr) facility for New York recyclables; the study posits that the facility would save $46million for the city waste management yearly. As the construction industry meets the growing human needs, the environment and the natural resource essential for development must be protected and conserved. WMRFs also process wastes into feedstock for biological conversion (Gheewala and Nielsen, 2003 cited in Kofoworola, 2006).

3. Research Method

A survey research design was used for this study. It was used because it enables the gathering of data from the respondents at a time to provide answers to the research objectives. The area of study was Lagos State. Lagos State is the second most populous state in Nigeria; the population is estimated at 17,552,940 (2012 census conducted by LASG) and population density of 2,500/Km2. Lagos State is one of the most economically vibrant states, a major financial centre and fifth largest economy in Africa ("Lagos State", 2019). The GDP per capita is $4,333 ("Lagos State", 2019). The population of the study is the construction firms in Lagos State, while the sampling frame comprises of those registered with the Lagos State Public Procurement Agency, categories C, D and E. The targeted respondents are construction professionals in the firms. The population size of the frame is 126 construction firms were identified, out of which 63 were randomly chosen for the study.

A structured questionnaire was used to collect data from the respondents. The questionnaire had two sections, A and B. Section A focuses on the demographic information of the respondents. Section B investigates the awareness and usage of a set of EWMPs on sites coined from literature, using a 5-point Likert scale. The questionnaires were administered to the construction professionals in the 63 selected firms, out of which responses were received from 57 and used for the study. Validity is defined as the degree to which a measuring instrument measures what it is designed to measure. It is the ability of the instrument to measure what it is supposed to measure. Academic scholars revealed the errors in the questionnaires and were adjusted to ensure validity. Reliability is defined as the consistency between independent measurements of the same phenomenon. It is the stability, dependability and predictability of a measuring instrument. It connotes the accuracy or precision of a measuring instrument. The coefficient alpha, otherwise known as Cronbach's Alpha reliability, was calculated for the data used in the study. The average Cronbach's Alpha reliability value was 0.850. This is significantly more than the satisfactory 0.7, and 0.6 values recommended in Robson (2000) and Azika (2004), respectively. It implies that the data used are adequately reliable. Mean and frequency was used to analyse the data.

4. Findings and Discussion

4.1 Demographic information

The organisations' and respondents' profiles are presented in Table 1.

Table 1: Demographic Information

	Desciption	Frequency	%
Respondents	Architects	15	27.3
	Builders	9	16.3
	Civil Engineers	20	36.4
	Mechanical Engineers	1	1.8
	Quantity Surveyors	10	18.2
	Total	**55**	**100**
	Educational Qualification		
	HND	9	16.1
	B.Sc.	27	48.2
	PGD	2	3.6
	M.Sc.	18	32.1
	Total	**56**	**100**
	Professional Membership		
	NIA	11	20.4
	NIOBE	8	14.8
	NSE	21	38.9
	NEWS	8	14.8
	NONE	6	11.1
	Total	**54**	**100**
	Experience		
	0 – 5	9	15.8
	6 – 10	18	31.6
	11 – 15	15	26.3
	16 – 20	6	10.5
	Over 20years	9	15.8
	Total	**57**	**100**
Organisations	**Category**		
	< ₦100M	2	3.6
	₦100M<₦300M	9	16.1
	₦300M<₦1B	10	17.9
	₦1B< ₦10B	17	30.4
	₦10M and above	18	32.1
	Total	**56**	**100**

Ownership		
Expatriate	13	22.8
Indigenous	44	77.2
Total	**57**	**100**
Type		
Contracting	**51**	89.5
Consulting	5	8.8
Client	1	1.8
Total	**57**	**100**

The professions of the respondents shown in Table 1 reveals that 27.3% of them are Architects, another 16.3% are Builders, 1.8% are Mechanical Engineers, 36.4% are Civil Engineers, and 18.2 % are Quantity Surveyors. About 16% of them holds higher national diploma (HND) degree, 48.2% holds B.Sc. degree, 32% holds M.Sc. degree and 3.6% holds postgraduate diploma (PGD) degree. Close to 16% each of the respondents' work experience were between 1 to 5 years, and above 20 years, 31.6% were between 6 to 10 years, 26.3% were between 11 to 15 years, and 10.5% were between 16 to 20 years. More than 20% of them were members of the Nigerian Institute of Architects (NIA), 14.8% each of the Nigerian Institute of Quantity Surveying (NIQS) and Nigerian Institute of Building (NIOB), about 39% of the Nigerian Society of Engineers (NSE) and 11% did not indicate whether they were members of any professional body. Additionally, 89.5% were contracting organisations, 8.8% were consulting, and 1.8% was a client organisation. Just 3.6% of the organisations belong to the category that is < N100 million project capability, 16% belong to N100m - < N300 million, 18% belong to N300million - < N1billion, 30.4% belong to N1billion - < N10 billion, and 32% belong to N10 billion and above project capability. About 77% of the organisations were fully indigenous organisations, while 23% were fully expatriate. It can be inferred that the respondents from these organisations can supply the needed information for the study.

4.2 Awareness of Environmental Waste Management Practices

The mean of items listed as EWMP was used to rank the awareness of respondents in order to determine the level of awareness of EWMPs on construction sites by Nigerian contractors in Lagos State. The result of the analysis is presented in Table 2. Respondents were asked to indicate their awareness of 47 EWMPs using a 5-point Likert scale.

Table 2: Awareness of Environmental Waste Management Practices

S/N	Environmental Waste Management Practices	N	1	2	3	4	5	STD	Mean	GR	OR
Zero Waste									**3.70**		
1	Good site material storage practice	57	0	0	6	26	25	.664	4.33	1	1
2	Ordering the required amount of materials as accurately as probable	56	0	1	5	25	25	.716	4.32	2	2
3	Checking deliveries for any shortages and or damages	57	0	3	5	23	26	.835	4.26	3	3
4	Just in time delivery for a reduction in storage and materials losses	57	0	3	13	31	10	.774	3.84	4	6
5	Use of site materials control	57	0	3	13	31	10	.774	3.84	4	6
6	Use of fabrication, offsite prefabrication	57	2	2	21	22	10	.938	3.63	6	9
7	Use of standard and realistic components	57	4	3	15	23	12	1.096	3.63	6	9
8	No 'throwing away waste'	57	5	7	14	22	9	1.163	3.40	8	14
19	Designing out waste at the earliest stage of the construction process	56	2	11	15	20	8	1.071	3.38	9	16
10	Minimising temporary works	56	0	10	28	14	4	.825	3.21	10	20
11	Use of recyclable materials	57	4	16	22	11	4	1.023	2.91	11	30
ISO 14001									**3.01**		
12	Top management commitment	57	3	10	13	22	9	1.117	3.42	1	13
13	Organisational waste objectives	56	5	9	21	13	8	1.146	3.18	2	21
14	Sources of materials considered if the company is certified with environmental standards	56	6	7	22	16	5	1.096	3.13	3	23
15	Supply chain impact by communicating environmental impacts to suppliers	56	6	12	20	15	3	1.069	2.95	4	29
16	Using designated waste management officer	57	13	13	14	10	7	1.330	2.74	5	32
17	Staff training on waste	57	12	15	16	9	5	1.232	2.65	6	40
Waste management plans (WMPs)									**2.81**		
18	Disposal at licensed sites	57	4	11	14	20	8	1.149	3.30	1	19
19	Sanctions for poor waste disposal	57	2	18	15	18	4	1.033	3.07	3	28
20	Information about the client, the principal contractor, the person that drafted the SWMP	57	5	18	19	12	3	1.037	2.82	4	31
21	Estimation and waste management action for each waste type	57	7	19	14	16	1	1.061	2.74	5	32
22	Use of waste carriers with valid waste carrier registration certification	57	8	16	19	13	1	1.034	2.70	6	35
23	Completion of consignment note before waste leaves the site	57	9	20	15	12	1	1.051	2.58	7	41
24	Completion of transfer notes before waste leaves the site	57	11	17	21	7	1	1.002	2.47	9	45
Waste Sorting									**2.85**		
25	Separation of inert and non-inert wastes on sites	57	1	10	32	9	5	.867	3.12	2	24
26	Designated skips for different materials	57	8	19	22	5	3	1.017	2.58	7	41
Waste accommodation/storage									**3.71**		

27	High quality of housekeeping on site	57	1	3	12	17	24	1.007	4.05	1	4
28	Site plan showing waste storage points	57	4	6	24	11	12	1.144	3.37	2	17
Waste Collection and Transportation									**3.43**		
29	Waste packed manually into waste trucks	57	1	4	14	23	15	.996	3.82	1	8
30	Loading of waste truck mechanically	57	1	7	25	16	8	.942	3.40	2	14
31	Waste collection planning	56	5	8	16	16	11	1.212	3.36	3	18
32	Use of hydraulic compactor	57	6	6	27	11	7	1.103	3.12	4	24
Waste recycling and recovery									**2.59**		
33	Reuse: conversion of the waste stream into reuse pathway	56	6	20	19	7	4	1.060	2.70	1	35
34	Reduction or recycling of the packaging for materials delivered	57	9	18	18	6	6	1.183	2.68	2	37
35	Recycle: recovery of the value of waste stream for recycling purpose	57	8	18	19	9	3	1.075	2.67	3	38
36	Use of compact, self-contained mini crushers or mobile crusher for demolished concrete	57	14	20	15	7	1	1.038	2.32	4	46
Revitalisation									**2.89**		
37	Replanting trees and vegetation.	57	5	14	17	12	9	1.205	3.11	1	26
38	Neutralisation of chemically harmful materials on site	57	8	17	19	12	1	1.024	2.67	2	38
Waste incineration									**2.72**		
39	Waste is transported to an incinerator	57	12	13	14	15	2	1.221	2.72	1	34
Waste Material Recovery Facility									**2.49**		
40	Waste is transported to Waste Material Recovery Facility	57	9	16	28	3	1	.889	2.49	1	44
Waste Behaviour									**3.33**		
41	Awareness of the consequences of waste and taking personal responsibility for others' well being	57	3	5	20	18	11	1.071	3.51	1	11
42	Cost savings from waste reduction made beneficial to all site management staff	57	5	6	26	16	4	1.008	3.14	2	22
Air Quality strategy									**3.50**		
43	Dust reduction measures during construction	57	2	1	11	29	14	.912	3.91	1	5
44	Maximum level of emission is considered for development application approval in each local council	57	6	7	24	16	4	1.057	3.09	2	27
Vegetation preservation									**3.46**		
45	Preservation of existing vegetation	56	1	9	20	15	11	1.044	3.46	1	12
Polluter pays principle									**2.56**		
46	Requirement for a waste generator to pay for appropriate disposal of unrecoverable material (Extended responsibility to the material manufacturer).	57	6	24	18	7	2	.964	2.56	1	43
Building materials exchange/ recycler's association									**1.82**		
47	Belong to a material exchange/recyclers' association	56	25	19	9	3	0	.897	1.82	1	47

N= total respondents, 1 represents Not aware, 2 represents Slightly aware, 3 represents Moderately aware, 4 represents Highly aware, 5 represents Very highly aware, mean, GR= Group Ranking, OR= Overall Ranking.

The criterion used to determine the awareness level of EWMPs on construction sites by the respondents are those variables whose mean scores are 3.00 and above, which represents 'moderate awareness' on the scale. The 47 EWMPs were categorised into 15; namely, zero waste, ISO 14001, waste management plans, waste sorting, waste accommodation/storage, waste collection and transportation, waste recycling and recovery, revitalisation, waste incineration, waste material recovery facility, waste behaviour, air quality strategy, vegetation preservation, polluter pays principle and building materials exchange/recycler's association. The following can be observed from Table 2:

Zero waste: the respondents are aware of the strategies in this category except for the use of recyclable materials (2.91). This result supports the conclusion of Ajayi et al. (2008); Wahab and Lawal (2011) that recycling is a rare practice in Nigeria. The first three highest-ranked practices are good site material storage practice, ordering the required amount of materials accurately and checking deliveries for shortages and damages with means of 4.33, 4.32 and 4.26, respectively. It has confirmed the assertion that contractors are more interested in issues that will affect the project cost; the construction industry is not ignorant of the need to consider the environment, but their focus is different.

ISO 14001: the first two highest-ranked under ISO 14001category are top management commitment and organisational waste objectives with mean scores of 3.42 and 3.18, respectively. This indicates that the importance of top management on EWMPs is acknowledged by the respondents.

Waste management plans: respondents are not aware of almost all practices under this category. However, disposal at licensed sites ranked highest (3.30). Further questioning revealed that most times, contractors do not measure or take cognisance of the waste being removed from their sites, and this can be the reasons for their unawareness of completion of consignment and transfer notes before waste leaves the site and other practices within waste management plans category.

Waste sorting: it can be observed that respondents are aware of the separation of inert and non-inert wastes on

sites (3.12). However, respondents are not aware of designated skips for different materials (2.58).

Waste Collection and Transportation: respondents are aware of all practices under this category since contractors must ensure that waste is packed and evacuated from their sites.

Waste recycling and recovery: respondents are not aware of all the four strategies under this category. This finding validates the work of Wahab and Lawal (2011) that reuse and recycling are new practices in Nigeria.

Revitalisation: respondents are not aware of the neutralisation of chemically harmful materials on site (2.67) but are aware of replanting trees and vegetation (3.11). Further questioning revealed that neutralisation of chemically harmful materials on site is not really a needed practice on c as respondents do not deal with many chemicals on sites. The awareness of replanting trees and vegetation is heightened through the greener initiatives of programmes of Lagos State Government.

Waste incineration: respondents are not aware of waste incineration (2.72). As earlier mentioned, the removal of construction waste from their sites is usually outsourced. Incineration is one of the treatments on construction waste after leaving sites.

Waste material recovery facility: it can be observed that transportation of waste to waste material recovery facility has a low level of awareness (2.49). This could be because waste recovery is new.

Waste Behaviour: it was discovered that most respondents are aware of waste consequences and taking responsibilities for others well-being (3.51), and cost savings from waste reduction made beneficial to all site management staff (3.14) under this category. The awareness of waste behaviour may be due to health and safety concerns on sites.

Air Quality strategy: Most of the respondents are aware of dust reduction measures during construction (3.91), and the maximum level of emission is considered for development approval in each local council (3.09) under this category. Further questioning revealed that some legislation directs operational approaches, such as equipment types that can be used to limit environmental disturbance. It can be implied that Government legislation has aided the awareness of the two practices in this category.

Vegetation preservation: the respondents are aware of the preservation of existing vegetations (3.46). Further questioning revealed that the awareness had been heightened through the greener Lagos initiatives programme of the Lagos State Government.

Polluter pays principle: this principle requires that waste generators pay for disposal of unrecoverable waste. It was found out that the respondents are not aware of it (2.56). It ranked 43rd in the overall ranking of the 47 practices.

Building materials exchange/recyclers' association: the awareness of this practice is low among the respondents (1.82). In Nigeria, it is scavengers that recycle building materials (Kofoworola, 2006).

In conclusion, out of the 15 EWMPs categories, the respondents are aware of seven categories - waste accommodation and storage (3.71), zero-waste (3.70), air quality strategy (3.50), vegetation preservation (3.46), waste collection and transportation (3.43), waste behaviour (3.33) and ISO 14001 (3.01). It can be observed that they are not aware of the remaining eight categories of EWMPs because their overall means are less than 3. Similarly, out of the 47 MPs, the respondents are aware of 28 EWMPs, the EWMP with the highest level of awareness is Good site material storage while Belong to a material exchange/recyclers association is the least.

4.3 Usage of Environmental Waste Management Practices

The mean of items listed as environmental waste management practices was used to rank the usage of the practices by the respondents in order to determine the application of the environmental waste management practices on construction site by Nigerian contractors. Respondents were asked to indicate their implementation of 47 EWMPs using a 5-point Likert scale. The criterion used to determine applied EWMPs on construction site by the respondents are those variables whose mean scores are 3.00 and above, which represents 'average usage' on the scale. The 47 EWMPs were categorised into 15; namely, zero waste, ISO 14001, waste management plans, waste sorting, waste accommodation/storage, waste collection and transportation, waste recycling and recovery, revitalisation, waste incineration, waste material recovery facility, waste behaviour, air quality strategy, vegetation preservation, polluter pays principle and building materials exchange/recycler's association.

Table 3: Usage of environmental waste management practices

S/N	Environmental Waste Management Practices	N	1	2	3	4	5	STD	Mean	GR	OR
Zero Waste									**3.67**		
1	Good site material storage practice	57	0	0	6	27	24	.659	4.32	1	2
2	Checking deliveries for any shortages and or damages	57	0	1	9	22	25	.786	4.25	2	3
3	Ordering the required amount of materials as accurately as probable	57	0	2	13	20	22	.872	4.09	3	4
4	Use of site materials control	57	0	2	14	28	13	.786	3.91	4	5
5	Just in time delivery for a reduction in storage and materials losses	57	0	7	12	25	13	.945	3.77	5	7
6	Use of fabrication, offsite prefabrication	57	0	3	22	21	11	.844	3.70	6	8
7	Use of standard and realistic components	57	0	5	18	29	5	.776	3.60	7	11
8	Designing out waste at the earliest stage of the construction process	57	2	9	14	28	4	.961	3.40	8	14
19	Minimising temporary works	57	1	9	30	12	5	.875	3.19	9	18
10	No 'throwing away waste'	57	7	9	17	19	5	1.160	3.11	10	23
11	Use of recyclable materials	57	4	10	29	7	7	1.042	3.05	11	25
ISO 14001									**2.92**		
12	Top management commitment	57	2	13	13	22	7	1.075	3.33	1	16

13	Organisational waste objectives	57	4	11	22	17	3	.997	3.07	2	24
14	Sources of materials considered if the company is certified with environmental standards	57	6	9	25	12	5	1.077	3.02	3	26
15	Supply chain impact by communicating environmental impacts to suppliers	56	4	16	19	16	1	.966	2.89	4	28
16	Staff training on waste	57	8	18	17	9	5	1.158	2.74	5	32
17	Using designated waste management officer	57	11	21	15	7	3	1.104	2.47	6	41
Waste management plans (WMPs)									**2.75**		
18	Disposal at licensed sites	57	7	10	15	18	7	1.217	3.14	1	20
19	Sanctions for poor waste disposal	57	4	10	24	12	7	1.076	3.14	1	20
20	Use of waste carriers with valid waste carrier registration certification	57	10	11	21	12	3	1.134	2.77	3	31
21	Information about the client, the principal contractor, the person that drafted the SWMP	57	16	11	15	9	6	1.333	2.61	4	36
22	Estimation and waste management action for each waste type	57	13	17	10	14	3	1.237	2.60	5	37
23	Completion of consignment note before waste leaves the site	57	12	15	21	6	3	1.104	2.53	6	39
24	Completion of transfer notes before waste leaves the site	57	12	18	17	8	1	1.042	2.43	7	44
Waste Sorting									**2.79**		
25	Separation of inert and non-inert wastes on sites	57	2	15	30	7	3	.859	2.89	1	28
26	Designated skips for different materials	57	3	24	20	8	2	.909	2.68	2	34
Waste accommodation/storage									**4.05**		
27	High quality of housekeeping on site	57	2	14	24	16	1	4.063	4.49	1	1
28	Site plan showing waste storage points	57	2	5	19	19	12	1.033	3.60	2	11
Waste Collection and Transportation									**3.33**		
29	Waste packed manually into waste trucks	56	1	0	17	29	9	.773	3.80	1	6
30	Waste collection planning	57	1	10	23	14	9	1.009	3.35	2	15
31	Loading of waste truck mechanically	57	0	8	29	18	2	.739	3.25	3	17
32	Use of hydraulic compactor	57	3	10	35	6	3	.842	2.93	4	27
Waste recycling and recovery									**2.44**		
33	Reduction or recycling of the packaging for materials delivered	57	10	19	15	5	8	1.270	2.68	1	34
34	Reuse: conversion of the waste stream into reuse pathway	57	6	23	22	4	2	.908	2.53	2	39
35	Recycle: recovery of the value of waste stream for recycling purpose	57	7	23	20	7	0	.868	2.47	3	41
36	Use of compact, self-contained mini crushers or mobile crusher for demolished concrete	57	14	27	13	3	0	.830	2.09	4	46
Revitalisation									**2.94**		
37	Replanting trees and vegetation.	57	4	9	25	12	7	1.066	3.16	1	19
38	Neutralisation of chemically harmful materials on site	57	8	12	26	10	1	.978	2.72	2	33
Waste incineration									**2.60**		
39	Waste transported to incinerators	57	9	21	13	12	2	1.100	2.60	1	37
Waste Material Recovery Facility									**2.47**		
40	Waste is transported to Waste Material Recovery Facility	57	7	20	27	2	1	.826	2.47	1	41
Waste Behaviour									**3.37**		
41	Awareness of the consequences of waste and taking personal responsibility for others' well being	57	1	4	19	25	8	.881	3.61	1	10
42	Cost savings from waste reduction made beneficial to all site management staff	57	4	9	22	20	2	.965	3.12	2	22
Air Quality strategy									**3.27**		
43	Dust reduction measures during construction	57	1	3	16	30	7	.827	3.68	1	9
44	Maximum level of emission is considered for development application approval in each local council	57	4	15	24	11	2	.943	2.86	2	30
Vegetation preservation									**3.48**		
45	Preservation of existing vegetation	56	0	8	22	17	9	.934	3.48		13
Polluter pays principle									**2.42**		
46	Requirement for a waste generator to pay for appropriate disposal of unrecoverable material (Extended responsibility to the material manufacturer).	57	12	16	22	7	0	.963	2.42		45
Building materials exchange/ recycler's association									**1.88**		
47	Belong to a material exchange/recyclers' association	57	27	14	12	4	0	.983	1.88		47

N= total respondents, 1 represents Nil level, 2 represents Low level, 3 represents Average level, 4 represents High level, 5 represents Very high level, Mean, GR= Group Ranking, OR= Overall Ranking

The following can be observed from Table 3:

Zero Waste: all the EWMPs under this category are used, but good site material storage practice (4.32) and checking deliveries for shortages and damages (4.25) were the most used practices by the respondents. This agrees with the findings of Adewuyi and Odesola (2016) that the most commonly used waste minimisation strategies on-site are properly securing stores after closing hour daily and checks on deliveries for shortages and or damages. The usage of all practices under zero waste could be owing to the fact that these practices ensure the safety and security of materials against theft, damages and vandalism. It can be implied that physical profit is mostly thought of by construction firms to using EWMPs.

ISO 14001: using designated waste management officer (2.47), staff training on waste (2.74), and supply chain impact by communicating environmental impacts to suppliers (2.89) are not used under this category. Further questioning during the survey revealed some respondents' view that EWM usage has cost and time implication; therefore, EWM issues be added in contractual clauses. Top management commitment (3.33) ranking highest is an indication that respondents appreciate the importance of top management. The commitment of top management is essential for EWMPs (Kareem et al., 2014). Other practices that are used in this category are organisation waste objectives (3.07) and sources of materials considered if the company is certified with environmental standards (3.02).

Waste management plans (WMPs): the usage of disposal at licensed sites (3.14) and sanctions for poor waste disposal (3.14) suggests that respondents agree that government legislation can influence the adoption of WMPs; its adoption is backed with legislation in the UK. However, use of waste carriers with valid waste carrier registration certification (2.77), estimation and waste management action for each waste type (2.60), completion of consignment notes before waste leaves the site (2.53), and others are not used. Further questioning revealed that most respondents are not sure of the destination of their waste. It can be implied that waste that leaves sites can be handled and dumped incongruously. Also, no one can be held responsible since the processes are not documented; this practice is a reverse to the duty of care in the UK. Details of duly licensed waste carrier and eventual waste destinations are recorded to ensure duty of care and prevent illegal dumping or other wrong wastes handling (Papargyropoulou et al., 2011). The finding of this study shows that contractors do not use the practices of waste management plans (WMPs) category (2.75). This differs from the findings of Oladiran (2009b) that revealed average use of WMPs on Nigeria construction projects, but it aligns with Papargyropoulou et al. (2011) that revealed a low level of awareness and adoption of SWMPs in Malaysia.

Waste sorting: this category is not used on construction sites (2.79); the two practices examined in this category are not implemented on the sites investigated. Designated skips for different materials is a practice that will require extra resources such as skips, and this can affect the contractors' profit. This finding supports the view of Singaporean contractors who felt that EMS could not be engaged owed to construction costs increase (Ofori et al., 2002) cited in (Ishola et al., 2015). Some respondents claim that value is attached to metals in tons; the metals are carefully sorted out and sold to metal recyclers; this validates Kareem et al. (2014) that individual judgment comes to play as regards value attached to reusable material.

Waste accommodation/storage: Site plan showing storage points (3.60) and high quality of housekeeping on site (4.49) are used. This result agrees with Sapuay (2016) that contractors uphold hygiene on sites by disposing waste away from their operational area. High quality of housekeeping on site is also a health and safety concern, as accidents on sites will cause delay, payment of insurance to the injured or on the dead, and cost on the organisation's reputation and so on. Improper debris management has caused major environmental problems, hazards and accidents (Papargyropoulou et al., 2011).

Waste collection and transportation: this category is used by the respondents (3.33). Contractors' duty is to ensure the removal of construction waste from the site. Waste packed manually into the waste truck (3.80) ranked 1st in this category. However, the use of hydraulic compactor (2.93) ranked least, and this result can be due to the fact that contractors outsource the evacuation of construction waste from their sites, so the mechanical equipment is rarely used by contractors.

Waste recycling and recovery: all EWMPs under this category are not used. This confirms the revelation by Kofoworola (2006) that Governments and waste management authorities in Nigeria give inadequate attention to recycling and resource recovery. Further questioning revealed that most construction and demolition works are usually sub-contracted; at times, construction waste is given out free on-demand by the local community, and the main contractors rarely attach commercial value to construction waste on-site, as the timely removal of the waste is of priority. Contractors are more interested in the management of project deliverables, time, budget and quality. Kamal (2009); Ren et al. (2012) recommend the consideration of 'environment' as an additional criterion for project planning. Some respondents claim that waste generation is avoided through accurate estimation of resources. Waste is inevitable (Wahab and Lawal, 2011), and estimators' allowances for materials waste are usually exceeded (Odusami et al., 2012).

Revitalisation: Neutralisation of chemically harmful materials on site (2.72) is not a practice that is applied. As already mentioned earlier, this result reflects the fact that many toxic elements are not used on construction sites. Replanting trees and vegetation (3.16) is used; this could have been encouraged or enforced through the implementation of the greener initiative programmes of the Lagos State Government.

Waste incineration: this category is not a used EWMP (2.60). As earlier mentioned, the evacuation of waste is mostly outsourced to a third party. Lagos State Waste Management Agency is sometimes employed; however, most respondents are not sure if waste carriers are certified or not; this implies that most respondents neither contribute to the actions taken on their wastes offsite nor aware of the waste destination; this is a defeat to the purpose of EWM. Waste Management (WM) is ensuring that waste is removed from the place of generation, treated

and disposed of or recycled safely (Demirbas, 2010). With proper research, a contractual relationship for successful implementation of WM practice can be negotiated with waste service providers (Davidson, 2011). The principles of Waste Material Management must be communicated to design and construction teams and also the WM contractors in order to experience the full benefits of good WMMPs (WRAP, n.d.).

Waste Behaviour: Awareness of the consequences of waste and taking personal responsibility for others' well-being (3.61); and cost savings from waste reduction made beneficial to all site management staff (3.12) are used in this category.

Air Quality strategy: Dust reduction measures during construction (3.86) are used by the contractors on sites, while maximum level of emission is considered for development application is not used (2.86). Further questioning revealed that the State Government regulates the use of equipment on construction sites.

Vegetation preservation: this practice is applied on construction sites (3.48). The usage level must have been heightened because of the Lagos State Government greener initiative programme.

Polluter pays principle: this is not used on construction sites (2.42). The construction waste disposal charging scheme (CWDCS) introduced in Hong Kong in 2006 has made the contractors embrace on-site waste sorting practice, reuse, recycling of C and D waste (Wahi et al., 2015).

Building materials exchange/recyclers' association: this is not a used EWMP on the sites. Belong to a material exchange/recyclers' association ranked least in the overall (1.82). This result indicates that 'building materials exchange' is not trendy among professionals, and this supports Kofoworola (2006) that scavengers pick items for recycling on dumpsites in Lagos. The recycling industry has over 2million informal waste pickers worldwide (Hoornweg and Bhada-Tata, 2012).

5. Conclusions

The study investigates the EWMPs of contractors on construction sites in Lagos. Survey research was used to carry out the study. The following conclusions are drawn on the findings of the study:

1. Contractors are aware of 28 EWMPs and use 26 on construction sites out of 47 EWMPs that were investigated. It implies that the awareness of the EWMPs determines their usage. If the awareness is increased, the implementation will be improved.

2. Waste accommodation/storage practice is the most used EWMPs, while building materials exchange/recyclers association is not a practice among contractors. It implies that a lot of waste will still be generated on sites because storage induces wastages.

6. Recommendations

The following recommendations are based on the conclusions drawn from the findings of the study:

1. Professionals should increase their awareness and usage of some neglected EWMPs. This can be achieved through construction firms, governments and institutions sponsoring the training of professionals on MPs. Seminars and conferences can also be organised by these bodies.

2. Polluter pays principle and recyclers' association should be enforced in project implementations. This can be achieved through governments legislations and policies for project procurements..

References

Adewuyi, T. O. & Odesola, I. A. (2016). Material waste minimisation strategies among construction firms in south-south Nigeria, *International Journal of Sustainable Construction Engineering and Technology*, 7, (1), 11-29.

Ajayi, O. M., Koleoso, H. A., Soyingbe, A. A., & Oladiran, O.J. (2008). The practice of waste management in construction sites in Lagos State, Nigeria. *The Construction and Building Research Conference of the Royal Institution of Chartered Surveyors*, 2008. Dublin.

Azika, N. (1991). *Research methodology in the behavioural sciences.* Lagos, Nigeria: Longman Nigeria PLC.

Chen, Z., Li, H., & Wong, C. T. (n.d.). Environmental management of urban construction projects in China.

Christini, G., Fetsko, M., & Hendrickson, C. (2004). Environmental Management Systems and ISO 14001 Certification for Construction Firms. *Journal of Construction Engineering and Management.*

Cox, (2016). Waste management on construction site. Retrieved from https://www.irsm.org

Dania, A. A., Kehinde, J.O., & Bala K. (2007). A study of construction material waste management practices by construction firms in Nigeria

Davidson, G. (2011). Waste management practices: Literature review. Office of Sustainability Dalhousie University, Dalhousie. Retrieved from https://cdn.dal.ca>dept>sustainability

Demirbas, A. (2010). Waste management, waste resource facilities and waste processes. *Energy Conversion and Management*, 52 (2011) 1280-1287

Dubanowitz, A. (2000). Design of a material recovery facility (MRF) for processing the recyclable materials of New York's municipal solid waste. (Master's thesis, Fu Foundation School of Engineering and Applied Science, Columbia). Retrieved from www.seas.columbia.edu>dubanmrf

Fashola commissions N1bn recycling plant in Igando, 2015. PM. News May 13, 2015. Retrieved from www.thenewsnigeria.com.ng/.../...

Gangolells, M., Casals M., Forcada N., & Macarulla, (2014). Analysis of the implementation of effective waste management practices in construction building project and sites. *Resources, Conservation and Recycling*, 93, 99-111.

Grimms, K. (2014). Achieving overall sustainability through green initiatives and investments. Retrieved from www.earthtimes.org/green-blogs/green-living/green initiatives-investments

Health and Safety Executive (n.d.). *The construction (Design and Management) Regulations 2015: Material storage and waste management*. Retrieved from

www.hse.gov.uk>construction>cdm/2015 on 8th November 2018

Hendrickson, C., & Horvath, A. (2000). Resource use and environmental emissions of US construction sectors. Journal of Construction Engineering Management 126 (1) 37-44

Hoornweg, D. & Bhada-Tata, P. 2012. What a waste: A global review of solid waste management. Urban Development Series Knowledge Papers, 15, chapter 2

International Organization for Standardization. (2015). Introduction to ISO14001:2015. Retrieved from https://www.iso.org>standards>docs

Ishola, O. S., Ojo, S. O., & Olaoluwa O. (2015). Profiling the environmental management practices on construction sites in Lagos State, Nigeria. *Civil and Environmental Research*, 7, (3), 89-96.

Jimoh, R. A. (2012). Improving site management practices in the Nigerian construction industry: The builders' perspective. *Ethiopian Journal of Environmental Studies and Management EJESM* 5(4). http://dx.doi.org/10.4314/ejesm.v5i4.5

Kareem, W. A., Asa, O. A., & Lawal, M. O. (2014). Resources conservation and waste management practices in Construction Industry. *Developing Country Studies* 4(26), 146-154

Kofoworola, O. F. (2006). Recovery and recycling practices in municipal solid waste management in Lagos, Nigeria. *Waste Management*, 27, 1139-1143.

Lagos State Governor's Office, 2015. Press releases/ news retrieved from tundefashola.com/archives/news/2015/05/12/…

Musa, J., Ashiru, A. S., & Jibrin A.M. (2015). The causes of waste generation of residential project sites in Abuja. *Journal of the Nigerian Institute of Building*, 6 (1), 29-36.

NetRegs (n.d.). Site-waste- it's criminal: A guide to site waste management plan. Retrieved fmwww.netregs.gov.uk/media/1114/swmp_sim or www.netregs.org.uk

Odusami, K. T., Oladiran, O. J., & Ibrahim, S.A. (2012). Evaluation of materials waste and control in some selected building sites in Nigeria. *Emirates Journal for Engineering Research*, 17 (2), 53-65.

Oladiran, O. J. (2008) Materials Wastage: Causes and their contributions' level. *Proceedings of CIB-2008-Transformation through Construction*, Dubai, 15-17 November. Retrieved from *Proceeding of CIB-2008, 2008-irbnet.de*

Oladiran, O. J. (2009). Innovation waste management using of waste management plans on construction projects in Nigeria. *Architectural Engineering and Design Management*, 5. 1-12.

Papargyropoulou, E., Preece, C., Padfield, R., & Abdullah, A.A. (2011). Sustainable construction waste management in Malaysia. *Management and Innovation for a Sustainable Built Environment*. Amsterdam, The Netherlands.

Rahman, M. M., Shafkath, E. S., & Rahman, M. A. (2020). Plastic Waste Recycling in Natore District, Bangladesh. *International Journal of Waste Resources*, *10*(6), 1-4.

Robson, C. (2000). *Real-World Research*. (2nd ed.) Oxford: Blackwell Publishers.

Sapuay, S.E. (2016). Construction waste- Potential and constraints. *Procedural Environment Sciences*, 35, 714-722.

Sen, (2012). What Is Awareness? retrieved from www.calmdownmind.com/what-is-awareness/

Shen, L.Y., & Tam, V. W.Y. (2001). Implementation of environmental management in the Hong Kong construction industry: Understanding Human Behaviour. *International Journal of Project Management*, 20, (7), 535-543.

Tam, V.W.Y., & Lu, W. (2016). Construction waste management profiles, practices, and performance: A cross-jurisdictional analysis in four countries. In G. Ioppolo & M.A. Rosen (Eds.). Sustainability 2016, 8, (190).

Wahab, A. B., & Lawal, A.F. (2011). An evaluation of waste control measures in the construction industry in Nigeria, *African Journal of Environmental Science and Technology*, 5, (3) 246-254.

Wahi, N., Joseph., C., Tawie, R., & Ikau, R. (2015). Critical review on construction waste control practices: legislative and waste management perspective. *Social and Behavioural Sciences*, 224, 276-283.

Waste and Resource Action Programmes (WRAP). (n.d.). Achieving good practise waste minimisation management. Retrieved from www.wrap.orguk>sites>files>wrap

Waste management. (n.d.). Retrieved July '25 2018 from https://en.m.wikipedia.org>wiki>waste

Zafar, S. (2018). Concept of zero waste and role of material recovery facility. Retrieved from https://www.bioenergyconsult.com/zerowaste-mrf2018

Zero Waste Scotland (n.d.) Best practice guide to improving waste management on construction sites. *Resource Efficient Scotland*. Retrieved from https://www.resourceefficientsotland.

JCBM (2021) 5(1).28-37.

University of Cape Town

Journal of Construction Business and Management

http://journals.uct.ac.za/index.php/jcbm

Diagnosing the Causes of Quackery in Quantity Surveying Practice in Lagos State, Nigeria

J. O. Dada[1] and G. O. Bamigboye[2]

[1 & 2] Department of Quantity Surveying, Obafemi Awolowo University, Ile-Ife, Nigeria

Received 14 July 2020; received in revised form 16 October 2020, 12 Feburary 2021 and 13 May 2021; accepted 20 May 2021.
https://doi.org/10.15641/jcbm.5.1.950

Abstract

The purpose of this paper is to examine the causes of quackery in quantity surveying practice to address the menace for enhanced service delivery. Using survey research design, primary data were collected through the administration of structured questionnaires on quantity surveyors in the 125 registered quantity surveying firms in Lagos State, Nigeria. The respondents were asked to rate the identified 34 causes of quackery in quantity surveying practice on a 5-point Likert scale. The elicited data were analysed using mean score analysis. Factor analysis was, after that, used to explore and detect the underlying relationship among the identified variables and categorise them into key factors. The results of the mean score statistics identified 32 important causes of quackery in quantity surveying practice, with the four most important ones being an unwillingness to seek professional advice and consultation, unwillingness to pay for professional services, lack of effective systems of punishment for quacks and inadequate monitoring by the quantity surveying professional association and regulatory body. It was concluded that the causes of quackery in quantity surveying are multidimensional and can be narrowed down to unethical practices, client engagement, job security, regulatory and corruption-related issues. The identified causes of quackery in quantity surveying practice will be useful in formulating policy and serve as future research agenda towards eradicating the menace and engendering an enhanced service delivery.

Keywords: Causes of quackery; Nigeria; Quackery; Quantity surveying; Service delivery.

1. Introduction

Quackery is a menace that has plagued virtually every profession, including Engineering, Health, and Law, across all nations of the world (Adeyemi, 2015). The act of quackery, as widely experienced across all professions in the built environment (Adeyemi, 2016), has caused many damages in the industry. For quantity surveying practice, the roles of quantity surveyors have evolved significantly in recent times. However, they are constantly confronted with the issue of the incursion of quacks and invasion of unprofessional personnel, as well as unhealthy competition from allied professionals. While the regulatory body of the profession in Nigeria, the Quantity Surveyors Registration Board of Nigeria (QSRBN), has taken measures to regulate the practice of the profession within the codes of professional ethics and conduct, the profession is being encroached by quacks. This is making the profession suffer continuous poor public perception (Iyortyer, 2016).

Currently, the quantity surveying profession is witnessing unregulated practices occasioned by incursion and invasion of quacks, by an army of unprofessional personnel of all manners, into the fields unrelated to their area of competency (Njoku, 2011; Ibrahim, 2012). This has led to unhealthy competition from allied professionals, outright disrespect for professionalism and far-reaching untoward consequences on construction project delivery (Nnadi and Ugwu, 2014). Traditionally, quantity surveyors are responsible for construction projects' cost and contract management functions (Shafiei and Said, 2008; Ekung and Okonkwo, 2015). They possess expertise that enhances the design process through the logical use of cost parameters to sustain viable

[2] Corresponding Author.
Email address: debbyjoe2002@yahoo.com

links relating to price, utility and forms, which assist in attaining construction project objectives within the predetermined budget (Maarouf and Habib, 2011). Quantity surveyors add value, predominantly, to the financial and contractual management of projects. They contribute to overall project performance by deploying appropriate competencies (Nkado and Meyer, 2001; Dada and Jagboro, 2012). These competencies are aimed at accomplishing projects that meet clients' value expectations (Olanrewaju and Anahve, 2015). However, quackery has caused many damages to the practice of the profession, with attendant consequences on the patronage of quantity surveying services and construction project delivery at large. This paper, therefore, reports the results of an exploratory survey aimed at examining the causes of quackery in the profession and factorising them into key components.

2. An Overview of Quackery in Built Environment Professions in Nigeria

The term 'built environment' refers to the man-made surroundings that provide the setting for human activities (Olapade, 2016). It consists of professionals who involve in the design, construction and maintenance of the built environment. These built environment professionals include Architects, Engineers, Builders, Estate Surveyors and Valuers, Quantity Surveyors, Land Surveyors and Urban and Regional Planners (National Building Code, 2006; Owolabi and Olatunji, 2014; Olapade, 2016). Each of these professionals has a unique role to play in the successful development of a nation. However, quack practices cut across all professions in the built environment (Adeyemi, 2016). This corroborates Kuroshi's (2017) view and Chendo and Obi (2015) as they confirmed quack activities in the building profession and showed how their activities have contributed to substandard buildings resulting in building collapse in Nigeria. Kuroshi (2017) defined a quack in the building profession as a trained professional not registered and licensed by the Council of Registered Builders of Nigeria (CORBON) and is involved in building production management. Kuroshi condemned the way and manner construction processes were being managed and executed in the country because of the belief that all the professions should be involved in the building process. Tanko et al. (2013) affirmed that quacks had penetrated the engineering profession at all levels, from design to construction and maintenance phases of engineering structures and services. They explicated how these activities have led to human and financial losses due to the engineering failure of buildings by pointing out typical examples of the failure of buildings either during or after construction being experienced regularly. They also noted how the profession's integrity is being eroded gradually because of the activities of quacks.

Asor (2015) classified quacks into three groups. The first group are real professionals who engage in the act of quackery. Second are non-professionals who claim to be professionals and engage in the act of quackery. The last group are those who have no knowledge of a particular profession but learn the trade and practice the profession because of their intelligence. Olapade (2016) identified six possible causes of the incursion of quacks into the real estate profession and considered "misinterpretation of roles by professionals in the built environment" as "major". Nemieboka (2010) argued that the activities of quacks in the real estate sector are responsible for the high sales and rental values of real estate. A study by Oladokun and Ojo (2011) looked into the incursion of non-professionals in property management practice in Nigeria, while Oloyede et al. (2011) discussed the issues confronting the estate surveying and valuation profession in Nigeria and gave four reasons why trespassers continue to flow into real estate business. The first reason was given as the inadequacy of registered estate surveyors and valuers to satisfy the local demand for their services. The second reason was poor service delivery, while the third was given as greed and high financial gain derivable from property management practice. Finally, the fourth reason was identified as a shortage of qualified personnel.

The activities of quacks have resulted in a lot of confusion and problems within the industry and society. Didigwu (2017) and Nwannekanma (2016) confirmed a high influx of other professionals into the town planning profession. They opined that most land surveyors engage in layout plans design even when the law categorically vests the power to prepare a layout plan on the registered town planner. It was further posited that some architects, draftsmen and numerous quacks interfere with the practice. Thus, quackery in the built environment professions is causing much damage to the construction industry.

3. Causes of Quackery in Quantity Surveying Practice

Akomolade (2006) classified quacks, who often parade themselves as professional quantity surveyors, into two groups. The first category is the educated ones who studied other disciplines different from quantity surveying at a University or Polytechnic. This category takes advantage of lack of work or economic viability in their hitherto business areas to venture into other disciplines diametrically. If they had been successful in their professional callings, the need for encroaching on other fields would not have arisen. The second class are quantity surveying graduates without professional certification or licence. Finally, the worst quacks are persons from fields unrelated to the construction industry like Economists, Lawyers, Accountants, and quantity surveying practices for which they have no clue.

Studies have revealed the possible causes of quackery in the quantity surveying profession. Osubor (2017) submitted that in Nigeria, the quantity surveyor's relevance/value and services are not maximised, especially in civil and heavy engineering projects. This has resulted in leaving construction cost experts forced out of their professional role by others not competent in those areas. Osubor (2017) further posited that external threats from other professions usurping the duties of the quantity surveyor, lack of publicity of the quantity surveyor, and ignorance of global best practices are other factors that contribute to the situation. Olapade (2016) explained that unlike other professions such as Medicine, Pharmacy and Law, where graduates are subjected to

further practical training before being licensed to practice, further training in the built environmental courses is acquired in active and non-active professional firms upon graduation. This has accounted for the lack of uniformity of practical training. Nnadi and Alintah-Abel (2016) added the issue of unwillingness to pay for professional services, especially by private building clients. Jimoh et al. (2016) opined the difficulty of clients in identifying the right professionals and the opinion that the same results will be obtained when non-professionals are given construction projects to handle as instrumental to the prevalence of quackery. Omeife and Windapo (2013); Dahiru, Salau and Usman (2014); and Babalola and Anifowose (2015) have also alluded to the naivety of clients, owing to restriction to professional service advertisement in compliance with the professional code of conduct, as contributing to the menace of quackery. Aniekwu, Anthony and Kehinde (2015) and Inuwa, Usman and Dantong (2014) identified corruption as a cause of quackery. Olanrewaju and Anifowose (2014) established that rivalry among the professionals in the industry causes professional quackery. Njoroge (2013) submitted that lack of an effective regulatory framework (i.e. poor implementation of existing policies and programmes or lack of harmonisation and coordination) causes quackery in a profession. Jimoh (2012) also supported the fact that the roles of a particular profession, when not well appreciated by the public, can cause quackery. Ede (2011) opined that when trained professionals operate illicitly (without a license) in the different fields of construction, quacks tend to infiltrate into the profession. From the review carried out, it is evident that quackery, in the quantity surveying practice, is prevalent and cannot be underestimated. There are many factors responsible for the actions that need to be critically examined to enhance the quantity surveying service delivery.

4. Research Method

This research examined the causes of quackery in quantity surveying practice. The survey research method was adopted for the study. The method is based on statistical sampling through questionnaire, has been frequently used for data collection in exploratory research. It is appropriate for collecting data because of its advantage in yielding responses in standard format from many respondents and the benefit of collecting data from respondents from geographically dispersed locations.

A structured, self-administered questionnaire was used in eliciting the necessary data required for the research. The first part of the questionnaire elicited general information about the respondents, including respondents' designation, years of experience, academic and professional qualifications, and their organisations. The other part dealt with issues relating to the causes of quackery in quantity surveying. The respondents' answers ranged on a 5 - point Likert scale from least significant to most significant. The study was carried out in Lagos State, given the high concentration of respondents in the State. A copy of the questionnaire was administered to a quantity surveyor in each of the 125 registered quantity surveying firms practising in Lagos State (NIQS, 2018). In all, a total of 57 filled (appropriate for analysis) copies of the questionnaire were returned. This represents 45.6% of the total number of copies of the questionnaire administered. Data obtained were analysed using both descriptive and inferential statistics.

5. Data Analysis

Thirty-four possible causes of quackery in quantity surveying practice were used for the study. These were synthesised from the reviewed literature. Most of the variables were identified from Olapade (2016); Osubor (2017); Nnadi and Alintah-Abel (2016); Jimoh et al. (2016); Anthony and Kehinde (2015); Inuwa et al. (2014); Omoife and Windapo (2013) and Olanrewaju and Anifowose (2014). The variable constructs were set out for the respondents to rate their significance levels. The Statistical Package for Social Sciences (SPSS) was used to rank the variables based on the mean values of the responses. In order to gain insights into the variables, factor analysis was employed to analyse the structure of interrelationships among the variables by defining a set of common underlying factors. Given the plethora of variables involved, several significant variables will measure the same criteria. The fundamental concept underlying factor analysis is the ability to statistically manipulate the empirical relationship among several variables to help reveal conjectural constructs of relationships (Neuman and Kreuger, 2003). This view is usually adopted to reduce several variables to a smaller set of underlying factors that summarise the essential information contained in the variables (Pallant, 2010; Coakes and Steed, 2001). The sample size determines the reliability of factor analysis as correlation coefficients change from one set to another. The suitability of the data collected was assessed through Kaiser-Meyer-Olkin (KMO – test) to measure sampling adequacy and Bartlett's Test of Sphericity.

6. Results and Discussion

6.1 Respondents' information

The demographic features of the questionnaire administered to the respondents include the present position in their firm, years of experience in the industry, academic and professional qualification. This was to ascertain the suitability and reliability of their responses. As presented in Table 1.

Table 1: Background Information of the Respondents

Parameters	Frequency	%
Present position in the firm		
Principal Partner	9	15.8
Associate QS	15	26.3
Senior QS	28	49.1
Assistant QS	5	8.8
Years of experience in the construction industry		
6-10 years	16	28.1
11-15 years	14	24.6
16-20 years	12	21.0
Above 20 years	10	17.5
Academic qualification of respondent		

Higher National Diploma (HND)	11	19.3
BSc./B.Tech	30	52.6
MSc./M.Tech	13	22.8
PGD	3	5.3
Higher National Diploma (HND)	11	19.3
Professional qualification of respondent		
MNIQS	41	71.9
FAQS	9	15.8
RICS	2	3.5
Other	5	8.8
Total	**57**	**100**

the results indicate that most respondents were in the top echelon of their firms with over ten years of experience and requisite academic and professional qualifications. Furthermore, the results show that the respondents were both academically and professionally qualified, and therefore, the information given by them is reliable. Ho and Ng (2003) considered experience as an important attribute for quantity surveyors. Also, the level of experience and years spent in quantity surveying practice provides a solid foundation for any survey (Smith, 2009).

6.2 Awareness of Environmental Waste Management Practices

The results of the causes of quackery in quantity surveying practice are as presented in Table 2, show that the mean scores (MS) range from 2.82 to 4.33. Unwillingness to seek professional advice and consultation was the most important cause of quackery in the study area with MS = 4.33 (SD = 1.11). Unwillingness to pay for professional services was ranked second most important cause of quackery with MS = 4.33 (SD = 1.22). The third most important cause of quackery was lack of effective punishment systems for quacks with MS = 4.28 and the fourth being inadequate monitoring by the quantity surveying professional association and regulatory body (NIQS and QSRBN) with MS = 3.98.

Table 2: Causes of Quackery in Quantity Surveying Practice

Causes of Quackery in quantity surveying	**MS**	**SD**	**Rank**
Unwillingness to seek professional advice and consultation	4.33	1.11	1
Unwillingness to pay for professional services	4.33	1.22	2
Lack of effective systems of punishment for quacks	4.28	1.00	3
Inadequate monitoring by the QS professional association and regulatory body (NIQS & QSRBN)	3.98	0.98	4
Politics in the award of contract/Godfatherism	3.97	0.93	5
Weaknesses of the legal and regulatory framework	3.90	0.78	6
Societal corruption	3.81	0.97	7
Clients inability to identify professionals	3.79	0.80	8
Loss of priority by the professional association and regulatory body	3.64	0.85	9
Excessive love for money/greed	3.63	0.84	10
Unfair award of contract to quacks	3.63	1.02	11
Underpayment of consultancy fees	3.63	1.11	12
Lack of transparency in contract award procedures	3.61	1.07	13
Leaking of tender information to quacks	3.60	1.03	14
Lack of fairness in the award of quantity surveying jobs	3.60	1.11	15
Weaknesses in investigative structures of the professional association and regulatory body	3.58	0.92	16
Lack of political will in regulating the quantity surveyors' activities	3.58	0.99	17
Socio-economic challenges	3.53	0.97	18
Monopoly of practice	3.52	0.88	19
Collusion between quacks and procurement officials	3.52	1.00	20
Lack of discretion by the professional association and regulatory body	3.50	0.95	21
Tailoring of a contract to favour quacks	3.48	1.05	22
Professional indiscipline and unethical behaviour	3.44	0.99	23
Availability of national database of skilled quantity surveyors	3.38	1.29	24
Hiding tender document information from professionals	3.38	1.35	25
Profit maximisation by professionals	3.37	1.25	26
Lack of interdisciplinary collaboration to live up to professional expectations	3.36	1.08	27
Attitudes of procurement officials	3.35	1.17	28
High cost of engaging professionals	3.35	1.28	29
Job insecurity	3.34	0.96	30
Procurement officials demanding money from quacks	3.25	1.08	31
Lack of transparency by the professional regulatory body	3.08	1.03	32
Lack of uniformity in practical training	2.99	1.20	33
Ageing population of highly skilled quantity surveyors	2.82	1.09	34

The results of the survey are aligned with the findings of Nnadi and Alintah-Abel (2016), Jimoh et al. (2016); Inuwa, Usman and Dantong (2014); Njoroge (2013) and Omeife and Windapo (2013), who identified unwillingness to pay for professional services, clients' inability to identify the right professionals, corruption, lack of effective regulatory framework and unwillingness to seek professional advice as causes of quackery. Quacks

believe in the value of the services they offer and reject both the contrary evidence provided by professional associations and regulatory bodies and the authority of these bodies to influence their behavior. Dada and Jagboro, (2012) opined that quantity surveyors need to continuously engage in lifelong learning to keep abreast with rapid advances in technology and knowledge that have profound impact on their current and evolving service offerings. In doing this, quantity surveyors will be able to deliver excellent services thereby increasing quantity surveying awareness, win clients' trust and limit their patronage for individuals who cannot give them professional services. On a general note, there exist more possibilities of recording higher rates of quackery in developing nations of the world due to issues ranging from poverty to weak government policies and enforcement of the same.

6.3 Factor Analysis of Causes of Quackery in Quantity Surveying Practice

In exploring the underlying relationship among the identified variables, the factor analysis statistical technique was used to categorise them into key factors. Bartlett's measure tests the null hypothesis that the original correlation matrix is an identity matrix. For factor analysis to be adequate, Kaiser (1974) recommended a minimum value of 0.5 as acceptable. Furthermore, Hutcheson and Sofroniou (1999) recommended values between 0.7 and 0.8 as good, values between 0.8 and 0.9 as excellent and values above 0.9 as superb. As shown in Table 3, the KMO is 0.719, which falls into the good category; hence, factor analysis is appropriate for the data set.

Table 3: KMO and Bartlett's Test of Causes of Quackery in Quantity Surveying Practice

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.719
Bartlett's Test of Sphericity	Approx. Chi-Square	1537.577
	Df	496
	Sig.	0.000

Similarly, Bartlett's test of Sphericity is highly significant (p = 0.000), suggesting that the responses were valid and suitable. Also, the communality, which describes the total amount of original variance shared with all other variables in the analysis and useful in determining the final variables extracted, was established. The average commonality of the variables after extraction was 0.62. This indicates the significance of the variables for further analysis (Kaizer, 1974; Braeken and van Assen, 2016).

Table 4: Reduced Component of Factors Causing Quackery in Quantity Surveying Practice

Communalities

Factor Component	**Initial**	**Extraction**
Loss of priority by the professional association and regulatory body	1.000	0.606
Lack of political will in regulating the quantity surveyors' activities	1.000	0.725
Lack of interdisciplinary collaboration to live up to professional expectations	1.000	0.641
Excessive love for money/greed	1.000	0.709
Politics in the award of contract/Godfatherism	1.000	0.515
Professional indiscipline and unethical behaviour	1.000	0.327
Societal corruption	1.000	0.581
Unwillingness to pay for professional services	1.000	0.653
Unwillingness to seek professional advice and consultation	1.000	0.547
Underpayment of consultancy fees	1.000	0.724
Job insecurity	1.000	0.614
Lack of transparency by the professional association and regulatory body	1.000	0.547
High cost of engaging professionals	1.000	0.450
Profit maximisation by professionals	1.000	0.610
Inadequate monitoring by the QS professional association and regulatory body (NIQS, QSRBN)	1.000	0.737
Lack of transparency in contract award procedures	1.000	0.692
Lack of discretion by the professional association and regulatory body	1.000	0.507
Weaknesses of legal and regulatory Framework	1.000	0.556
Attitudes of procurement officials	1.000	0.540
Monopoly of practice	1.000	0.392
Weaknesses in investigative structures of the professional association and regulatory body	1.000	0.609
Lack of fairness in the award of quantity surveying jobs	1.000	0.463
Tailoring of a contract to favour quacks	1.000	0.747
Leaking of tender information to quacks	1.000	0.770
Collusion between quacks and procurement officials	1.000	0.840
Hiding tender document information from professionals	1.000	0.830
Procurement officials demanding money from quacks	1.000	0.686
Unfair award of contract to quacks	1.000	0.604
Lack of effective systems of punishment of quacks	1.000	0.590
Clients inability to identify professionals	1.000	0.634
Lack of national database of skilled quantity surveyors	1.000	0.656
Socio-economic challenge	1.000	0.681

Extraction Method: Principal Component Analysis

Having established that data collected were suitable for conducting factor analysis, using varimax normalisation, the data were subjected to factor analysis, presented in Table 4. The results were subjected to further analysis to extract the eigenvalues of the factors that cause quackery in quantity surveying practice. The factors with eigenvalues greater than 1.0 were retained for this purpose. Six out of the 32 variables met these criteria (Table 5). The six extracted factors cumulatively explained 61.817% of the variation in the data. This supports the proportional variance criterion of at least 50% variation of the extracted variables (Coakes and Steed, 2001; Pallant, 2010).

Table 5: Total Variance Explained for Causes of Quackery in Quantity Surveying Practice

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
NO	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	8.672	27.099	27.099	8.672	27.099	27.099	5.863	18.320	18.320
2	3.014	9.418	36.518	3.014	9.418	36.518	3.719	11.621	29.942
3	2.363	7.385	43.903	2.363	7.385	43.903	3.043	9.508	39.450
4	2.158	6.742	50.645	2.158	6.742	50.645	2.930	9.155	48.604
5	1.947	6.084	56.730	1.947	6.084	56.730	2.270	7.093	55.697
6	1.628	5.088	61.817	1.628	5.088	61.817	1.958	6.120	61.817
7	1.421	4.441	66.258						
8	1.269	3.965	70.224						
9	1.170	3.657	73.881						
10	1.070	3.345	77.225						
11	0.917	2.865	80.091						
12	0.728	2.276	82.366						
13	0.631	1.973	84.339						
14	0.564	1.763	86.102						
15	0.495	1.547	87.649						
16	0.464	1.451	89.100						
17	0.419	1.309	90.408						
18	0.399	1.246	91.654						
19	0.373	1.165	92.819						
20	0.335	1.047	93.866						
21	0.297	0.928	94.794						
22	0.248	0.776	95.570						
23	0.240	0.750	96.320						
24	0.218	0.682	97.006						
25	0.209	0.652	97.654						
26	0.173	0.541	98.195						
27	0.156	0.488	98.683						
28	0.112	0.349	99.032						
29	0.091	0.285	99.317						
30	0.084	0.262	99.579						
31	0.074	0.233	99.811						
32	0.060	0.189	100.000						

Extraction Method: Principal Component Analysis

This shows that 61.817% of the common variance shared by the 32 variables can be accounted for by six components. However, following the recommendations of Field (2005); Gosling, Rentfrow and Swann (2003); Little, Linderberger and Nesselroade (1999) and Velicer and Fava (1998), stating that a limit should be set to the maximisation process since the number of items per factor is crucial and thus recommended adherence to no fewer than three items per factor. It was found that one of the six components had less than three loading items. Therefore, the component with less than three items was discarded. The observed variance of the five remaining variables accounted for 56.728% of the observed variance.

Table 6 presents the rotated component matrix of the five major factors. Before interpretation of the five extracted factors, it is essential to name them. The name given to each factor was generated based on the interrelated characteristics and coupled with the loading value. The five factors extracted for this study were named unethical practice related factor, client engagement related factor, job security related factor, regulatory factor and corruption-related factor. The loading values of variables in all the factor components range from 0.579 to 0.860. From the overall ranking of all the variables based on their factor loadings, the top most ranked cause of quackery factor was collusion between quacks and procurement officials with a factor loading of

0.860. Other causes of quackery include hiding tender documents/information from professionals, leaking of tender information to quacks, procurement officials demanding money from quacks, unfair award of contracts to quacks, tailoring of contracts to favour quacks, monopoly of practice, the attitude of procurement officials and lack of fairness in the award of quantity surveying jobs. This result considerably agrees with the results of top-ranked causes of quackery in quantity surveying practice in Table 2.

Table 6: Principal Factor Extraction and Total Variance Explained of Causes of Quackery in Quantity Surveying Practice

Components	**Factor Loadings**	**Initial eigenvalue**	**% of total variance explained before extraction**	**Cumulative % of total variance explained after rotation**
Component 1-Unethical practice related factor		8.67	27.09	18.32
Collusion between quacks and procurement officials	0.860			
Hiding tender document information from professionals	0.853			
Leaking of tender information to quacks	0.829			
Procurement officials demanding money from quacks	0.792			
Unfair award of contract to quacks	0.707			
Tailoring of the contract to favour quacks	0.662			
Monopoly of practice	0.580			
Attitudes of procurement officials	0.556			
Lack of fairness in the award of quantity surveying jobs	0.552			
Component 2-Client engagement related factor		3.01	9.41	11.62
Unwillingness to pay for professional services	0.784			
Clients inability to identify professionals	0.744			
Lack of effective systems of punishment of quacks	0.671			
Unwillingness to seek professional advice and consultation	0.645			
Lack of national database of skilled quantity surveyors	0.592			
Component 3-Job Security related factor		2.36	7.38	9.51
Lack of transparency by the professional association and regulatory body	0.661			
Job insecurity	0.638			
Socio-economic challenge	0.630			
Profit maximisation by professionals	0.588			
Underpayment of consultancy fees	0.545			
Component 4-Regulatory factor		2.15	6.74	9.16
Inadequate monitoring by the QS professional association and regulatory body (NIQS, QSRBN)	0.707			
Weaknesses of legal and regulatory Framework	0.700			
Lack of transparency in contract award procedures	0.655			
Lack of discretion by the professional association and regulatory body	0.516			
Component 5-Corruption related factor		1.94	6.08	7.09
Excessive love for money/greed	0.832			
Politics in the award of contract/Godfatherism	0.598			
Societal corruption	0.579			

Extraction Method: principal component analysis, rotation method: varimax with Kaiser normalisation, rotation converged in 11 iterations.

Factor 1: Unethical practice related factor

As detailed in Table 6, factor 1 was labelled unethical practice. It accounted for 27.099 % of the observed variance, with nine loading variables having load scores that ranged ≥0.552≤0.860. Variables loaded under this factor included collusion between quacks and procurement officials, hiding tender document information from professionals, leaking of tender information to quacks, procurement officials demanding money from quacks, among others. These are purely unethical practices that are unacceptable in any professional clime.

Factor 2: Client factor

The second factor, which explained 9.418% of the total variance and named client factor, has five loading variables with scores within the range ≥0.592≤0.784. Notable variables loaded under this component factor include unwillingness to pay for professional services, clients' inability to identify professionals and unwillingness to seek professional advice and consultation. These variables are related to the bidding of clients. The results obtained agree with Nnadi and Alintah-Abel (2016); Jimoh et al. (2016), who confirmed unwillingness to pay for professional services and

difficulty of clients to identify the professionals as factors causing quackery. The study confirms that these key variables need adequate consideration in mitigating the quackery of quantity surveying practices. The quantity surveying professional association and regulatory body must make a concerted effort to advocate and showcase the profession. The issue of remuneration for service rendered should also be examined.

Factor 3: Job security-related factor

The third factor was job security-related factors that accounted for 7.385% of the observed variance, with five loading variables with loading scores ranged between ≥0.545 and 0.661. Notable among the variables that loaded under this component factor were: lack of transparency by the professional association and regulatory body, job insecurity, and socio-economic challenge. A stable political environment that promotes job security, adequate legislation to protect services being rendered, and a supportive, vibrant economy where jobs are readily available will seriously limit the involvement of quacks in quantity surveying practice. On the other hand, competition, unavailability of alternative jobs and high demand for quantity surveying services could be why other professionals dabble into quantity surveying practice. Therefore, job security and the social needs of professionals should be taken seriously for more proficient service.

Factor 4: Regulatory factor

Factor four accounted for 6.742% of the observed variance, with four loading variables having loading scores in the range of ≥0.516≤0.707. Variables loaded under this factor were: inadequate monitoring and weaknesses in investigative structures (of "who is who" in the professional practice) by the QS professional association and regulatory body (NIQS and QSRBN). For quackery of quantity surveying practices to be exterminated, the support of the professional regulatory body is highly vital to develop strong investigative structures, legal and regulatory framework to curtail quackery (Pheng and Ming, 1997). The ideology and operations of the professional regulatory body will enhance and maintain the functionality of quantity surveying practices. These results agree with the opinion of Njoroge (2013) that lack of effective regulatory framework, harmonisation and coordination causes quackery in a profession. Activities of the professional association and regulatory bodies are very crucial to the growth of a profession. Regulations provide a basis for the enforcement of good professional practice (Opaleye and Talukhaba, 2014). Regulatory bodies are forces that help curb quackery and create effective firms and competent professionals (Geroski, Mata and Portugal, 2007). The findings of this study, in this regard, were in harmony with Njoroge (2013) and Ede (2011) that lack of an effective regulatory framework of quantity surveying activities and priority by the professional regulatory bodies to check professionals operating illicitly (without a license) are factors causing quackery.

Factor 5: Corruption related factor

The fifth factor accounted for 6.084% of the observed variance, with three loading variables having loading scores that ranged 0.579≤0.832. Variables loaded under this factor were: excessive love for money/greed, politics in the award of contract/Godfatherism and societal corruption. As postulated by Inuwa, Usman and Dantong (2014) and Hogarth-Scott and Owusu (2007), corruption, inefficient legal system, and lack of transparency in contract awards promote institutional quackery.

7. Conclusion and Recommendations

This paper examined the causes of quackery in quantity surveying practice in Lagos State, Nigeria, based on an explorative survey of quantity surveying practitioners. Among the thirty-four causal variables investigated, the survey showed thirty-two of them as important. The topmost of these are: “Unwillingness to seek for professional advice and consultation”, “Unwillingness to pay for professional services”, “Lack of effective systems of punishment for quacks”, “Inadequate monitoring by the quantity surveying professional association and regulatory body (NIQS and QSRBN)”, “Politics in award of contract/God fatherism”, “Weaknesses of legal and regulatory framework”, and “Societal corruption”. From the initially identified causes, factor analysis was used to determine the underlying principal grouping of the causal variables. The findings revealed that the causes of quackery in quantity surveying practice are multidimensional. These are unethical practices, client factor, job security factor, regulatory issue and corruption-related issues. The identified causes of quackery in the quantity surveying profession can help in policy formulation and serve as a base for future research towards eradicating the challenge of quackery in the profession. By dealing with quackery, quantity surveying professional service delivery will be enhanced, which promotes an improved construction project delivery. Therefore, there is a need to reposition the profession by ensuring that quacks and non-professionals do not bastardise it. In this regard, a lot has to be done in guarding against the activities of quacks in the profession. The outcome of the study calls for far-reaching actions to be taken. Thus, the following recommendations are proffered.

It is crucial that licensed professionals and established professional governing bodies maintain the forefront in proactively blowing the whistle against unethical practices in the profession on the unethical practice issue. There should also be effective systems in the implementation of disciplinary action against unethical conduct by professional members. Furthermore, there is a need for continuous sensitisation and education of the general public about the quantity surveying profession and services rendered and the future benefits on the client issue. Finally, regarding clients' inability to identify the right and authentic professionals, there is a need to publish a regularly updated database of practising quantity surveyors continuously.

For job security, there is a need to develop a structure distinguishing the roles and functions of quantity surveyors, which could guard against function overlap among the professionals in the construction industry. Furthermore, the issue of underpayment for service rendered should be examined. In all this, the issue of regulation cannot be overemphasised. As such, the development of the regulatory framework and a good

implementation plan by the professional association and regulatory body (NIQS and QSRBN) will play a significant role in curbing the activities of quacks. Lastly, the anti-corruption crusade in Nigeria should be faithfully implemented in the process of construction project procurement. While this may be beyond the purview of quantity surveyors, the antigraft agencies must do their bit in ensuring transparency in the award of contracts and eventual construction processes. If these recommendations are faithfully implemented, it will strengthen the effort to eliminate the infiltration of quacks into quantity surveying practice.

References

Adeyemi, K. (2015). 7 Top Reasons Why Engineers Should Take the Lead Against Quackery in Professional Practice, available at https://www.linkedin.com/pulse/. Accessed on 16th June 2017.

Adeyemi, A.O. (2016). Quackery in practices cut across all profession, *The Guardian*, available at https://guardian.ng/property/. Accessed on 16th June 2017.

Akomolade, K. (2006). *Estate Agency in Nigeria*, Published by Bamboo Books, Printed by EdAsae Press, Lagos.

Aniekwu, A.N, Anthony, C.I. and Kehinde, O.M. (2015). Critical Issues in Reforming the Nigerian Construction Industry, *British Journal of Applied Science & Technology*. 5(3), 321-332.

Asor, V. (2015). Eliminating Quackery in Nigeria, available at www. eliminating-quackery-Nigeria, Accessed on 27th July 2017.

Babalola, A.A and Anifowose, O.S. (2015). A Study of the Compliance of Practicing Quantity Surveyors with the Professional Code of Conduct in Nigeria, *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 20(1), 16-20.

Braeken, J. and van Assen, M. A. L. M. (2016). An Empirical Kaiser Criterion,

Psychological Methods. (Advance online publication). http://dx.doi.org/10.1037/met0000074

Chendo, I.G. and Obi, N.I. (2015). Building Collapse in Nigeria: The Causes, Effects, Consequences and Remedies, *International Journal of Civil Engineering, Construction and Estate Management*, 3(4), 41-49.

Coakes, S.J. and Steed, L.G. (2001). *SPSS Analysis without Anguish, Version 10.0 for Windows*, John Wiley & Sons Australia, Ltd. 1st Ed.

Dada, J. O. and Jagboro, G. O. (2012). Core Skills Requirement and Competencies Expected of Quantity Surveyors: Perspectives from Quantity Surveyors, Allied Professionals and Clients in Nigeria, *Australasian Journal of Construction Economics and Building*, 2(4), 78–90.

Dahiru, D., Salau, S. and Usman, J. (2014). A Study of Underpinning Methods Used in the Construction Industry in Nigeria, *The International Journal of Engineering and Science (IJES)*, 3(2), 5-13.

Didigwu A.U.S. (2017). *Issues in Surveying and Urban Planning for Sustainable Development*. Department of Surveying and Geoinformatics Enugu State University of Science and Technology, Enugu, Nigeria

Ede, A.N. (2011). Measures to Reduce the High Incidence of Structural Failures in Nigeria, *Journal of Sustainable Development in Africa*, 13(1), 153-161.

Ekung, S. and Okonkwo, E. (2015). Trend in Influences On Career Choice in Quantity Surveying and Its Implications, *International Journal of Education* (IJE), 3(1), 1–9.

Field, A. (2005). Discovering statistics using SPSS (2nd Ed.), Sage, London.

Geroski, P.A., Mata, J. and Portugal, P. (2007). Founding Conditions and the Survival of New Firms, *Strategic Management Journal*, 31, 45-56.

Gosling, S.D., Rentfrow, P.J. and Swann, W.B. Jr. (2003). A very brief measure of the Big Five personality domain, *Journal of Research in Personality*, 37(6), 504-528.

Ho M.C. and Ng C.V., (2003). Quantity surveyors' background and training, and their ethical concepts, conceptions and interests considerations, *Journal of Construction Management and Economics*, 21(1), 43-67.

Hogarth-Scott, S. and Owusu, K., (2007). *A Case Study of Factors Leading to Growth in Small Firms, An Examination of Factors that Impact on Growth of Small Manufacturing in Least Developed Countries: The Case of Ghana*, University of Bradford School of Management, England.

Hutcheson, G. and Sofroniou, N. (1999). *The Multivariate Social Scientist: Introductory Statistics Using Generalised Linear Models*, Sage Publication, Thousand Oaks, CA.

Ibrahim, Y. (2012). Challenges for the Quantity Surveying Profession -- Quackery and Encroachment by other Professionals and Quacks, *Quantity Surveying Assembly and Colloquium, Shehu Musa Yar'Adua Centre, Abuja*, September 28 and 29.

Inuwa, I.I., Usman, N.D. and Dantong, J.S.D. (2014). The Effects of Unethical Professional Practice on Construction Projects Performance in Nigeria, *African Journal of Applied Research (AJAR)*, 1(1), 72-88.

Iyortyer, M. (2016). *NIQS President Blames Quacks for Poor Building Projects*, available at www. niqspresident-blames-quacks-for-poor-building-projects. Accessed on 25th July 2017

Jimoh, R, Suleiman, S, Isa, R and Oyewobi, L. (2016). Stemming Quackery on Construction Sites in Abuja-Nigeria: Supervision and Productivity Nexus, *Journal of Construction Project Management and Innovation*, 6, 1583 – 1600.

Jimoh, R.A. (2012). Improving Site Management Practices in The Nigerian Construction Industry: The Builders' Perspective, *Ethiopian Journal of Environmental Studies and Management (EJESM)*, 5(4), 366-372.

Kaizer, H.F. (1974). An index of factorial simplicity, *Psychometrika*, 39(1), 31-36.

Kuroshi, P. (2017). Quackery in Building Profession to Be Curbed, *PM NEWS*, July 18.

Little, T. D., Lindenberger, U. and Nesselroade, J. R. (1999). On selecting indicators for multivariate measurement and modeling with latent variables: When "good" indicators are bad, and "bad" indicators are good, *Psychological Methods*, *4*(2), 192–211. https://doi.org/10.1037/1082-989X.4.2.192

Maarouf, R. and Habib, R. (2011). *Quantity Surveying Role in Construction Projects – a Comparison of Roles in Sweden and the UK*, Malmo University: Anders Peterson.

National Building Code. (2006). National Building Code (1st Ed.), LexisNexis Butterworths, Capetown.

Nemieboka, M. (2010). We'll Check Quacks in Property Market, available at www.thetidenewsonline.com/.../we'll-check-quacks-in-property-market-–niesv-boss/. Accessed on 1st Aug. 2017

Neuman, W. L. and Kreuger, L. (2003). *Social Work Research Methods: Qualitative and Quantitative Approaches*, Allyn and Bacon, Boston, MA.

Njoku, J. (2011). *QSRBN Vows to Prosecute Quacks; Inducts 299 Quantity Surveyors*, available at https://www.vanguardngr.com. Accessed on 18th July 2017

Njoroge, P.C. (2013). *A Study of Effectiveness of Regulatory Framework in Construction Industry in Promoting Sustainability (A Case Study of Nairobi County)*, Department of Real Estate and Construction Management

Nkado, R. and Meyer, T. (2001). Competencies of professional quantity surveyors: South African perspective, *Construction Management and Economics*, 19, 481-491.

Nnadi, E.O.E and Alintah-Abel, U. (2016). Utilisation of Quantity Surveyors' Skills in Construction Industry in South-Eastern Nigeria, *International Journal of Latest Research in Engineering and Technology (IJLRET)*, 2(2), 42-51.

Nnadi, E.O.E. and Ugwu O. O. (2014). Managing Construction Risk in Nigeria through Capitalization of Construction Firms, *Int'l Conference on Artificial Intelligence, Energy and Manufacturing Engineering (ICAEME'2014) Kuala Lumpur (Malaysia),* 70-74, June 9th -10th.

Nigerian Institute of Quantity Surveyors (NIQS) (2018). *List of Registered Quantity Surveying Firms*. Retrieved September 23, 2018, from NIQS: niqs.org.ng/niqs-firms/

Nwannekanma, B. (2016). Quackery in practices cut across all professions, The Guardian, Nov. 21st

Ofori, G. and Toor, S.U.R. (2012). Role of Leadership in Transforming the Profession of Quantity Surveying, *Australasian Journal of Construction Economics in Building*, 9(1), 37-44.

Oladokun, T.T. and Ojo, O. (2011). Incursion of non-professionals into property management practice in Nigeria, *Property Management*, 29(3), 305-320.

Olanrewaju, A and Anahve P.J. (2015). Duties and Responsibilities of Quantity Surveyors in the Procurement of Building Services Engineering, *Procedia Engineering*, 123, 352 – 360.

Olanrewaju, S.B and Anifowose, O.S. (2014). Causes of Rivalry among Professionals in the Nigeria's Construction Industry, *International Journal of Engineering Science and Innovative Technology (IJESIT)*, 3(6), 54-59.

Olapade, B. (2016). *Interactions of The Built Environment Professionals in Real Estate Service Delivery: An Estate Surveyor and Valuer View Point*, College of Environmental Sciences, Bells University of Technology, Ota, Ogun State, Nigeria.

Oloyede, S.A., Ayedun, C.A. and Ajibola, M.O. (2011). Issues facing the Estate Surveying and Valuation Profession in Nigeria, *Business Management Dynamics*, 1(2), 54-60.

Omeife, C.A and Windapo A.O. (2013). Impact of the National Building Code On Professionalism, *Proceedings of the 43rd Builders Conference/AGM holding held at the International Conference Centre, Abuja;* 26th -30th August.

Opaleye, O. S. and Talukhaba, A. A., (2014). Evaluating Causes of Workers Fatality on Construction Sites, *Proceedings of the 8th Construction Industry Development Board (cidb) Postgraduate Conference*, University of the Witwatersrand, Johannesburg, South Africa, 281-292. 10th -11th February.

Osubor, O. (2017). Where There Is No Quantity Surveyor: The Dilemma of Civil/Heavy Engineering Construction Project Delivery, *International Organization of Scientific Research Journal of Engineering (IOSRJEN)*, 7(3), 88-95.

Owolabi, O.S.B. and Olatunji, A.S. (2014). The Roles of Construction Professionals in the Nigeria's Construction Industry, *IOSR Journal of Humanities and Social Science*, 19(11), 5-10.

Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using the SPSS program (4th Edition)*, McGraw Hill, New York.

Pheng, L.S. and Ming, K.H. (1997). Formulating a strategic marketing mix for quantity surveyors, *Marketing Intelligence & Planning*, 15(6), 273-80.

Shafiei, M.M.W., and Said, I. (2008). The Competency Requirements for Quantity Surveyors: Enhancing Continuous Professional Development, *Sri Lankan Journal of Human Resource Management*, 2(1), 17-27.

Smith, P. (2009). Trends in the Australian quantity surveying profession: 1995–2008, *13th Pacific Association of Quantity Surveyors Congress (PAQS 2009), Kuala Lumpur*, 22-32.

Tanko, J.A., Ilesanmi, F.A. and Balla, S.K. (2013). Building Failure Causes in Nigeria and Mitigating Roles by Engineering Regulation and Monitoring, *Engineering*, 5, 184-190.

Velicer, W. F. and Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery, *Psychological Methods, 3(*2), 231–251. https://doi.org/10.1037/1082-989X.3.2.231

JCBM (2021) 5(1).38-46.

University of Cape Town

Journal of Construction Business and Management

http://journals.uct.ac.za/index.php/jcbm

Exploring the effects of positive organizational behaviour (POB) models on occupational eustress amongst construction employees

A. C. Ogwueleka[1] and D.I. Ikediashi[2]

[1] Department of Quantity Surveying, University of Uyo, Nigeria
[2] Department of Building, University of Uyo, Nigeria

Received 11 January 2021; received in revised form 27 Feburary 2021, 27 July 2021 and 30 August 2021; accepted 5 September 2021.
https://doi.org/10.15641/jcbm.5.1.1041

Abstract

The general perspective of organizational behaviour (OB) has been characterized more by negativity than positively. The introduction of a positive approach into OB is known as positive organizational behaviour (POB), which focuses on employees' positive emotions and strengths to enable them to thrive and reinforce the organization. The study assesses the effects of POB constructs on eustress amongst construction employees in Nigeria. Data were collected from 326 respondents practising in the construction firms using a quantitative survey and analyzed using both descriptive and inferential surveys, including structural equation modelling (SEM). The study identified five constructs of POB models and five parameters of eustress that have a significant influence on eustress. The study focuses on identifying the areas that can propel positive mental health among construction employees to improve their performances and increase work productivity. Therefore, it recommends that construction stakeholders should consider adopting company policies that can drive their implementations.

Keywords: Construction employees, distress, occupational eustress, positive organizational behaviourdelivery.

1. Introduction

Today's psychology movement has dramatically shifted from researching what is wrong with people and how to fix it to make peoples' lives more productive and fulfilling by nurturing their talents (Luthans, 2002). This prompted the earlier adoption of positive approach into psychology as positive psychology by well-known research-oriented psychologists such as Seligman and Csiksentmihalyi (2000), Diener (2000), Peterson (2000), and Synder (2000)]. Positive psychology (PP) is focused on maximizing peoples' strengths. Seligman (2002) defines PP as the study of positive emotions and the strengths that enable individuals and communities to thrive. There exists a high demand for the improved work performance of which employees' well-being plays a role. This provides the need to formulate frameworks and models to manage employees' capabilities toward improved work performance. The application of positively-oriented models to foster human strengths is targeted towards reinforcing the organization.

Luthans (2002) argues that previously the general perspective in organizational behaviour (OB) has been characterized more by negativity than by positivity, for example, more focus on stress and burnout than eustress, and dysfunctions; hurdles and inadequacies of managers rather than their puissance and capabilities for development and improving performance. OB studies the "behaviour, attitudes, and performance of people in organizations" (Dailey, 2016). This field of study emphasizes how employees' work contributes to or lowers an organization's overall project success and work productivity (Dailey, 2016). PP is integrated into the study of organizational behaviour to promote the employees' well-being and organizations towards improved performance; this is known as positive organizational behaviour (POB) (Seligman & Csikszentmihalyi, 2000). McHugh (2001) emphasizes that the application of POB

[1] Corresponding Author.
Email address: *amakaogwueleka@gmail.com*

increases the employees' commitment at work and thereby decreases the risk of losing talented ones.

Likewise, stress management has been studied extensively, but the majority of research works focus on negativity. Previous studies on stress management have identified strategies of coping with stress (Chinyio et al., 2018); factors affecting stress and stressors (Ng et al., 2005; Leung et al., 2012); and managing occupational stress amongst construction professionals (CIOB, 2006; Leung et al., 2010). Several written works show that work stress is rooted in psychology(Ng et al., 2005; Leung et al., 2010). This paper will not consider recapturing them but rather focus on assessing the effects of psychology capabilities adopted for this study as POB models on positive stress at the workplace. Stress is an inevitable element of human life, but the changing trends in stress management research have advocated a focus on positivity. A positive state of stress is known as eustress, while the negative aspect denotes distress (Matejek, 2019). This study focuses on the positive aspect of stress, which is eustress. It is important to note that the focus on positivity is based on the recent shift in stress management. The question is, why do we dwell on negativity while positivity can promote better work balance and well-being of employees? Jones (2016) defines eustress as a "positive reaction to stress that generates within us a desire to achieve and overcome a challenge" (Jones, 2016). This produces positive feelings amongst workers, resulting in increased performance and a general sense of well-being and contentment.

The ability to manage the stress associated with work conditions is influenced by cognitive and behavioural efforts that an individual exerts on it (Chinyio et al., 2018). When stressful conditions at work are not adequately managed, it influences the interpersonal relationships amongst project team members and organizational relationships, which will affect work performance (Leung et al., 2003). The study aims at assessing the effects of POB models on occupational eustress amongst construction employees in Nigeria. The adoption of POB models is still in its infancy, although studies have advocated that employees' positive responses will contribute to a higher level of eustress (Tavakoli, 2010).

2. Literature review

2.1 The POB models

The recent positive emphasis in organizational behaviour focuses on building human strength by promoting their state-like characteristics within an organization. This allows the psychological resource capabilities to be measurable and open to evolution, resulting in improved performance. Luthans (2002) proposed five psychological constructs for POB models, which are self-efficacy (confidence), hope, optimism, subjective well-being (happiness), and emotional intelligence. Whereas four positive constructs known as psychological capital or PsyCap were recommended by Luthans and Youssef (2007) for assessing the positive psychological state in human capital, these are hope, resilience, optimism, and self-efficacy. These positive psychological constructs are explained as follows:

2.1.1 Self-efficacy

Bandura (2012) defines self-efficacy as "peoples' judgments of their capabilities to organize and execute courses of action required to attain designated types of performance". Luthans (2002) also describes self-efficacy as confidence; this can further be explained as believing in one self's ability to control a person's attitudes towards the social environment. Previous studies have shown that self-efficacy positively correlates with goal aspirations/attainment, job satisfaction, and performance (Bandura, 2000; Judges et al., 2001; Harter et al., 2002). Four sources of self-efficacy are identified as past performance, vicarious experience, verbal persuasions, and emotional clues (Lunenberg, 2011). The study adopts the ten measures of self-efficacy identified by Schwarzer and Jerusalem (1995) for data collection.

2.1.2 Hope

This is defined as a positive motivational scale that can be acquired by applying both aspired will-power goals and mapping out routes to achieve targets (Ogwueleka and Ogbonna, 2018). This aspired will-power involves setting goals and developing the driving force while mapping out routes to achieve targets involves providing pathways for achieving such goals and overcoming barriers. An assessment tool known as Adult Dispositional Hope Scale (ADHS) was developed by Synder et al. (1991), consisting of twelve questions to measure hope. The hypothetical question for this research was restructured from the measures.

2.1.3 Resilience

It is defined as "the developable capacity to rebound or bounce back from adversity, conflict, and failure or even positive events, progress and increased responsibility" (Luthans, 2002). The construct promotes the competence of individuals to cope successfully with adversity or uncertainty in the work environment. There exists a positive correlation between psychological resilience and psychological well-being (Rees et al., 2015). Therefore, the workplace climate has an important role to play in fostering resilience among employees. Four factors influencing resilience in the workplace were identified as an individual, individual jobs, teams, and organizations (Australian Government Comcare, 2014). For this study, the four identified factors were structured into a hypothetical question to measure resilience in the workplace.

2.1.4 Optimism

McCann (2015) attributes optimism as positive thinking, which confers eagerness to succeed in all endeavours. This is a belief that the outcomes of events will be favourable; or in other words, this involves thinking and feeling optimistic about the future. That does not mean that stress is not inevitable, but the approach towards a stressor is usually in a productive manner. An individual with a mindset of optimism views the world more productively and displays a positive thinking lifestyle, with greater control perception. This study restructured the five shortcomings of optimism and their remedies as identified by Smith (2015) into a research question for data collection.

2.1.5 Subjective well-being

This refers to how people experience and evaluate their lives and specific domains and activities (National Research Council, 2013). It is a subset of positive psychology that captures the judgment of overall life satisfaction, including cognitive judgment and affective reactions. Subjective well-being (SWB) allows for the evaluation of a person's typical emotional experience along with life satisfaction. This provides a balance between one's behaviour/notions and the surrounding. The satisfaction with life scale was developed by one of the world's foremost SWB researchers, Professor Ed Diener, in 1985. The scale consists of 48 items, and this was later reduced to 5 items using factor analysis (Diener et al., 1985). This scale is restructured into a research question for data collection.

2.1.6 Emotional intelligence

Emotional intelligence (EI) is considered an important aspect of one's life because it deals with the ability to read other people's signals and react appropriately to them. Zeidner et al. (2009) define EI as the ability to perceive, understand, and regulate one's own emotions and also the emotions of others. Over the years, research has linked EI to positive life outcomes and improved mental and physical health (Martins et al., 2010). There exist several methods used to assess the different levels of EI, in which any of them may fall into either one of two types, namely: self-report tests or ability tests. This study focuses on construction personnel. Therefore the self-report test is considered suitable for data collection. This allows for respondents to rate their behaviours unlike-ability tests that a third party administers. For this study, the five categories of EI were adopted for self-report tests: self-awareness, self-regulation, motivation, empathy, and social skills and a research question was formulated to assess them.

2.2 Stress management: Eustress versus Distress

Work pressure can be considered either safe or threat, depending on an individual's coping abilities. An individual may have the coping abilities to perceive a medium level of work pressure, while the others may lack the coping abilities to manage expectations placed on them; this can lead to stress. Over the years, there exists the notion that stress is unhealthy and can lead to anxiety and depression (Li, Cao & Li, 2016). The negative perception of stress influences our physiological responses that lead to distress, while when positively perceived, it results in eustress. Some researchers argue that stress is not always bad for individuals (Pandey, 2005). Some level of stress is required to inspire and energize people in organizations.

Notwithstanding, the individual's subjective judgment influences his/her capability to cope with it. Quick et al. (2010, citing Lazarus & Folkman's, 1984) on the study of cognitive appraisals of stressors, emphasize that challenges are considered eustress while threats are referred to as distress. They may co-occur, even as a result of the same stressor. Simmons (2000) further illustrates stress using the holistic model of bathtub analogy. He argues that the two faucets (distress and eustress) are necessary to get the water level and temperature right.

The new trend of stress management has advocated how to manage stress positively. Some researchers have promoted a preventive approach that focuses on preventing individual and organizational distress and promoting health (Haynes & Love, 2004; Pandey & Gaur, 2005). Therefore, it is important to note that healthy employees will eventually form productive teams that will result in healthy organizations. An organization with positive mental health provides a good work environment for its employees to maintain work-life balance and healthy well-being (Pandey, 2005). In examining what constitutes healthy individuals, earlier researchers stipulate that it goes beyond the absence of disease and disorder (pathogenesis) to understanding the true potential of an individual in terms of health and well-being (salutogenesis) (Antonovsky, 1987). Pandey and Gaur (2005) state that positive mental health represents a state of well-being, where an individual can overcome the normal stresses of life and be productive and fruitful in one's endeavour and contribute to his/her community.

As earlier stated, stress is inevitable; therefore, there is a need to create a work environment where workers will be willing to cope with it and remain productive. It is important to note that the experience of stress is conditioned by an individual's perception of control of the stressor; this can determine the behavioural, physical, and psychological outcomes of such an individual. The advocacy for positive mental health is to enable an individual to have control over the stressor. Control can be defined as "a person's agency and capacity to make choices: (Moore, 2016). The ability to make choices is rooted in whether the individual has developed a mindset equipped to deal with challenges rather than fear them. The subjective well-being (self-evaluation) is prone to cognitive reflection, which includes reflective appraisals of one's life and domains of life, such as work. The positive state of one's domain will generate eustress; this is targeted towards preventing and resolving distress. Those who experience eustress regularly are bound to reap several positive health benefits. Indicators of eustress are identified as positive affect, meaningfulness, manageability, engagement, and positive emotions (Nelson & Simmons, 2003; Simmons & Nelson, 2007; Little, Simmons, & Nelson, 2007).

3. Conceptual Framework/ Hypothesis Development

As previously mentioned, the integration of POB models to occupational eustress within the construction sector is still in its infancy (Nangia & Chaturvedi, 2015). Stress causes both physical and psychological harm. Therefore, managing stress at the workplace requires identifying the stressors at work, assessing and managing them. Stress at work does not always lead to distress, where associated challenges are effectively dealt with. The cognitive behaviour of an individual influence their ability to cope with any challenge, where an individual perceives the stressor as a challenge that can be conquered, then it becomes positive stress. This positive perception of stress motivates employees to be more productive. Stress is good, where the individual possesses the coping abilities to manage expectations and demands placed on him/her at the workplace (Haynes & Love,

2004). Eustress is a key factor in motivating employees to actualize improved performance and enhance job satisfaction (Nangia& Chaturvedi, 2015). Previous studies have examined the relationship between job stress and job performance (Haynes & Love, 2004; Nangia & Chaturvedi, 2015). Their findings revealed that workplace stress significantly influences employee performance; this may incur psychological, physiological, and financial costs for both employees and the organization. Likewise, POB characteristics are aimed at protecting individuals at the workplace by helping employees to be able to defend their existence overcome challenges. At the conceptual level, this study proposes a linear relationship between POB models and eustress. From the literature review, six psychological constructs for POB models were identified, and five indicators for eustress were also mentioned. The conceptual framework is illustrated in Figure 1, while the research hypothesis is shown below.

Hypothesis one: Positive organizational models have a significant influence on eustress.

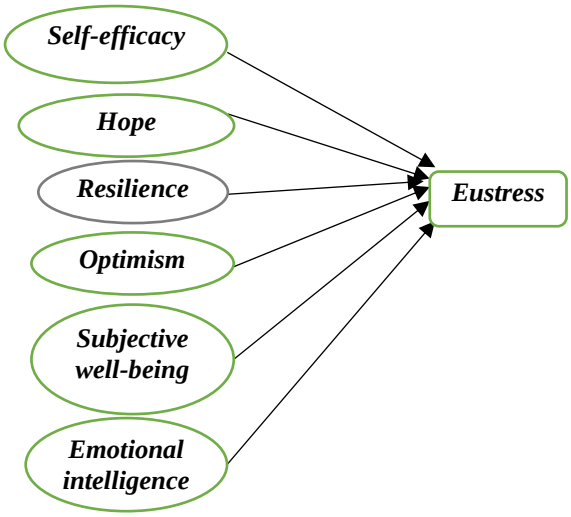


Figure 1: Conceptual framework

4.0 Research Methods

4.1 Sample characteristics

There are two types of sampling methods in a research survey: probability sampling and non-probability sampling. Probability sampling allows for multi-source information of the entire population due to its random selection procedure (Hamed, 2016). The study adopts a probability sampling method based on randomness and probability theory and a non-probability sampling technique for sample selection. The first is used to identify the sample frame, and the latter is adopted for selecting the respondents of sample size from the sample frame.

The study covers the sample frame of three major states in Nigeria, including Port Harcourt, Lagos, and Abuja. The target population comprises construction personnel who have executed commercial or public infrastructure projects or both. They include Quantity Surveyors, Builders, Engineers, Architects, Project Managers, and Foremen employed by registered construction companies (grade A to C) with the Federal Ministry of Works and Housing in the three selected states. The sample size of 375 was adopted for this study using Monte Carlo Simulation.

4.2 Data collection procedure

The study adopts field survey methodology to uncover the effects of POB models on occupational eustress amongst construction employees. Surveys through questionnaires were effective because of the relative ease of obtaining standard data appropriate for achieving the research aim (Ogwueleka, 2011). A drafted copy of the questionnaire was initially developed, and a pilot study was conducted using a selected group of experts and senior practitioners within the construction industry. Saunder et al. (2009) suggest that the use of content validity ensures that the questions are clear, relevant, and free of ambiguity. The questionnaire was revised based on the suggestions made during the pilot study. The face-to-face contact method of questionnaire distribution was adopted to increase the response rate and improve reliability. A total number of six field assistants who were university students in the related disciplines during the survey period were mobilized for the field survey, and also one-day workshop training was organized for them.

An introductory letter was first sent to the organizations to indicate their willingness to participate, followed by questionnaire administration to the selected respondents. A total number of 375 questionnaires were administered, the selected respondents were given three weeks to respond. An additional one week was given to those who could not respond within the period. After the survey period (September - October 2019), 326 valid responses were returned and computed for data analysis representing a response rate of 87 per cent.

4.3 Measures/variables

The study measures two key variables, which are POB constructs and construction eustress. In order to achieve this, the questionnaire was divided into three parts. Part 1 presents the background information about the respondents, while part 2 assesses the effects of POB constructs amongst respondents. These POB constructs are self-efficacy, hope, resilience, optimism, subjective well-being, and emotional intelligence. A five-point Likert scale was adopted in measuring each construct with different parameters.

Table 1: Compiled POB constructs and their measures

Variables/Codes	POB measures
Self-efficacy	*I am confident that I could deal effectively with unexpected events.*
Hope	*I can attain any goals that I set for myself at my workplace.*
Resilience	*My work environment can influence my ability to bounce back.*
Optimism	*There is a way out in any challenge (problem-solving initiative)*
Subjective well-being	*In most ways, my life is close to my ideas.*
Emotional intelligence	I usually anticipate, recognize, and meet clients' needs.

For self-efficacy, hope, and emotional intelligence, a scale of 1=definitely false to 5=definitely true was considered, resilience and optimism were measured with a scale of 1=not influential to 5=highly influential, while subjective

well-being was measured with a scale of 1=strongly disagree to 5=strongly agree. Part 3 examines the influence of indicators of occupational eustress on construction employees. The indicators are positive effect, meaningfulness, manageability, engagement, and positive emotions. The respondents were asked to indicate their levels of agreement using a five-point Likert scale of 1=never to 5=always. Both variables and their measures are presented in Tables 1 and 2.

Table 2: Indicators of occupational eustress and their measures

Variables/Codes	Eustress measures
Positive effect (Z1)	*My efforts have had a positive impact on my organizational performance.*
Meaningfulness (Z2)	*Do I find my work interesting?*
Manageability (Z3)	*I am always confident of my abilities and skills for my work.*
Engagement (Z4)	*Does my work support the services of my employer?*
Positive emotions (Z5)	*I am always on the right track at my workplace.*

4.4 Structural equation modelling (SEM)

SEM is a powerful statistical tool that combines both confirmatory factor analysis (CFA) and structural models for a simultaneous statistical test. It permits the measurement of several variables and inter-relationships simultaneously (Hoe, 2008). SEM is adopted in this study to test the proposed hypothesis. There are several indices of goodness-of-fit of the model. Researchers in SEM recommend that it is ideal to observe more than one of the indicators in evaluating models (Bentler & Wu, 2002; Hoe, 2008). The commonly applied fit indices and their thresholds are X2 /df (ratio of 3 or less), RMSEA (< 0.08 indicates acceptable fit), and CFI/NNFI (> 0.09 indicates good fit) (Hoe, 2008; Chen et al., 2008). The covariance-based SEM calculation is executed using AMOS 21.0, a professional software program designed for SEM analysis.

5. Data analysis/Interpretation

Initially, descriptive statistics were used to calculate the proportion of categorical variables, as shown in Table 3. The collected data from part two were screened using SPSS Missing Value Analysis Expectation Maximisation and Amos Mahalanobis distance (D) statistics to test for missing data. Kline (2010) suggested that missing data should be treated to prevent negative influence on correlation and regression weights. The result reveals two missing data, and they were substituted by mean for each measured variable. Nunnally and Bernstein (2007) emphasize that it is important to determine Cronbach's alpha coefficient when adopting the Likert scale on a questionnaire. Cronbach Alpha analysis was used to test if all the measured variables contribute to their corresponding latent variables. To confirm whether all the items on the questionnaire contribute to good internal consistency, the items were cross-examined to check if any value is above the overall coefficient means. The overall Cronbach alpha coefficient for the variables is 0.92, while none of the two groupings has a Cronbach alpha value of less than 0.8.

Table 3: Demographic characteristics of respondents

Characteristics	Sample size (n)	% of respondents
Professional roles		
Quantity Surveyors	78	24
Builders	48	15
Engineers	74	23
Architects	36	11
Project Manager	39	12
Foreman	51	15
Years of work experience		
0-5	103	31
6-15	126	39
16-25	72	22
Above 25	25	8
Educational background		
Technical college certificates	48	15
First Degree certificates	228	70
Second Degree certificates	50	15
Total	**326**	**100**

Part two is analyzed using SPSS 19.0 (IBM Corp, Armonk, NY) and AMOS 21.0 software. The SEM relationship mode path diagram was constructed, and the hypothetical model was analyzed to determine whether the model is a good fit. The first step involves using confirmatory factor analysis to confirm the validity of the scale, and the second step includes adopting Maximum Likelihood to estimate the causal relationship of the research model. The initial result indicates a lack of fit between the proposed model and data. The model was modified twice using modification indices provided by AMOS software. The initial and final model fit indices are shown in Table 4; the chi-square value is 101.151 [P<0.000], while values of the other eight metrics were considered good after modification.

Table 4: Result of the Goodness of fit measures

Goodness of fit measures	Criteria for assessment	Hypothetical model	Revised model
X^2 / degree of freedom	<5	3.101	2.975
RMSEA	< 0..08	0.870	0..078
Comparative Fit Index (CFI)	≥ 0.90	0.781	0..910
RFI	≥ 0.90	0.696	0.890
Parsimonious Normed of Fit Index	≥ 0.50	0.743	0.641
PCFI	≥ 0.50	0.645	0.749
Normed Fit Index (NFI)	≥ 0.90	0.931	0.922
IFI	≥ 0.90	0.897	0.934

Figure. 2 shows the final model and its correlation coefficient, and Table 5 presents the parameter estimation of the final Structural Equation Model. The one-tailed significance ($p < 0.05$) is used to determine the impacts of latent factors on one another. From the results, all the positive organizational behaviour models positively influence eustress except resilience, while eustress can be significantly predicted by positive affect, meaningfulness, manageability, engagement, and positive emotions.

Table 5: The parameter estimation of the final Structural Equation Model

Route of path	Standardized coefficients	Unstandardized coefficients	Standard error	P-value	Interpretation
SE →Eustress	0.35	0.18	0.037	<0.001	Supported
H →Eustress	-0.20	-0.11	0.046	0.016	Supported
R → Eustress	0.11	0.05	0.028	0.089	Rejected
P → Eustress	-0.17	-0.08	0.030	0.011	Supported
SWB → Eustress	0.15	0.08	0.034	0.022	Supported
EI → Eustress	0.24	0.11	0.033	<0.001	Supported
Eustress → Z1	0.53	1.00	-	<0.001	Supported
Eustress → Z2	-0.25	-0.40	0.128	0.002	Supported
Eustress → Z3	0.42	0.79	0.184	<0.001	Supported
Eustress → Z4	0.54	0.99	0.195	<0.001	Supported
Eustress → Z5	052	0.95	0.205	<0.001	Supported

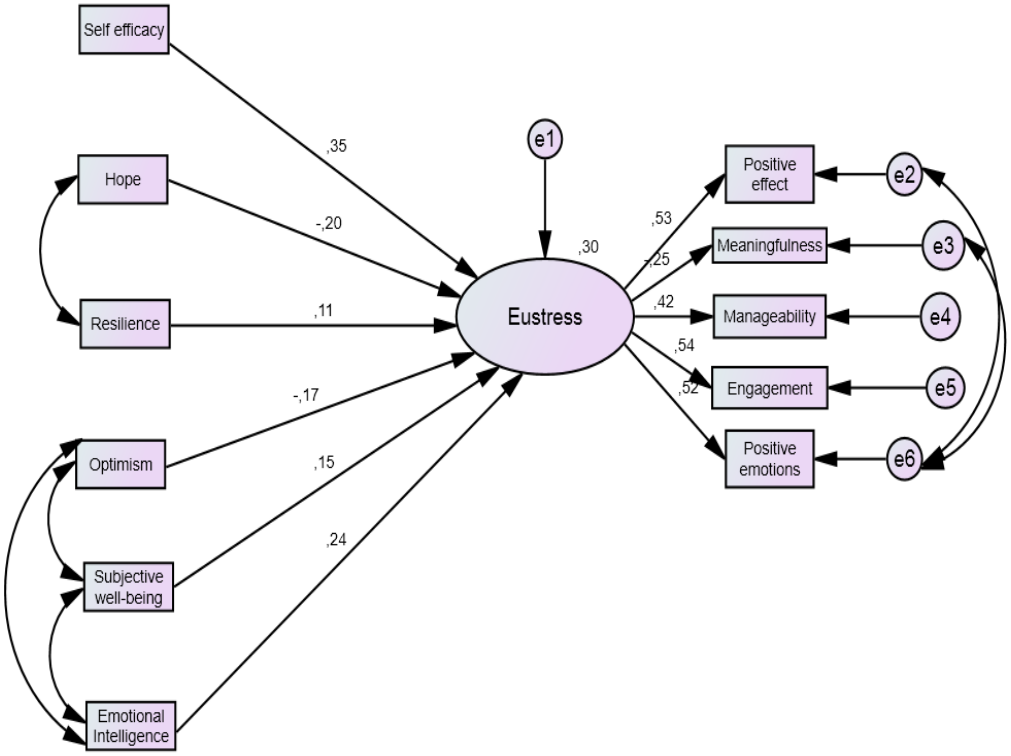


Figure 2: The final model and its correlation coefficient

6. Discussion

The structural component of the model suggests that the identified five constructs of POB models are important parameters to measure eustress among construction employees. These parameters are self-efficacy, hope, optimism, subjective well-being, and emotional intelligence. As earlier stated, eustress is viewed as when someone displays a positive reaction over an incident, with a willingness to overcome such a challenge. The measure of “I am confident that I could deal effectively with unexpected events" is used to test the influence of self-efficacy on eustress. The result shows that there is a significant level of influence on eustress. This is in line with the study conducted by O'Sullivan (2011), which emphasizes that when eustress and self-efficacy are examined together, they predict life satisfaction better. The findings reveal that employees are better satisfied at work when these parameters exist. The findings imply that one's judgment over their capability will influence their action. If an individual perceives a certain stimulus as controllable, the person will intensify their emotional action, which will generate a willingness to overcome. The measure of hope is "I can attain any goals that I set for myself at my workplace", this displays the belief that one has both the will and ways to accomplish a given goal has a significant, negative influence on eustress. A

negative correlation shows this; this suggests that highly hopeful people perceive stress at a lower rate in line with the study conducted by Sucan (2019) on the relationship between hope and perceived stress in teacher candidates; it reveals that programs related to the high level of hope to be implemented in schools may have positive effects on individuals' low stress in the examination.

The parameter "There is a way out in any challenge (problem-solving initiative)" is used to measure optimism in POB models. Optimism involves having a mindset to expect good things in future; this has a significant, negative influence on eustress. Coversano et al. [2010] describe optimism as an inclination of hope. This may have influenced the findings that a positive mindset may lower workers' perceptions of stress. Nes (2016) emphasizes that optimism is positively associated with coping strategies seeking to solve or manage stress and negatively associated with avoidance coping strategies. This implies that the respondents are more responsive toward avoidance coping strategies. The measure of subjective well-being to eustress reveals a significant, positive correlation; this implies that evaluation of one's experience can positively influence one's perception of control to the stressor. Likewise, emotional intelligence has significant, positive influence on eustress. This is in line with the study conducted by Almazrouei (2017), which reveals that emotional intelligence has positive association with employees' eustress. The hypothesis of resilience having a significant influence on eustress is rejected; this may result from resilience focusing on reinstating someone's self after an event, while eustress involves the ability to control such a situation from occurring. Likewise, the significant indicators of eustress are identified as a positive effect, meaningfulness, manageability, engagement, and positive emotions. The findings are supported by previous studies conducted by Simmons and Nelson (2007), Nelson and Simmons (2003), and Little, Simmons, and Nelson (2007).

7. Conclusions

The study assesses the effects of POB models on occupational eustress amongst construction employees in Nigeria. Although the adoption of POB models is still in its infancy, some researchers have made meaningful contributions to the study of POB models. The study focuses on unveiling the constructs of POB models that can effectively influence a healthy lifestyle of managing stress (eustress). This will enable practitioners to focus on areas that can propel positive mental health of employees in order to improve their performances and increase productivity. From the literature scan, six POB constructs and five parameters of eustress were reviewed.

The research findings revealed that self-efficacy, hope, optimism, subjective well-being, and emotional intelligence significantly influence eustress, although hope and optimism have negative correlations. This implies that those identified constructs can have a direct effect on eustress. Therefore, organizations should establish company policies that effectively drive the three positive constructs, such as self-efficacy, subjective well-being, and emotional intelligence, to promote employees' positive mental health and well-being. The findings revealed five parameters of eustress that influence eustress as positive effect, meaningfulness, manageability, engagement, and positive emotions. Although the study of POB models is still in its infancy, the findings expand POB theories. The results will guide project practitioners on areas to focus on to propel positive mental health amongst construction workers.

References

Almazrouei, S.A.S. (2017). The Effect of Emotional Intelligence Dimensions on Enhancing Employees' Eustress at work, Information Management and Business Review, 9(4), 18-27.

Antonovsky, A. (1987). Unraveling the Mystery of Health: How People Manage Stress and stay well, Jossey-Bass publisher, San Francisco.

Australian Government Comcare. 2014. "Four Factors that Influence Resilience in the Workplace." Accessed August 9, 2016. http://www.comcare.gov.au.Bandura 2012,

Bandura, A. (2000). Cultivate self-efficacy for personal and organizational effectiveness, In: E.A. Locke (Ed), The Blackwell handbook of principles of organizational behaviour, Oxford, UK: Blackwell, 120-136.

Bandura, A. (2012). "On the Functional Properties of Perceived Self-Efficacy Revisited." Journal of Management, 38, 9–44.

Bentler, P. M. and Wu, E. J. C. (2002). EQS 6 for Windows User's Guide, Encino, CA: Multivariate Software.

Chartered Institute of Building (CIOB). (2006). Occupational stress in the construction industry. CIOB Published National Stress Survey Results. Bracknell, UK: CIOB. Available at: http://www.ciob.org.uk/resources/publications [Accessed on June 21 2012].

Chen, F.; Curran, P.J.; Bollen, K.A.; Kirby, J.; Paxton, P. (2008). An empirical evaluation of the use of fixed cut-off points in RMSEA test statistics in structural equation models. Sociological Methods Research, 36, 462–494.

Chinyio, E., Riva, S. and Hampton, P. (2018). Strategies to cope with stress among construction professionals: an integrated perspective, RICS COBRA 2018, 23-24 April 2018, RICS HQ, London, UK.

Conversano, C., Rotondo, A., Lensi, E., Della Vista, O., Arpone, F., and Reda, M. A. (2010). Optimism and its impact on mental and physical well-being. Clinical practice and epidemiology in mental health CP & EMH, 6, 25–29.

Dailey, R. (2016). Organizational behaviour, Edinburgh Business School, Heriot-Watt University,etsglobal/EBS/media/EBS/PDFs/organisational-behaviour-course-taster.pdf.

Diener, E. (2000). Subjective well-being: the science of happiness and a proposal for a national index, American Psychologist, 55, 34-43.

Diener, E. D., Emmons, R. A., Larsen, R. J., and Griffin, S. (1985). The satisfaction with life scale. Journal of Personality Assessment, 49, 71–75.

Hamed, T. 2016 Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. International Journal of Academic Research in Management (IJARM), 5. ffhal-02546796

Harter, J. K., Schmidt, F.L. and Hayes, T.L. 2002. "Business unit-level Relationship between Employee Satisfaction, Employee Engagement and Business Outcomes: A Meta-Analysis." Journal of Applied Psychology 87 (2), 268–279.

Haynes, N. and Love, P. (2004). Psychological adjustment and coping among construction project managers, Construction Management and Economics, 22(2), 129-140.

Hoe, S.L. (2008). Issues and procedures in adopting structural equation modeling technique, Journal of Quantitative Methods, 3(1), 76-83.

Jones, L. (2016). What Is Eustress? - Definition & Examples, Retrieved from https://study.com/academy/lesson/what-is-eustress-definition-examples-quiz.html.

Judges, T.A., Thoresen, C.J., Bono, J.E. and Patton, G.K. (2001). The job satisfaction-job performance relationship: a qualitative and quantitative review, Psychology Bulletin, 127:376-407, assessed August 10, 2016.

Leung, M.Y., Chan, Y.S. and Yu, S.W. (2012). Managing the stress of Hong Kong expatriate construction professionals in Mainland China: A focus group study exploring individual coping strategies and organizational supporting Hong Kong. Journal of Construction Engineering and Management, 1061(10): 1943–7862.

Leung, M.Y., Chan, Y.S. and Yuen, K.W. (2010). Impacts of stressors and stress on the injury incidents of construction workers in Hong Kong. Journal of Construction Engineering and Management, 136(10): 1093–1103.

Leung, M.Y., Olomolaiye, P., Chong, A. and Lam, C.C.Y. (2003). Impact of stress on estimation performance, Construction Management and Economics, UK: E&FN Spon.

Li, C.-T., Cao, J. and Li, T.M.H. (2016) Eustress or Distress: An Empirical Study of Perceived Stress in Everyday College Life. Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing Adjunct, Heidelberg, Germany, 12-16 September 2016, 1209-1217.

Little, L.M., Simmons, B.L., & Nelson, D.L. (2007). Health among leaders: Positive and negative affect, engagement and burnout, forgiveness and revenge. Journal of Management Studies, 44, 243–60.

Lunenberg, F. C. 2011. "Self-efficacy in the Workplace: Implication for Motivation and Performance." International Journal of Management, Business and Administration 14 (1): 1–6.

Luthans, F. (2002). The need for and meaning of positive organizational behavior, Journal of Organizational Behavior, 23: 95-706.

Luthans, F., and C. M. Youssef. 2007. "Emerging Positive Organisational Behaviour." Journal of Management 33: 321–349.

Martins, A., Ramalho, N., & Morin, E. (2010). A comprehensive meta-analysis of the relationship between emotional intelligence and health, Personality and Individual Differences, 49, 554 –564

Matejek, E. T. (2019). The explanatory role of Eustress and Distress in the relationship between Extraversion and Depression A Cross-sectional Study, Bachelor Thesis, University of Twente, Enschede.

McCann, D. 2015. "Optimism: It's role in the workplace." This Worldwide. Accessed August 9, 2016. http://www.tmsworldwide.com.

McHugh, M. 2001. "Employee Absence: An Impediment to Organisational Health in Local Government." The International Journal of Public Sector Management 14: 43–58.

Moore JW (2016) What Is the Sense of Agency and Why Does it Matter? Frontier in Psychology, 7:1272, DOI: 10.3389/fpsyg.2016.01272.

Nangia, N. and Chaturvedi, V. (2015). Understanding the role of positive stress as a mediating tool for employee performance: A conceptual insinuation, International Journal of Management and Business Studies, 5(1), 39-41.

National Research Council, (2013). Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience. Washington, DC: The National Academies Press. https://doi.org/10.17226/18548.

Nelson, D.L., & Simmons, B.L. (2003). Health psychology and work stress: a more positive approach. In J.C. Quick and L.E. Tetrick (Eds), Handbook of Occupational Health Psychology (pp. 97–119). Washington, DC: American Psychological Association.

Nes, L.S. (2016). Chapter 51: Optimism, Pessimism and Stress, In Stress: Concepts, Cognition, Emotion and Behavior, Handbook of Stress Series, 1:405-411.

Ng, T. W. H., Eby, L. T., Sorensen, K. L., and Feldman, D. C. 2005. Predictors of objective and subjective career success: A meta-analysis. Personnel Psychology, 58: 367-408.

Nunnally, J.C. and Bernstein, I.H. (2007). Psychometric Theory, McGraw-Hill, New York.

O'Sullivan, G. (2011). The Relationship between Hope, Eustress, Self-Efficacy, and Life Satisfaction among Undergraduates, Social Indicators Research, 101:155–172.

Ogwueleka A.C. (2011) The critical success factors influencing project performance in Nigeria, International Journal of Management Science and Engineering Management, 6(5), 343-349, DOI: 10.1080/17509653.2011.10671182

Ogwueleka, A.C. and Ogbonna, S.N. (2018) Effect of positive organizational behaviour (POB) characteristics on construction employees' turnover in Uyo City of Akwa Ibom State, Nigeria, African Journal of Science, Technology, Innovation and Development, 10(2), 159-168.

Pandey, S. (2005). Time to manage stress positively, Human Resources, January edition, 2005, 84-89.

Pandey, S. C. and Gaur, S. P. (2005). "A Positive Mental Health Model for Stress Management Interventions in Organizations: Insights from Positive Psychology", presented at 92nd Indian Science Congress, organized by Indian Science Congress Association,

Nirma University, Ahmedabad and National Institute of Occupational Health, Ahmedabad, January 3-7, 2005.

Peterson, C. (2000). The future of optimism. American Psychologist, 55(1), 44–55. https://doi.org/10.1037/0003-066X.55.1.44

Quick, J.C., Cooper, C.L., Gibbs, P.C., Little, L.M. and Nelson, D.L. (2010). Positive organizational behavior at work, Chapter 5, International Review of Industrial and Organisational Psychology, 25, 253-292.

Rees, C. S., Breen, L. J., Cusack, L., and Hegney, D. (2015). Understanding individual resilience in the workplace: the international collaboration of workforce resilience model, Frontier in Psychology, 6:73, DOI: 10.3389/fpsyg.2015.00073.

Saunders, M., Lewis, P. and Thornhill, A. (2009) Research Methods for Business Students. Pearson, New York.

Schwarzer, R., and Jerusalem, M. 1995. "Generalized Self-Efficacy Scale." In Measures in Health Psychology: A User's Portfolio, Causal and Control Beliefs, edited by J. Weinman, S. Wright, and M. Johnson, 35–37. Windsor, UK: NFER-NELSON.

Seligman, M. and Csiksentmihalyi, M. (2000). Positive psychology, American Psychologist, 55:5-14.

Seligman, M. E. P. (2002). Positive psychology, positive prevention, and positive therapy. In C. R. Snyder & S. J. Lopez (Eds.), Handbook of positive psychology (p. 3–9). Oxford University Press.

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. American Psychologist, 55(1), 5-14.

Simmons, B. L. (2000). Eustress at work: Accentuating the positive, Unpublished doctoral dissertation, Oklahoma State University.

Simmons, B., & Nelson, D. (2007). Eustress at work: extending the holistic stress model. In D. L. Nelson, & C. L. Cooper (Eds.), Positive organizational behavior (pp. 40-54). SAGE Publications Ltd, https://www.doi.org/10.4135/9781446212752.n4

Smith, S. (2015). Maximizing Optimism in the Workplace, EHS Today, Accessed August 9, 2016. http://ehstoday.com.

Snyder, C. R. (2000). Hypothesis: There is hope. In C. R. Snyder (Ed.), Handbook of hope: Theory, measures, and applications (p. 3–21). Academic Press. https://doi.org/10.1016/B978-012654050-5/50003-8Stay Well. San Francisco, CA: Jossey-Bass

Sucan, S (2019). The Relationship between Hope and Perceived Stress in Teacher Candidates, International Journal of Higher Education, 8(2), 1-6, Sciedu Press.

Synder, C.R., Harris, C., Anderson, J.R., Holleran, S.A., Irving, L.M., Sigmon, S.T., Yoshinobu, L., Gibb, J., Langelle, C. and Harney, P. (1991). The will and the ways, Journal of Personality and Social Psychology, 60, 570-585.

Tavakoli, M. (2010). A positive approach to stress, resistance, and organizational change, Procedia Social and Behavioral Sciences, 5, 1794-1798.

JCBM (2021) 5(1).47-59.

University of Cape Town

Journal of Construction Business and Management

http://journals.uct.ac.za/index.php/jcbm

The Management of Theft and Vandalism on Construction Jobsites in the Southern Region of Malawi

W. Simukonda[1] and N. Kamwela[2]

[1& 2] Department of Land Economy and Quantity Surveying, Malawi University of Business and Applied Sciences

Received 15 April 2021; received in revised form 18 July 2021 and 28 August 2021; accepted 30 August 2021.
https://doi.org/10.15641/jcbm.5.1.1072

Abstract

The phenomenon of theft and vandalism on construction job sites in Sub-Saharan Africa (SSA) has not been fully explored to guarantee the implementation of evidence-based security management practices (SMPs) to minimise losses and improve projects' profitability margins. This study investigated the management of theft and vandalism by large contractors in the Southern Region of Malawi to identify implementation issues that need improvement. A quantitative approach using an empirical survey-based questionnaire was adopted. 44 SMPs identified from the literature review were tested by data collected from a sample survey of 40 large contractors in the Southern Region of Malawi. The descriptive statistical method of mean score ranking was used to analyse the data through IBM Statistical Package of Social Sciences (SPSS) version 20.0. Among the five-point Likert scale agreement measurements used, 11 SMPs were found to be "always used", 12 SMPs "often used", 15 SMPs "sometimes used", and six SMPs "rarely used". Overall, the top three highly ranked SMPs (in descending order) were inventorying construction materials, tools and equipment, termination of employment for offenders, and reporting theft and vandalism to enforcement agencies. Contrariwise, the use of closed-circuit television (CCTV), alarm systems and access control systems (ACS) was the least ranked SMPs. The contractors' management improvements for theft and vandalism would need to focus on implementing proactive anti-theft and anti-vandalism SMPs whose choice should be informed by comprehensive Jobsite security risk assessment. Dissemination of the results may help contractors understand their security management strategies and implement practical solutions for curbing theft and vandalism on job sites to minimise its endemic effect on contractors' financial performance.

Keywords: Theft and Vandalism; Security management practices; Likert scale; Malawi.

1. Introduction

Over the recent two decades, incidents of theft and vandalism in the construction industry have evolved from conventional theft and vandalism of materials and fixtures to sophisticated crimes targeting expensive construction assets. The consequences of theft and vandalism are direct and indirect costs incurred by contractors. Farinloye et al. (2012) reported that contractors lose huge sums of money through theft and vandalism each year. Direct costs comprise replacement costs and a residual value of the stolen or damaged item (Ablordeppey et al., 2020). Conversely, indirect costs consist of productivity and administrative losses, disruption in business operations, lost contracts and penalty clauses (Sakurai et al., 2008). Financial losses resulting from theft and vandalism have profound negative impacts on projects' profitability margins (Berg and Hinze, 2005). In order to minimise costs of theft and vandalism and improve profitability, and sustained business growth and stability, contractors are challenged to implement appropriate security management practices (SMPs). Several authors have recommended measures for curbing theft and vandalism on job sites. Some of the predominant ones include inventorying construction assets, marking of plant with indelible identifications, use of secure storage areas and

[1] Corresponding Author.
Email address: *wsimukonda@poly.ac.mw*

perimeter fencing (Ablordeppey, 2020: 38-39; Edike and Babatunde, 2017). However, their effectiveness has been questioned as more incidents of theft and vandalism continue to occur on job sites. Other authors have mourned the underutilisation of appropriate measures such as closed-circuit television (CCTV), alarm systems and background checks on applicants' records (Edike and Babatunde, 2017). This has been partly attributed to high capital cost (Ablordeppey et al., 2020) associated with their implementation and, therefore, common among small and medium-sized contractors. However, for large contractors, the cost-benefit analysis for adopting these SMPs is sufficiently compelling. Unfortunately, these SMPs continue to be neglected, as recently observed by Ablordeppey et al. (2020) and large contractors, according to Farinloye et al. (2012), continue to experience huge losses from theft and vandalism.

Therefore, crime prevention has become a major concern for players in the construction industry as losses from theft and vandalism can greatly affect the profitability of contractors. Considering the industry's economic contribution to the national economies, effective security strategies must be explored and implemented to minimise losses to contractors. Further, theft and vandalism remain insufficiently researched phenomena within the construction management discipline in Africa, specifically, Sub-Saharan Africa (SSA). Several studies, including that of Edike & Babatunde (2017), Farinloye et al. (2013) and Ablordeppey et al. (2020), were conducted in Nigeria and Ghana. These studies may not adequately portray the experiences of SSA countries to the phenomenon. The lack of practical experience of contractors SMPs could be the missing link in implementing evidence-based strategies to make construction job sites less attractive to thieves and vandals. Further, not much is read into the SMPs used on construction job sites due to the previous studies probing few SMPs. The current study conducted a thorough literature review and compiled a long list of successful SMPs for preventing crime on construction job sites, which was then probed. Hence, the purpose of this study was an assessment of SMPs implemented by large contractors in curbing crimes on construction job sites in the Southern region of Malawi.

The following section defines the terms theft and vandalism and the kinds of crime incidents and criminals. Various causes of theft and vandalism, including locations of job sites, are discussed in section 3, while sections 4 and 5 highlight the cost of theft and vandalism and symmetrical measures for their prevention on job sites. Section 6 presents methods used to collect and analyse the data on the assessment of SMPs implemented by contractors. Section 7 discusses the findings related to the data collected and the literature reviewed, while section 8 provides major practical and theoretical implications of the study.

2. An overview of construction theft and vandalism

The People's Law Dictionary (1981) defines theft as "a generic term for all crimes in which a person intentionally and fraudulently takes personal property of another without permission or consent and with the intent to convert it to the takers' use (including potential sale)." Construction job sites are naturally at high risk of victimisation due to the valuable assets found on them. Such items include large excavators, loaders, vibrator rollers, dumpers, generators, pumps, drillers, breakers, shutters and scaffolds (Gwynn et al., 2005). According to Boba and Santos (2006), theft of high-value assets such as construction plant results in loss of profits for contractors and sordid gain and filthy lucre for criminals. Conversely, Farinloye et al. (2012) describes vandalism as a crime of destroying or damaging something or property deliberately and for no good reason. Though it does not result in massive losses for contractors, Berg and Hinze (2005) states that vandalism is a nuisance that must be avoided. Vandalism manifests in the form of destruction of in-place materials, graffiti, broken glass and damage to construction plants (Farinloye et al., 2012). Taken together, theft and vandalism ought to be critical facets of commercial construction projects which must be given attention.

Boba and Santos (2006) categorise perpetrators of theft and vandalism into amateur opportunists, insiders and professional thieves. The authors describe amateur opportunists as people who dwell or travel within the vicinity of the Jobsite and who usually steal small items circumstantially. However, such burglars do not pose a higher security risk than insiders if job sites are well protected. Instead, insiders - contractors' employees, pose a higher security risk because they know the job site's security procedures. Even more risky is theft by professional thieves, who use sophisticated means to steal high-value construction assets (Ablordeppey et al., 2020).

3. Factors contributing to theft and vandalism

Understanding the factors that predominantly cause theft and vandalism on construction job sites is critical for selecting effective security measures for curbing the crimes. The following section discusses several factors that emerge as contributing to the vulnerability of job sites to theft and vandalism.

3.1 Location and accessibility

Construction job sites locations and accessibility are important risk factors. Warne (2016) found that crime increases when working in or around cities and big towns. Similarly, Sakurai et al. (2008) observed consistently higher theft and vandalism rates in central business districts (CBDs), reporting 40% and 25% each for job sites located in inner-city suburbs and outer suburbs respectively. Generally, cities and towns are characterised by high population and unemployment rates which may instigate theft and vandalism on job sites. Iwuagwu (2014) affirmed a direct relationship between locations with a high population and unemployment rates with the crime rate. Sakurai et al. (2008) and Boba and Santos (2006) state that construction job sites, greater visibility and accessibility further compounds the problem, especially for job sites with inferior security features.

3.2 Time and days

Construction job sites theft and vandalism are predominant on specific days and times. A study by Sakurai et al. (2008) discovered that 67% of theft occurs

during weekdays and 33%, with more incidents of vandalism during weekends. This is corroborated by Smith and Walmsley (1999), who discovered that stolen equipment was reported seen on Friday and missing the following Monday. Further, Sakurai et al. (2008) showed that theft and vandalism mainly occur in the evening and at night, with few pockets of incidents in the morning and evening. These observations could be attributed to fewer workers and guardianship available at the Jobsite at the mentioned timestamp. Berg and Hinze (2005) characterises a construction Jobsite as a 'ghost town' after hours and, as such, a soft target by criminals.

3.3 High cost and shortage of construction items

The high cost of construction assets encourages theft and vandalism on construction job sites and increases the risk of victimisation by professional thieves. Similarly, a shortage of construction materials such as cement, wood and steel in local markets instigates burglary. Shortage of materials is attributed to production and logistical challenges inherent in the supply chain, for the import-dependent products and inability to meet local demand by local suppliers, for locally produced materials (Rahman et al., 2017). High demand for construction materials in the local markets may create an appetite for theft of cash value materials, which according to Ablordeppey et al. (2020), may be sold to readily available buyers in the steal-to-order business.

3.4 Inferior security measures

According to Sakurai et al. (2008), hardly any optimal security measures are used to secure construction job sites. If any, contractors generally employ unsophisticated and relatively easy to breach measures. Several thefts and vandalism incidents have occurred on job sites, with some of the SMPs, such as fencing and storage areas, duly in place (Berg and Hinze, 2005).

3.5 Negligence

Among the contractors' negligent tendencies include delivering materials onsite before their installation time, the tendency of not checking tools in and out daily and non-reporting of theft and vandalism incidents to police agencies (Boba & Santos, 2006). Such proclivities give employees the impression that their employer is not serious about the security of the job site. Less attention given to security issues breeds rationalisation (Berg and Hinze 2005), resulting in more thefts and losses for the contractor.

3.5 Labour practices

Crime on construction job sites may be a sign of reprisals as a result of unfair labour practices. Unfair termination of employees accounts for many incidents of crime on job sites (Berg and Hinze 2005; Farinloye et al., 2012). The authors suggest reinforcement of security on construction job sites, especially in the moments leading to and after a difficult termination or dismissal.

4. Cost of construction theft and vandalism

The losses due to construction job sites theft and vandalism run into millions of dollars. In Europe, the value of plant purloined annually is as high as $9 billion with around $144 million, $90 million and $38 million in France, Netherlands and Belgium, respectively (Gwynn et al., 2005). In the UK and the US, the annual loss due to equipment theft accounts for £500 million (Allianz, 2018) and $1 billion (Sharma & Bausman, 2009), respectively. The US's mean dollar losses resulting from theft and vandalism of construction assets were $1,388/1 million of work performed (Berg & Hinze, 2005) and $100,000 (Montealegre, 2003), respectively. According to Big Box (2018), construction job sites theft account for the loss of R1 billion in the South African construction industry. The direct costs of theft and vandalism include replacement cost (new-for-old) and residual value (depreciated) and indirect costs such as productivity loss, hire replacement cost, increased premium insurance and social costs (Sakurai et al., 2008: 20). However, the figures given above could be a tip of an iceberg as the fuller and accurate loss associated with theft and vandalism is unknown owing to the lack of systematic methods of estimating the losses (Berg & Hinze, 2005:). Berg and Hinze (2005) summarises the consequential impact of theft and vandalism as having "a direct impact on the success of a project and diminish the potential profitability of the project" under construction. Addressing theft and vandalism management challenges could therefore protect millions of dollars and improve contractors' financial performance.

5. Construction job sites security measures

5.1 Perimeter fencing

Perimeter fencing is temporary structures installed to protect the peripheral of the construction job site and used as a delaying tactic measure in crime prevention (Edike and Babatunde, 2017). Several forms of perimeter fencing exist, including solid flat-sided hoardings and mesh wire fencing (BSIA, 2012; Farinloye et al., 2013). Perimeter fences should be designed to prevent climbing by installing ant-climb features such as spikes or barbed wire and eliminate any form of hand and footholds (BSIA, 2012). The type of fence to be employed on a construction job site should depend on the nature of the perceived threat in the area. Where possible, it is recommended to construct permanent fencing, which usually stands on a concrete foundation and prevent burrowing (BSIA, 2012). Overall, fencing is an effective security measure common among contractors (Ablordeppey et al., 2020).

5.2 Entrances and exits

Minimising the number and locking of the gates optimise accessibility control at the job sites (BSIA, 2012; Ablordeppey et al., 2020). The authors state that entrance and exit should be controlled by guards or electronic entrance systems. Gates must be designed to avoid being easily breached by using locks, protection plates and padlocks (BSIA, 2012). Where possible, Farinloye et al. (2012) recommends off-site parking of workers' private vehicles to minimise vehicular numbers onsite.

5.3 Secure storage

Construction job sites keep high-value assets that need proper storage. For equipment, BSIA (2012) recommends designating a secure parking lot with controlled access. Workers should ensure that all assets are returned, and

keys for vehicles are properly secured. The use of steel vaults with shielded padlocks is recommended for the storage of tools. Locked containers or site huts can be used as storage areas. However, extra security features such as steel doors, locks and key controls could be incorporated to make storage areas sturdier (Edike and Babatunde, 2017).

5.4 Security lighting

Lighting is used as a deterrent mechanism by illuminating the whole construction Jobsite or specific areas such as gates or parked equipment locations. It was a highly rated security measure for protecting construction assets (Ablordeppey et al., 2020) and a frequently used measure on job sites (Sharma and Bausman, 2009). However, it is recommended that wires and cables for the lighting network should be barely exposed and switches only accessible to authorised personnel (BSIA, 2012). Photoelectric cells may be used to protect the lighting from tampering or vandalism by intruders (BSIA, 2012). At the minimum, the authors advise directing the lighting inwards to reveal intruders either directly or by silhouette.

5.5 Technical systems

Technical systems comprise CCTV, access control systems (ACS) and alarm systems (BSIA, 2012). They use cameras, multiplexers, monitors, recorders or intrusion detection systems (Edike and Babatunde, 2017: 35) to provide deterrent and mitigation effects to security risks inherent on construction job sites (BSIA, 2012). However, recent studies emanating from countries in Western Africa, such as Nigeria and Ghana, indicate that CCTV and alarm systems are the least used (Edike and Babatunde, 2017) and ineffective measures (Ablordeppey et al., 2020) for preventing crime on job sites. The observation is attributed to the high capital outlay associated with the technology. Additionally, their usage is particularly low among small and medium-size contractors due to low-risk projects such firms executed (Edike and Babatunde, 2017). However, technical systems are viable for high-risk projects (Edike and Babatunde, 2017), where the cost-benefit ratio is sufficiently compelling for their deployment (BSIA, 2012).

5.6 Guarding services

The use of guard force was ranked 1st and 2nd as the most frequently used and efficient on job sites of Ghanaian contractors, respectively (Ablordeppey et al., 2020). Depending on the perceived security risk, contractors may employ their trained guards or outsource the services of security companies. However, it is prudent to consider personnel training, qualification (Edike and Babatunde, 2017), and communication systems for greater liaison with police agencies (BSIA, 2012), especially when employing their guards. Overall, after-hours guards are common among contractors with higher annual volume turnover (Sharma and Bausman, 2009).

5.7 Policy and processes

Contractors ought to have a security policy to guide job sites security operations. The policy must lucidly state the obligations and responsibilities of employees (BSIA, 2012). Some of the measures and processes must include making employees responsible for assets they use, reporting theft and vandalism to police agencies, an anonymous system of reporting suspicious activities, and other legislative and administrative practices such as the procedure for hiring (pre-screening of applicants) and termination of employment, provision for crime prevention coordinator and inventory supervisor (Edike and Babatunde, 2017; Farinloye et al., 2013). Administrative processes have proved effective in mitigating crime on construction job sites (Sharma and Bausman, 2009). For example, assigning specific security-related responsibilities may promote accountability and transparency in theft and vandalism management.

Other measures for protecting high-value construction assets on job sites include marking all assets with quick visual identifications, maintaining inventory of tools and equipment, immobilising plants, not in use, providing vehicle or product identification numbers and strategic parking of equipment (Ablordeppey et al., 2020; Edike and Babatunde, 2017). A list of SMPs as reviewed from literature is provided in appendix 1.

6. Research Methodology

The study was aimed at assessing the SMPs implemented by contractors in the Southern region of Malawi. A quantitative research approach using a questionnaire survey as an instrument for data collection was adopted. The rationale for this approach was that questionnaires are commonly reported to develop scales intended to measure the frequency of effective constructs such as experiences and processes (Fadiya et al., 2012; Rowley, 2014). The questionnaire instrument was compiled, piloted and amended as suggested by professional experts. Minor changes were made to the actual wording of the SMP variables to maximise communication of information in the main stage of the survey. The study targeted senior management personnel of large contractors such as directors and managers. The risk of theft and vandalism is higher on job sites of large contractors (Sakurai et al., 2008), and senior management personnel are more likely to be knowledgeable of their companies' theft and vandalism management practices (Farinloye et al., 2013).

6.1 Research instrument

The survey instrument was structured and comprised questions eliciting single or multiple-choice responses. Questionnaires with a combination of response options to questions are common in construction management research (Berg & Hinze, 2005; Babatunde et al., 2018; Fadiya et al., 2012). The questionnaire was divided into two major sections. Section A sought demographic information of the respondents and the contractors' business characteristics, such as professional roles, experience, age, and size, to determine the credibility of the collected data. Section B was designed to assess how frequently particular SMPs were used to curb theft and vandalism on construction job sites. Unlike previous

studies which had probed relatively fewer SMPs, such as seven (Ablordeppey et al., 2020), 11 (Farinloye et al., 2013), 30 (Edike & Babatunde, 2017), this study tested 44 SMPs, compiled from a comprehensive literature review of empirical research papers (Ablordeppey et al., 2020: 30; Farinloye et al., 2013; Fadiya et al., 2012; Berg and Hinze, 2005; Edike & Babatunde, 2017). The selection was conducted to avoid omissions or repetitions of the measures appearing in various sources.

Likert scale, one of the most popular response scales used in survey designs (Chyung et al., 2017) and general construction management research (Danku, 2020; Edike & Babatunde, 2017; Chileshe et al., 2020), was used to capture SMPs implemented by contractors on job sites. Several Likert scale formats exist, including a five-point (Farinloye et al., 2013), a seven-point (Osei-Kyei & Chan, 2016) and a ten-point (Babatunde et al., 2018). However, a five-point Likert scale rating is common in construction management research (Nyakala et al., 2021; Wuni et al., 2021; Fadiya et al., 2012). This is due to the reliability and validity to produce unbiased data (Chyung et al., 2017). More importantly, a five-point Likert scale was adopted to generate interval scale data that could be interpreted using descriptive statistics (Chyung et al., 2017). Additionally, to avoid cognitive effort and mis-responses due to respondents being under time pressure or less experienced in survey questionnaires, a Likert scale rating with fewer descriptors such as five was deemed necessary. A five-point Likert scale maximises the communication within the gradations of agreement scales used and allows the respondents to express their opinions succinctly (Chyung et al., 2017). However, mid-point Likert type scales are criticised for creating response tendencies, satisfying behaviours and social desirability bias (Chyung et al., 2017: 17) which compromise the quality of the data. However, response tendencies were avoided in this study by targeting senior management personnel directly involved in decision making regarding the management of theft and vandalism, thereby being unambiguously well knowledgeable on the responses to provide. As such, the respondents were invited to indicate the frequency of use of the SMPs on a five-point Likert scale where 1 = never used, 2 = rarely used, 3 = sometimes used, 4 = often used, and 5 = always used.

6.2 Sampling design

The study population comprised contractors licensed by Malawi's national construction industry council (NCIC) to undertake building and civil engineering works for the financial year 2019-2020. The sampling frame was retrieved from the NCIC website and comprised 591 building and civil engineering contractors operating in the Southern region of Malawi. The purposive sampling method was used to select contractors licensed to operate in financial classes of 6, 7 and 8 (See Table 1) for two reasons. First, based on their financial capacity, tiers 6, 7 and 8 are deemed medium and large contractors with higher or no financial limit on contracts they tender for. According to Farinloye et al. (2012), large contractors experience huge losses due to theft and vandalism. Besides, they are involved in large construction projects where many construction assets are deployed (Fadiya et al., 2012). Further, large construction projects entail a large onsite construction workforce, putting construction job sites at a higher security risk. Second, this profile of respondents tends to have established physical offices for the administration of the questionnaires. This study's questionnaire was self-distributed to avoid very low returns associated with online or emailed questionnaire surveys. A similar approach was employed by Edike & Babatunde (2017) on a study of crime prevention in Ogun state, Nigeria. Consequently, 98 contractors were sampled to participate in the survey.

Table 1: NCIC classification of contractors

Class	Building Category (MWK)	Civil Category (MWK)
1	10.0M	10.0M
2	20.0M	20.0M
3	50.0M	50.0M
4	100.0M	100.0M
5	200.0M	200.0M
6	500.0M	500.0M
7	1.0 Billion	1.0Billion
8	Unlimited	Unlimited

Note: M = Million; MWK = Malawi Kwacha.
(Source: NCIC, 2019)

6.3 Data Analysis

The study adopted the data analysis techniques as applied by Babatunde et al. (2018) and Edike & Babatunde (2017). The collected data was coded to obtain numeric values and then exported into IBM's Statistical Package of Social Sciences (SPSS) version 20.0. The descriptive statistical methods of the mean score and standard deviation were used to determine the SMPs used by contractors on construction job sites. The mean scores formed the basis for ranking the SMPs. Standard deviation was provided to rank SMPs with the same mean scores. In line with Babatunde et al. (2018), SMPs with lower standard deviation were ranked higher than SMPs with higher standard deviation. The decision rule regarding categorisation of SMPs about mean values were as follows: ≤ 1.00 = never used, 1.01 to 2.00 = rarely used, 2.01 to 3.00 = sometimes used, 3.01 to 4.00 = often used, and 4.01 to 5.00 = always used. Edike & Babatunde (2017) used a slightly similar decision rule in their study of crime management on construction sites in Nigeria.

Cronbach's alpha was used to statistically determine the average interitem correlation of Likert scale items in a survey instrument. Cronbach's alpha model is one of the most popular internal consistency statistics used in research studies (Babatunde et al., 2018; Chileshe et al., 2020). The Cronbach's alpha values range from 0 to 1, where 0 represents no reliability and 1 represents absolute reliability, respectively (Wuni et al., 2021). An alpha value greater than 0.70 is considered acceptable (Osei-Kyei & Chan 2016). The Cronbach's alpha of 0.877 was obtained, which signifies an excellent internal consistency of the survey instrument adopted for this study. The result rendered the dataset reliable for further analysis. Further, out of 98 questionnaires distributed, 40 valid questionnaires were used, representing a 40.8% response rate. The survey's number of responses is considered satisfactory as it exceeds the 30-sample central limit theorem espoused in Wuni et al. (2021). Further, the

response rate compares favourably against similar studies, targeting specific geospatial respondents such as 35%, Lagos, Nigeria, (Farinloye et al., 2013), and 8.5%, Southeastern, USA (Berg and Hinze, 2005).

7 Results and Discussion

7.1 Profile of respondents

The respondents' professional roles are considered a good representation of a diverse pool of experts and fields, with at least 60% being project managers and estimators (See Table 2). Fadiya et al. (2012) observed that directors and managers are decision makers who understand the consequences of theft and vandalism in the construction sector. Regarding working experience, 52.5% of the respondents had an accumulated working experience of more than 6 years while 47.5% had up to 5 years. The responses provided by the respondents could thus reflect primarily the contractors' theft and vandalism management strategies over the years.

Table 2: Respondents' professional roles

Professional roles	Frequency	%
Company director	4	10.0
Estimators	14	35.0
Project manager	10	25.0
Site engineer	1	2.5
Purchasing coordinator	1	2.5
Site agent	2	5.0
Others	8	20.0

7.2 Business characteristics of contractors

The business characteristics of the responding contractors were also necessary for determining the credibility of the responses given to the questions about the contractors' SMPs. Regarding the age, 61.5% of the responding contractors have been in business for over 11 years (See Appendix 2), which is a good reflection of the contractor's theft and vandalism experiences across projects (Edike & Babatunde 2017; Fadiya et al., 2012). Appendix 3 indicates that a considerably higher number of contractors (60.0%) were licensed to operate in financial class 8. This implies that a majority of contractors that took part in the survey operate in the unlimited category, indicating their involvement in mega projects where management of theft and vandalism is paramount. Usually, megaprojects entail deploying a substantial numeral of workers and plants (Fadiya et al., 2012). A combination of the building (95.0%) and civil engineering (60.0%) contractors responded to the questionnaire, thereby soliciting rich data from a homogenous population. Taken together, the information gathered from the contractors could be a true reflection of their SMPs.

7.3 Contractors' management strategies for theft and vandalism

The results for the mean score and ranking of SMPs are presented in appendix 4. Out of 44 SMPs, 11 SMPs, representing 25%, fell within the "always used" category, 12 SMPs (27%) in the 'often used' category, 15 SMPs (34%) in the 'sometimes used' category and 6 SMPs (14%) in the 'rarely used' category. None of the SMPs fell within the 'never used' category. The results and implications of these findings to the management of theft and vandalism are further discussed in descending order of their respective implementation categories. A table for each category, extracted from appendix 2, has been provided within the text to improve readability.

The high mean scores for SMPs in Table 3 indicate their 'always used' status on construction job sites. This finding aligns with a previous study by Edike and Babatunde (2017) which found an inventory of tools, materials and equipment, storing goods in the secured compound and marking of plant for identification, as the always used SMPs by contractors. Similarly, Farinloye et al. (2013) discovered that the most predominant preventative measures for theft of tools on construction sites were maintenance of tool inventory, secure storage and marking of tools. Similar findings were also reported by Berg and Hinze (2005). The study had found that contractors were more likely to use the maintenance of secure storage area (71%), marking of tools (67%) and maintenance of tool inventory (61%) as measures for preventing theft on job sites. Equally, the use of guards, fencing, locking gates and marking of the plant were highly ranked SMPs on a study by Ablordeppey et al. (2020).

Table 3: Always used SMPs

Security Management Practices	N	Mean	SD	Rank
All Construction materials, tools and plants on site are inventoried	40	4.55	0.71	1
Termination of employees caught stealing or committing vandalism	40	4.48	0.99	2
Report theft and vandalism to the law enforcement agency	40	4.45	0.99	3
Minimising the number of entrances	40	4.38	0.93	4
Use of own-trained security personnel	40	4.28	1.20	5
Use of Perimeter fences without barbed wire	40	4.28	1.41	6
Assigned personnel with the responsibility of maintaining tight inventory	40	4.23	1.21	7
Use of site cabins or containers for storing tools	40	4.23	1.21	8
Use of padlocks and locked gates	40	4.20	1.24	9
Removal of unused equipment from site	40	4.13	1.07	10
The plant is covered with corporate logo or colours	40	4.05	1.24	11

The prevalence of SMPs in the 'always used' category can be attributed to the location of construction job sites. Incidents of crime are high on construction job sites in towns and cities because of high population growth and unemployment rates (Warne, 2016). The use of physical measures such as fences, storage areas, minimised and secured gates provide defence depth, especially for construction job sites located in highly populated areas

such as CBDs. Physical security measures are employed to demarcate public and private land, prevent viewing of the site interior, restrict trespassing and prevent scaling the fencing (BSIA, 2012).

Besides, the SMPs in the ‘always used' category may play a crucial role in repelling crimes committed by professional thieves. Even though professional thieves employ sophisticated means of committing a crime, using fences, guards, locked gates, and secure storage areas compromise the time efficiency in their criminal operations. While BSIA (2012) observes that delaying the action of a criminal increase the chances of their being caught, Edike and Babatunde (2017) assert that delaying tactics minimise the available time of the criminal for the targeted asset.

Further, evidence reveals that high crime incidents are reported to take place in the after-hours of weekdays and during weekends (Sakurai et al. 2008; Smith and Walmsley, 1999). Providing guardship services, securing storage areas and using padlocks and locked gates minimise crime on construction job sites during odd hours. Edike and Babatunde (2017) and Farinloye et al. (2013) stresses the importance of these SMPs in maintaining the security of construction assets.

Ordinarily, theft and vandalism on construction job sites have been attributed to the implementation of minimally inferior measures (Sakurai et al., 2008), most of which are SMPs in the ‘always used’ category. Berg and Hinze (2005) found that among the contractors that had used fencing, lockboxes, guards and removal of unused items as security measures, three contractors experienced more than 50 theft incidents and two contractors experienced 42 and 109 incidents of vandalism each. An average of 3.6 vandalism incidents was reported each year among the contractors. Regardless, implementation of SMPs in the 'always used' category remains common among contractors in the construction industry. Their high implementation cannot, therefore, be taken as a bureaucratic add-on without any additional value. Apart from lower cost, other invincible motivating factors such as the duty to fulfil legislative and administrative requirements seem to play a role.

Termination of employees caught stealing or committing vandalism (2nd, 4.48) is consistent with Section 59 of the Employment Act of Malawi of 2000. The Act stipulates that an employer is entitled to summarily dismiss an employee where an employee is guilty of serious misconduct inconsistent with the fulfilment of the expressed or implied conditions of his contract of employment (Malawi Government, 2000). According to BSIA (2012), employees have an implied obligation to keep the job sites secure, report crimes, and cooperate with the guard force. Employees who steal from job sites would be in contravention of this implied obligation, resulting in dismissal. In effect, Ebong (2017) highlights that the law has a deterrent effect. It functions through fear of being apprehended and punished to produce a desired sobering behaviour and repel thieves and vandals.

Further, Part III and V of the Malawi Occupational Health, Safety and Welfare Act of 1997 assign a legal duty on the employer to ensure the safety of his/her employees and the public at the workplace (Malawi Government, 1997). In fulfilling this duty, contractors erect fences and use locked gates to protect employees and the public from hazardous construction works. Contemporaneously, such measures provide a physical barrier and prevent unauthorised access to the Jobsite, especially by amateur opportunists. Again, terminating employment for offenders and reporting of crime to law enforcement agencies are enforced as administrative requirements. Employment for criminals would be terminated due to disciplinary action, which coincidentally would deter would-be offenders and set good precedence in the fight against crime. Conversely, reporting theft and vandalism incidents help contractors with information in applying internal disciplinary and recovery measures. Berg & Hinze (2005) reported that 76% of contractors in the Southeastern United States frequently use the measure on construction job sites.

In terms of costs, the ‘always used’ SMPs are generally unsophisticated in their implementation. Ablordeppey et al. (2020) states that such SMPs entail less technology, making their costs relatively lower than technical systems. This study also conveys that perimeter fencing could be constructed from readily available re-usable local materials such as timber, plywood, steel sheets and installed by simply nailing steel sheets or plywood to timber or steel poles. Further, steel containers (8th; 4.23) could be brought onto the job site in the early stages of the project to act as temporary storage areas and converted to any preferable use at the end of the project. Minimising the number of entry points (4th; 4.38) saves the cost incurred in installing the gates and maintenance of guardianship at access points. Likewise, the cost associated with using own-trained security personnel (5th; 4.28) could be relatively lower than hired police patrols (39th 2.03). These approaches achieve additional value without necessarily increasing the cost, thereby being prevalent among contractors.

An analysis of SMPs in the “often used” category (See Table 4) indicates that the measures are ordinarily used to supplement SMPs in the "always used" category. According to the Oxford dictionary, supplementary is defined as "provided in addition to something else in order to improve or complete it” (Oxford Learners Dictionary, 2020). Multiple examples are given to exemplify this assertion. Perimeter fences (6th, 4.28) could be toppled with ant-climb features (16th, 3.45) or used to display no trespassing signs (14th, 3.63); use of storage areas such as containers (8th, 4.23) could be enhanced by installing door and window protectors (13th, 3.63) (BSIA, 2012:19-20); use of PIN and VIN (18th; 3.43) is critical in inventory management (1st; 4.55) while delaying delivery of whitegoods (15th; 3.53) minimises the number of unused items onsite (10th; 4.13). These synergies address the inadequacies inherent in the ‘always used’ SMPs and further explain their dominance among contractors.

Further, in instances where SMPs in the “always used” category are breached, SMPs in the "often used" category provides a security cover. This is achieved through sufficient delay to the action of the intruder caused by anti-climb features, use of protectors on doors and windows, use of padlocks, chains and wheel camps (19th; 3.43) and use of locks on oil and gas tanks (21st; 3.38). The complementarity makes these SMPs fall in the "often

used" category and rank behind SMPs in the "always used" category. The deployment of SMPs in the 'often used' category could thus be a matter of choice and pick of measures that better supplement SMPs within the "always used" category on a particular construction job site.

Table 4: Often used SMPs

Security Management Practices (SMPs)	N	Mean	SD	Rank	Category
Station uniformed guards at entrance gates	40	3.93	1.49	12	
Use of protectors for vulnerable doors and windows	40	3.63	1.31	13	
Display of " No Trespassing " signs	40	3.63	1.51	14	
Delaying delivery and installation of white goods	40	3.53	1.28	15	
Use of perimeter fence with barbed wire	40	3.45	1.55	16	
Providing contact information for a responsible person during non-working hours	40	3.43	1.17	17	
Recording of vehicle identification number (VIN) or a product identification number (PIN)	40	3.43	1.78	18	Often used
Secure small mobile equipment with padlocks, chains, hitches, wheel clamps	40	3.43	1.14	19	
Just-in-time delivery of materials and tools	40	3.38	1.51	20	
Use locks on oil and gas tanks	40	3.38	1.66	21	
Conduct staff security awareness training	40	3.13	1.59	22	
Tools such as hammers, shovels are marked with an indelible identification mark	40	3.05	1.50	23	

The findings for the 'sometimes used' category indicates that the SMPs are mainly those used to prevent theft of plant stationed onsite (See Table 5). Such SMPs include the use of locking points to immobilise plant (24th; 2.93), strategic parking for large equipment (26th; 2.83), engraving equipment with serial numbers (27th; 2.78), installing plant tracking devices (34; 2.38) and disabling plant with hidden ignition cut-out switch (37th; 2.18). Berg & Hinze (2005) reported that 67% of contractors parked equipment in well-lighted areas, 43% parked equipment in a specific formation, 42% used strategic parking of equipment, and 37% included additional identification marks on the plant. Similar findings were also reported by Edike and Babatunde (2017) and Farinloye (2012). Therefore, the prevalence of SMPs in the ‘sometimes used’ category across studies as measures for securing construction plant entails their effectiveness in preventing theft of machinery. However, large contractors that participated in this study do not use these SMPs frequently. A plausible explanation for the observation could be that such contractors rely on 'always' and 'often' used SMPs to mitigate plant theft.

Again, pre-screening of applicants (35th, 2.35) and employee hotline (38th, 2.05) are not widely adopted, inconsistent with findings of Edike & Babatunde (2017: 40, 45). Pre-screening of applicants ensures that only those individuals without criminal records are employed. Similarly, establishing an employee hotline to report crimes ensures that incidents of theft and vandalism, planned or abrupt, are instantaneously reported for immediate action. According to Sharma and Bausma (2009), these SMPs minimise incidents of theft on construction job sites. It would be therefore prudent for contractors to adopt these practices if their effectiveness is anything to consider.

Table 5: Sometimes used SMPs

Security Management Practices (SMPs)	N	Mean	SD	Rank	Category
Using locking points to immobilise plant when not in use	40	2.93	1.38	24	
Security planning and design	40	2.90	1.37	25	
Strategic parking for large equipment	40	2.83	1.56	26	
Engraving the equipment with serial numbers	40	2.78	1.40	27	
Use of lockable steel vaults for storing tools and small equipment	40	2.70	1.34	28	
Encouraging employees to mark ID numbers on tools	40	2.68	1.44	29	
Crime prevention coordinator	40	2.60	1.63	30	
Computer-based documentation of information onsite	40	2.62	1.52	31	Sometimes used
Use of full-height turnstile on entrances	40	2.54	1.35	32	
Use of workers badge or ID	40	2.43	1.38	33	
Install tracking devices on the plant or equipment	40	2.38	1.41	34	
Pre-employment screening investigation to verify applicants’ criminal history	40	2.35	1.46	35	
Use of guard dogs after working Hours	40	2.28	1.52	36	
Disabling machines with hidden ignition cut-out switch	40	2.18	1.22	37	
Establishing an employee hotline to report crime	40	2.05	1.30	38	

Table 6 shows that 6 SMPs, representing 14%, fell within the "rarely used" category. They are least ranked, 39th to 44th, with mean scores ranging from 2.03 to 1.50. This finding is consistent with Edike and Babatunde's (2017) study, which discovered the least use of CCTV and alarm systems (30th, 1.33) among contractors in Nigeria. Security cameras and alarm systems were also minimally ranked in a study of theft on construction job sites in the Upper West Region of Ghana (Ablordeppey et al., 2020). Their unpopularity has been attributed to the high cost of procurement, installation and operation. Their none deployment ought to be predominant among small and medium contractors and not among large contractors. Here again, the domineering and adamantine effect of SMPs in the 'always' and 'often' used categories seem to be in manifestation. However, considering that none use of technical systems is a major cause of crime on job sites (Berg and Hinze, 2005) and that the security risk is high on large projects, deployment of technical systems as deterrence and detection security strategy needs to be encouraged among large contractors. The cost-benefit analysis for the deployment of these SMPs is sufficiently compelling for large contractors. The systems are re-usable and may offer additional value, such as monitoring health and safety issues.

Table 6. Rarely used SMPs

Security Management Practices (SMPs)	N	Mean	SD	Rank	Category
Use of police patrols	40	2.03	1.23	39	Rarely used
Use of neighbourhood watch	40	2.00	1.30	40	
Fitting Passive electronic tags or markers to plant	40	1.85	1.19	41	
Use alarm system to detect motion and send signals	40	1.53	1.11	42	
Use of electronic entrance system	40	1.50	1.26	43	
Use of CCTV/security cameras	40	1.48	1.11	44	

8. Conclusion

Crime prevention has become a major concern in the construction industry due to theft and vandalism costs. This paper explored SMPs implemented by contractors in curbing theft and vandalism on construction job sites in the Southern Region of Malawi. SMPs that were commonly implemented included 11 in the 'always used' and 12 in the 'often used' categories. The ubiquitous nature of SMPs in these two categories is attributed to the job sites' locations that demand the implementation of physical measures. Other factors that influence these SMPs include compliance with legislative and administrative requirements and a strong synergism among the SMPs. It was expected that large contractors would implement the proven to be successful security measures to mitigate threats on their job sites. This would be due to the high value of construction assets found on such job sites. However, it was surprising to note that most SMPs used to prevent theft of plants and tools were categorised as 'sometimes used'. Similarly, technical systems such as CCTV and alarm systems, together with background checks on employees and establishing employee hotline, were among the least used SMPs. Therefore, the absence of these SMPs is an indicator of how exposed job sites of large contractors are to theft and vandalism. This would also imply that cost is not the only most influencing factor in choosing security measures for contractors. If that were the case, the implementation of the technical systems would have been high among the large contractors probed in this study, whose financial capacity is an enabler to investment in such systems. Instead, other compelling factors such as legislative and administrative requirements play a role.

Together, contractors should prioritise the implementation of SMPs in the 'always used' category while the deployment of SMPs in another category should be in tandem with the overall security assessment of the construction job site. For example, SMPs, in the "often used" category should be employed to supplement inadequacies created by "always used" SMPs, while SMPs in the "sometimes used" category should be employed to deter theft of tools and plants. SMPs in the "rarely used" categories are the most effective anti-theft and anti-vandalism SMPs. Large contractors should therefore reconsider investing in technical systems.

The findings contribute to the wider construction project management discourse where issues of theft and vandalism are paramount. The results provide empirical evidence on SMPs that need improvement to prevent theft and vandalism on job sites. Further, the study contributes to the theft and vandalism phenomenon by suggesting that implementing SMPs belonging to a particular category only may not necessarily result in improved security on construction job sites. Implementation of a combination of SMPs based on security risk assessment may be necessary to achieve a desired level of security. However, though adequate, the study is limited by a relatively smaller sample size which may compromise the generalizability of the results. Therefore, this study might have offered a generic analysis on which future research studies covering wide geospatial areas may be based. Future research may also consider conducting discriminant analysis of the results using ANOVA or t-test to investigate if the implementation of SMPs varies with business characteristics.

References

Ablordeppey, E.E, Moo, F., Akorsu, W. and Mustapha, A. (2021). Minimising Theft on Construction Sites in Ghana: The Perspective of Contractors in the Upper West Region of Ghana. *Civil and Engineering Research*, 12, (5), 30-40.

Allianz, (2018). 2018 will hit a new high for plant theft claims. Retrieved from https://www.allianz.co.uk/news-and-insight/news-blogs-and-press-releases/2018/11/2018-predicted-new-high-for-plant-theft-claims.html

Babatunde, S.O., Perera, S. and Adeniyi, O. (2018). Identification of critical risk factors in public-private partnership project phase in developing countries. *Benchmarking: An International Journal*, 26, (2), 334-355.

Berg, R. and Hinze, J. (2005). Theft and vandalism on construction sites. *Journal of Construction Engineering and Management*, 131, (7), 826-833.

Big Box. (2018). Preventing construction site theft in South Africa. Retrieved from https://www.bigboxcontainers.co.za/blog/preventing-construction-site-theft-south-africa

Boba, R. and Santos, R. 2006. Burglary at single-family house construction sites. Working paper [43], Office of Community Oriented Policing Services, US Department of Justice, Washington. Retrieved from https://justiceacademy.org/iShare/Library-Training/e07021611.pdf

British Security Industry Association (BSIA). (2012). Construction site security-a guide. Working paper [123], British Security Industry Association, January, UK. Retrieved from https://www.bsia.co.uk/zappfiles/bsia-front/new%20pdfs/123-construction-site-security-a-guide.pdf

Chileshe, N. Njau, C.W., Kabichii, B.K., Macharia, L.N. and Kavishe, N. (2020). Critical success factors for public-private partnerships (PPP) infrastructure and housing projects in Kenya. *International Journal of Construction Management*, 1-23.

Chyung, S.Y., Roberts, K., Swanson, L. and Hankinson, A. (2017). Evidence-based Survey Design: The Use of a Midpoint on the Likert Scale. *International Science for Performance*, 56, (10), 15-23.

Danku, J.C. (2020). Exploring the Concept of Social Licence in the Construction Industry of a Developing Country. *Journal of Construction Business and Management*, 4, (2), 25-33.

Ebong, S. (2017). Influencing behavior for crime prevention through architectural design and construction: an overview. *Journal of Sustainable Architectural and Civil Engineering*, 2, (19), 5-12.

Edike, U.E. and Babatunde, A. (2017). Crime prevention on construction site: A study of Ogun State, Nigeria. *Covenant Journal of Research in the Built Environment*, 5, (1), 32-47.

Fadiya, O.O., Georgakis, P., Chinyio, E. and Nwagboso, C. (2012). Perceptions of Building Contractors Concerning Plant Theft. *International Journal of Architecture, Engineering and Construction*, 1, (1), 47-54.

Farinloye, O., Odusani, K. and Adewunmi, Y. (2013). Theft and vandalism control measures on building sites in Lagos, Nigeria. *Journal of Engineering, Project and Production Management*, 3, (1), 9-21.

Gwynn, M., Engels, F., Green, N., Henry, J., Kellow, J. (2005) Theft of Construction Plant and Equipment. International Association of Engineering Insurers (IMIA) 43 (05). Retrieved from https://www.imia.com/wp-content/uploads/2013/05/wgp4305.pdf

Iwuagwu, C. (2014). Statistical appraisal of crime rate in Nigeria. *Journal of Physical Science and Innovation*, 6, (1), 38-48.

Malawi Government. (1997). Occupational safety, health and welfare. Retrieved from https://www.malawi.gov.mw/labour/doc/occ%20safety%20health.pdf

Malawi Government. (2000). Employment Act 2000 No. 6 of 2000. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_125534.pdf

Montealegre, F. (2003). Jobsite security in residential construction. Retrieved from https://ufdc.ufl.edu/UFE0001192/00001/pdf

National Construction Industry Council (NCIC). (2019). First and upgrading registration form for building and civil – 2019. Retrieved from https://ncic.mw/resources/

Nyakala, K.S., Pretorius, J.C. and Vermeulen, A. (2021). Construction quality process implementation as a source of competitive advantage in small and medium-sized construction projects. *Journal of Construction Business and Management*, 4, (2), 46-54.

Osei-Kyei, R. and Chan, A.P.C. (2016). Factors attracting private sector investments in public-private partnerships in developing countries: A survey of international experts. *Journal of financial management of property and construction*, 22, (1), pp. 92-111.

Oxford Learners Dictionary. (2020). Supplementary. Retrieved from https://www.oxfordlearnersdictionaries.com/definition/english/supplementary?q=supplementary

Rahman, M.M, Yap, Y.H., Ramli, N.R., Dullah, M.A. and Shamsuddin, M.S.W. (2017). Causes of Shortage and Delay in Material Supply: A Preliminary Study. IOP Conf. Series: Materials Science and Engineering. 1-7

Rowley, J. (2012). Conducting research interviews. *Management Research Review*, 35, (3/4), 260-271.

Sakurai, Y., Mayhew, P. and White, M. (2008). Theft and vandalism at residential building sites in Australia. Retrieved from http://www.sanantonio.gov/saPD/pdf/CONSTRUCTION_SITE.pdf

Sharma, A. and Bausman, D. (2009). Construction site security – the impact of company size and loss history on security measures. Retrieved from http://ascpro0.ascweb.org/archives/cd/2010/paper/CPRT119002010.pdf

Smith, A. and Walmsley, R. (1999). The nature and extent of construction plant theft. Working paper [117], Home Office, London. Retrieved from https://www.imia.com/wp-content/uploads/2013/05/EP44-2010-Plant-Theft-Report-UK-vers-4.pdf.

The People's Law Dictionary. (1981-2005) Theft. Retrieved from https://legal-dictionary.thefreedictionary.com/theft

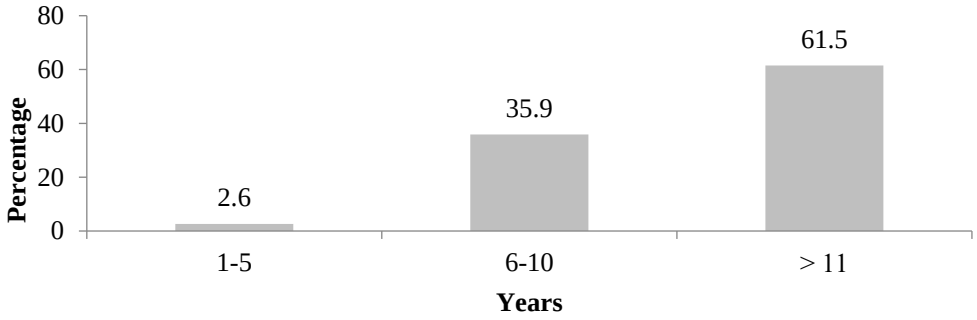
Warne, L. (2016). Crime in the construction industry. Retrieved from https://prime-secure.co.uk/wp-content/uploads/2021/02/CIOB-Crime-in-the-Construction-Industry.pdf

Wuni, I.Y., Shen, G.Q. and Osei-Kyei, R. (2021). Evaluating the critical success criteria for prefabricated prefinished volumetric construction projects. *Journal of Financial Management of Property and Construction*, Vol. ahead-of-print No. ahead-of-print. Retrieved from https://doi-org.gcu.idm.oclc.org/10.1108/JFMPC-03-2020-0013.

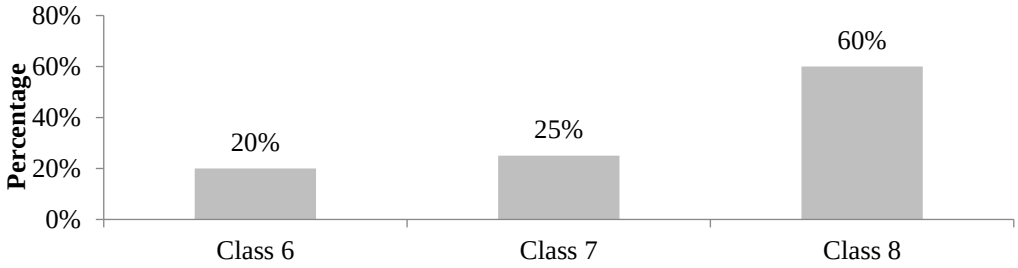
Appendix 1: Proposed construction Jobsite security management strategies

Security Management Practices (SMPs)	**Sources**
All Construction materials, tools and plants on site are inventoried	Farinloye et al., 2013: 14; Fadiya et al., 2012: 49; Berg and Hinze, 2005: 828; Big Box. 2018: 1; Boba & Santos, 2006: 22-33; BSIA, 2012: 16-20; Edike and Babatunde, 2017: 38-43).
Termination of employees caught stealing or committing vandalism.	
Report theft and vandalism to the law enforcement agency	
Minimising the number of entrances	
Use of own-trained security personnel	
Use of Perimeter fences without barbed wire	
Assigned personnel with the responsibility of maintaining tight inventory	
Use of site cabins or containers for storing tools	
Use of padlocks and locked gates	
Removal of unused equipment from site	
The plant is covered with corporate logo or colours.	
Station uniformed guards at entrance gates	
Use of protectors for vulnerable doors and windows	
Display of " No Trespassing " signs	
Delaying delivery and installation of white goods	
Use of perimeter fence with barbed wire	
Providing contact information for a responsible person during non-working hours	
Recording of vehicle identification number (VIN) or a product identification number (PIN)	
Secure small mobile equipment with padlocks, chains, hitches, wheel clamps	
Just-in-time delivery of materials and tools	
Use locks on oil and gas tanks	
Conduct staff security awareness training	
Tools such as hammers, shovels are marked with an indelible identification mark.	
Using locking points to immobilise plant when not in use	
Security planning and design	
Strategic parking for large equipment	
Engraving the equipment with serial numbers	
Use of lockable steel vaults for storing tools and small equipment	
Encouraging employees to mark ID numbers on tools	
Crime prevention coordinator	
Computer-based documentation of information onsite	
Use of full-height turnstile on entrances	
Use of workers badge or ID	
Install tracking devices on the plant or equipment	
Pre-employment screening to verify applicant’s criminal history	
Use of guard dogs after working Hours	
Disabling machines with hidden ignition cut-out switch	
Establishing an employee hotline to report crime	
Use of police patrols	
Use of neighbourhood watch	
Fitting Passive electronic tags or markers to plant	
Use an alarm system to detect motion and send signals.	
Use of electronic entrance system	
Use of CCTV/security cameras	

Appendix 2: Age of contractors



Appendix 3: Business financial class of registration



Appendix 4: Implementation of SMPs by contractors

Security Management Practices (SMPs)	N	Mean	SD	Rank	Category
All Construction materials, tools and plants on site are inventoried	40	4.55	0.71	1	
Termination of employees caught stealing or committing vandalism	40	4.48	0.99	2	
Report theft and vandalism to the law enforcement agency	40	4.45	0.99	3	
Minimising the number of entrances	40	4.38	0.93	4	
Use of own-trained security personnel	40	4.28	1.20	5	
Use of Perimeter fences without barbed wire	40	4.28	1.41	6	Always
Assigned personnel with the responsibility of maintaining tight inventory	40	4.23	1.21	7	used
Use of site cabins or containers for storing tools	40	4.23	1.21	8	
Use of padlocks and locked gates	40	4.20	1.24	9	
Removal of unused equipment from site	40	4.13	1.07	10	
The plant is embroiled with corporate logo or colours	40	4.05	1.24	11	
Station uniformed guards at entrance gates	40	3.93	1.49	12	
Use of protectors for vulnerable doors and windows	40	3.63	1.31	13	
Display of " No Trespassing " signs	40	3.63	1.51	14	
Delaying delivery and installation of white goods	40	3.53	1.28	15	
Use of perimeter fence with barbed wire	40	3.45	1.55	16	
Providing contact information for a responsible person during non-working hours	40	3.43	1.17	17	
Recording of vehicle identification number (VIN) or a product identification number (PIN)	40	3.43	1.78	18	Often used
Secure small mobile equipment with padlocks, chains, hitches, wheel clamps	40	3.43	1.14	19	
Just-in-time delivery of materials and tools	40	3.38	1.51	20	
Use locks on oil and gas tanks	40	3.38	1.66	21	
Conduct staff security awareness training	40	3.13	1.59	22	
Tools such as hammers, shovels are marked with an indelible identification mark	40	3.05	1.50	23	
Using locking points to immobilise plant when not in use	40	2.93	1.38	24	
Security planning and design	40	2.90	1.37	25	
Strategic parking for large equipment	40	2.83	1.56	26	
Engraving the equipment with serial numbers	40	2.78	1.40	27	
Use of lockable steel vaults for storing tools and small equipment	40	2.70	1.34	28	
Encouraging employees to mark ID numbers on tools	40	2.68	1.44	29	
Crime prevention coordinator	40	2.60	1.63	30	
Computer-based documentation of information onsite	40	2.62	1.52	31	Sometimes
Use of full-height turnstile on entrances	40	2.54	1.35	32	used
Use of workers badge or ID	40	2.43	1.38	33	

Install tracking devices on the plant or equipment	40	2.38	1.41	34	
Pre-employment screening investigation to verify applicant's criminal history	40	2.35	1.46	35	
Use of guard dogs after working Hours	40	2.28	1.52	36	
Disabling machines with hidden ignition cut-out switch	40	2.18	1.22	37	
Establishing an employee hotline to report crime	40	2.05	1.30	38	
Use of police patrols	40	2.03	1.23	39	
Use of neighbourhood watch	40	2.00	1.30	40	
Fitting Passive electronic tags or markers to plant	40	1.85	1.19	41	Rarely used
Use alarm system to detect motion and send signals	40	1.53	1.11	42	
Use of electronic entrance system	40	1.50	1.26	43	
Use of CCTV/security cameras	40	1.48	1.11	44	