JCBM

ISSN 2521-0165

Volume 3, Number 1, June 2019

JOURNAL OF CONSTRUCTION BUSINESS & MANAGEMENT

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

JCBM

Table of Contents
Volume 3, Number 1, June 2019

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 fifth issue of the Journal of Construction Business and Management. The experience of construction industry stakeholders and businesses in the dynamic global economic environment needs investigation towards equipping companies and stakeholders with strategies for navigating the challenges encountered. The topics covered in this issue are related to construction business management, organisational commitment, cost planning, sustainability and practices used in the procurement of construction projects. The issue contains six articles that were written by thirteen scholars based in Nigeria, South Africa and Zambia. The articles provide robust narratives relating to recent advances in construction business and management research. The conclusions reached in the paper are stimulating.

The first paper by Oluwatayo, Amole and Alagbe identified attributes in the profile, structure and strategies of architectural firms, which are associated with the success of these firms. They found that factors which were related to the success of these firms. They found that factors which were related to the success of the Architectural firms include the availability of information technology and the levels of specialisation of duties. They posit that architectural firms use IT facilities strategically in enhancing business performance. Paper two by Aghimien, Awodele and Maipompo noted the shortage of skilled construction workers in the industry and how ensuring the commitment of the few available workers to their organisation objectives is essential. Using a survey design of construction company workers to assess their level of organisation commitment, the study found that the typical type of commitment exhibited by skilled construction workers is the continuance commitment. Aghimien et al. advance that construction companies need to continually improve in the aspects of human resource management to attain better commitment of their workers and at the same time improve their productivity. The paper by Ogunbayo investigated risk factors in timing development, minimisation of cost and expected a return as they influence the successful delivery of residential property development. Ogunbayo established that real estate developers were more concerned with the influence of economic and technological risks than other sources of risk. Paper four by Mwanaumo and Mambwe examined management strategies that impact organisational safety culture in the electricity industry in Zambia. The rationale for their investigation was based on their assumption that entrenching safety cultural aspects is one of the functional areas within management systems that underlie various strategies. They reviewed various literature on management strategies and employed a structured questionnaire in obtaining the required information. The study by Mwanaumo and Mambwe concluded that management commitment and their involvement in the safety aspects of the electricity industry is not just a benevolent obligation, but it compels and motivates workers they protect to achieve organisational objectives and goals. The article by Aiyetan identifies the influencing factors of management practices and quality of management during construction that impact on project delivery time. The study employed a quantitative research approach in obtaining the necessary information that answers the research objectives. The study found that the management style and the quality of management used on construction projects are poor and suggested ways through which this reduced level of performance can be improved. Lastly, the paper by Oladiran, Ogunsanmi and Dada suggested a novel approach to solving the incidence of building material waste on sites through developing a framework of the issues and processes that are involved in its minimisation. Oladiran et al. conducted a survey to validate the proposed framework for material waste minimisation. They recommended that the proposed framework that was developed should be adopted by construction stakeholders to prevent and minimise material waste at all stages of development of building projects.

Finally, I wish to acknowledge all authors who submitted papers for consideration, members of the JCBM Editorial Board and panel of reviewers for their support, timeous review and comments that have helped in defining and improving the quality of manuscripts published by the journal. We welcome feedback and suggestions from readers towards improving the quality of the journal and in maintaining the integrity of the findings published.

Abimbola Windapo *PhD*
Editor-in-chief

JCBM (2019) 3(1). 1-7

University of Cape Town

Journal of Construction Business and Management

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

Firm Attributes and Performance: A Study of Architectural Firms in Nigeria

A. A Oluwatayo [1], D. Amole[2] and O. A. Alagbe[3]

[1,.3] Department of Architecture, Covenant University, Ota, Ogun State, Nigeria;
[2] Department of Architecture, Obafemi Awolowo University, Ile-Ife, Nigeria

Received 15 June 2018; received in revised form 17 July 2018; accepted 3 August 2018.
https://doi.org/10.15641/jcbm.3.1.2019.592

Abstract

The performance of architectural firms has been a concern to the professional bodies. Studies have however shown that there are factors within organisations that influence their performance. From the Resource-Based Theory of the Firm, this study aims to identify attributes in the profiles, structure and strategies of architectural firms, which are associated with the success of these firms. The performance of firms is conceptualized according to profitability, while the attributes considered are the ones identified as resources in the Resource-Based Theory of the firm. Data on the attributes and performance of the firms were obtained from a survey of ninety-two randomly selected architectural firms in Nigeria, using questionnaires and interviews. The results of the discriminant analysis carried out show that factors, which were related to the successes of the firms, include the availability of information technology facilities and the level of specialization of duties. The findings suggest that appropriate sizes, professionally qualified staff; and provision and use of IT facilities were areas that architectural firms can concentrate on for enhanced performance.
Keywords: Architectural firms, Architectural practice, Firm attributes, Firm Performance, Nigeria, Professional Service Firms.

1. Introduction

Scholars such as Phua (2006) have noted that the economy determines the performance of industries and their structures. However, the unique attributes of a firm determines its performance relative to the other firms within the same industry. This suggests that determinants of firms' successes may be industry specific. In the context of architectural firms, Larsen (2005) and White (2005) decried the poor performance and subsequent failures of many architectural firms in Europe and America respectively. Only 25 per cent of architectural firms in America is said to exist beyond the first three years (Schwennsen, 2004). This poor performance is also evident in the fact that individual architects are alleged to be paid lower salaries than their counterparts are in other professions. Flynn-Heapes (2000) attributed poor performance of architectural firms to the tendency by principals of these firms to build the firms around clients instead of around proven business principles. It is often believed that business gets in the way of the arts that the profession seeks to project. This has often led to the lack of attention to issues of management and profitability. There are however firms, which have proven that it is possible to build profitable firms (Cramer, 2006). Very little study however exists on the attributes that make for success in these firms. It is therefore of interest to this study to investigate high-performing firms in comparison to low-performing ones to elucidate the unique attributes that distinguish between them.

The unique attributes of firms are said to be important determinants of their performance (Rumelt, 1991). This principle is based on the Resource-Based Theory of the Firm (RBT). The unique attributes of firms consist of their resources and capabilities. Proponents of this theory described the resources in the firm as the assets, knowledge, capabilities and organizational processes, with which the organisation gain competitive advantage. Studies, which consider the performances of firms in relation to their resources, also consider the contexts of the firms. Such contexts include the strategy, structure, and environment of the firms. Several studies have investigated firm-specific resources and capabilities and how they influence the performances of the firms. Very

[1] Corresponding Author.
Email address: dapo.oluwatayo@covenantuniversity.edu.ng

few of these studies, however, focus on architectural firms. The purpose of this study is to investigate the unique attributes, which distinguish high performing architectural firm from the low-performing ones. This study is justified in three ways. First, architectural firms, as firms in the construction industry are increasingly under pressure to run more effective practices for the delivery of quality services. A study of this nature may, therefore, contribute to the debates on the attributes that make for successful practice in the construction industry. Second, there is a need to bridge the gap between practice and scholarship. This is in the light of the fact that research must precede practice. Third, the study provides empirical data from the context of architectural firms, which are mostly managed by principal architects, who may or may not have formal management training.

2. Firm Resources and Performance

Some studies have drawn attention to the issues of leadership, core competencies, market orientation, and corporate culture as factors, which make some companies more successful than others (Matzler *et al.*, 2010). It is believed that these are the resources and capabilities of the companies with which they gain competitive edge. The concept that captures this is the Resource-Based Theory (RBT). The RBT (Penrose, 1959) states that firms compete on the bases of resources or capabilities that are valuable, rare, and difficult to substitute and imitate. While the resources of the firms are said to include the financial capital, physical assets, technology, personnel, reputation and brand image, the capabilities include business processes and routines. In this context, a firm is "a collection of resources bound together in an administrative framework, the boundaries of which are determined by the area of administrative coordination and authoritative communication".

There are important dimensions of the RBT highlighted in the literature. These, according to Bainey and Hesterly (1999) include financial resources, physical resources (such as machines), human resources (experience, training), and organizational resources (reputation, teamwork and trust). Also, the contexts such as the strategy, structure, and environment of the firm are taken into cognizance of the context in which the resources are used. While many of these attributes are within the control of the firms, the environment in which the firm operates is not within the control of the firms. Some of these factors that have been investigated in literature These include the size, the organizational structure, human resources, and managerial orientations of top management (Matzler *et al.*, 2010). Other factors in the literature include the culture of the firms and market orientations of organizations. Besides, skills and technologies have also been found to influence the performance of organizations. The performance of an organization is often defined in terms of its growth, advantageous market position/ market share, competitiveness and profitability. Performance in this study is defined in terms of the profitability of a company.

A significant resource in architectural firms, which this study focuses on, is the human resource. This is because the industry, as a professional service industry, is labour and knowledge-intensive (Pathirage *et al.*, 2007). Services rendered often depend on the knowledge and skill of the workforce. Also, Sirmon *et al.* (2011) observed that managers vary in the ways they manage resources and these differences influence firm performances. The ways managers manage their firms could depend on the attributes of the managers. It may therefore be expected, that the characteristics of the principal may influence the way the firm is run and subsequently the performances of the firms. Besides, Matzler *et al.* (2010) noted that the orientation of leaders of firms also determines what the organization invests time and resources on. This goes further to inspire and motivate employees of the firm to achieve set objectives. The manager in an architectural firm is usually the owner, who is referred to as the principal. This principal may or may not have any management training, but is nonetheless saddled with the responsibility of managing the firm. In this respect, the study by Kim and Arditi (2010) found that the education, experience, and leadership styles of owners of construction firms influence the performances of those firms.

Technology, which has been mainly conceptualized as Information Technology (IT), has also been found to influence firm performance (Koellinger, 2008). Scholars (for example, Benbunan-Fich, 2002) argued that technology could be used to gain competitive advantage. In other words, it is also a resource in an organization, which may determine the performance of the firm in the end. Also, IT is said to be an enabler of innovation, which is very important to architectural firms. In fact, Koellinger (2008) and Tanriverdi (2005) associated IT with innovation. According to Barret and Sexton (2007), innovation, which entails solving problems using new ideas, technologies, and processes, is a means of achieving sustainable competitiveness in the construction industry. Matzler *et al.* (2010) also investigated innovation orientation of top executives concerning their willingness to take risks and search for new solutions. Matzler *et al.* found that organizations with higher innovation orientation were more successful.

Apart from innovation orientation, other strategies influence firm performance (Aragon-Sachez and Sanchez-Marin, 2005). The strategies of a firm are the approaches the firm adopts to please customers, achieve organizational goals, and create competitive edge. These strategies could influence the technology, personnel characteristics, and profiles of organizations (Thompson *et al.*, 2004). Although scholars have found that the influence of other attributes of an organization on its performance is moderated by the strategy as posited in the RBT, the direct influence of strategy and performance is investigated in this study.

Debates on the influence of strategies of firms on the performances of the firms abound in literature. Starting from the studies of Miles and Snow in 1978, scholars seem to agree that prospectors, defenders, and analyzers outperform reactors, in that order. The findings of Matzler *et al.* (2010) also suggest that organizations that focus on innovation as their orientation tend to outperform other organizations. While the prospector strategy seeks to identify and exploit new opportunities, firms adopting the defender strategy seek to protect their market and

establish stability, reliability, and efficiency. Liu, Ratnatunga and Yao (2014) observed that organizations that compete using the defender strategy often use the cost leadership approach. Analyzers on the other hand focus on cautiously seeking innovativeness, combining the characteristics of both the prospectors and the defenders. This is in contrast with the reactor strategy where course of action depends on existing situations.

Previous research such as the one by Zott and Amit (2007) have also focused on the role of organizational design in determining the performance of firms. The structure of an organization denotes the task and job reporting relationships in the organization. The dimensions of the structure identified in literature are centralization, formalization, and specialization (Miller and Droge, 1986). While centralization denotes the extent to which decision-making is concentrated in top management, formalization is the extent to which rights and duties of members of the organization are written. Specialization, on the other hand, is the extent to which tasks are divided into sub-tasks which individuals are assigned to. The attributes within the firm are investigated in this study. These include the IT, personnel, and culture of the firms. Also, the structure and strategy of the firms are also investigated.

In addition to these resources, size (Tsai, 2014) and culture (Matzler *et al.* 2010) are said to influence firm performance. The culture was measured in terms of intensity. The size of the firm has been measured in the literature by the total number of employees, sales and net sales. Literature suggests that firms with larger sizes outperform smaller ones. There is however the need to investigate these attributes that influence organisational performance in a professional context, such as architectural firm. This will contribute to knowledge in this field and define the limits of generalisation of findings.

One of the flaws identified in previous studies by Matzler *et al.* (2010) is that only successful companies were investigated. These authors highlighted the importance of relating seemingly successful companies with others in order to identify what makes them successful. Matzler *et al.* also highlighted the flaws of relying on only interviews for such studies as the senior executives tend to attribute the successes of their companies to themselves. In this study, high performing firms were compared with the ones that did not perform so well. Also, measured from the literature that indicate firm attributes were used to obtain data in self-administered questionnaires.

3. Research Method

The cross-sectional survey was adopted as a research strategy for this study. This design collects data at a given time from a representative sample to allow results to be generalised to a larger population. The unit of data collection was the firm, and the sources of data were the principals of the firms or their representatives. Respondents for this study were randomly selected from the list of Architectural firms that were registered to practice in Nigeria ARCON (2006). Using the formula proposed by Adedayo (2006), [n =N⁄(1+α^2 N) where n = sample size; N = population α = level of significance, which for this study is 0.05]. A sample size of 157 out of 341 registered firms was arrived at. The firms were then approached and asked to fill questionnaires, which consisted of three sections. The first section gathered data on the profiles of the firms including personnel, while the second section gathered data on the strategies, structure and IT characteristics. In the third section, data on the performances of the firms was gathered. Only 97 of the questionnaires were returned giving a response rate of 59 per cent. The respondents were the principals of the firms, and where they were not available, the senior associates within the firms were asked to fill the questionnaires. Eight of the principals were also interviewed to gain deeper insight into the subject of study.

The measures of technological positions include the availability of IT facilities (computers, intranet and internet), and application of internet facilities in carrying out operations within the firms. These were measured on 3-point scales of not available at all/ not used at all to highly available/ highly used.

Data on the qualifications and gender of architects of the firms were also obtained. Other human resource data obtained included those on the gender, age, experience, qualification of the principals of the firms. Firm size was measured in terms of the number of staff within the firms. The respondents also indicated the legal ownership forms of their firms.

Respondents were asked to indicate on a scale of 1 (strongly disagree) to 5 (strongly agree) their level of agreement with 11 statements that represent their strategies. The statements include phrases such as "new ideas and technology are the determinants of the strategies of this firm"; "we are very cautious with risky ventures"; we aggressively pursue business opportunities" and maintaining tradition and consistency is very important to us". A cluster analysis of the firms was then carried out to determine the strategies that exist. The first cluster had a strategy that was similar to the prospector strategy of Miles and Snow (1978). The firms in this cluster allowed new ideas and technology to determine their strategy, are highly innovative, but are cautious in risky ventures. The firms in the second cluster had a strategy similar to the defender strategy. These firms scored very high in maintaining tradition and consistency, although they are achievement-driven. While firms in the third cluster had strategies similar to the analyzer strategy, those in the fourth cluster had a strategy similar to the reactor strategy. This is because the while the firms in both the third and fourth clusters scored high in the exercise of caution in a risky venture and allowing new ideas and technologies to determine their strategies, firms in the third cluster were, also, innovative.

The structure of the firms was measured in terms of the specialization, formalization, and centralization in the firms. For the level of specialization, the respondents were asked to indicate the tasks that were carried out exclusively by one person. The respondents were also asked to indicate the level to which procedures and rules were written to deduce the level of formalization within the firms. The level of centralization was deduced from the responses of the principals and associates on the ones

who took certain decisions. The options were arranged in order of seniority in the firms.

Ali *et al.* (2013) identified the measures available for measuring performance in the construction industry. Objective data were however not available in the architectural firms. Respondents were also reluctant to declare their profit and access to audited accounts was not given. The respondents were, however, willing to indicate on a scale, their perception of the profitability of the firms. Wall *et al.* (2004) and Runyan *et al.* (2008) concluded that these subjective measures are as valid as objective measures when obtained from members of the top management. We, therefore, operationalized performance as the perception of the profit of the firm in the last two years on a 5-point Likert scale, which ranged from "not good at all" to "very good".

4. Results and discussion

The results in Table I show that more than half of the firms could be said to have recorded good performances in the preceding two years. These could be classified as firms with high performances, while the other firms could be classified as firms with low performances. The firms in the study were mostly sole-principal firms, aged less than 15 years and with most of the firms having less than 20 staff. Table I further shows that most of the firms indicated low level so specialisation, but high levels of centralisation of decision-making and formalisation of office activities. The firms were headed by principals who were mostly aged above 40 years, with more than 15 years of experience, and having worked in two firms or less.

Table 1: Profiles of the architectural firms

Variables		Percentage
Performance of the firms	Very good	32.6
	Good	39.3
	Fair	24.7
	Not so good	3.4
Age of the firms	0-5 years	9.9
	6-10 years	16.0
	11-15 years	27.2
	16-20 years	19.7
	21-25 years	13.6
	26 years and above	13.6
Size of the firms	1-5 staff	14.9
	6-10 staff	33.3
	11-20 staff	27.6
	21-30 staff	8.0
	31-40 staff	6.9
	41-50 staff	5.8
	51 staff and above	3.5
Level of specialisation	No specialised task	9.5
	1-2 specialised task	41.7
	3-4 specialised task	21.4
	5-6 specialised task	19.1
	7 or more specialised task	8.3
Level of formalisation	Informal	7.5
	Fairly formal	37.5
	Very formal	55.0
Level of centralisation of decision-making	Moderate level of centralisation	31.9
	High level of centralisation	68.1
Level of availability of information technology facilities	Low	26.0
	Moderate	30.1
	High	43.8
The degree of use of internet facilities	Low use	33.8
	Moderate use	36.9
	High use	29.2
Legal structure of ownership	Sole principal	52.3
	Partnership	21.6
	Unlimited liability company	8.0
	Limited liability company	18.1
Gender of the principal	Male	89.8
	Female	10.2
Age of the principal	Below 30 years	1.2
	31-40 years	22.4
	41-50 years	43.5
	51-65 years	27.1
	Above 65 years	5.9
Highest qualification of the principal	HND	3.5
	BSc	3.5
	MSc	43.5
	BArch	42.4
	Others	7.1
Years of experience of the architect	1-5 years	1.5
	6-10 years	12.1
	11-15 years	15.2
	16-20 years	18.2
	21-25 years	21.2
	26 years and above	31.8
Management style of the principal	A mentor in the firm	9.3
	A visionary and innovative leader	38.4
	An efficient manager	11.6
	A productivity-oriented achiever	40.7
Number of firms the principal worked in before starting the firm	None	3.5
	1 firm	17.6
	2 firms	54.1
	3 firms	18.8
	4 firms	2.4
	5 or more firms	3.5
Strategy	Prospector	29.3
	Defender	30.4
	Analyser	29.3
	Reactor	10.9

Discriminant analysis was carried out to investigate the variables, which differentiate high-performing architectural firms from low-performing ones. All the attributes earlier mentioned were entered as independent variables. The perceptions of profits were entered as dependent variables. For this analysis, the responses "not good at all", "not good" and "fair" were recoded as 1, while the responses "good" and "very good" were recoded

as 2. Table II shows the variables that best differentiated the high-performing architectural firms from the low-performing ones. The Wilk's lambda was significant for the discriminant function, ($\lambda 2 = 60.49$, df = 25, p = 0.00). What this suggests is that the discriminant function does better than chance at separating the two groups. These results confirm that the unique attributes of the architecture firms determine their performances, relative to other firms in the industry as asserted by Matzler *et al.* (2010) and Phua (2006). The discriminant variables include the size, levels of specialization and formalization, as well as the levels of availability of IT facilities and use of internet in carrying out the operations of the firms. Other factors, which distinguish high-performing architectural firms from low-performing ones, are the gender and leadership styles of the principals. The structure matrix shows that the availability of IT facilities had the highest standardized coefficient, suggesting that it is most successful at discriminating between high-performing and low-performing architectural firms. This is followed by level of specialization, then size of the firms.

Table 2: Factors that discriminate between high-performing architectural firms and low-performing ones

Factor	Wilks' Lambda	F	Standardized coefficients	Sig.
level of availability of information technology facilities	.560	24.371	.176	.000**
level of specialization	.758	9.923	.112	.004**
size of firm	.769	9.303	.109	.005**
Gender of principal	.800	7.750	-.099	.009**
level of use of internet facilities	.807	7.428	.097	.010*
level of formalization of office activities	.849	5.509	.084	.025*
leadership style of principal	.862	4.980	-.080	.033*
ownership form of firm	.895	3.655	.068	.065
Number of architects with BSc	.933	2.214	.053	.147
Number of architects with OND/HND	.938	2.042	.051	.163
highest qualification of the principal architect	.943	1.864	.049	.182
Number of architects with other qualifications	.965	1.116	.038	.299
age of firm	.969	1.005	.036	.324
Number of architects with BArch/MSc	.973	.847	.033	.365
level of centralization	.981	.602	-.028	.444
Number of female architects	.988	.383	.022	.541
Number of registered architects	.988	.382	.022	.541
strategy type	.991	.291	-.019	.593
number of firms principal had worked previously	.993	.230	-.017	.635
age group of the principal	.997	.093	.011	.762
years of experience of principal	.999	.028	.006	.869

Further interrogation of the data shows that the high-performing architectural firms were mostly headed by male principals whose described themselves as either efficiency manager or productivity-oriented achievers. The fact the firms with male principals were found to perform better than those with female principals may be connected with the gender biases and challenges faced by female principals, whom one of the respondents to the interview described as often being "saddled with domestic issues". Besides, a female interviewee noted that most female principals might not be achievement oriented, stating that "men are more ambitious."

The high-performing firms were also smaller, in terms of the number of employees, confirming that size influences the performance of firms (Tsai, 2014). This result is also similar to that of Greenwood *et al.* (2005) who found that larger professional service firms were poor performers. This had to do with the total number of employees in the firms. However, firms with more architects with higher architecture qualifications performed better than those with fewer architects in those categories. This may suggest that the composition of the employees in the firms, not just the number may be more relevant in determining firm performance. Confirming the results of Koellinger (2008), IT also influenced the firms' performances. IT facilities were highly available in the high-performing firms. It would thus appear that, as in previous studies (Barret and Sexton, 2007), IT was used as a tool to gain competitive advantage. Also, the level of specialization in the high-performing firms was high; the level of formalization was low.

The fact that the strategies of the firms did not directly differentiate between high- and low- performing architectural firms may confirm the approach of the RBT that the influence of other attributes of the firms on performance is moderated by the strategies of the firms (Aragon-Sachez and Sanchez-Marin, 2005), although little direct influence may be observed. In the study by Kim and Arditi (2010), the qualifications of the employees as well as the principals were found to influence the performance of firms in the construction industry. This study, however, found that none of these distinguished the high-performing architects from the ones that did not perform so well. One reason for this may be that the present study only took samples from one profession in the construction industry. It may also signify that other training apart from core architectural skills may be necessary to run a high-performing firm. This may be evident in the fact that principals who led by demanding

efficiency and productivity had firms that performed better than those who were just innovative or mentors.

The design of the organizations also differentiated the firms in terms of their performances as found by Zott and Amit (2007). This was not expected as literature describes the structure of organizations a moderating variable, which influences other attributes of the firms, which in turn influence the performances of the firms. In particular, higher specialization of tasks was common with high-performing architectural firms. This may follow from the fact that when tasks are repeated, persons develop dexterity in handling those tasks to the benefits of their organizations. However, the level to which rules and procedures were written in the high-performing firms was lower.

5. Conclusion and Recommendations

This study contributes to the Resource-Based Theory (RBT) of the firm by investigating attributes that distinguish high-performing firms from those that do not perform well in the context of architectural firms. Direct influences of strategy and structure were investigated in addition to the moderating effect of the relationship between firm attributes and performance suggested in literature. The findings reveal the direct influence of specialization and formalization dimensions of the structure of the firm on its performance.

This study concludes that architectural firms' attributes influence their performance. Attributes such as economic sizes, qualification of staff, and availability and use of IT facilities were significant in this respect and may indicate areas that architectural firms may focus on to improve performance. What would represent an economic size has however not been investigated in this study. Further studies may focus on the right sizes for architectural firms in the construction industry.

Without detracting from the usefulness of the findings of this study, a few limitations were observed. First of all, this study has only been carried out using samples of architectural firms in Nigeria. Some variances in the results, when compared with previous studies, maybe as a result of context. There is, therefore, a need to investigate firm attributes and performance in other contexts. Secondly, the subjective measure of performance was used in this study as a result of the unavailability of objective data. Further studies may consider more objective measures of performance. Lastly, the moderating effects of structure and strategy have not been investigated. Literature, however, suggests the existence of such a relationship. This can, therefore, be investigated in further studies.

References

Adedayo, O. A. 2006. Understanding statistics. Lagos, Jas Publishers

Ali, H. A. E., Al-Sulaihi, I. A. and Gahtani, K. S. 2013. Indicators of measuring performance in building construction companies in Kingdom of Saudi Arabia. Journal of King Saud University- Engineering Sciences 25(2): 125-134.

Aragon-Sachez, A. and Sanchez-Marin, G. 2005. Strategic orientations, management characteristics and performance: a study of Spanish SMEs. Journal of Small Business Management 43(3): 287-308

Architects Registration Council of Nigeria (ARCON) 2006. Register of architectural firms entitled to practice in the Federal Republic of Nigeria. Nigeria, ARCON

Bainey, J. B. and Hesterly, W. 1999. Organizational economics: understanding the relationship between organization and economic analysis in Clegg, S. R. and Hardy, C., Studying organizations: theory and method, Sage publications, London. Pp 109-141

Benbunan-Fich, R. 2002. Information technology in organizations: paradigms and metaphors. CIS working paper series, Zicklin School of Business Baruch College, New York. [Online] http://cisnet.baruch.cuny.edu/papers/cis200201.pdf (14 May 2017)

Barrett, P. and Sexton, M. 2006. Innovation in small, project-based construction firms. British Journal of Management 17: 331-346 DOI: 10.1111/j.1467-8551.2005.00461.x

Cramer, J. P. 2006. Performance, productivity and profits. DesignIntelligence [Online] http://www.di.net/articles/compensation/page3 (1 May 2017)

Flynn-Heapes, E. 2000. Creating wealth: principles and practices for design firms SPARKS: U. S. A.

Greenwood, R.; Li, S. X.; Prakash, R. and Deephouse, D. L. 2005. Reputation, diversification, and organizational explanations of performance in professional service firms. Organization Science 16(6), 661–673

Kim, A. and Arditi, D. 2010. Performance of minority firms providing construction management services in the US transportation sector. Construction Management and Economics 28(8): 839 - 851

Koellinger, P. 2008. The relationship between technology, innovation and firm performance-empirical evidence from e-business in Europe. Research Policy. DOI: 10.1016/j.respol.2008.04.024

Larsen, T. 2005. Minding your Ps: three fundamentals for improving business performance. AIA Practice Management Digest. [Online] at http://www.aia.org/nwsltr_pm.cfm (16 August 2017)

Liu, L., Ratnatunga, J. and Yao, L. J. 2014. Firm characteristics and balanced scorecard usage in Singaporean manufacturing firms. International Journal of Accounting and Management 22(3): 209-222

Matzler, K., Bailom, F., Anschober, M. and Richardson, S. 2010. Sustaining corporate success: what drives the top performers? Journal of Business Strategy 31(5): 4-13

Miles, R. E. and Snow, C. C. 1978. Organizational strategy, structure and process. New York: McGraw-Hill

Miller, D. and Droge, C. 1986. Psychological and traditional determinants of structure Administrative Science Quarterly 31, 539-560

Pathirage, C. P., Amaratunga, D. G., and Haigh, R. P. 2007. Tacit knowledge and organizational performance: construction industry perspective. Journal of Knowledge Management 11(1): 115-126

Penrose, E. 1959. The theory of growth of the firm. Oxford: Blackwell.

Phua, F. T. T. 2006. Predicting construction firm performance: an empirical assessment of the differential impact between industry- and firm-specific factors. Construction Management and Economics 24(3):309 - 320

Rumelt, R. P. 1991. How much does industry matter? Strategic management Journal, 12, pp 168-186

Runyan, R., Droge, C. and Swinney, J. 2008. Entrepreneurial orientation versus small business orientations: what are their relationships to firm performance? Journal of Small Business Management 46(4), 567-588

Schwennsen, K., 2004. J /Firm planning and positioning. Iowa State University, Department of Architecture, [Online] http://www.lib.iastate.edu/commons/arch482/04spr/pdf/JFirmPlan&Position.pdf (13 September 2017)

Sirmon, D. G., Hitt M. A., Ireland R. D. and Gilbert B. A. 2011. Resource orchestration to create competitive advantage: breadth, depth and life cycle effects. Journal of Management 37 (5), 1390-1412 DOI: 10.1177/0149206310385695

Tanriverdi, H. 2005. Information technology relatedness, knowledge management capability and performance of multi-business firms. MIS Quarterly 29(2): 311-334

Tsai, M. 2014. Corporate governance, resources, FDI commitment and firm performance: empirical analyses of Taiwanese high-tech firms. Chinese Management Studies 8(3): 313-332 DOI 10.1108/CMS-08-2012-0118

Thompson, A. A., Gamble J. E., and Strickland A. J., 2004. Strategy- winning in the marketplace. McGraw-Hill Irwin, New York

Wall, T. D., Michie, J., Patterson, M., Wood, S. J., Sheehan, M., Clegg, C. W. and West, M. 2004. 'On the validity of subjective measures of company performance', Personnel Psychology, 57 (1), 95-118

White, B. 2005. RIBA Constructive Change: a strategic industry study into the future of the Architects' Profession, Full Report, December 2005. [Online] http://www.architecture.com/fileLibrary/pdf/Constructive_Change_Report_-_Full_(Final).pdf (August 17, 2017)

Zott, C. and Amit, R. 2007. Business model design and the performance of entrepreneurial firms. Organizational Science 18(2): 181-199.

JCBM (2019) 3(1).8-17

University of Cape Town

Journal of Construction Business and Management

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

Organisational Commitment of Construction Skilled Workers in Selected Construction Firms in Nigeria

D.O. Aghimien[1], O. A. Awodele[2], and C.S. Maipompo[3]

[1]Sustainable Human Settlement and Construction Research Centre, Faculty of Engineering and the Built Environment, University of Johannesburg, South Africa.
[2&3]Department of Quantity Surveying, Federal University of Technology, Akure, Ondo State, Nigeria.

Received 9 December 2017; received in revised form 1 February 2018, 22 March 2018 and 16 September 2018; accepted 20 September 2018.
https://doi.org/10.15641/jcbm.3.1.2019.481

Abstract

Skilled construction workers are crucial to the successful delivery of construction projects. However, there have been reports of their shortage within the Nigerian construction industry. Ensuring commitment of the few available ones to their organisation is important as this is bound to influence the service delivery of these organisations. This paper presents the result of the assessment of the organisational commitment of skilled construction workers in Abuja, Nigeria. A quantitative survey design was adopted, and data were gathered from selected skilled construction workers in 31 construction companies registered with Nigeria's Federation of Construction Industry. Organisational Commitment Scale was adopted in assessing the commitment of these set of workers, and data were harnessed through the use of a questionnaire. Percentage, mean item score and Kruskal-Wallis H-Test were used in analysing the data gathered. Cronbach Alpha test was also conducted to test the reliability of the research instrument. The study revealed that the common type of commitment exhibited by skilled construction workers is the continuance commitment. Factors such as getting feedback from supervisors, payment received being equal to work done, and the availability of opportunities to grow, play a major role in the commitment type being exhibited. The practical implication of this result is that construction companies within the country need to improve in the aspect of human resource management to attain better commitment and at the same time improve their productivity. It is believed that the findings of this study will assist construction organisations in adopting the right method that will help enhance the organisational commitment of their skilled workers.
Keywords: Construction workers, Nigeria, Organisational commitment, Skilled workers, Workers satisfaction.

1. Introduction

In the delivery of construction projects, there is the need for labour (skilled and unskilled). Construction firms rely heavily on these set of workers in order to carry out their activities. According to Olofinji (2016), skilled construction workers play an important role in the survival and growth of the construction industry since the practical completion of projects depend largely on them. Despite the obvious importance of these set of workers, the shortage of same has been evident in the construction industry of most developing countries around the world. It is believed that the construction industry appears not to be appealing to youths. Young people tend to pursue college degrees more, with lesser desire to take up blue-collar jobs (Tucker et al., 1999). Reason for this, among other factors, can be the poor organisational investment and lack of promotion avenues within most construction companies (Carley et al., 2003). In Nigeria, although the country as a whole is blessed with a skilled workforce, the situtation within its construction industry is ironic. While the Nigerian construction industry (NCI) is believed to be one of the highest employers of labour, the industry is still faced with problems of shortage in technically skilled workers (Bilau et al., 2015).

Commitment which according to Nehmeh (2009), is as an attachment or loyalty within an organisation, can go both ways. This can be a worker's commitment to the organisation or the organisation's commitment to its workers. While it is assumed that workers need to show

[1] Corresponding Author.
Email address: aghimiendouglas@yahoo.com

some sense of attachment or loyalty to their organisation, they also need reassurance that their jobs are secure. Although this present study focused on worker's commitment to their organisation, issues surrounding the organisation's commitment to their workers can be seen in most human resource management (HRM) studies. The choice of basing this study on workers commitment to their organisation is premised on the fact that skilled workers are important to the successful delivery of construction projects, and their shortage is evident within the NCI. Thus, it is important to ascertain the commitment of the available ones to their organisations. The commitment of a worker, according to Miller (2003), can be described as that point where such worker identifies with the goals of his or her organisation and strives to maintain affiliation with such organisation. Therefore, skilled workers commitment in the context of this study is the state or level of identification of these set of workers with their respective organisations and their desire to continue in that organisation.

Bhatti and Qureshi (2007) submitted that the major issue of most organisations is the implementation strategies that could help the development of their human resources. In construction, Ibrahim et al., (2010) noted that the key problem in the achievement of construction demands is related to human resources within the industry. This shows that there is the need to adequately ascertain the factors that influence the desire of construction workers to stay or leave a particular organisation, in order to effectively manage the available workforce within the organisation and achieve desired commitment and optimum worker's productivity.

This study identifies with the fact that various research has been conducted on organisational commitment of workers in most sectors and even the construction industry (Abiola-Falemu, 2013; Ashraf et al., 2012; Gangai and Agrawal, 2015; Girth et al., 2013; Haq et al., 2014; Luchak, et al., 2008; Norizan, 2012; Oyewobi et al., 2012; Salim et al., 2007). However, not much has surfaced regarding the commitment of skilled construction workers whose impact in successful project delivery is crucial and which unfortunately is becoming scarce in the NCI. It is in light of this that this study assessed the commitment of skilled construction workers in selected construction firms in Nigeria, through the identification of the type of commitment exhibited by this set of workers, and the factors influencing their commitment. This was done towards providing possible recommendations that will improve their commitment and by so doing improving the construction firm's project delivery.

2. Literature Review

2.1 Skilled Construction Workers in the Construction Industry

The impact of the availability of skilled construction workers on construction projects, coupled with the expectation from construction contractors to deliver projects of desired quality, cost and on schedule, has been sufficiently reported in literature (Institute of Management and Administration [IOMA] 2005; Medugu et al., 2011; Olomolaiye and Ogunlana, 1989; Ugheru, 2006). Studies have also shown that skilled construction workers contribute greatly to the successful delivery of the end products of the construction industry (Medugu et al., 2011). According to Bustani (2000), for the industry to be effective in the delivery of its services, the quality and availability of its skilled workforce are important. The insufficiency of technically qualified personnel in the face of increased demand has led to a situation where the big contractors are considering investing in training and development (T&D) of their workforce. This T&D can be seen as a way of garnering more workers' commitment to their organisation (Owoyemi et al., 2011). In an industry where the shortage of skilled workers has been identified as a challenge (Bilau et al., 2015), the commitment of the available ones to their organisation is crucial.

2.2. Organisational Commitment

Often commitment is described as that force of cohesion between an individual and some course of action relevant to the attainment of one or more goals (Cohen, 2003). Organisational commitment can be the commitment from an organisation to the employee or commitment from the employee to the organisation. This study, however, focused on the latter. Miller (2003) opined that organisational commitment could be seen as "a state in which an employee identifies with a particular organisation and its goal and wishes to maintain membership in the organisation". Arnold et al. (2005) further stated that organisational commitment is that relative strength an individual exhibits when they indentify with and are involved in, the activities of an organistion. Thus, when an employee is committed to an organisation, there is every tendency that such employee will not want to leave. Hence, there is a sense of responsibility and attachment to an organisation by a committed employee. The most popular method of ascertaining the type of commitment of employees is the Meyer et al. (1993) organisational commitment scale (OCS). This approach is the most widely accepted conceptualisation of organisational commitment and has been adopted for over 20 years (Cohen, 2003). It sees commitment from three facets. One is that commitment can be affective in nature. Also, commitment can be continuance or normative.

2.2.1 Types of Commitment

Cohen (2003) viewed affective commitment as a positive affection towards an organisation. This positive affection is reflected in the employee's desire to see the organisation succeed. Affective commitment can also be seen as the emotional attachment an employee has to his/her organisation. It is believed that employees that exhibit this kind of commitment remain in their organisation out of their own volition not just as a 'means to an end' (Allen and Meyer, 1997). This form of commitment is based solely on individual's desire. For continuance commitment, Meyer et al. (1993) describe this as an individual's knowledge of the price they will have to pay for leaving an organisation. People who exhibit this commitment type remain in their organisation not because they want to, but because they need to. They find it difficult to leave their organisation due to the fear of the unknown or having few or no other option (Nagar, 2012). Normative commitment according to Antilla

(2014) is the feeling of obligation to stay within an organisation. As a result of this feeling, an employee will remain with an oragnisation because he/she feels they obligated to do so. It is believed that the experience of workers within and outside the organisation plays a vital role in the exhibition of this type of commitment. This means that normative commitment of an employee emanates from both the relationship they have within the organisation and that which they experience within their immediate family and society (Allen and Meyer 1990; Markovits et al., 2013).

2.2.2 Factors Influencing Skilled Workers Commitment

Several factors influence the type of commitment exhibited by an employee. Haq et al., (2014) opined that factors such as job conditions, supervisor's support, rewards, work-family support, and career growth opportunities affect the commitment of employees to an organisation. This implies that if an organisation wants to have a higher commitment from its workforce, these outlined factors should be improved and in effect, employees, in turn, will exhibit such behaviours as beneficial to the organisation. Bhavna and Swati (2012) outlined some factors that influence employee's commitment. These factors are "the quality of working relationships, workplace leadership, having a say, clear values, being safe, the built environment, recruitment, pay, and conditions, getting feedback, autonomy and uniqueness, a sense of ownership and identity, learning, passion, having fun, and community connections". Antilla (2014) assessed the components of organisational commitment and concluded that the significant factors affecting organisational commitment could be company related factors, community-related factors, and work characteristics factors. Alsiewi and Agil (2014) examined job satisfaction influence on affective commitment and observed that most of the job satisfaction variables which include; job security, pay, and benefits, feelings of satisfaction towards teaching staff and principals, growth and development opportunities and relevance and meaning of job have a significant relationship with affective commitment.

Adeyemo and Aremu (1999) analysed the effects of some multiple predictors on satisfaction and commitment of workers. The study concluded that the variety in skills and ambiguity in the role of workers are best determinantes of satisfaction, while the kind of leadership within the organisation coupled with the organisation's age are best determinantes of commitment. Adeyemo (2000) observed that there exist a positive relationship between education and organisational commitment. This was rather in contrast to earlier findings of Ellemer et al. (1998) which revealed that background variables such as gender, level of education, or team size have no significant relationship to any of the three forms of commitment an employee can exhibit. Similarly, Irving et al. (1997) found that age has nothing to do with the kind of commitment an employee will have to his/her organisation. This submission, however, contradicts Meyer and Allen (1984) submission that age influences commitment. On the issue of gender, Mathieu and Zajac (1990) reported its relationship to organisational commitment. This was further confirmed by Irving et al., (1997)'s findings which revealed that out of a group of people sampled, men had a higher level of commitment than the women.

3. Research Methodology

This study assessed the commitment of skilled construction workers in selected construction firms in Nigeria, using Abuja as the study area. The choice of this area is premised on the fact that Abuja is one of the metropolitan cities in Nigeria and it is also the administrative centre of the country. The area has lots of construction projects being executed on a daily basis, and as such has attracted, many construction organisations with most of them having their head office or branches there. A survey approach was adopted, and quantitative data were gathered from skilled construction workers in 31 construction firms registered with Nigeria's Federation of Construction Industry which is the largest body of construction contractors in the country (Aje et al., 2015). The choice of a quantitative questionnaire survey was based on the fact that the study hoped to solicit responses from a different set of skilled workers within these identified organisations. As a result, a qualitative study through an interview or other approaches would have been time-consuming and almost practically impossible to achieve. Tan (2011) described the questionnaire survey as a simple survey approach which can cover a wider range of audience within a short period. Also, Ackroyd and Hughes (1981) described the questionnaire as a tool which can achieve quantifiability and objectiveness in research, hence its adoption in this study.

The questionnaire used was designed in two parts. Part A dwelt on the background information of respondents, while Part B dwelt on the objective of the study. The objective one which was to determine the type of commitment exhibit by skilled construction workers in the study area was assessed using Meyer et al. (1993)'s OCS. Abiola-Falemu (2013) and Jena (2015) adopted a similar approach in determining the commitment of workers in Nigeria and India. The OCS employs the use of specific questions relating to the three major commitment types and respondents were asked to rate these questions on a 5-point Likert scale. The second objective aimed at identifying the factors influencing the commitment of these set of workers was also assessed on a 5-point Likert scale based on their level of significance, with 5 being very high, 4 being high, 3 being average, 2 being low and 1 being very low. While some of the respondents were able to fill the administered questionnaire themselves, others could not as a result of their lack of formal education. In this case, the researcher personally read the questions, and the respondents gave their answers which were adequately filled on their behalf.

A total of 93 questionnaires were distributed (3 each for the identified 31 construction firm), with 71 retrieved. This shows a response rate of 76%, and this is far above the usual response rate of 20-30% for questionnaire surveys in construction management studies, as suggested by Akintoye (2000) and Moser and Kalton (1999). The reliability of the instrument used was tested using Cronbach's alpha test. The normal range of Cronbach

alpha value is between 0.0 and + 1.0, and the higher the value, the higher the degree of internal consistency. The alpha values of 0.717 and 0.911 were derived for the type of commitment, and factors influencing the type of commitment of skilled workers respectively. This result shows that the questionnaire use is reliable since the alpha values are closer to 1.0. Data analysis was done using frequency and percentage in analysing the background information of the respondents. Kruskal-Wallis H-test which is a non-parametric test used in testing the relationship in the view of three or more groups of respondents was employed in testing the relationship in the view of all the various types of skilled workers as regards their commitment types and the factors influencing the type of commitment they exhibit. Mean Item Score was further employed in ranking the various commitment types and factors based on the respondents' selection.

4. Findings

4.1 Background Information

The result in Table 1 shows the characteristics of the respondents sampled. From the table it is evident that skilled male workers dominate the assessed construction organisations. Most of these skilled workers fall within the age range of 31 to 40 with an average age of 32 years recorded. Concerning employment types, most skilled workers (60.6%) work for their respective construction organisation on a contract basis, while some (32.4%) are employed on a part-time basis. Only 5.6% are full- time workers for their respective organisations. This implies that construction organisations in the study area rarely employ permanent skilled workers; instead, they rely more on hiring workers on a temporary basis. More response was gathered from skilled workers involved in masonry (22.5%), carpentry (19.7%) and electrical works (12.7), most of whom do not have any formal education (47.9%). However, 42.3% possess ordinary level (O' level), while 9.9% possess a national diploma. The highest years of working experience of the respondents fall between 6 to 10 years (26.8%) and 16 to 20 years (23.9%). On average, the respondents have 13 years of working experience, and an average of 4 years working with their present organisation. Based on the background information of the respondents, it is evident that most skilled workers sampled are matured in terms of age and working experience to give reasonable answers to the questions of the research.

Table 1: Background information of respondents

Category	Classification	Frequency	Percentage
Gender	Male	69	97.2
	Female	2	2.8
Age	18-30	27	38.0
	31-40	36	50.7
	41-60	8	11.3
Employment Type	Full Time	4	5.6
	Part Time	24	33.8
	Contract	43	60.6
	Total	71	100.0
Area of Specialization	Masonry	16	22.5
	Carpentry	14	19.7
	Electrical	9	12.7
	Metal-works	7	9.9
	Plumbing	7	9.9
	Tiling	7	9.9
	Painting	6	8.5
	Roofing	5	7.0
Academic qualification	None	34	47.9
	O'Level	30	42.3
	OND	7	9.9
Years of experience	0-5	8	11.3
	6-10	19	26.8
	11-15	14	19.7
	16-20	17	23.9
	Above 20	13	18.3
Years with the present organisation	0-5	55	77.5
	6-10	16	22.5
	Total	71	100.0

Key: O'Level: Ordinary Level Certificate; OND: Ordinary National Diploma

4.2. Type of Commitment Exhibited by Skilled Construction Workers

In assessing the type of commitment skilled workers exhibit, some commitment statements were identified from existing literature and respondents were asked to rate their level of agreement with these statements as they apply to them. These statements were asked in no particular order, and no heading was given in the questionnaire. This was done in a bid to avoid bias in the choice of respondents' response. However, Table 2 shows these commitment statements grouped under their respective commitment types during analysis. The result in Table 3 shows the different commitment types as rated by the respondents. Since these skilled workers have different employment types which include full-time, part-time and contract, it is believed that their type of commitment may vary. Based on this assumption, Kruskal-Wallis H-Test which is a non-parametric test was adopted to determine if there is a statistically significant difference in the response of the three different groups of respondents as regards these commitment variables. This test compares the mean value of the groups and converts the scores on the continuous variable to ranks, and determines the significant difference between the groups. It gives a chi-square value and a significant p-value. When the derived p-value is lower than the predetermined significance value of 0.05, it means that there is a significant difference in the mean value of the groups (Pallant, 2005). In the case of this study, this implies that there is a significant difference in the view of respondents working on full-time, part-time, and contract basis. However, the reverse is the case if the derived p-value is higher than the predetermined significance value of 0.05. The result revealed that under the affective commitment, six out of the eight assessed commitment variables have a mean score of above average of 3.0. The commitment variable of skilled workers having similar values with their organisation ranked top with a mean value of 3.51. Kruskal-Wallis test shows that there is no significant difference in the response of respondents from these different employment types, as a significant p-value of

above 0.05 was derived for all assessed variables under this commitment group. This means that there is a unified view among the respondents as to how they exhibit this commitment type.

Under the continuance commitment, all the seven assessed commitment variables have a mean value of above average of 3.0. The most significant of these variables are; the fear of what might happen if they quit their job without having another one lined up and the feeling of having few options to consider before leaving their present organisation with a mean value of 3.82 and 3.63 respectively. Kruskal-Wallis test also revealed that there is no significant difference in the view of the three categories of respondents. A significant p-value of above 0.05 was derived for all commitment statement under this group. Hence there is a convergent view among the respondents as to them exhibiting this commitment type. For normative commitment, the result shows that all five assessed commitment variables have a mean value of above average of 3.0. However, the believe that a person must always be loyal to his/her organisation, was ranked top with a mean value of 3.58, while "things were better in the days when people stayed with one organisation for most of their career life" was ranked as the least with a mean value of 3.00. Kruskal-Wallis test revealed that there is no significant difference in the view of the three categories of respondents as a p-value of above 0.05 was derived for all commitment statement under this group. Thus, the ranking of these variables can be relied upon as a convergent view was evident among the different group of respondents.

Table 2: Types of commitment assessed

Types of Commitment	Code
Affective	
My personal values with that of this organisation are similar	Aff1
I enjoy discussing my organisation with people.	Aff2
I will be happy to end my career in this organisation.	Aff3
I am inspired to perform to my very best in this organisation.	Aff4
I feel emotionally attached to this organisation.	Aff5
The organisation makes me feel like I am part of a family.	Aff6
I treat this organisation's problems as my own.	Aff7
I have a strong sense of belonging here in this organisation.	Aff8
Continuance	
I am scared of quiting my job now as I do not have another one lined up.	Con1
My options are limited if I decide to leave this organisation.	Con2
I fear if I leave this organisation I will face scarcity of available alternatives.	Con3
I feel leaving this organisation now will disrupt my life plans and activities.	Con4
Even if I wanted to leave this organisation right now, it will be difficult for me.	Con5
I fear that I might not get another organisation that will give me the same benefits I get from this organisation.	Con6
Right now, staying with this organisation is a matter of necessity.	Con7
Normative	
I believe workers need to be loyal to their organisation.	Norm1
Leaving this organisation wont be the right thing to do, even if I got a better offer	Norm2
I was taught to believe in the value of remaining loyal to one organisation.	Norm3
I think people these days move from company to company too often.	Norm4
I believe it will be better if worker remains with one organisation for most of their career life.	Norm5

Kruskal-Wallis H-Test also shows that on the overall, there is no significant difference in the commitment type exhibited by the different skilled construction workers employed on a full time, part time and contract basis, as a significant p-value of above 0.05 was derived for the three commitment types assessed (affective = 0.635, continuance = 0.455, normative = 0.970). This result implies that the type of commitment being exhibited by skilled construction workers in the study area is not dependent on the basis on which they were employed. Looking at the group mean of each commitment type, it is evident that skilled construction workers mostly exhibit continuance commitment as it has the highest group mean of 3.45. This is followed by normative commitment with a group mean of 3.30, while the least exhibited commitment type is affective commitment with a group mean of 3.11.

Table 3: Types of commitment exhibited by skilled construction workers

	Overall		Kruskal-Wallis	
Commitment	**Mean**	**Rank**	**Chi-Sq.**	**Sig.**
Affective				
Aff1	3.51	1	0.569	0.753
Aff2	3.39	2	2.720	0.257
Aff3	3.30	3	2.646	0.266
Aff4	3.17	4	1.018	0.601
Aff5	3.08	5	0.105	0.949

Aff6	3.01	6	3.180	0.204
Aff7	2.79	7	0.200	0.905
Aff8	2.65	8	5.600	0.061
Group Mean	**3.11**		**0.910**	**0.635**
Continuance				
Con1	3.82	1	2.567	0.277
Con2	3.68	2	1.768	0.413
Con3	3.48	3	0.055	0.973
Con4	3.39	4	1.275	0.529
Con5	3.37	5	2.119	0.347
Con6	3.31	6	0.633	0.729
Con7	3.09	7	0.814	0.676
Group Mean	**3.45**		**1.574**	**0.455**
Normative				
Norm1	3.58	1	0.223	0.895
Norm2	3.41	2	0.414	0.813
Norm3	3.31	3	1.781	0.410
Norm4	3.20	4	0.793	0.673
Norm5	3.00	5	0.409	0.815
Group Mean	**3.30**		**0.610**	**0.970**

4.3. Factors Influencing the Commitment of Skilled Construction Workers

Result in Table 4 shows the rating of the identified factors influencing the commitment of skilled construction workers and their respective significant p-value derived from Kruskal-Wallis H-Test. From the table, it is evident that all the seventeen assessed factors have a mean value of above average of 3.0. This implies that to a considerable extent they all tend to influence the commitment of these set of workers. Chief of these factors are getting feedback from supervisors, payment received is equal to work done, and the availability of opportunities to grow, with a mean value of 3.92, 3.66 and 3.58 respectively. The least rank factor is the social relationship among workers with a mean value of 3.02. Kruskal-Wallis H-test also revealed that there is no statistically significant difference in the view of the different respondents with regards to the significance of the identified factors as a p-value of above 0.05 was derived. This result implies that irrespective of the type of employment, the factors influencing the commitment of skilled construction workers within the construction industry are the same. Thus, construction companies will do well to understand these factors and improve where necessary.

Table 4: Factors influencing the commitment of skilled construction workers

	Overall		**Kruskal-Wallis**	
Factors	**Mean**	**Rank**	**Chi.-Sq.**	**Sig.**
Getting feedback from supervisors	3.92	1	1.578	0.454
Payment received is equal to work done (fair wages)	3.66	2	1.243	0.537
Availability of opportunities to grow	3.58	3	1.400	0.497
Leadership support in job performance	3.48	4	0.295	0.863
Recognition of workers performance/efforts	3.42	5	2.376	0.305
Recognition of important holidays by the organisation	3.41	6	1.852	0.396
Availability of incentives such as bonus and payment of overtime	3.41	6	1.243	0.537
Leadership style that enhances job satisfaction	3.37	8	1.491	0.475
Company policy	3.37	8	1.130	0.568
Working environment	3.34	10	0.898	0.638
Having a sense of responsibility	3.32	11	2.051	0.359
Avenue for training and staff development	3.24	12	0.859	0.651
Having a balance between organisation values and personal values	3.20	13	0.574	0.751
The benefit of healthcare services	3.18	14	2.117	0.347
Good communication structure within the organisation	3.14	15	3.044	0.218
Opportunity to balance working life with family life	3.09	16	1.023	0.600
Social relationship among workers	3.02	17	5.126	0.077

5. Discussions

Findings revealed that the construction organisations in the study area rarely employ permanent skilled workers; instead, they rely more on hiring workers on a temporary basis. This might be associated with the fact that most of the construction companies in the country are the small and medium size (Ogbu, 2017) and they cannot finance projects independently before client's financial contribution (Odediran et al., 2012). This financial constraint is bound to affect their ability to keep skilled workers on a permanent basis, since they may not have

many construction projects to handle. However, findings revealed that the type of organisational commitment exhibited by skilled construction workers is not dependent on their type of employment; either on a permanent, part-time or contract basis. This result follows the line of some past researches (Ellemer et al., 1998; Irving et al., 1997) that have discovered that background/demographic information such as gender, age, team size, level of education, do not have any significant relationship with the commitment type being exhibited. The major type of organisational commitment exhibited by skilled construction workers in the NCI is the continuance and normative type of commitment. Meyer et al. (1993) have stated that continuance commitment is an individual's awareness of the costs of leaving the organisation. According to Nagar (2012) workers with a high level of continuance commitment remain a member of the organisation because they need to. It has been established that when workers exhibit continuance commitment, they do not remain in their organisation because they are satisfied; rather they do it just because they need to, and they might have no other option (Gangai and Agrawal 2015; Lumley et al., 2011; Meyer et al., 1993).

This type of commitment being majorly exhibited by skilled construction workers within the study area is not the best as the organisation might not get the best from these set workers. According to Meyer and Allen (1997), the affective type of commitment motivates employees to higher levels of performance than continuance or normative commitment. Unfortunately, this commitment type is the least exhibited by these set of construction workers. This result is in contrast with the findings of Jena (2015) which revealed that workers in ferroalloy companies in Odisha, India exhibit more affective and normative commitment than continuance commitment. This disparity in result further emphasises the need for improvement in the NCI.

Findings of this study also revealed that the significant factors influencing the organisational commitment of skilled construction workers are getting feedback from supervisor, payment received isequal to work done, and availability of opportunities to grow. This result is in line with Bhavna and Swati (2012) submission that factors such as pay and conditions, and getting feedback, are crucial in achieving high employees' commitment. Martin and Root (2008) observed that workers generally value certain conditions of work, and when these conditions are met, they will be more satisfied and committed, with less intention to leave the organisation. One of these conditions is their payment. Lumley et al. (2011) submitted that workers pay is a significant determinant in explaining workers' overall commitment. Mathieu and Zajac (1990) have indicated that there is a positive relationship between pay and commitment of workers. According to Spector (1997), an unfair payment is bound to lead to demotivation of workers. Findings of this study also corroborate Haq et al., (2014) submission that factors such as growth opportunities affect the commitment of employees to an organisation. Oyewobi et al. (2012) discovered that Quantity surveyors in Nigeria are more committed to their jobs when there are adequate opportunities for advancement. This finding is not peculiar to this set of construction professionals alone, as this current study has been able to reveal that opportunities for growth is also important to skilled workers and it has a considerable influence on their commitment to their establishment.

6. Conclusion

This study set out to assess the organisational commitment of skilled construction workers in the NCI. Using a survey of selected skilled workers in Abuja, the study has been able to ascertain the type of commitment being exhibited by these set of workers, and the factors influencing their commitment. Based on the findings, the study concludes that the type of employment of skilled workers (full time, part-time or contract) has no significant relationship with their commitment type. Irrespective of the type of employment arrangement they have with their respective organisations, their commitment type is the same. As such, construction organisations within the country will do well by treating workers' commitment issues within their organisations in like manner.

The common type of commitment exhibited by skilled construction workers is the continuance commitment. The most significant factors influencing their commitment are; getting feedback from supervisors, payment received is equal to work done, and the availability of opportunities to grow. This, therefore, implies that construction companies within the country need to improve in the aspect of managing their human resources to attain better commitment and at the same time improve their productivity. This can be achieved by ensuring that giving feedback is a priority to site supervisors, as this has a huge tendency in influencing the commitment of skilled workers either negatively or positively. Also creating some job enrichment schemes and ensuring workers get fair wages is imperative if the commitment level of these workers is to change from being continuance to affective. At least the minimum standard obtainable for wages should be given to workers as this will help boost their moral to perform and increase their commitment to the organisation. Finally, the need to create opportunities for growth for these workers is essential. Occasional promotion of deserving workers, from ordinary site workers to site supervisors, can go a long way in increasing their commitment.

It is believed that the findings of this study will assist construction organisations within the country in doing appropriate planning and developing significant methods that will assist them in enhancing their organisational commitment of their skilled workers and by so doing increasing organisational performance and workers productivity. However, the major limitation of this study lies in the fact that the study was limited to the commitment of skilled construction workers in construction firms in Abuja, Nigeria. The findings can therefore not be generalised to other parts of the country, as situations and organisation policies might differ between regions of the country. Therefore, further studies can be conducted by appraising the commitment of skilled construction workers in construction firms in other areas or regions within the country in order to compare results. Also, more work can be done by assessing the effect of

the commitment type exhibited by skilled construction workers, on their job performance.

References

Abiola-Falemu, J. O. (2013). Organisational culture, job satisfaction and commitment of Lagos-based construction workers, IOSR Journal of Business and Management, 13(6), 108-120

Ackroyd, S. and Hughes, J.A. (1981), Data Collection in Context, Longman: London, UK.

Adeyemo, D. A. and Aremu, A.O. (1999). Career commitment among secondary school teachers in Oyo state, Nigeria. The Role of biographical mediators. Nigerian Journal of Applied Psychology, 5 (2), 184-194.

Adeyemo, D.A. (2000). Job involvement, career commitment, organisational commitment and job satisfaction of the Nigerian police. A multiple regression analysis. Journal of Advanced Studies in Educational Management 5(6), 35-41.

Aje, I.O., Makanjuola, S.A and Olatunji, O.A (2015). Assessment of Factors Affecting Bid-No-Bid Decision of Construction Contractors in Nigeria. In: Ogunsemi, D.R., Awodele, O.A and Oke, A.E. (Eds). Proceedings of the 2nd Nigerian Institute of Quantity Surveyors Research Conference. Federal University of Technology, Akure 529-536

Akintoye, A., (2000). Analysis of factors influencing project cost estimating practice. Construction Management and Economics, 18 (1), 77-89.

Allen, N. J., and Meyer, J. P. (1997). Affective, continuance, and normative commitment to the organisation: An examination of construct validity. Journal of Vocational Behaviour, 49, 252-276

Allen, N., and Meyer, J. (1990) Organisational socialization tactics: a longitudinal analysis of links to newcomers' commitment and role orientation. The Academy of Management Journal, 33(4), 847-858.

Alsiewi, A. M. and Agil, S. (2014). Factors that influence affective commitment to teaching in Libya. IOSR-Journal of Business and Management, 16(2), 37–46.

Anttila, E. (2014). Components of organisational commitment – A case study consisting of managers from Finnish industrial company master's thesis, School of Education, University of Tampere

Arnold, J. Silvester, J. Cooper, C.L., Robertson, I.T., and Patterson, F.M (2005). Work psychology: understanding human behaviors in the workplace, 4th edition, Prentice Hall/Financial Times.

Ashraf, Z., Jaffri, A. M, Sharif, M. T., and Khan, M. A (2012), Increasing employee organisational commitment by correlating goal setting, employee engagement and optimism at workplace, European Journal of Business and Management, 4 (2), 71-77

Bhatti, K. K and Qureshi, T. M. (2007). Impact of Employee participation on Job Satisfaction, Employee Commitment and Employee Productivity. International Review of Business Research Papers, 3(2), 54 – 68

Bhavna, A. and Swati, G., (2012) Maximum Success: Become an Employer of Choice, KKIMRC IJRHR, 1(2), 1-6

Bilau, A. A., Ajagbe, M. A., Kigbu, H. H, and Sholanke, A. B. (2015). Review of Shortage of Skilled Craftsmen in Small and Medium Construction Firms in Nigeria, Journal of Environment and Earth Science 5(15), 98-110

Bustani, S.A. (2000). Availability and Quality of Construction Craftsmen and Artisans in the Nigerian Construction Industry. Journal of Construction Technology and Management, 3(1), 91-103.

Carley, L.A., Goodrum, P.M., Haas, C.T. and Borcherding, J.D. (2003). Experiences with multiskilling among non-unit craft workers in US industrial construction projects. Engineering, Construction and Architectural Management, 10 (6), 374-381.

Cohen, A. (2003). Multiple commitments in the workplace: An integrative approach. Mahwah, NJ: Lawrence Erlbaum

Ellemmer, N., Gilder, D., and Heuvel, H. (1998). Career oriented versus team-oriented commitment and behaviour at work. Journal of Applied Psychology 83 (3), 717-730

Gangai, K. N. and Agrawal, R. (2015). Job satisfaction and organisational commitment: is it important for employee performance. Int. J. Manag. Bus. Res., 5 (4), 269-278

Ghasemi, A. and Zahediasl, S. (2012). Normality Test for Statistical Analysis: A guide for non-statisticians. International Journal of Endocrinol Metab, 10 (2), 486-489

Girth, H, Sertyesilisik, B, and Horman, B. (2013). An investigation into job Satisfaction and organisational commitment of construction personnel, Global Advanced Research Journal of Social Science, 2 (1), 1-11

Haq, M. A, Jindong, Y., Hussain, N. and Anjum, Z. Z (2014) Factors affecting organisational commitment among bank officers in Pakistan, IOSR Journal of Business and Management, 16 (4), 18-24

Ibrahim, A. R., Roy, M. H., Amed, Z., and Imtiaz, G., (2010), An investigation of the status of the Malaysian construction industry, Benchmarking: An International Journal, 17(2), 294-308

Institute Of Management and Administration (IOMA) (2005). Confronting the craft labour shortage. Contractor's Business Management Report, 1-7.

Irving, P.G., Coleman, D.F., and Cooper, C.L. (1997). Further assessment of a three-component model of occupational commitment: Generalizability and differences across occupations. Journal of Applied Psychology 82, 444-452.

Jena, R.K (2015). An assessment of demographic factors affecting organisational commitment among shift workers in India. Management, 20(1), 59-77

Luchak, A. A., Pohler, D. M. and Gellatly, I. R. (2008). When do committed employees retire? The effects of organisational commitment on retirement plans under a defined-benefit pension plan. Human Resource Management, 47 (3), 581-599.

Lumley, E. J., Coetzee, M., Tladinyane, R. and Ferreira, N. (2011). Exploring the job satisfaction and organisational commitment of employees in the

information technology environment. Southern African Business Review, 15(1), 100-118

Markovits, Y., Boer, D. and van Dick, R. (2013). Economic crisis and the employee: The effects of economic crisis on employee job satisfaction, commitment, and self-regulation. European Management Journal, 32, 413–422

Martin, A. and Root, G. (2008). Perceptions of organisational commitment, job satisfaction and turnover intentions in a post-merger South African tertiary institution. South African Journal of Industrial Psychology, 34(1), 23–31.

Mathieu, J., and Zajac, D. (1990). A review and meta-analysis of the antecedents, correlates and consequences of organisational commitment. Psychological Bulletin, 108(2), 171-194.

Medugu, N. I., Rafee Majid, M., Bustani, S. A., Bala, K., Abdullahi, U., and Mbamali, I. (2011). Craft Skills Availability in the Nigerian Construction Industry: Perception of Contractors and Consultants. Craft Skills Availability in the Nigerian Construction Industry: Perception of Contractors and Consultants. The IUP Journal of Infrastructure, 9(3), 63-73

Meyer, J. P. and Allen, N. J. (1984). Testing the 'side-bet theory' of organisational commitment: some methodological considerations. Journal of Applied Psychology, 69, 372-378

Meyer, J. P. and Allen, N. J. (1997). Commitment in the workplace: Towards a general model: A review of literature. Research papers management, 11(3) 299-326

Meyer, J. P., Allen, N. J. and Smith, C. A. (1993). Commitment to Organisations and Occupations: Extension and Test of a Three-Component Conceptualization. Journal of Applied Psychology, 78 (4), 538-551

Miller, K. (2003). Values, attitudes and job satisfaction' In Robbins, S.P., Odendaal A. and Roodt, G. (Eds), Organisational Behavior: Global and Southern African Perspectives. Cape Town: Pearson Education South Africa.

Moser, C.A. and Kalton, G. (1999). Survey Methods in Social Investigation, 2nd Edition. Gower Publishing Company Ltd, Aldershot

Nagar, K. (2012). Organisational Commitment and Job Satisfaction among Teachers during Times of Burnout. Vikalpa, 37 (2), 43-60.

Nehmeh, R. (2009). What is Organizational commitment, why should managers want it in their workforce and is there any cost-effective way to secure it? SMC Working Paper, 5, 1-11

Norizan, I. (2012) Organisational commitment and job satisfaction among staff of higher learning education institutions in Kelantan, Doctoral Dissertation, University Utara Malaysia), 1-73

Odediran, S. J, Adeyinka, B. F, Opatunji, O. A. and Morakinyo, K. O. (2012). Business Structure of Indigenous Firms in the Nigerian Construction Industry. International Journal of Business Research and Management, 3(5), 255-264

Ogbu, C. P (2017). Survival practices of indigenous construction firms in Nigeria. International Journal of Construction Management, 18(1), 78-91

Olofinji, L. (2016). Why is there a shortage of Skilled Construction Workers in Nigeria. An article in the Nigeria Real Estate Hub. Accessible on: http://nigeriarealestatehub.com/shortage-skilled-construction-workers-nigeria.html/

Olomolaiye, P.O and Ogunlana, S.O. (1989). An Evaluation of Production Outputs of Key Building Trades in Nigeria, Construction Management and Economics, 7(1), 75-86

Owoyemi, O. A., Oyelere, M., Elegbede, T., and Gbajumo-Sheriff, M (2011). Enhancing employees' commitment through training. International Journal of Business and Management, 6(7), 280-286.

Oyewobi, L.O., Bolaji, S., and Muhammad-Jamil, A. (2012). Job satisfaction and job commitment; A study of Quantity Surveyors in Nigeria Public service. International Journal of Business Management, 7 (5), 179-192

Pallant, J. (2005), SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows (Version 12). 2nd Edition, Allen and Unwin, Crow's Nest NSW 2065 Australia

Salim, M., Kamarudin, H. and Abdul-Kadir, M. B (2007). Factors affecting organisational commitment among lecturers in higher educational institution in Malaysia, Retrieved from http://e-library.unw.ac.id/images/jurnal/4e5e0cd9c876e8652f3e7ad21908b474.pdf

Spector, P. 2008. Industrial and Organisational Behaviour (5th edition). New Jersey: John Wiley and Sons.

Tan, W.C.K. (2011), Practical Research Methods, Pearson Custom: Singapore.

Tucker, R. L., Haas, C. T., Glover, R. W., Alemany, C. H., Carley, L. A., Eickmann, J. A., Rodriguz, A. M. and Shields, D. (1999). Craft Workers' Experiences with and attitudes Towards Multiskilling. Report No. 3, Center for Construction Industry Studies, The University of Texas at Austin, Austin, TX.

Ugheru, D.C. (2006). Training of craftsmen for Nigeria construction industry. Journal of the Nigerian Association of Engineering Craftsmen, 5, 9-10.

JCBM (2019)3(1).18-26

University of Cape Town

Journal of Construction Business and Management

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

Respondents' perception of Risk Factors on Residential Property Development in Abuja, Nigeria

O. T. Ogunbayo[1]

[1] Department of Estate Management, Obafemi Awolowo University, Nigeria.

Received 9 May 2018; received in revised form 20 June 2018; accepted 2 August 2018.
https://doi.org/10.15641/jcbm.3.1.2019.588

Abstract

Significant risk factors such as social, technological, economic, environmental and political in the timing development, minimization of cost and expected return as they influence the successful delivery process of residential property development were investigated in this study towards enhancing real estate development decisions. This is expedient because it has been argued that the link between project success criterions determines a successful project delivery. Data were obtained from members of Real Estate Developers Association (REDAN) in Abuja through the use of a self-administered questionnaire. The respondents were asked to rate the influence of risk factors on residential property development parameters, and the data were computed using logistic regression analysis. The study revealed that real estate developers were more concerned with the influence of economic and technological risk than other sources of risk. Also, the statistical effects were computed through logistic regression analysis. It was explained by significant value ($p<0.05$) which depicts the likelihood of the risk factor which could either be positive or negative, as explained by beta (β). The findings revealed the effect of economic risk factors in timing development to be ($\beta=1.833$, $p<0.05$). Also, the effect of technological risk factors to influence development cost were found to be ($\beta=--.187$, $p<0.05$) while the effect of economic risk factors on return was found to be ($\beta=1.026$, $p<0.05$). The main contribution of the study to the body of knowledge is developing a risk factors assessment technique for practitioners and academia to assess the residential property development performance as related to timely completion, cost and returns to enhance the need to develop competence in managing and minimizing the effect of risk factors on the residential investment appraisal.

Keywords: Development appraisal, Expected return, Profit maximization, Residential property, Risk analysis, Time.

1. Introduction

Risk is a part of everyday life. The distinction between financially successful and unsuccessful people is the early awareness of risk in their businesses operations. Tularam and Attili (2012) opined that decision makers successfully manage situation subject to uncertainty by awareness of risks inherent in the project. The real estate industry comprised an extensive range of organizations and individuals in the developing and operating property to meet housing needs in the country (UDIA 2003). Property development as a whole is risky, and it has been asserted that every part of a project is fraught with risk which could result in deviation from the expectation. It is expected that the higher the complexities of the project, the higher the risks involved in such projects (Belo and Agbatekwe, 2002; Newell and Steglick, 2006).

However, the basic parameter has been identified as critical factors to achieve project success. For instance, Bowen et al. (2012), Michell et al. (2007) established the link between time, profit and total value for money in the literature. Rwelamila and Hall (1995) argued that poor handling of the three parameters is detrimental in achieving project objectives. The study likened cost, time and quality as three points of the triangle that neglecting one parameter would have an adverse effect in attaining a successful project. This explained that in the long run, timely completion of a project would secure profit and upon completion guarantee a return on investment. Moreover, the three basic parameters have been considered as one that determines the feasibility of a project objective to guarantee a successful and profitable development. All these measures are inevitable in

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

property development and are usually affected by the consequences of risk.

Meanwhile, Khumpaisal (2007); Otegbulu, et al., (2011) posited that property development is subject to risks that are related to social, technological, environmental, economic and political factors which could hinder timely completion of project, expected income, use and general orientation of the proposed project. During the past, research has concentrated more on the real estate development process and the risks evident throughout the property development process (Ogunbayo et al. 2018, Muka et al. 2015, Khumpaisal, 2007, Newell and Steglick 2006) but research into the investigation of risk analysis in the real estate development period, the project cost flow and the total value which could have an impact on the investment decision making has received little attention, hence the need for the study. Also, with the current economic trends both in developed and emerging countries, rational investors will only be interested in developing a project that could be completed within a defined period as well as being able to predict the likely anticipated returns and profit on investment. Thus, real estate investors need to understand the effect of the significant risk factors on the project criterion to enhance profit over the total value of the project.

Also, this study will be limited to residential property development in Abuja. Fisher and Robson (2006), Windapo and Martin (2010) opined that property development is a multifaceted process that comprises features which fluctuate with time and place that could affect development given that real estate market is localized. Thus, it has been justified that real estate developers are keen towards residential property development due to the commercial activities in the state which has encouraged migration of people from different countries across the world and these are a strong indication that influence residential property development opportunities in Abuja, hence, the need for the study. The main aim of this study is assessing the social, technological, economic, environmental and political risk factors in residential property development as related to the timely completion, expected returns via the quality of the project and the overall cost of an investment in order to tap into the potential of real estate sector. This is because it has been revealed that proper handling of these parameters guarantees a successful investment decision making.

2. Literature Review

2.1 Project Time, cost and quality

Numerous researchers have conducted studies on the criteria to measure a successful project delivery that enhances property decision-making process. Meanwhile, Lui et al. (2015), suggested that there is need to develop the concept of operational excellence in construction and management consulting industries because of the complexity of the project so as to enable team members to perform the specified tasks in the right manner, at the right time as to ensure a desirable outcome. Thus, the criterion is seen as a determiner to enable successful project performance (Bowen et al.2012, Michell et al.2007).

2.1.1 Time

The clients, contractors, real estate developers have seen time as one of the critical factors in arriving at a successful project development. Completion of projects within the specified timeframe or schedules is a major problem confronting real estate development projects; thus it is worthwhile to carry out a survey investigating how the risk factors could impact the timely project delivery. Studies such as Divakar and Subramanian (2009) examined the concept of time in a construction project. The study argued that scheduling of project is faced with uncertainties which could result in project time overrun ranging from days to week and weeks to months depending on the project condition. The study identified critical factors as cash flow of the budget, preparation of bill of quantities, coordination between agencies parties that could cause project time overrun if not adequately monitored. Dissanayaka and Kumaraswamy (1999) evaluated the factors that could affect time performance in Hong Kong construction industry. The data were analyzed with the use of multiple linear regression and artificial neural network. The finding revealed that non-procurement related factors such as clients, project characteristics and client representative characteristics are the main factors that could influence the timely completion of a project. While Chan and Kumaraswamy (1996) asserted that risk is an unavoidable element in construction projects and identified that contractor-related" factor category has a high impact on time performance than a client-related factor. Nevertheless, all these studies examined the construction time performance in building projects, but the scope did not cover the influence of risk on the timely completion of residential property development.

2.1.2 Cost

Rational investors or clients are concerned with the overall profitability of a project generally. Charles and Andrew (1990), Saidu and Shakantu (2017) presented cost overrun in relation to the timely completion of a project as a principal factor that could result in high construction cost of building projects. Chimwaso (2000) examined the cost performance of a public project in Botswana and factors that influence construction cost overruns. The study used a questionnaire survey to elicit information among professionals in the construction industry. Thus, the study ranked variations, re-measurement of provisional works, fluctuations in the cost of labor and materials, contractual claims, that is, claims for extension of time with cost as the critical factors that could influence cost performance of public projects in the study area. Whilst Kaming, et al., (1997), Cox, et al., (1999) identified design changes, inadequate planning, unpredictable weather conditions; and fluctuations in the cost of building materials, inaccurate experience of project location and type as main factors that could influence cost performance of a project. Thus, these studies examined the factors influencing cost performance of building projects, but the scope did not cover the entire basic project criterion for achieving successful delivery of a project which is the focal point of the present study.

2.1.3 Quality

It has been observed that to determine the quality performance of building projects there is a need to consider the service received by the owner and the end user of the developed project as to improve the quality performance. Vincent and Joel (1995) presented total quality management as "the integration of strategy and structure, technical component and culture within an organization to achieve continuous improvement of the quality of goods and services. Thus, the project will start to realize important, quantifiable, and noticeable improvements if the three elements have been put in place.

A study conducted by Sanni and Windapo (2008) investigated the quality control practices on construction site in Lagos to establish the contractor's alignment with the implementation of the quality control plan in the study area. The study analyzed data with the use of descriptive and inferential statistics, and the results revealed that most of the contractors do take quality control plan. The study further details that there is a significant relationship between having an effective quality control plan and delivering a high-quality project in the construction industry. In the same manner, Firuzan et al. (2010) identified the elements that could influence contractors' quality performance in the construction industry with the view to developing an effective construction process and improving the levels of satisfaction derived by the customers. The study identified the elements as related to the construction product, service, and the corporate quality culture. The study further recommended that a quality control plan should be implemented to guide the contractors to enhance the quality of their operations and high-quality building projects. However, the scope of these studies did not examine the influence of quality performance on residential property development that could improve real estate development decisions in accruing maximum returns.

Jazayeri and Dadi (2017) investigated the indicators that could guarantee safety management system in construction industries in the United States of America. The study further explained that researches drawn elements of safety management by analysis of accidents, the structure of the highly reliable organization among others as this could enable owners, contractors, and decision makers to choose and implement methods to improving the performance of construction safety management system. In the same manner, Alsulamy et al. (2012) reviewed the key performance indicators on the cost, quality and time through the use of construction process model that spanned through the initiative to execution stage as to ensure delivery of projects and meet the needs and expectation of the stakeholders. The study concluded that performance measurement in the construction sector and corporate level differs. This is because the construction cost, time and quality are relied upon in determining the extent of project success while the corporate level is evaluated based on the financial and non-financial measures. The study implied that the performance measurement indicators should be considered as marketing tools to achieve a desirable outcome.

Nevertheless, these studies were a theoretical investigation of significant metrics in the measurement of project performance but did not investigate the influence of risk on the successful delivery of the building projects. Contrary, an empirical study conducted by Jazayeri et al. (2018) examined the perception of the subcontractor on the influential factors to the project's cost, schedule, quality, and safety outcomes to assess management safety policies. The study developed a safety rating system that could enable clients and contractors to evaluate subcontractor management procedures and policies for improving safety performance. However, the scope of the study did not examine the influence of risk on the project success criterion which is the focus of this study.

However, successful project delivery could be attained with the integration of the basic parameter to realize the feasible objective of the project. A study by Olaku et al., (2015) investigated the perception of stakeholder on the parameters for successful project delivery. The study used descriptive statistics such as a mean and ranking method which revealed time, under budget and precise specification as the main criterion in enhancing a successful building project in Niger Delta, Nigeria. Also, Chandr et al., (2012) posited that project success could be measured by time, cost, quality, profitability and customer satisfaction. The study used the project indicators to predict the function of stakeholders on project success in East Java. The findings revealed the role of stakeholders' influence which regarded as stakeholder impact, stakeholder engagement, and stakeholder psychological empowerment was correlated to project success. The studies were conducted in African countries, but the scope did not cover the respondent's perception of the analysis of risk factors on the three criterions for a successful project delivery which is the focus of this paper.

In summary, the manner in which the clients, contractors and real estate developers engaged in housing development projects will exert a significant influence on the project outcome. However, all these studies did not examine time, cost and quality in relation to the influencing risk factors in determining the most optimal value of the project. Therefore, there is a need to understand the critical risk factors that could affect the project success criterion in other to generate well-planned strategies for improving the performance of future building projects.

2.2 Risks in Real Estate Development

Risk is unavoidable in property development process. Its influence can easily be discerned from the inception of the idea, project feasibility, design and planning, construction and disposal stage (Khumpaisal and Chen, 2010; Sotoni et al., 2010). Risk connotes different meaning depending on the exposure to difficulty or loss. The US-based Project Management Institute (PMI) (2008) defined risk as “an uncertain event or condition that, if it occurs will have either a positive or negative effect on one or more of the project’s objectives”, which could be project cost, time, scope and quality.

In addition, risks in real estate development have been related to the “separation of design from construction, lack of integration, poor communication, uncertainty,

changing environment and increasing project complexity and economic changes such as inflation and deflation, and regional economic crisis including greater competition" which could be understood as the risk that could cause adverse effect on the property development (Gehner, et al., 2006). Several authors such as (Muka et al. (2015), Otegbulu et al. (2011), Chen and Khumpaisal (2009), identified property development risk factors as social, technological, economic, environmental and political because of the overall impact on the project management processes with respect to project delay, project cost, overrun, the usage and management of the property which could result in the variation of the total value of the project whilst Akintoyeand MacLeod (1997) identified different risk factors with respect to construction project under extensive group of physical, environmental, design, logistics, financial, legal, political, construction and operation risks. All these risk factors depend on their sources and nature of the project been considered by the developers or investors within a given environment.

However, for this study, the analysis of social, technological, economic, environmental and political (STEEP) risk factors in residential property development are considered while other sources of risk were neglected since it has been established in the literature that STEEP risks are peculiar with the real estate development. These risk assessment criteria or indicators used in the design of the questionnaire survey are briefly summarized as follows.

Table 1: Risks assessment criteria for the real estate development

Risk criteria	**Risk assessment**
Workforce availability	This risk measures the level of developer's satisfaction in relation to the workforce availability in the project trade area (Danter, 2007)
Community acceptability	This is measured by the degree of benefit of the project to the local communities
Cultural compatibility	This is measured by the perception of the developers toward the lifestyle harmony in the local market area
Public hygiene	The degree of impacts on local public health and safety due to the development of the specific project
Language barrier	This is measured by the degree of satisfaction of the developers towards the influence of language in the project area.
Location	The risk is measured by the degree of the location concentration on properties values
Site condition	This is measured by the degree of difficulties in selection of site or preparation of the site for a project.
Designers and constructors	It is measured by the developers' satisfaction with the professional experience with regards to the requirement of the development plan
Multiple functionalities	It is measured by the degree of technical difficulties in construction which could affect the project construction cost (Lam *et al.* 2006)
Duration	It is measured by the total duration of the design and construction which has been specified in the project development plan
Amendments	It is measured by using the possibility of amendments in design and construction for each specific development plan
Accessibility and evacuation	It is measured by the access degree and quick emergency depending on the design of the project (Moss et al., 2007).
Inclement weather condition	It is measured by the perception of the developers on the influence of weather condition on the project
Adverse environmental impact	It is measured by the overall impact of the environment in the project area.
Pollution	It is measured by the perception of developers towards the degree of land pollution in relation to the specific development
Work hour restriction	It is measured by the rate of work hour restriction during the developmental stage of a project.
Accident related loss	It is measured by the level of the risk impact on the financial aspect of the development project.
Demand and supply	It is measured by the degree of estimation of demand and supply of similar property.
Cash flow liquidity	It is measured by the degree of ability to pay the contractual sum
Lifecycle valuation	It is measured over five years for properties in the area
Area accessibility	measured by using the degree of regional infrastructures usability associated with a specific development
Fluctuation in material price	It is measured by the degree of impacts of variation in the prices of materials on projects
Interest rate	This is assessed by the degree of impact change in interest rate on project investment.
Marketing liquidity	It is measured by the sale of property at the same rate in terms of unit price and transaction time of similar properties in the trade area
Investment returns	to measure the expected investment returns are internal rate of return, net present value or return on investment in real estate development

Political group or activists	This is measured by the degree of protest of the urban communities in relation to real estate development in the trade area.
Rigid bureaucracy or corruption	This is measured by the perception of the developers' satisfaction towards project administration of the same kind of real estate development project
Local tax/council approval	This is measured by the total days of construction design approval process by Abuja Metropolitan Management Council (AMMC) and the rate of the local tax impact on a specific project.

Source: Chen and Khumpaisal (2009)

3. Methodology

Primary data was used for this study. The data were elicited through the use of questionnaire administration and sourced from the member of Real Estate Developers Association (REDAN) Abuja Chapter, Nigeria. It was observed that there were 65 active members in Abuja, the study adopted a total enumeration survey. Out of 65 members, about 90% questionnaire was accurately filled and returned. There is a consensus among housing experts on the need for a paradigm shift from government provision to partnerships between the public and private sectors because the government lacks enough resources to address growing housing challenges in many developing countries (Odebode & Oladokun, 2010) and hence the choice of REDAN members for this study. The study selected project time, cost, and profitability as the criteria for project success. This is principally because of the cost, time, and profitability metrics are objective. Consequently, our dependent variable, "Residential property development success", is binary, with 1 indicating that a project finishes within budget, scheduled time frame and makes a profit whilst the criteria for our independent variables are based on an extensive review of literature in real estate development risks because it has been explained that risks and uncertainties occurred in all real estate development projects which could have impact on overall project development processes as relates to project delay, project cost overrun and the usage of the property that causes a considerable loss in project income (Khumpaisal 2007, Otegbulu et al. 2011).

Therefore, to evaluate the effect of development risk factors (social. technological, environmental, economic and political) in project success, respondents were asked to rate their perception on the relative influence of the risks in project criteria in other to arrive at risk factors that could influence a successful residential property development decision. Also, the respondents were asked to rate on a Likert scale from 1-No effect to 5-Very high, and the results were used to compute logistic regression analysis. The data were analyzed through the use of statistical package for social sciences (SPSS). The Logistic regression (LR) explores the predictive ability of sets or blocks of variables, and it specified the entry of variables. In logistic regression, instead of predicting the value of a variable Y from a predictor variable X1 or several predictor variables (Xs), it predicts the probability of Y occurring given known values of X1 (or Xs).

The logistic formulas are stated in terms of the probability that Y = 1, which is referred to as ṗ. The probability that Y is 0 is 1- ṗ.

$$P(y) = \frac{1}{1 + e^{-(b_0 + b_i x_i + \cdots + b_n x_n)}}$$

Where P(Y) is the probability of Y occurring, e is the base of natural logarithms, and the other coefficients form a linear combination much the same as in simple regression.

The efficiency of LR models was established. As 81.8 per cent of the total cases were found to be correctly predicted for timely completion of the project, 61.8 per cent were correctly predicted for cost overrun rate of the project while 65.5 per cent was predicted for the expected return on the project. Hence the established LR models can be used to examine the relationship between the risk factors in residential project success criterion. Thus, this paper presents the logistic regression analysis on the residential property development in the study area. It was used to determine the level of contribution and the level of significance of the independent variables (social, economic, technology, political and environmental risk factors) on the dependent variables to achieve a possible delivery process.

4. Discussion and Findings

Presented below are the significant findings of the study discussed under various subheadings.

Table 1: 1.Demographic information

Variables	Levels	Frequency	Percentage
Ownership	Private(Individual)	46	83.6
	Corporate (Limited Liability)	9	16.4
Years of experience	1-10yrs	31	56.4
	11-20yrs	15	27.2
	21-30yrs	7	12.7
	31yrs above	2	3.6
Job Position of the respondent	Project manager	23	41.8
	Director	1	1.8
	managing director	3	5.5
	senior manager	1	1.8

	Manager	15	27.3
	Architect	2	3.6
	Estate surveyors	6	10.9
	Advisory Valuer	1	1.8
	Quantity Surveyors	3	5.5
Risk Acceptability	Optimistic (risk-loving)	19	34.5
	Pessimistic (risk averse)	29	52.7
	Midway between optimistic and pessimistic (risk neutral)	7	12.7
Total		**55**	**100.0**

Table 1 shows that 46(83.6%) of the real estate organization is privately owned while 9(16.4%) are corporately owned. This can be inferred that private real estate developers participate more in real estate development in the study area. Also, it is observed that 56.4% of the organizations have 1-10 years of experience in real estate development, 27.2% fell within the range of 11-20 years of experience; while 12.7% and 3.6% have 21-30 years and above 31years' experience respectively. This showed that a reasonable number (43.5%) of the companies had obtained above ten years' experience and suggested that there has been rapid progress in real estate sector over the years in the Federal Capital Territory, Abuja. Further examination of Table 1 also showed the job position of the respondents in the organization with 23(41.8%) of total respondents being project managers, director of project 1(1.8%), managing director accounts for 3(5.5%), senior managers 1(1.8%), manager 15(27.3%), architect 2(3.6%), estate surveyors 6(10.9%), advisory valuers 1(1.8%) and quantity surveyor accounts for 3(5.5%). The outcome of the results implied that the respondents are competent, experienced and qualified them in exercising sound judgment in providing answers to the questions. Hence, the responses provided by them could be relied upon for this study. Besides, it can be established from Table 1 that 29(52.7%) of the real estate developers accounted for risk-averse, 19(34.5%) accounted for risk-loving while 7(12.7%) accounted for risk neutral (i.e. midway). It can be implied that due to the fact the property development is fraught with risk, the respondents still geared by the expected return to be accrued from building projects.

4.1 Risk factors for timely delivery, cost and return (value for money) on residential property development

The LR analysis begins with the selection of statistically significant independent variables to be included in the analysis. The outputs given in Table 2.1-2.3 showed the stepwise LR result indicating the estimated coefficients and related statistics of the developed models for time, cost and value for money of the residential property development. Thus, among the five factors, economic factor is found to be significant as regards the timely completion and return of the project while technological factors play the most significant role in explaining the effect in cost performance of the residential property development.

Table 3: The effect of risk factors on the timely delivery of residential property development

	B	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**
Social factor	.261	.852	.094	1	.759	1.298
Technological factor	.250	1.191	.044	1	.834	1.284
Environmental factor	-.677	.602	1.265	1	.261	.508
Economic factor	1.833	.758	5.854	1	.016	6.253
Political factor	.188	.433	.188	1	.665	1.206
Constant	-3.925	2.781	1.992	1	.158	.020

Cox & Snell RSquare= .270, Nagelkerke R Square=.441

Table 2.1 showed the influence of risk factors on residential property development timely completion and the significant value is set at .05. From the analysis, it is found that the variables in the equation explained between 27.0% and 44.1% variability in the dependent variable (timely completion) as suggested by (Cox & Snell RSquare= .270, Nagelkerke R Square=.441). It is evident from the analysis that economic risk factor is statistically significant to timely delivery of residential property development. The significant value is at .016, and the wald level that is the contribution of the factors in timely completion is 5.854. Furthermore, from the table, the likely effect of economic risk factors on timely delivery in residential property development is accounted as 1.833. This implied that a decrease in the effect of economic risk factors would lead to the successful, timely delivery of the development and vice versa. The outcome of the result is in agreement with the study conducted in Ghana (Chileshe and Yirenkyi-Fianko 2012), Malaysia (Alaghbari et al., 2007), Cambodia (Durdyev et al. (2017) and Nigeria (Owolabi et al.,2014) that revealed that changes in the economic risk variables such as fluctuation in the cost of materials, lack of payment for completed works, changes in interest rate among others could impact project in terms of the speed of construction resulting into the delay in the progression of development through unworkable project scheduling and late delivery of material.

Table 4: The effect of risk factors on the cost of residential property development

	B	S.E.	Wald	Df	Sig.	Exp(B)
Social factor	-.298	.647	.211	1	.646	.743
Technological factor	-1.925	.711	7.319	1	.007	.146
Environmental factor	-.187	.388	.232	1	.630	.830
Economic factor	.489	.718	.464	1	.496	1.631
Political factor	.120	.277	.186	1	.666	1.127
Constant	7.035	2.656	7.018	1	.008	1135.974

Cox & Snell R Square= .273, Nagelkerke R Square=.371

Table 2.2 shows the effect of risk factors in cost that will lead to profit maximization. In this case, the risk factors in the equation explained between 27.3% and 37.1% variability in the dependent variable. Also, the significant column provided information on the variables that contributed significantly to the predictive ability of the dependent variables. The technological risk factor is statistically significant to profit maximization at a p-value of 0.007. The beta (B) value in the second column explained the probability or likelihood of the predictor variables on the dependent variables and also showed the direction of the relationship. The outcome of the result indicated that an increase in the effect of the technological risk factor in residential property development would affect the likelihood of achieving maximum profit. This outcome is in agreement with Subramani et al. (2014), Durdyev et al. (2017), asserted that inclement weather, the high cost of skilled labor and project managers, change orders, reworks and additional works could serve as indicators to cost overruns in the residential building projects. In contrary to this, Dokata (2017) pointed out that fluctuation in the price of construction materials, the size of a project, the rate of human capital expenses and project cost were the main influencing factors likely to impact cost performance of a real estate projects. The difference might be because the scope of the study was limited to commercial buildings cost performance and the difference in the business environment.

Table 5: The effect of risk factors on returns(value for money) in residential property development

	B	S.E.	Wald	Df	Sig.	Exp(B)
Social factor	-.144	.523	.076	1	.782	.866
Technological factor	.264	.871	.092	1	.762	1.302
Environmental factor	-.651	.531	1.500	1	.221	.522
Economic factor	1.026	.490	4.391	1	.036	2.790
Political factor	-.434	.331	1.722	1	.189	.648
Constant	-.691	2.443	.080	1	.777	.501

Cox & Snell RSquare= .187, Nagelkerke R Square=.258

Table 2.3 provides information on the influence of risk factors on residential property development expected return at the significant value of 0.05. From the analysis, it was found that the variables in the equation explained between 18.7% and 25.8% of the variability in the dependent variable as suggested by (Cox & Snell RSquare= .187, Nagelkerke R Square=.258). Furthermore, it is evident from the analysis that the economic risk factor is statistically significant to residential property development expected return. The significant value is .036 at the level of contribution of 1.026. It was revealed that the probability of the effect of economic risk factors on residential property development expected return is 1.833. The outcome of the result is in consonance with the studies by Fereidouni and Bazrafshan (2012), Klimczak (2012), Anule and Umeh (2016) that changes in interest rate, selling price and volume rate of the same kind of properties in the local market, marketing strategy as related to housing projects returns might affect the real estate investors to take effective and rational investment decisions that constitute the total value of the projects. This implied that a decrease in the effect of economic factors would lead to a higher expected return that would be generated on the developed residential property.

5. Conclusion

The study investigated the respondent's perception of residential property development in Nigeria. From the outcome of the survey, significant prioritized risk factors that could influence the time, cost and the expected return of a residential project were identified. The data were analyzed using mean and logistic regression analysis of which are critical in knowing the most influencing risk factors in residential property investment appraisal. The findings revealed that technological risk factor such as accessibility and evacuation, condition of the site, designers and constructors, inclement weather, reworks/amendment among others are statistically

significant in assessing the cost performance whilst economic risk factor such as fluctuation in cost of building materials, demand and supply, cash flow liquidity, location among others are statistically significant in examining timely completion and value for money (return) of the residential property development which could cause variation between the actual and estimated outcomes. This implied that if consequences of risk factors are not adequately understood and managed or monitored it could affect the successful property development appraisal. Hence, there is a need for the real estate investors both the local and international to develop risk factors assessment technique for practitioners and academia to assess the residential property development performance as related to timely completion, cost and returns elements to improve competence to manage and minimize the effect of risk factors on the residential investment appraisal.

Also, the study contributed to the empirical investigations related to the analysis of risk factors regarding the residential project success which will strengthen the existing theories. This study provided information into the phenomenon of how risks could impact the residential property development performance and could guide real estate developers to improve real estate investment decision making given the negative effects of project's time and cost overrun on investors profit expectation. However, the limitation to the findings of the study is that the analysis was conducted on residential property development and the respondents involved were only the registered property developers while others actors in the development industry were left out of the sample. Therefore, the paper may serve as a guide on which further detailed analysis could be examined to establish significant contributors to improving the time, cost and value for money performance in the real estate development industry.

References

Akintoye, A. S., and MacLeod, M. J. 1997. Risk Analysis and Management in Construction.International journal of project management, 15(1):31-38.

Alaghbari, W., Kadir, A, Salim, A. and Ernawati, 2007. The Significant factors causing Delay of Building Construction projects in Malaysia. Engineering, Construction and Architectural Management,14(2):192-206,

Alsulamy, S., Wamuziri, S. and Taylor, M. 2012. Evaluation of key metrics for Measurement of Project Performance In Smith, S.D (Ed) Proceedings 28th Annual ARCOM Conference, 3-5 September 2012, Edinburgh, UK, Association of Researchers in Construction Management.1101-1110.

Anule, S.A. and Umeh, O.L. 2016. Investment Performance Indicators of selected Lagos Commercial Properties. Journal of Property Investment and Finance, 34(1):83-97.

Belo, M. and Agbatekwe, A. 2002. Project Management in Property Development: The Nigeria Experience. Published by University Press Plc Three Crowns Building, Jericho Ibadan.

Bowen, P. A., Cattel, K. S., Hall, K. A., Edwards, P. J. and Pearl, R. G. 2012. Perceptions of time, cost and quality management on building projects. Construction Economics and Building, 2(2):48-56.

Chan, D. W. and Kumaraswamy, M. M. 1996. An Evaluation of Construction Time Performance in the Building. Building and Environment, 31(6):569- 578.

Chandr, H. P and Indart, I. 2012. Model of Stakeholder Influence on Project Success: Finding from Construction Project in East Java. International Journal of Academic Research, 4(2): 41-45.

Charles, T.J. and Andrew, M.A. 1990. Predictors of Cost-overrun Rates. Journal of Construction Engineering and Management. ASCE 116: 548-52.

Chen, Z. and Khumpaisal, S. 2009. An Analytic Network Process for Risks Assessment in Commercial Real Estate Development. Journal of Property Investment and Finance, 27(3): 238-258.

Chileshe, N. and Yirenkyi-Fianko, A.B. 2012. An Evaluation of Risk Factors impacting Construction Projects in Ghana. Journal of Engineering, Design and Technology, 10(3):306-329.

Chimwaso, D. K. 2000. An Evaluation of Cost Performance of Public Projects: Case of Botswana. In Proceedings of the 2nd International Conference on Construction in Developing Countries. 81-89.

Cox, I D, Morris, J P, Rogerson, J H and Jared, G E. 1999. A Quantitative study of Post Contract award Design in Construction. Construction Management and Economics, 17(4): 427 – 439.

Dissanayaka, S. M., and Kumaraswamy, M. M. 1999. Evaluation of Factors affecting Time and Cost Performance in Hong Kong Building Projects. Engineering Construction and Architectural Management, 6(3): 287-298.

Divakar, K. and Subramanian, K. 2009. Critical success factors in the real-time monitoring of construction projects. Research Journal of Applied Sciences, Engineering and Technology, 1(2):35-39.

Dokota R.A. 2017. Factors' influencing Building Construction Projects Costs Management in Commercial Real Estate in Nairobi County, Kenya. Research Project Submitted in Fulfillment of Master of Arts in Project Planning and Management of the University of Nairobi.

Durdyev, S., Omarov, M., and Ismail, S. 2017. Causes of delay in Residential Construction Projects in Cambodia. Cogent Engineering, 4(1):1291117.

Durdyev, S., Omarov, M., Ismail, S., and Lim, M. 2017. Significant contributors to Cost Overruns in Construction Projects of Cambodia. Cogent Engineering, 4(1):1383638.

Fereidouni, H.G. and Bazrafshan, E. 2012. Determinants of returns on Housing: The Iranian Case. International Journal of Housing Markets and Analysis, 5(4):351-360.

FiruzanY. , David A.and Jamshid M. 2002. Assessing Contractor Quality Performance. Construction Management and Economics, 20(3): 211-223.

Fisher, P. and Robson, S. 2006. The Perception and Management of Risk in UK office Property Development. Journal of Property Research, 23(2):135-161.

Gehner, E., Halman J. and Dejonge H. 2006. Risk Management in the Dutch Real Estate Development Sector: A Survey. In: Amaratunga, D., Haigh, R., Vrijhoef, R., Ham-blett M., Van den Broek C., (Eds.): Proceedings of the 6th International postgraduate research conference in the built and human environment, Delft, The Netherlands, 6-7 April. 541-552.

Jazayeri, E. and Dadi, G. B. 2017. Construction safety management systems and methods of safety performance measurement: A review. Journal of Safety Engineering, 6(2):15-28.

Jazayeri, E., Liu, H., and Dadi, G. B. Assessing and Evaluating Subcontractor Management Safety Policies. In Construction Research Congress 2018. 251-261.

Kaming, P.F., Olomolaiye, P.O., Holt, G.D. and Harris, F.C. 1997. Factors influencing Construction Time and Cost-overruns on High Rise Project in Indonesia. Construction Management and Economics, 15(1):83 - 94

Khumpaisal, S. 2007. Risks in the Construction project Procurement Process and the Mitigation Methods. Journal of Architectural / Planning Research and Studies, 5(2):135-145.

Khumpaisal, S. and Chen, Z. 2010. Risks Assessment in Real Estate Development: An Application of the Analytic Network Process. Journal of Architectural Research and Studies, 7(1):103-116.

Klimczak, K. 2010. Determinants of Real Estate Investment. Economics and Sociology, 3(2): 58-66.

Liu, H., Jazayeri, E., and Dadi, G. B. 2017. Establishing the Influence of Owner Practices on Construction Safety in an Operational Excellence Model. Journal of construction engineering and management, 143(6):1-9.

Michell, K., Bowen, P., Cattell, K., Edward, P. and Pearl, R. 2007. Stakeholder Perceptions of Contractor Time, Cost and Quality Management on Building Project. In Proceeding of the CIB World Building Conference on Construction for Development, Cape Town, South Africa.14-18.

Muka, I. W., Tamin, R. Z. and Wibowo, A. 2015. Property Development Risk: Case Study in Indonesia. International Refereed Journal of Engineering and Science, 4(7):21-26.

Newell, G. and Steglick, M. 2006. Assessing the Importance of Property Development Risk Factors. Pacific Rim Property Research Journal,12(1):22-37.

Odebode A.A. and Oladokun T.T. 2010. Public Private Partnership in Housing Delivery in Nigeria. In Fadare, S.O. and D.A. Adesanya (Eds). Sustainable Environment, Ile-Ife: Obafemi Awolowo University Press, 132-142.

Ogunbayo, O.T., Odebode, A.A., Oyedele, J.B. And Ayodele, O.T. 2018.The significance of Real Estate Development Process Analysis to Residential Property Investment Appraisal in Abuja, Nigeria. International Journal of Construction Management, Taylor and Francis,1(1):1-10

Olaku A.P., Ibrahim S., Abdulazeez, A., Adeniran O.W. and John, T. A. 2015. Evaluation of Perception of Stakeholders on Key Performance Indicators for UBE Building Projects. Journal of Multidisciplinary Engineering Science and Technology, 2(3):277-285.

Otegbulu, A., Mohammed, M. and Babawale, K. 2011. Survey on Risk Assessment Techniques Applied in Real Estate Development Project in Nigeria (A Case Study of Federal Capital Territory, Abuja).Journal of Contemporary Issues in Real Estate,1(1):189-202.

Owolabi, J. D., Amusan, L. M., Oloke, C. O., Olusanya, O., Tunji-Olayeni, P. F., Dele, O., ... and Omuh, I. O. 2014. Causes and Effect of Delay on Project Construction Delivery Time. International Journal of Education and Research, 2(4):197-208.

Project Management Institute, 2008. A Guide to the Project Management Body of Knowledge,4th ed., Project Management Institute, Atlanta, GA.

Rwelamila, P. D. and Hall, K. A. 1995. Total Systems Intervention: An Integrated Approach to Time, Cost and Quality Management. Construction Management and Economics, 13(3): 235-241.

Saidu, I., and Shakantu, W. (2017). An investigation into cost overruns for ongoing building projects in Abuja, Nigeria. Acta Structilia: Journal for the Physical and Development Sciences, 24(1), 53-72.

Sanni, A. A. and Windapo, A. O. 2008. Evaluation of Contractor's Quality Control Practices on Construction Sites in Nigeria. In: Dainty, A (Ed) Proceedings 24th Annual ARCOM Conference,1-3 September, Cardiff, UK, Association of Researchers in Construction Management.257-265.

Sotoni, A., Qefalia, A. and Barolli, E. 2010. Risks in Large Scale Projects Management: Case of Industrial Parks Development in Albania. Conference paper at Faculty of Economy, Tirana University, Albania. Economics. University of Pennsylvania (Wharton) and NBER, Edited version, March 8.106-117.

Subramani, T., Sruthi, P. S., & Kavitha, M. (2014). Causes of cost overrun in construction. IOSR Journal of Engineering, 4(6), 1-7.

Tularam G.A. and Attili G.S. 2012. Importance of Risk Analysis and Management – The Case of Australian Real Estate Market. International Journal of Technology,16: 357-383.

Urban Development Institute of Australia 2003. The Development Industry – NSW's Engine Room. Developers Digest, 3: 12-13.

Vincent, K.O. and Joel, E.R. 1995. Principles of Total Quality. Kogan Page, London

Windapo, A. and Martin, O. 2010. An investigation into Nigerian Property Construction Companies' Perception of Critical Risk. Insurance Markets and Companies: Analyses and Actuarial Computations,1(1):78-82.

JCBM (2019) 3(1).27-37

University of Cape Town

Journal of Construction Business and Management

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

Effect of Management Strategies in Entrenching Organisational Safety Culture in the Electricity Industry of Zambia

E. M. Mwanaumo[1] and M. Mambwe [2]

[1& 2] Department of Civil and Environmental Engineering, School of Engineering, University of Zambia, Great East Road Campus, Lusaka, Zambia

Received 7 June 2018; received in revised form 23 October 2018 and 28 December 2018; accepted 10 January 2019.
https://doi.org/10.15641/jcbm.3.1.2019.598

Abstract

Entrenching safety cultural aspects is one of the functional areas within the management system that underlines various strategies. A number of investigations in the electricity industry revealed that a deficiency of organisational safety culture is one of the underlying causes of accidents. This study sought to determine management strategies that impact organisational safety culture in the electricity industry in Zambia. The objectives underpinning the study include establishing management strategies that affect organisational safety culture, assessing worker's knowledge on safety, health and environmental (SHE) programs, and ascertain the effect of organisational safety culture on workers attitude towards safety. Various literature was reviewed on management strategies. The research used the quantitative method in which descriptive and analytical survey methods using one-way analysis of variance (ANOVA) as inferential statistics. A structured questionnaire to obtain data was designed, and the multiple linear regression method to analyse data in order to meet the research objectives was applied. The study selected 230 workers from companies within the electricity industry using simple random sampling while 170 questionnaires were completed, giving a response rate of 73.91%. Findings revealed that workers understand organisational safety culture and SHE processes; while management strategies such as recruitment, and rewards and compensation, had a significant influence on organisational safety culture. The study concluded that management commitment and their involvement in the safety aspects of the electricity industry is not just a benevolent obligation, but it compels and motivates the workers they protect to achieve organisational objectives and goals. Furthermore, the study recommended the restructuring of processes during induction and orientation to maintain high levels of safety at workplaces in order to record few workplace accidents.

Keywords: Electricity Industry, Entrenching, Management Strategies, Organisational Safety Culture

1. Introduction

SHE management has historically been very responsive in the electricity industry, with measures of improvement only happening after root causes of major incidents have been established. Organisational safety culture has the capacity to create a cohesiveness that cultivates growth and give distinctiveness by providing standards that allow a variety of approach in an organisation (Mwanaumo & Thwala, 2011). According to the United Nations, Safety at work is not only a sound economic policy but also a basic human right which can be achieved through culture (WHO, 2006). This is an important statement that encourages the need to employ safety policies world over, as a human right.

Rendering Du Toit (2012), on operational safety culture in the organisation, he postulated that development of humanity could enable the magnitude of threats in a workplace. Further, several studies have been undertaken that conclude that organisational safety culture in any industry is an imperative element to SHE management that ascertains the significance of noticeable engagement of top management in heightening the adoption of safety culture by workers (Kwayisi, 2014: 36).

According to Son (2016), organisational safety culture has increasing prominence and acceptance as one of the essential elements in the management of risks in large and complex engineering systems. As a result of the relatively high magnitude of consequences which are synonymous with high hazardous industries, a strong emphasis is

[1] Corresponding Author.
Email address: erastus.mwanaumo@unza.zm

placed on development of an excellent safety culture within an organisation (Olusuyi, 2011). Entrenching safety cultural aspects is one of the salient functional areas of the majority of management systems, with strategies aimed at establishing key frameworks ranked amongst the top priority of management. The electricity industry is one such industry that is synonymous with issues of safety culture due to the dynamic nature of operations undertaken, coupled with a high level of risk.

Aspects of organisational behaviour that are related to culture are normally unnoticed and their impact on organisational safety culture underrated. In entrenching organisational safety culture in the electricity industry, management involvement and its commitment to ensuring safety values are maintained as one of the factors to organisational safety culture as postulated by Mihai and Sorin (2010: 305). Implicitly, a relationship exists between management commitment and safety performance even though it warrants further research (Kwayisi, 2014).

In Agbola (2012: 54) organisational safety culture is considered as a subset of organisational culture and is focused on commonalities among attitudes to safety. Organisational safety culture was also paraphrased by Zou and Sunjino (2015) that it includes shared values at the group level, formal safety issues attributed to an organisation, linkages related to management and supervisory systems that emphasises the contribution of all organisational partakers, has a positive effect on workers' behaviour, and involves reward and durability.

According to the Auditor General's Report on the Management of Occupational Health and Safety in Zambia presented during the Fifth Session of the Eleventh National Assembly (2015), the rise in the number of occupational accidents in high-risk industries such as the electricity industry could be attributed to lack of strategies by organisations used to reduce the risk of incidences. The report further indicated that there was need for top management to come up with strategies that can be implemented within such organisations to curb the rise in accidents and create a culture of safety.

Additionally, according to the Energy Regulation Board (ERB) Report of Zambia (2014) most electrical accidents result from unsafe equipment or installation, unsafe environment, or unsafe work practices. Investigations into these accidents identified that some of the causes of injuries and fatalities are related to the safety perception and include factors such as faulty insulation, improper grounding, loose connections, defective or wrong parts, unguarded live parts, and failure to de-energise electrical parts before inspection or repair, improperly maintained electrical tools and equipment, failure to exercise caution when working, exposed energised lines and equipment, and using inappropriate personal protective equipment and insulated tools.

Further, ZESCO Limited, a government-owned entity, experienced a lot of work-related accidents attributed to SHE in the first quarter of 2016 indicating 38% of the total incidences in the industry this is according to the report by the Worker's Compensation Fund Control Board (WCFCB). These incidences caused electrocutions, road traffic accidents, fall from a height, electrical burns/flashes, hit/struck by an object, material/manual handling and caught-in-between and disease contracted during employment. Another analysis of data obtained from WCFCB revealed that the rate of fatalities arising from workplace accidents rose from 67 to 127 cases in 2011 and 2014 respectively representing an increase of 65% in the period under review (WCFCB, 2016).

Furthermore, during the 2019 National Budget presentation on 28 September 2018 to the Zambian Parliament, it was mentioned that the Government had planned to recruit over 1,000 Safety Inspectors in the Ministry of Labour and Social Security in order to closely monitor high risk industries on issues related to SHE and help organisations formulate strategies, policies and procedures that can be used to curb accidents and promote employee welfare. This pronouncement is an indication that the Zambian Government was ready to work with the industries in making sure accidents are reduced by helping promote strategies at a national level that can be adapted to stimulate organisational safety culture. Similarly, high-risk industries can develop roadmaps and plans that would be a basis in formulating strategies to organisational safety culture.

Given the above, management strategies are required and important to achieve organisational objectives aligned with the national strategies on safety. Therefore, the objectives of the study was to establish management strategies that have a positive effect on promoting organisational safety culture; to assess worker's knowledge of SHE programs; and to establish the effect of organisational safety culture on workers' attitude towards safety.

The study findings will contribute to the Zambian electricity industry safety performance by proposing strategies to promote organisational safety culture to the Department of Occupational Health and Safety in the Ministry of Labour and Social Security, and industry organisational top management. Furthermore, the research results shall be of great significant in illustrating the effects, whether positive or negative, of the strategies employed specific to the organisation according to the policies.

2. Overview of Organisational Safety Culture and Management Strategies

2.1 Organisational safety culture

Organisational safety culture as designated by Dumas (2011) is a constituent of the general philosophy of an organisation that affects the attitudes and beliefs of the workers regarding health and safety routine. Although there is no treaty on organisational safety culture definition, various definitions with similar elements have emerged over the years within the literature such as Dumas (2011) and Zou and Sunjino (2015). These elements include attitude, behaviour and perception of workers in an organisation which make them realise that safety is a priority. Choudhry et al., (2007) further described organisational safety culture as: Learned behaviour and those beliefs in the necessity, practicality and effectiveness of controls, attitudes and risk perception which makes people think safely and trust in safety measures or characteristics and attitudes in an organisation resulting in safety issues being a priority.

Additionally, according to Guldenmund (2007), organisational safety culture are aspects of the organisational culture that have a future impact on attitudes and behaviour and values to increase or decrease safety risks.

2.2 Organisational safety culture in the electricity industry

Organisational safety culture lies in the heart of effective management of all risks related to the electricity industry such as major accidents and hazards according to Olusuyi (2011: 3) and is understood to be a major pointer to safety performance as indicated by Wachter and Yorio (2014: 119). Organisations have programs they can use to improve organisational safety culture in order to reduce costs and increase performance (Haukelid, 2008). Subsequently, some of the accidents in the electricity industry can be reduced through appropriate safe working behaviour (Hopkins, 2006). Accumulation of errors, questionable decisions, and misguided priorities placed ahead of safety, results in accidents. Nonetheless, causes of most accidents are ascribed to human error, and as suggested by most researchers in this knowledge area, 85%- 98% of injuries that occur at workplaces are caused by unsafe attitudes (Williamsen, 2007: 19). Workers' unsafe acts are postulated to be the cause of about 88% of industrial accidents and that organisational failures are the underlying factors in individual action-oriented errors (Carrillo, 2010: 50).

Most studies reviewed in the Sub-Saharan regions have applauded the need for management to create strategies that would increase the levels of safety awareness and encourage organisational safety culture. However, the studies reviewed are not specific to the electricity industry but inclined to other industries such as mining, construction and aviation. In the study by Akpan (2011) on effective health and safety management policies for improved performance in organisations in Africa, he mentioned that there was a need for management to be the driver for effective health and safety. Some of his findings can be used in the electricity industry since most of the safety problems in the region are similar regardless of the sector. Additionally, Asiedu-Appiah et al. (2013) whose study was specific to the mining industry indicated the importance of management involvement in formulating SHE strategies. Other proponents for using management strategies such as policies and procedures, training and worker involvement in uplifting organisational safety culture in organisations in the construction and health industry include Mwanaumo and Thwala (2011) in Botswana and Kwayisi (2014) Ghana.

On the other hand, in some organisations within the electricity industry in Zambia, management are disconcerted with issues of safety. This assertion is supported by Asiedu-Appiah, et al. (2013) who opined that responsibilities in coordination and planning of organisational safety cultural aspects in the electricity industry had no clear-cut and that adherence to SHE laws and regulations were generally low. Kilian (2012) further espoused that management requires that it champions organisational safety culture as they have a significant role to play through administering, communicating, facilitating and supporting the process.

A report prepared by the Kafue Gorge Regional Training Centre (2014: 5) showed that safety programs were not highly recognized especially in the distribution divisions of the electricity sector. This report recommended that there was need for management, especially in distribution facades to adopt organisational safety culture as a key function and hence establish safety programs. This gap could be ascribed to a lack of safety policy at the time, to provide the direction needed for the framework and successful implementation of safety-driven culture.

2.3 The role of management strategies in organisational safety culture

In the perspective of the organisational safety culture of an organisation, participation of top and middle management denotes the extent to which individual workers get involved with critical safety activities (Dumas, 2011). According to Mambwe and Mwanaumo (2017: 567), these safety activities include management presence, collaboration and interaction of managers at safety seminars, SHE Circles (Safety Tool Box), Green Area Meetings, and ability to stay in-touch with risks relevant to the day to day operations with the workers.

The Occupation and Safety Act No. 36 (2010) requires an employer to ensure all workers implement safety and health strategies. This ensures that Safety Managers assist in the implementation and management of SHE programs, processes and strategies of an organisation and are responsible for the maintenance of safety records, coordinating induction and orientation on SHE for new and existing workers, accident investigation, communication and information materials on safety.

Tan and Nasurdin (2011: 157) aver that management strategies are aligned to specific strategies, attitudes and policies planned to motivate, attract, develop and retain workers to ensure the effective operation and survival of an organisation. In effect, SHE policies are intended to improve and maintain a safety cultural environment that prevents and reduces potential risks, and workplace hazards. Management strategies impact the operation of the organisation in terms of safety and health management as postulated by Asiedu-Appiah et al. (2013: 32). As functional areas of management in ensuring organisational safety culture, they included training and development, recruitment and selection, information and communication and performance management, as paramount strategies.

However, Akpan (2011: 162) expounded numerous ways of edifying organisational safety culture which include management leadership and organisational commitment, roles and responsibilities, employee participation in hazard identification and assessment process, determination of controls, enforcement of controls and emergency response plans. While the management commitment is acknowledged as very contributory, Mihai and Sorin (2010: 303) in their study specified that managers had limited understanding of both their legal and corporate responsibilities on safety and health and on ensuring a hazard-free workplace environment.

The account of the problem can be derived from the fact that several studies have been conducted on organisational safety culture in the electricity industry in Zambia and have overlooked the roles and strategies that key players such as safety managers and top management add to the implementation of an organisational safety culture. Management formulates appropriate policies on safety and health, and environmental management systems by making sure there is a conducive atmosphere for safety at work. Nonetheless, according to the Auditor General's Report on Occupational Health and Safety (2015), Zambia has seen an increase in fatalities in the industry arising from workplace accidents. The increase was from 67 to 127 cases from 2011 to 2014 representing an increase of 65%. This led to a public outcry on the need to improve occupational safety and health conditions and to introduce strategies that can be used to curb accidents and help reduce fatalities.

Hence, as can be seen from the empirical studies undertaken, the lack of literature on management strategies in entrenching a safety-driven culture necessitated this study. Therefore, the objective of the study was to assess the effect of management strategies in entrenching a safety-driven culture in the electricity industry of Zambia in order to reduce workplace accidents. Furthermore, the study determined management strategies that have an impact on organisational safety culture, assessed worker's knowledge on SHE programs and established the effect of organisational safety culture on workers. The study adopted six themes as management strategies that can be used in entrenching organisational safety culture according to Asiedu-Appiah et al. (2013), Iqbal et al. (2015) and Byers and Rue (2011: 325).

3. Research Methodology

The study adopted a quantitative research approach and descriptive survey in which both primary and secondary sources of data were used in assessing management strategies. According to Weigmann et al. (2004), quantitative approaches especially surveys of individual responses, are more practical in terms of time and cost-effectiveness. Primary sources of data were collected using a structured questionnaire as a research instrument, while secondary sources of data such as articles, statutes, journals and past researches, were also reviewed in the study as applauded by Machabe and Indermun (2013) of South Africa. According to Guldenmund (2010), as cited by Ganson (2014), organisational safety culture is normally assessed or measured by conducting questionnaire surveys among a group of workers in an organisation. The study utilised a descriptive survey research. Leedy and Ormrod (2015) postulated that descriptive surveys could be used as a means to collect data from the questionnaire. The survey in this study involved asking workers to complete a designed pre-tested specific, standardized questionnaire which was administered to provide the respondent with an opportunity to give their perceptions on certain health and safety related dimensions, and as such, this method was considered for data collection and analysis purposes.

The study respondents comprised of technicians, engineers, safety managers, supervisors, and maintenance managers, senior managers and top managers from the electricity companies in Zambia that were categorized as government owned and privately-owned organisations. The sampling techniques adopted in the study were for purposes of selecting respondents strategically designated based on the roles they play within the electricity industry. Hence, simple random sampling techniques and purposive sampling techniques were applied. According to Davies (2007) and Saunders et al. (2009) purposive sampling helps the researcher identify and target individuals that will be typical candidates of the population under review. Distributed questionnaires were 230, of which 170 usable responses were received, while 35 (15.22) were either incomplete or spoiled, which gave a response rate of 73.91% and included usable questionaires and was onsidered as being close to the acceptable range of 80% as reported by Branson et al., (2017). The remaining 25 (10.87%) questionnaires were not recovered or responded. Statistical Package for Social Science (SPSS) and Microsoft Excel software were applied to analyse the data through the use of descriptive statistics and linear regression models.

Mojapelo et al. (2016; 106) applied seven dimensions to explore perceptions of employees in the steel industry towards occupational health and safety standards in the manufacturing industry in South Africa, in order to tailor a structured questionnaire distributed to a purposive sample of 165 employees. The results revealed that employees perceived occupational health and safety standards as satisfactory in all seven-occupational health and safety dimensions adopted as independent variables for the multiple linear regression analysis to assess the data. These were (1) information and training, (2) health and safety awareness, (3) employee behaviour (4) role of the supervisor, (5) health and safety reporting mechanisms, (6) workplace inspection, and (7) workplace environment. Conversely, Mojapelo et al.'s (2016) study was focused on employees, while the present study was more focused on management strategies.

However, to assess the effect of management strategies in entrenching organisational safety culture, the current study espoused six themes as safety dimensions and human resource strategies as applied by Akpan (2011). These include (1) Recruitment, (2) Training & Development, (3) Performance Analysis, (4) Communication, (5) Induction & Orientation, and (6) Reward & Compensation. These dimensions were applied as independent variables to create a multiple linear regression model, while organisational safety culture was applied as a dependent variable.

Additionally, Davids (2016) undertook a study using the 5-point Likert scale to respond to 49-item statements by choosing one answer per statement. The results indicated that a highly positive correlation was found to exist between the themes of organisational commitment and management involvement. The study, therefore, adopted the use of a 5-point Likert scale. Several studies have indicated the use of a 5-Point Likert scale in the study of organisational safety culture. The scale allows the respondents to express how much they agree or disagree with a particular statement on the questionnaire,

the scale is also easily understood, and responses are easily quantifiable and subjective to the computation of some mathematical analysis (Leedy & Ormrod, 2015).

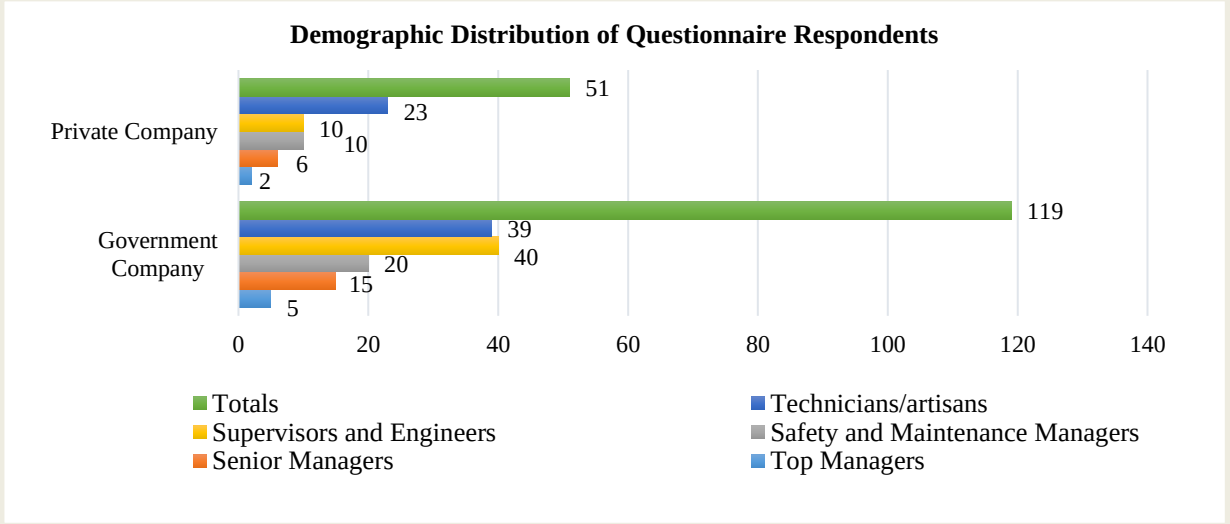

Figure 1: Demographic Distribution of Questionnaire Respondents

According to Mason et al. (1989), descriptive statistics are used to summarise data, hence considering that the sample size was 170, the parametric test was carried out for normality (Motulsky, 2005). Trochim (2004) indicates that reliability is established when the data is collected from the correct sources through the appropriate method. Therefore, it was considered that the government and private employees working in the electricity industry provided reliable answers to the questions on the effect of management strategies on organisational safety culture.

The research also centred on capturing the relationships that exist between management strategies and organisational safety culture, in order to conceptualise the study. The relationship that exists is inversely proportional, in that when strategies such as the right recruitment of staff, training and development on SHE, performance analysis, enhanced communication, induction and orientation, and rewards and compensation, are implemented, the rate of incidents, environmental risks and occupational health diseases are reduced. Once these measurements are reduced, safety culture in the organisation is increased affirmatively. Correspondingly, when worker's knowledge on issues of SHE is enhanced, organisational safety culture is increased and inversely affects the rate of safety incidents positively by reducing the risks. Similar accessions were also postulated by Agba (2012), Du Toit (2012) and by Wachter and Yorio (2014). In all instances, organisational safety culture was dependant on management strategies and worker's knowledge of safety which are independent variables.

Further, Guldenmund (2007) and Carrillo (2010) acknowledged that when organisational safety is enhanced, workers attitude towards safe work is enhanced. This study conceptualizes that there is a direct interaction between organisational safety and the dependent variable, workers attitude towards safe work as illustrated in Figure 2.

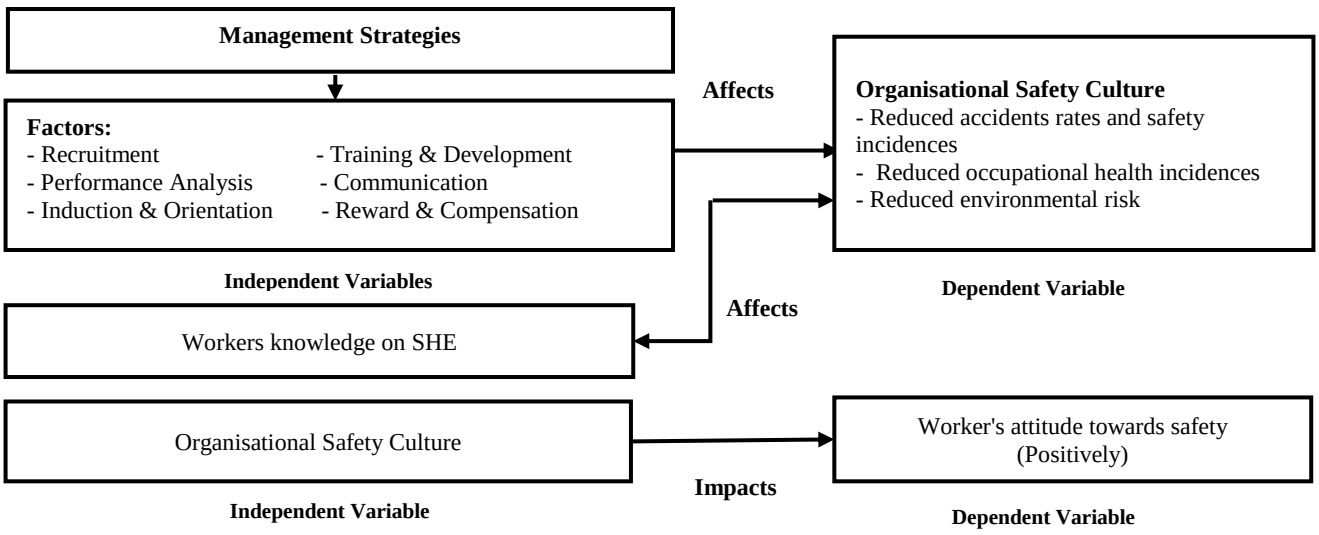

Figure 2: Conceptual framework - effects of management strategies in entrenching organisational safety culture (Author, 2018)

4. Findings and Discussion

4.1 Demographic profile of respondents

This section analysed the respondent's demographic information by use of percentages based on counts and charts that were undertaken. The demographic profile of respondents used was educational attainment of respondents and the position or grade held at the workplaces.

4.1.1 Descriptive analysis of respondents' educational attainment

To establish the educational attainment levels of the workers in the electricity industry of Zambia as recorded across the survey's respondents. According to Table 1, it was found that the highest educational attainment was that of a Doctorate which constituted 1% of the entire electricity organisations respondents that took part in the study and then from Master's degree, Bachelor degree, Diploma, and Certificates holders, as the most attained level of education.

Table 1: Educational attainment of respondents

	Sum	**Percentage**
PhD	2	1.18
Masters	46	27.06
Bachelor	55	32.35
Diploma	50	29.41
Certificate and others	17	10
Totals	**170**	**100**

Among these qualifications, most of the workers indicated to have a Bachelor's Degree (32.35%) and a Diploma (29.41%). With regards to work experience, the results indicated that most of the workers had experience for over nine (9) years while those who worked less than three (3) years, were a smaller group. With more qualified workers and reasonable experience in the electricity industry, it can be deduced that the composition of workers are more experienced and understand the management strategies in entrenching organisational safety culture in the electricity industry in Zambia.

4.1.2 Analysis of respondents' grade/position at the workplace

For easy reference, respondents were grouped into three categories, senior management, junior management and unionised workers. The senior management category comprised of principal and chief engineers, managers, senior managers and directors. Junior management staff included engineers, support staff with degrees, senior officers, superintendents and supervisors. Most unionized workers were made up of foremen, technologists, artisans, linesmen, and daily casual of employees. The senior management represented 23.2% of the total respondents, while junior management and unionized workers represented 56.4% and 20.4% respectively. The study incorporated the position of the workers during the questionnaire survey to understand the roles and responsibilities of each rank and how they would affect the management strategies that management and supervisors use to support organisational safety culture.

4.2 Central Tendencies Measurement

Measurement of central tendency using a mean of the various themes in the questionnaire was analysed. According to Son (2016), most of safety culture measurement tools employ 5-point Likert scale. David (2016) undertook a study using the 5-point Likert scale to respond to 49-item statements by choosing one answer per statement. His results indicated that a highly positive correlation was found to exist between the themes of organisational commitment and management involvement. Therefore, based on those mentioned above, the study adopted the use of a 5-Point Likert scale with five scales of intervals that ranged from strongly agree (SA) to strongly disagree (SD). The view of respondents on organisational safety culture knowledge from respective workplaces and departments was gathered to measure the level of exposure on the strategies on SHE management.

Table2: Statistical interpretation of knowledge on organisational safety culture

	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean (N)	Rank (N)
I understand safety and health issues as required in OSH Act 36 of 2010 and Factories Act, Cap. 441 of the Laws of Zambia	24.9	52.4	12.1	5.7	4.9	2.33	2
Provision of significant updates on knowledge on SHE.	8.5	35.6	32.1	18.7	5.1	2.71	1
Non-conformance to safety procedures lead to punishment.	22.6	56.2	11.5	8.2	1.3	2.12	4
Unsafe workplace and environment gives me the right to refuse to work	33.2	26.2	29.1	8.2	3.3	2.17	3
Management understands the risks associated with operations.	32.1	48.0	12.4	2.9	4.6	1.90	6
Management and the workforce work together to tackle safety issues.	23.5	38.6	11.4	14.1	12.4	1.91	5

Scale denotation: Likert Scale: 1 = Strongly agree to 5 = Strongly disagree
Overall mean score = 2.43

Management strategies in inculcating organisational safety culture are very critical when addressing SHE adherence. The overall mean score for the scale was 2.43 indicating a moderate inclination to the "agree" scale. The mean scores in this study ranged from 1.90 – 2.71 As indicated in Table 2 the theme with the highest mean score of 2.71 ranking is "Provision of significant updates of knowledge on SHE". This represents a stronger inclination towards 'agree' position on the Likert scale. The higher mean scores demonstrate that management provides significant updates of knowledge on SHE and can be deduced that employees have significant knowledge and understanding on SHE. While the lowest mean score value of 1.90 was found to be "management understands risks associated with operations". This can be deduced that management takes time to understand the risks that the operations of the electricity industry bring about and hence lie in the category of strongly agree on the Likert scale. From the above, it can be deduced that workers that took part in the survey appreciably understand and have knowledge on safety and health and the role that management play in driving an organisational safety culture in the industry. Furthermore, this finding was supported by the research undertaken by Nunez and Villanueva (2011) who affirmed that there is a direct relationship between management involvement, safety risks and safety knowledge/awareness to lower the occurrence of accidents. If workers did not have the knowledge required, as postulated in the OSH Act 36 of 2010 and Factories Act, Cap 441 of the Laws of Zambia, working under a congenial environment that is safe would not be possible.

In assessing the knowledge that workers had pertaining to organisational safety culture about SHE operations of the electricity industry, it was found that 70% of the workers had a good understanding of the ascription made in the OSH Act 36 of 2010 and the Factories Act, Cap 441 of the Laws of Zambia. They also corresponded to have been involved in the SHE aspects. Additionally, it was disclosed that workers are involved in the provision and updates regarding knowledge on SHE aspects of the organisations they represent. This was an attestation of knowledge on safety and health activities at various workplaces in the electricity industry.

4.3 Respondents views analysed inferentially

Statistical inferential techniques were used to analyse the data drawn from the questionnaire survey in order to determine the Analysis of Variance (ANOVA) and model of Multiple Linear Regression to quantify the effect of management strategies on organisational safety culture entrenchment in the electricity industry as perceived by the workers. According to Leedy and Ormrod (2015), normally distributed data that can use the one-way or two-way ANOVA test are parametric. Moreover, the data fitted the normal distribution by assuming normality. Justifiably, the use of the one-way ANOVA indicates that there were no outliers in the data set. The use of ANOVA based on the literature reviewed in the study was applied by Davids (2016) who assessed safety culture of professional pilots within the aviation industry, and his results indicated assumed normality after testing using a one-way ANOVA with a size of over 100 respondents. Similarly, tests were used by Mojapelo et al. (2016) whose test for normality was affirmative after applying ANOVA and multiple regression analysis to quantify safety perception of employees in the steel industry. Additionally, the use for normality in this study indicated that the there were no multiple outliers in the data set and that the sample size of 170 was justifiable to use parametric tests. Since the dependent variable was only organisational safety culture, the research adopted the one-way ANOVA. However, their study used seven dimensions of safety culture as independent variables while this study employed five strategies as independent variables for the multiple regression analysis.

4.3.1 Analysis of variance (ANOVA)

A set of independent variables whose normality was determined using ANOVA technique showed variability in the outcome. The results were derived using SPSS as shown in Table 3.

Table 3: Analysis of variance of the data

	Sum of Squares	**Degree of Freedom**	**Mean Square**	**F-Statistics**	**Sig**
Regression	83, 637	6	12.844	17.325	0.00
Residual	128, 434	162	0.702		
Total	212, 071	168			

The independent variables used in the analysis were the six management strategies: recruitment; training and development; performance analysis; communication and information; induction and orientation; and reward and compensation, illustrated 83, 637 from the total of 212, 071. The indicative results showed that the dependent variable, organisational safety culture signified 39.44% of the whole variability of the data. This implies that the remaining 60.56% representing the sum square of 128, 434 in the outcome is considered to be unexplained by the independent variables used in this study. Additionally, the p-value of 0.00 is affirmative of the six management strategies and significant influence on the process of entrenching organisational safety culture in the SHE management systems. Thus, demonstrating that there are more independent variables that could have been used and were not included in the regression analysis hence the variability proportion in the outcome.

4.3.2 Multiple Linear Regression Analysis

The independent variables used in the study and the dependent variable were used to create the multiple linear regression model. The six independent variables were used in the multiple linear regression formula in a

collective manner and organisational safety culture as a variable that was dependent.

Table 4: Multiple linear regression estimates

Dependent Variable: Organisational Safety Culture	**Unstandardized Coefficient Estimate**	**Standard Error**	**Standardized Coefficient Estimate**	**T-Statistic**	**Sig.**	**VIF**
Constant	1.927	0.441	-	4.520	0.000	-
Recruitment	0.671	0.128	0.477	5.541	0.000	1.912
Training & Development	0.153	0.129	0.082	1.272	0.243	1.643
Performance Analysis	0.072	0.132	0.038	0.586	0.629	1.574
Communication	-0.066	0.097	-0.047	-0.692	0.555	1.407
Induction & Orientation	-0.423	0.086	-0.383	-5.426	0.000	1.309
Reward & Compensation	0.056	0.132	0.037	0.493	0.696	2.240

The results of the multiple linear regression from Table 4 shows that the independent variables with high significant diverse effects on organisational safety culture were training and development, and induction and orientation. Additionally, the practice of recruitment was affirmative while induction and orientation indicated a non-affirmative effect on organisational safety culture. Conversely, this implies that an increase in the right recruitment of workers to perform the right jobs leads to a 0.671 increase in organisational safety culture at workplaces. While a reduction in induction and orientation strategies by management tends to reduce organisational safety culture by 0.423. Training and development, performance analysis, communication and rewards and compensation indicated varied effects not statistically significant. This was because the literature on the use for instance, of rewards and compensation varied. It could be affirmed that the Zambian electricity industry does not reward or compensate appropriately for adherence to SHE procedures.

The standardised coefficient estimates are beta coefficients resulting from the regression analysis that have been homogeneous so that the variances of dependent and independent variables are one (1) (Wakefield, 2014). The negative beta indicates that there is a decreased use of the dimension in communication, and induction and orientation since the outcome variables decreased by 0.047 and 0.383 respectively.

4.3.3 Goodness-of-fit and collinearity

No two or more independent variables with their estimated coefficients are expected to have the same influence on the dependent variable according to the principle of multicollinearity as postulated by Wakefield (2014). This implies that independent variables do not exert the same degree of effect on a given dependent variable. The Variance inflation Factor (VIF) should be below 5 for the non-existence of collinearity. Table 4 shows that none of the six strategies had VIF above 5, implying absence of collinearity between the six independent variables. This confirms that each of the independent variables employs distinctive influence on organisational safety culture.

The multiple linear regression technique is used in determining the fit for adequacies. The R-value in this study as indicated in Table 5 provides the correlation coefficient between the six strategies and organisational safety culture.

Table 5: Goodness-of-fit Statistical Analysis

R	**R-Squared**	**Adjusted R-Squared**	**Standard Error (S.E) of Estimate**	**Dublin-Watson**
0.637	0.387	0.354	0.885	1.809

The correlation coefficient which is the R-Value of 0.637 was found to be of a reasonably high positive correlation. The adjusted R-squared which gives the amount of proportion to which the set of the six independent variables could explain the variations in organisational safety culture is a dependent variable. From this background, the study was indicative of the six strategies which only elucidate 35.4% of the variations in organisational safety culture; while 64.6% was non-indicative. This implies that there were certain variables not used in the study that were equally important. Furthermore, a standard error of 0.885 was fairly considerate for the assessed coefficients. The fit for adequacies passed the acceptable threshold of 1.500 to 2.500 as it indicated a Dublin-Watson test statistic of 1.809.

The specific objectives underpinning the study were namely, to determine management strategies that have an impact on organisational safety culture, to assess worker's knowledge on SHE programs and to establish the effect of organisational safety culture on workers. Various literature was reviewed on management strategies. In analyzing the data, the adoption of ANOVA and multiple linear regression analysis to further explore the data applied six management strategies that include: recruitment, training and development, performance

analysis, communication and information, induction and orientation and reward and compensation, as independent variables. While organisational safety culture was used as a dependent variable, it can be postulated that the strategies implored in the study have a statistically significant effect on organisational safety culture. A similar analysis was used by Yule (2008) and indicated the need to adopt other independent variables besides the ones used in the analysis. Hence the six factors used in the regression could not elucidate much of the total variability of management strategies in organisational safety culture.

Further to the effects, the results were indicative of recruitment which was positive and induction and orientation which was negative, as being factors that had variability effect on organisational safety culture. This variability could be attributed to the failure of management to induct successfully and orient workers on SHE related issues to promote organisational safety culture. On the other hand, of the remaining four with a positive indication of the effect on organisational safety culture, the study did not adjudge their statistical connotation.

Based on the literature review and the research results the study showed that management, in essence, plays an important and participatory role in inculcating the needed safety requirements in an electricity organisation whose ultimate responsibilities is to ensure safety and health strategies are understood and followed by all workers. As a management strategy, aligning the policies and procedures to the current legal statutes and regulatory requirements such as the OSH Act 36 of 2010 and the Factories Act, Cap 441 of the Laws of Zambia, gives credit of understanding safety values, culture and behaviour from an individual to a country in driving development in a safe environment. Having disclosed in the reviewed literature and the research results that workers are involved in making sure that aspects of SHE are embraced and updated with knowledge and reviewed continuously, it substantiates the existence of knowledge on SHE activities at various workplaces they represent in the electricity industry.

Having noted in the literature reviewed, according to Tan and Nasurdin (2011) and Asiedu-Appiah et al. (2013), that management strategies relate to organisational policies and attitudes, training and development, recruitment and selection, information and communication, performance appraisals and retention, they ensure continuous improvement of organisational safety requirements. Besides these strategies, this study also proposed that the use of information, induction, reward and compensation can also be used as management strategies in entrenching organisational safety culture and safety performance in the electricity industry. Hence, it can be postulated that the strategies examined in the study have a statistically significant effect on organisational safety culture and can be used with other strategies recommended in the safety and health body of knowledge by other researchers.

5. Conclusion

The overarching aim of the study was to assess the effect of management strategies in entrenching a safety-driven culture in the electricity industry of Zambia to reduce workplace accidents. The study sought to establish knowledge of SHE programs to entrench organisational safety culture in the industry. The study found that recruitment and induction and orientation were cardinal factors that indicated statistical significance of management strategies and had varied effects on organisational safety culture. Further, the results indicated that recruitment had positive effect while induction and orientation factors recorded a negative effect. There was an understanding of safety and health process as tabulated in the OSH Act 36 of 2010 and Factories Act Cap 441 since most of the workers established to being provided with SHE knowledge. Additionally, the study showed that the workers in the electricity industry get fairly involved in SHE related problems. The study's objectives were achieved and were in line with previous research.

The outcome of the study was limited by restriction to the electricity industry, and however, the results can be generalised to other sectors as data collected was only from the players within the electricity industry in Zambia. Additionally, the sample used in the study is a reflection of the representation of the major companies that are in the electricity industry.

It is therefore recommended that similar studies can be pursued outside the confines of the electricity industry in order to attain a longitudinal and comparative study. The study recommends stronger recruitment practices that are appropriate and would have a positive effect on organisational safety culture. The study also recommends restructuring processes during induction and orientation to maintain high levels of safety at workplaces and record fewer workplace accidents. For additional research, it is recommends an exploration and examination of the effects of several other management practices in SHE processes be undertaken.

The findings of the study will significantly contribute to the existing body of knowledge in the area of SHE and management strategies useful in entrenching organisational safety culture in the electricity industry. The recommendations of this study would also be used to strengthen management strategies and improve operations within institutions in the safety and health systems. Lastly, the study would provide the basis for further research in line with management strategies and organisational safety culture in the electricity industry.

References

Agbola, R. M. (2012). Impact of occupational health and safety management on employee safety. Developing Country Studies, II (9), 156-167.

Akpan, E. I. (2011). Effective safety and health management policy for improved performance of organization in Africa. International journal of business and management, VI (3), 159-168.

Asiedu-Appiah, F., Kontor, E., & Asamoah, D. (2013). Effect of human resources management practices on employee retention: Perspective from the mining

industry. International Research Journal of Arts and Social Sciences, II (2), 30-40.

Auditor General. (2015). Report by the Auditor General on the Management of Occupational Safety and Health for the fifth Session of the Eleventh National Assembly, National Assembly of Zambia. 1-99. Lusaka: National Assembly of Zambia.

Bayers, L., & Rue, L. W. (2011). Human Resource Management (10th ed.). New York: McGraw-Hill Publisher.

Carrillo, A. (2010). Positive safety culture: How to create, lead and maintain. Professional Safety, 55 (5), 47-54.

Choudhry, R. M., Fang, D., & Mohamed, S. (2007). The Nature of Safety Culture: A Survey of the State of the Art. Journal of Safety Science, 45, 993-1012.

Davids, G. T. (2016). Assessing Safety Culture of Professional Pilots within Selected South African Based Aviation Organisations. The University of Western Cape, Faculty of Economics and Management Sciences. South Africa: Western Cape University Library.

Davies, M. B. (2007). Doing a successful research project: using qualitative or quantitative methods. Palgrave, UK: MacMillan Publishers.

Du Toit, W. J. (2012). The Relationship Between Health and Safety and the Human Risk Taking Behaviour in the South African Electrical Construction Industry. Nelson Mandela Metropolitan University. Durban, South Africa: NMMU Library.

Dumas, M. C. (2011). Influence of management's leadership on safety culture: The role of the construction contractors; in Proceedings of the SPE European health, safety and environment conference in oil and gas exploration and production. Proceedings of the SPE European health, safety and environment conference in oil and gas exploration and production, (pp. 22-24). Vienna: Austria.

ERB. (2014). The Energy Regulator. The Energy Regulator Newsletter, 1 (21), 1-20.

Guldenmund, F. W. (2007). The Nature of Safety Culture: A Review of Theory and Research. Safety Science, 45, 215-257.

Haukelid, K. (2008). Theories of (safety) culture revisited—an anthropological approach. Safety Science, 46, 413-426.

Hopkins, A. (2006). Studying organisational Cultures and their Effects on Safety. Safety Science, 44, 875-889.

Impact of health and Safety Management on Employee Safety. (2012). Developing Country Studies, II (9), 156-167.

Iqbal, N., Anwar, S., & Halder, N. (2015). Effect of Leadership Style on Employee Performance. Arabian Journal of Business Management Review, 5 (146).

Kafue Gorge Regional Training Centre. (2014). Effective Management and Safety Study. Lusaka: KGRTC and ZESCO Limited.

Kilian, J. (2012). What is the Role of the HR in Health and Safety Compliance? Retrieved March 28, 2018, from Human Capital Web Site: www.eohumancapital.co.za.

Kwayisi, K. A. (2014). The effect of human resources management practices on health and safety: A case study of the Ghana health service. Accra, Ghana: Nkwame Nkrumah University of Sciences and Technology.

Leedy, P., & Ormrod, J. (2015). Practical Research: Planning and Design (11th ed.). Essex: Pearson Education Limited.

Machabe, A. P., & Indermun, V. (2013). Management Perceptions of the Occupational Health and Safety System in Steel Manufacturing Firm. Arabian Journal of Business and Management Review (Nigerian Chapter), 1 (11), 25-36.

Mambwe, M., & Mwanaumo, E. M. (2017). The Impact of Organisational Safety Culture On Safety Health and Environment (SHE) in Zambia's Electricity Distribution Industry. Proceedings in Joint CIB W099 & TG59 International Safety, Health and People in Construction Conference. Cape Town, South Africa: Joint Construction in Building.

Mason, R. L., Gunst, R. F., & Hess, J. L. (1989). Statistical Design and Analysis of Experiments with Applications to Engineering Science. New York: Wiley.

Mihai, M. P., & Sorin, B. M. (2010). Behavioral Based Safety Management in Electric Power Industry – Complementary Safety of Workers. Advances in Automatic Control, Modelling and Simulation, 303 - 307.

Mojapelo, J., Mafini, C., & Dhurup, M. (2016). Employee Perceptions of Occupational Health and Safety Standards in the Steel Industry. International Journal of Social Sciences and Humanity Studies, 8 (2), 106-121.

Motulsky, I. (2005). Prism 4 Statistics Guide - Statistical Analyses for Laboratory and Clinical Researchers. San Diego CA, USA, 2003: GraphPad Software Inc.

Mwanaumo, E. M., & Thwala, W. D. (2011). A Review of health and Saftey legislation in Botswana relative to construction industry stakeholders. In S. Laryea, R. Leiringer, & W. Hughs, Proceedings of West Africa Built Environment Research (WABER) Conference, 19-21 July 2011 (pp. 47-57). Accra, Ghana.

National Assembly of Zambia. (2010). Occupational Health and Safety Act No.36 of 2010. Lusaka: GRZ.

Nunez, I., & Villanueva, M. (2011). Safety capital: The Management of Organisational Knowledge on Occupational Health and Safety. Journal of Workplace Health, 1 (23), 56-71.

Olusuyi, B. O. (2011). Influencing Safety Culture in the UK Offshore Oil and Gas Industry: The Importance of Employee Involvement. Department of Management. Aberdeen: Published Thesis; Aberdeen Business School.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Research Methods for business students. Harlow: Pearson Education Limited.

Son, C. (2016). Study of Safety Culture Assessment Framework for Process Industries and its Application to a Bayesian Belief Network Analysis. Texas: Submitted to the Office of Graduate and Professional Studies of Texas A&M.

Tan, C. L., & Nasurdin, A. M. (2011). Human resource management practices and organizational innovation: Assessing the mediating role of knowledge management effectiveness. Electronic Journal of Knowledge Management, 9 (2), 155-167.

Trochim, B. (2004). Research Methods Tutorials. Retrieved September 30, 2018, from http://www.socialresearchmethods.net/tutorial.htm.

Wachter, J. K., & Yorio, P. L. (2014). A system of Safety Management Practices and Worker Engagement for Reducing and Preventing Accidents: An Empirical and Theoretical Investigation. Science Direct, 68, 117-130.

Wakefield, J. (2014, September 29). Wiley StatsRef: Statistics Reference Online. Retrieved April 3, 2018, from General and Introductory Statistics: http://www.onlinelibrary.wiley.com

WCFCB. (2016). Worker's Compensation Fund Control Board (WCFCB) Report. Lusaka: WCFCB.

WHO. (2006). World Health Organisation Report. New York: WHO, United Nations.

Williamsen, M. (2007). The culture of safety: Interview with safety pioneer Dan Petersen. Professional safety, 52 (7), 17-27.

Yule, S. (2008). Senior Management Influence on safety performance in the UK and US energy sectors. Scotland: Doctoral thesis: University of Aberdeen.

Zou, P. X., & Sunjino, R. Y. (2015). Strategic Safety Management in Construction and Engineering. West Sussex: John Wiley & Sons Ltd.

JCBM (2019) 3(1). 38-44

University of Cape Town

Journal of Construction Business and Management

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

Influence of the Management Styles and Quality of Management on Project Delivery

A. O. Aiyetan[1]

[1.]Department of Construction Management and Quantity Surveying, Durban University. of Technology, South Africa

Received 9 November 2016; received in revised form 19 April 2017, 6 September 2018; accepted 2 October 2018.
https://doi.org/10.15641/jcbm.3.1.2019.65

Abstract

Construction projects differ in features and complexity to each passing decade. Therefore, control is a fundamental requirement to avoid overruns of key performance parameters. The study aims to identify influencing factors of management practices and quality of management during construction on project delivery time to mitigate their impact. The inferential statistic was used in the analysis of data for the study. The sample population consists of architects; builders; quantity surveyors; structural engineers, and clients, totalling eighty-eight (88). The metropolitan cities of five provinces constituted the geographical delimitation of the study. The provinces are Eastern Cape; Free State; Gauteng; KwaZulu-Natal, and Western Cape, while the metropolitan cities are Bloemfontein; Cape Town; Durban; Johannesburg, and Port Elizabeth. The probability sampling method was employed in the selection of architects, South African property owner's, and masters builders. While stratified sampling was used for quantity surveyors. A questionnaire survey was conducted among these stakeholders in the Building Construction Industry to access influencing factors of management style and quality of management during construction. Finding relative to management style include that set time limits, specify goals people are to accomplish and require regular reporting on progress and for quality of management during construction are effectively coordinating resources, developing an appropriate organizational structure to maintain workflow influences project delivery time In most cases these tradesmen require supervision construction, which results in delay and attending, may drastically reduce delay on projects. Based on the finding of the study, ways to mitigate poor management style and quality of management during construction were suggested.
Keywords: Construction, Delivery time, Management style, Quality.

1. Introduction

Construction involves a lot of tasks, which are executed by tradesmen. In most cases, these tradesmen require supervision to deliver the work according to specification and quality. The extent of management of these tradesmen concerning the level of control given and management style will determine the quality of product and productivity level. Management style dictates the quality of the product, as happy workers engender commitment to work, leading to high productivity and quality. It is in the interest of the contractor to keep workers happy; else the contrary has an adverse effect on the delivery of the project, such as delay. Gonzalez et al. (2016) state that delays can lengthen schedules, increase project costs, and jeopardise quality and safety. Generally, workers do not want to be coarse to work. There is a need to balance supervision with the management style being adopted to achieve the optimum level of production and quality. Accidents on sites are common occurrences (Yilmaz, 2015). Planning against their occurrence is important. The consequences of accidents are adverse relative to project delivery, final cost figure, the company's image and competitive advantage, and the client's finances are always affected. On the part of the industry, the public impression is that of a hazardous industry, which leads to low entrants into the industry at all levels, with the most effect on skilled labour, resulting in shortages. The objectives of this paper are to assess the influence of management styles and qualities on project delivery time in South Africa.

First, a literature review of relevant concepts is presented in Section 2. Section 3 presents the research methodology for the study. This is followed by the presentation of results and discussion of findings in Section 4. The paper ends by identifying further research

[1] Corresponding Author.
Email address: Ayodejia@dut.ac.za

areas and drawing conclusions on the findings of the study.

2. Literature Review

2.1 Project Delivery Time and Project Duration

It is intended for every project to start, finish and use for its intended purpose and afterwards it is demolished. Project delivery time is the time it takes from commencement to the handing over of key or the project to the client (Darwish, 2017). Project duration is the initial completion time agreed to while awarding the contract for the project, stemming from the master schedule of works submitted by the contractor (Acebes et al., 2015). Project delivery time is different from project duration in that project delivery time encompasses the time for mobilisation of the project team and resources, project duration, and defect liability period (Atkinson, 1999; Darwish, 2017). According to Acebes et al. (2015), project duration is critical to project delivery time because any increase in the project duration will lead to an increase in the project delivery time.

2.2 Management Style

Management style deals with the personal attributes possessed by the manager in managing an organisation along with the leadership style. Managers operate within an organisation and manage the functions of an organisation. These attributes possessed by managers that enable them to succeed are called competency. Rees and Porter (2001) define competence as the skills or knowledge possessed by individuals that allows them to manage an organisation successfully. Smallwood (2006:3) states that competencies can be divided into two categories: threshold or surface, which are required to be minimally effective and differentiating or core, a yardstick for superior performers. These are the competitiveness factor (Orozco et al., 2011).

The threshold or surface competencies are Knowledge – information regarding content, and Skills – the ability to perform a task. According to Singh (2004), competences predict performance. Goals need to be defined before actions are taken and performance measured. There are three types of goals, Organisation-wide goals – these include objectives about future directions for large segments of the organisation population; Task-oriented goals – which are specific objectives assigned to an individual or small group of individuals; and Personal goals or level of aspirations – these are goals set by the individuals themselves.

Fryer (2004) points out that lots of leadership studies have taken account of the leader's competence or ability, either in the limited sense of technical knowledge or the broader understanding of competence to lead. For effective and efficient management of human resources, both the technical ability and competence to lead must be employed and could be referred to as management practice. The technical ability concerns laying down construction methods and drawing up of the schedule of works. The competence to lead refers to the motivation and support given to workers.

Griffith and Watson (2004) identify three leadership styles. Autocratic leaders give orders which they insist shall be obeyed; determine policies for the group without consulting it; provide no detailed information about future plans but merely tell the group what immediate step it must take; give personal praise or criticism to each member on their own initiative and remain aloof from the group for the greater part of the time; Democratic leaders give orders only after consulting the group; see to it that policies are worked out with the acceptance of the group (this is critical for effective implementation); never ask people to do things without sketching out the long-term plans on which they are to work; make it clear that praise or blame is a matter for the group and participate in the group as a member, and Laissez-faire leaders do not lead, but leave the group entirely to itself and do not participate.

2.3 Management Styles of Construction Managers

According to Burke and Barron (2007), management styles refer to the characteristics, attributes, and skills of construction managers. Although management and leadership are unique systems of action, they are also complimentary. The management styles of construction managers are reinforced and balanced with leadership styles to successfully operate in the complex project environment (Toor and Ofori, 2008). These management styles are identified and summarised in the following sub-sections.

Pheng and Chuan (2005) state that the definition of goals affects project performance positively. The overall goal of an activity must be set out for each. This will be the driving force for day-to-day achievement and overall accomplishment of the goal. Goal-setting can inspire and motivate subordinates, especially if their performance is linked to remuneration. It also provides an effective means of evaluation and control (Du Toit et al., 2007). Additionally, when staff participate in the decision-making process of the organisation, it creates a sense of belonging which leads to individuals paying greater attention to their jobs. These create an environment conducive for work, resulting in high productivity.

One of the factors influencing performance in construction projects is the sequencing of work and the allocation of crew sizes. Rojas and Aramvareel (2003) are of the opinion that out-of-sequence scheduling of work may result in a loss of momentum (rhythm). Walker and Shen (2002) suggest that contractor-related factors such as poor site management and supervision are significant causes of delays in project delivery. Lack of organisation creates a situation of confusion and chaos, a situation in which no meaningful progress can be made. A site that is well laid out, in which offices, storage, and workspaces are well defined, aids the smooth flow of work.

For the achievement of targeted production, time limits should be set for each task to be carried out. A bricklayer has a certain number of bricks to lay per day, depending on the type of brick. A fitter has a certain amount of tonnes/kilograms of steel to bend or cut for a day's wage, and this applies to all trades. Based on this analogy, timelines are set for the achievement of each activity to avoid delay as clear time-lines promote more efficient and goal-driven work.

Managers or site engineers provide specific guidance on what must be done and how it must be done. Bassioni

et al. (2005) acknowledge that one factor that enhances performance is the development of the organisation's mission, vision and values by a leader and communication of these attributes to the workforce. Pheng and Chuan (2005) conclude that thirteen factors negatively affect project performance, among which is, the non-availability of information. When this is lacking errors may occur, which may lead to poor workmanship and repetition of work. When these situations arise, the project suffers delays.

Edum-Fotwe and McCaffer (2000) identify management skills such as time management and leadership as having a positive effect on construction project delivery. Chan et al. (2004) argue that a project leader's commitment to time affects the delivery of a construction project. A work schedule is a tool that is used to monitor the progress of work. To avoid delays in project delivery, the performance of the project should be evaluated regularly on this through work schedule. This helps in identifying areas of poor performance so that the reasons for this lag in

Management of an organisation should not only be concerned about work performance but also staff welfare. Management should not turn a blind eye to staff challenges. There should be a means for the personal challenges of workers to be made known to management. The labourers and skilled labour are those who perform construction activities with guidance from management staff; therefore their health is crucial to the speedy completion of a project. All the factors discussed above are those that create job satisfaction and boost productivity.

2.4 Quality of Management During Construction

Many factors affect quality, which impedes on the construction speed of a contractor. Aiyetan (2011) gives a listing while Ponpeng and Liston (2003) conclude that the factors outlined in the following sub-sections are criteria that determine contractor's ability to deliver a project with regards to acceptable quality standards.

Scheduling of activities using the Gantt chart is an aid for an operative, smooth flow and monitoring of works during the construction stage. Arditi and Mohammadi (2002) state that timeliness is the completion of the contract as planned, and with high accuracy. That is, the ability to execute the work regarding the correct specification and quality are good indicators of a contractor's expertise.

The key parameters of delivering a project are quality, time, and cost. Therefore, it is important to analyse the various construction methods as against the volume and complexity of work. This is done, in order, to select the best delivery solution for the project. While bearing in mind the key performance parameters in doing this. Belout and Gauvreau (2003) and Proverb and Holt (2000:2) also share this view

One of the factors that may contribute to project delay is access to and from the site. A bad road surface to the site will cause vehicles to break down and result in late delivery. Materials need to be moved from one point to another on site. For example, from production point to place of incorporation on the project. Difficulty in the movement of materials will lead to late supply and ultimately result in delayed delivery of the project. This is further buttressed by Koushki and Kartam (2004) declaring that late delivery and damaged materials to site cause project delays. Besides, Pertula et al. (2003:10) report that a total of 2 945 disability days were experienced on a project over a period of eighteen months, which is traceable to accidents resulting from materials handling on site.

This refers to the chronology of work execution. The planning of activities as they should flow to avoid stoppages. The identification of the critical path contributes immensely to achieving work sequencing and maintenance of workflow. Fox et al. (2003) state that construction processes should be assessed before implementation.

The continual updating of the schedule and planning afford the opportunity of keeping the project on track. Lee et al. (2004) cite Lantelme and Formoso (2000) who declare that measurement-managed companies have proven better performance compared to their non-measurement counterparts. Pongpeng and Liston (2002) identify criteria for contractors' ability to perform with regards to a project, that monitoring is one out of five most important factors.

A project will take a longer time to complete compared with the initially planned time if activities are repeated (Hardie, 2001). The causes of these problems are the poor quality of workmanship and poor quality of material usage. The ability to quickly resolve and recover from these problems on a project is a good quality relative to the project manager. Dainty et al. (2004) specify qualities for successful project completion that a project must possess, which include analytical thinking power, information seeking and initiative. These will enhance problem-solving on site. Scott-Young and Samson (2007) postulate that there is a direct and positive relationship between effective team problem–solving and project outcomes.

The effective layout of a site is very important and afford minimum travel time and movement of materials, plant and labour (Tam et al., 2002). Different authors have varying views concerning the coordination skills of a project manager. Chan et al. (2004) note that it affects the construction of the project. Kazaz and Ulubeyli (2003) declare that the assignment of resources determines the overall duration and cost of the project. Therefore, to overcome this, there must be a good inventory system in place. Material movement schedule should be developed to monitor levels of materials at any time, to ensure a continuous flow of activities. Also, Jha and Iyer (2005) affirm that coordination among project participants and resources positively influence project delivery.

Bassioni et al. (2005) are of the view that the involvement of leaders in ensuring that management systems are developed for operations is a significant performance factor for success. For operations to flow smoothly and ensure its successful delivery, there should be a good system in place concerning command and information dissemination. Activities are executed based on information given and relative to the next operation, the quantity of materials and work crew supply. Therefore, an organogram concerning hierarchy in an organisation is needful and will assist in this regard.

3. Research Methodology

A study titled influence of management style and quality during construction was conducted at the Nelson Mandela Metropolitan University, Port Elizabeth in South Africa, to identify and assess factors influencing the delivery of project concerning these factors. The study focussed on project duration. The research methodology consists of five parts; an in-depth review of related literature; the research design; findings and discussion; conclusions and recommendations, and references. The sampling frame consist architects 1149 (obtained from the South African Institute of Architects (SAIA)); Master Builders 320 (obtained from the Master Builder's Association (MBA)); clients 161 (obtained from the South African Property Owners Association (SAPOA)); structural engineers 43 (obtained from Civil Engineers' South Africa (CESA - East Cape)), and quantity surveyors 473 (obtained from the Association of South African Quantity Surveyors (ASAQS)). From these, the sample sizes were calculated.

Probability sampling technique was employed for sample selection. For the Architects, Master Builders, and the Clients random sampling was used. Systematic sampling techniques were used for the quantity surveyors, and the structural engineers and other the entire sample were surveyed based on the recommendation of Leedy and Omrod (2014). The research instrument for this study was a questionnaire survey, which was administered to respondents through the post (Architects, Master Builders, Structural engineers, SAPOA and CESA) and e-mail (Quantity Surveyors).

Based on Griffith and Watson's categorization of leadership styles, nine (9) management styles (Set timelines, Specify goals people are to accomplish, Require regular reporting on progress, Provide specific direction, Organise the work situation for workers, Involve team members through discussion of work, Provide support and encouragement, Allow the workers to organize the work, Seek worker's opinion and concerns) were identified and presented to the respondents to indicate their influences on project delivery time. The responses were received through the same means. The questionnaire response rate according to professional obtained is architects (9), master builders (18), quantity surveyors (23), and structural engineers (23), clients (12) and others (3). A total of eighty-eight (88) questionnaires are representing 6.1% response rate achievement recorded on questionnaire administration.

The data obtained were analysed using descriptive and Inferential statistical techniques. A five-point Likert scale adjoined with 'Unsure' and 'Does not' (DN) options were employed to analyse summated scores of the respondent's responses. Given that there are five points on the scale, and that $5 - 1 = 4$, the ranges were determined by dividing four by five which equates to 0.8. Consequently, the scales and their definitions are given as follows:

- $4.20 \leq 5.00$ between a near major to major/major influence;
- $> 3.40 \leq 4.20$ between moderate influence to a near major / near major influence;
- $> 2.60 \leq 3.40$ between a near minor to moderate influence / moderate influence;
- $> 1.80 \leq 2.60$ between a minor to near minor influence / near minor influence, and
- $> 1.00 \leq 1.08$ between a minor to near minor influence.

Cronbach's coefficient test and validity test were performed and were found satisfactory. Cronbach's alpha of $\geq .97$ and factor loading of $>.60$ for samples sizes 85-89 were obtained. Based on these data obtained can be deemed reliable. It was found that majority of the respondents belong to the private sector (74%), their average working years is 17, and most are over the age of thirty (30). Respondents with Bachelor's degree predominate (25%), and who have handled not less than six (6) types of projects.

4. Findings and Discussion

4.1 Influence of Management Styles on Project Delivery Time

The study sought to find out the influence of management styles on project delivery time. The data collected in this regard is presented in Table 1.

Table 1: Mean score of the influence of management styles on project delivery time

Management styles adopted	Mean score
Set timelines	4.13
Specify goals people are to accomplish	4.06
Require regular reporting on progress	3.97
Provide specific direction	3.96
Organise the work situation for workers	3.79
Involve team members through discussion of work	3.93
Provide support and encouragement	3.85
Allow the workers to organise the work	3.79
Seek worker's opinion and concerns	3.54

Table 1 presents the respondents' rating of the influence of management styles on project delivery time in South Africa. It is notable that all factors in this category have mean scores is 3.40<Mean Score<4.20, which indicates that these factors have between a moderate to near major / near major influence on project delivery time. Nine (9) management styles were presented to the respondents for rating; out of which four (Set timelines, Specify goals people are to accomplish, Require regular reporting on progress, Provide specific direction) were derivatives of autocratic leadership styles, three (Organise the work situation for workers, Involve team members through discussion of work, Provide support and encouragement) were derived from democratic leadership styles, and two (Allow the workers to organize the work, Seek worker's opinion and concerns) from laissez-faire leadership styles. Table 1 shows that management styles derived from autocratic leadership styles were found to have the most influence on project delivery time (Mean Score is from 3.96 to 4.13). Among the autocratic-based management styles, the most influential management styles on project delivery time are setting timelines.

This finding is close in agreement with previous studies by Rojas and Aramvareel (2003) that out-of-sequence scheduling of work may result in a loss of

momentum (rhythm) per time and subsequently lost in production. This implies that to achieve meaningful progress, managers need to define the number of tasks to be performed within a specified time. Also, the result shows that the lack of specification of timelines for the performance of activities may have an adverse effect on the delivery of projects. Construction activities have been described as difficult and masculine. Therefore, to meet production targets, measures such as setting timelines are set to achieve planned production levels.

The next significant management style among the autocratic-based management styles is specifying the goals that people are to accomplish. Construction projects consist of activities, which need to be specified to workers and supervisors through information given by management for monthly, weekly or daily task executions until project completion. This is partly the reason for the need to provide a work schedule. When these details are not adhered to, it may have an adverse effect on the delivery time of projects. This agrees with the conclusion of Pheng and Chuan (2005) that the definition of goals affects project performance positively.

Require regular reporting on progress and Provide specific direction only have a moderate influence on project delivery time. A progress report is a project control system, and when the project delivery time is being monitored and controlled effectively, the chance of timely delivery is high. All the three democratic-based management styles have a moderate influence on project delivery time (Organise the work situation for workers (Mean Score=3.79), Involve team members through discussion of work (Mean Score=3.93), Provide support and encouragement (Mean Score=3.85)). This shows that the efforts by construction managers to organise tasks, involve the workers in the organisation of works, and encourage workers, contribute positively to the project delivery time. It is deduced from this result that workers value the encouragement and involvement in work planning and organisation.

The least influential management styles are found in laissez-faire-based management styles category (Allow the workers to organise the work (Mean Score=3.79), Seek worker's opinion and concerns (Mean Score=3.54)). This shows that although it is important to involve the workers in work planning, it is detrimental to the project objectives and expectations to allow the workers to be in control of the work planning and organisation. Workers are not very skilful in contributing ideas to improve work execution. Most of the workers are afraid to speak to their supervisors. These are the most likely reasons for this factor having the lowest impact on project delivery time.

4.2 Influence of Management Qualities on Project Delivery Time

The study also sought to investigate the influence of management qualities on project delivery time. The data collected in this regard is presented in Table 2.

Table 2: Mean score of the influence of management qualities on project delivery time

Management styles adopted	**Mean score**
Effectively coordinating resources	3.92
Developing an appropriate organisational structure to maintain workflow	3.88
Forecasted planning date - activity duration, resource quantities required	3. 80
Responding to recover from problems or taking advantage of opportunities presented	3.77
Monitoring and updating plans to reflect work status appropriately	3.66
Analysing of work sequencing to achieve and maintain workflow	3.66
Analysing resource movement to and on-site	3.50
Analysing construction methods	3.38

Respondents were required to rate the influence of management qualities during construction on project delivery (Table 2). Seven out of eight management qualities have Mean Score $> 3.40 \leq 4.20$, which indicates a moderate to a near major / near major influence on project delivery time. The most critical management quality as found in this study is effectively coordinating resources. The lack of effective control of resources, namely machines, materials and human resources may lead to disorder on construction sites. A clash of activities, which may, in turn, lead to a lack of materials on site and a shortage of labour on site, may, in turn, result in low productivity. These all have a cumulative adverse effect on the delivery time of the project. These findings concur with the findings of Chan et al. (2004) and Kazaz and Ulubeyli (2003). Chan et al. (2004) found that the coordinating skills of the project team leader affect the construction of a project and Kazaz and Ulubeyli (2003) are of the view that assignment decisions of resources such as labour, equipment and materials control the overall duration and cost of a project.

The next influential management quality is developing an appropriate organisational structure to maintain workflow. Construction activities are carried out by issuing instructions, and by providing guidance and support. Superiors give instructions to subordinates. The labourers and supervisors must be aware of whom they must take instructions from and whom to report. A situation where these are not well defined may lead to poor performance on the project. A well-defined organisational structure will assist in the maintenance of a steady workflow. This finding is in line with the conclusion of Bassioni et al. (2005) declaring that the involvement of leaders in ensuring that management systems are developed for operations is a significant performance factor for success

The management quality with the lowest mean score is analysing the movement of resources to and from the site. The various resources that are required on site must be estimated to avoid idleness which engenders waste. These could be in the form of time losses, which is indirectly wasting money and may lead to bankruptcy and abandonment of the project.

The findings of this study agree with most results of studies that have been conducted in different countries in the world such as Koushki and Kartam (2004) that show that late delivery and damaged materials to site cause project delays. Pheng and Chuan (2005) found that

management style adopted adversely affect workers productivity when the specification of goals workers are to achieve are not set. Relative to management quality during construction, inability to effectively coordinate resources were found to have an adverse effect on project delivery time, when adequate measures are not in place to mitigate their impact on project delivery time (Tam et al., 2002); develop appropriate organization structure (Bassiani et al., 2003), and forecasted planning date (Arditi and Mohammed, 2002).

5. Conclusion and Further Research

The study reached these conclusions that the following adversely affect project delivery time when attention is not given to them: setting timelines, specifying goals for workers, regular reporting on progress, effectively coordinating resources, developing an appropriate organisational structure to maintain workflow, and forecasting planning date. To mitigate the effect of the findings, it is recommended that weekly planning of resources and optimum gang size should be developed. This is relative to alleviating materials shortages and achievement of the target output of production, selecting adequate gang sizes to the task, and ensuring correct activity sequencing. Identification of key performance factors such as physical and socio-cultural factors that could impede on construction speed is recommended for further research.

6. Publication

An earlier version of this paper was presented at the 9th cidb PG Conference, 1-4 February 2016, Cape Town, South Africa.

References

Acebes, F., Pajares, J., Galan, J.M., and Lopez-Paredes, A. (2015). Exploring the relations between project delivery and activity duration. J.L. Ayuso Munoz et al. (eds.) Project Management and Engineering. DOI 10.1007/978-3-319-12754-5-2.

Aiyetan, A.O. 2011. Influences on Construction Project Delivery Time: Influencing Factors of Delays on Project Delivery. 1st ed VDM Publishing House Ltd., USA.

Andawei, M. M. 2003. Critical Path Method: A tool for project Delay Control. The Quantity Surveyor, 44 (3), 2-5.

Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. International Journal of Project Management, 17(6): 337-342.

Bassioni, H. A., Price, A. D. F. and Hassan, T. M. 2005. Building a Conceptual Framework for Measuring Business Performance in Construction: An Empirical Evaluation. Construction Management and Economics, (23), 495-507.

Belout, A. and Gauvreau, C. 2004. Factors influencing project success: The Impact of Human Resource Management. International Journal of Project Management, 22 (1), 1-11.

Burke, R. and Barron, S. (2007). Project management leadership. UK: Burke publishing.

Chan, A. P. C., Scott, D. and Chan, A.P.L. 2004. Factors Affecting The Success of a Construction Project. Journal of Construction Engineering and Management, ASCE 130 (1), 153-155.

Dai, J., Goodrum, P. M. and Maloney, W. 2007. Analysis of Craft Workers' and Foremen's perceptions of the Factors Affecting Construction Labour Productivity. Construction Management and Economics, (25), 1139-1152.

Dainty, A.R.J., Cheng, M. and Moore, D.R. 2003. Redefining Performance Measures for Construction Project Managers: An Empirical Evaluation. Journal of Construction Management and Economics, (21), 209-218

Darwish, M. (2017). Construction project delivery methods.https://www.researchgate.net/publication/320165827_Construction_Project_Delivery_Methods

Edum – Fotwe, F.T. and McCaffer, R. 2000. Developing Project Management Competency: Perspective from the Construction Industry. International Journal of Project Management, 18 (2), 111-124

Fox, S., Marsh, L. and Cockerham, G. 2003. Assessing the Capability of Construction Processes to Realize Building Designs. Construction Management and Economics, (21), 7-10.

Fryer, B. 2004. The Practice of Construction Management. 4th Ed, Oxford: Blackwell Publishing.

Griffith, A. and Watson, P. 2004. Construction Management Principles and Practice, 1st Ed, Palgrave Macmillan, New York.

Gonzalez, P.; Gonzalez, V.; Molenaar, K. Orozco, F. (2016) Analysis of Causes of Delay and Time Performance in Construction Projects. Journal of Construction, Engineering and Management, 140(1).

Hardie, N. 2001. The Prediction and Control of Project Duration: A Recursive Model. International Journal of Project Management (1(0, pp. 401-409.

Jha, K.N. and Iyer, K.C. 2006. Critical Determinants of Project Coordination. International Journal of Project Management, l24 (4), 314-322

Koushki, P. A. and Kartam, N. 2004. Impact of Construction Materials on Project Time and Cost in Kuwait. Engineering, Construction and Architectural Management, 11 (2), 126-132.

Lantelme, E. And Formoso, C. T 2000. Improving Performance Through Measurement: The Application of Lean Production and Organisational Learning

Principles. Proc. IGLC – 8. International Group for Lean Construction, Brington.

Lee, H., Yu, J. and Kim, S. 2004. Impact of Labour factors on Workflow. Journal of Construction Engineering and Management, 130 (6), 918-923.

Leedy, P. D. And Ormrod, J. E. 2014. Practical Research: planning and design. 10th Ed. New Jersey: Pearson Prentice Hall.

Ogunsemi, D. R. and Jagboro, G. O. 2006. Time - Cost Model for Building Projects in Nigeria. Construction Management and Economics, (24), 253 – 258.

Orozco, F., Serpell, A., Molenaar, K., and Forcael, E. 2011. "Modeling Competitiveness Factors and Indexes

for Construction Companies: Findings of Chile." Journal of Construction, Engineering and Management.

Perttula, P., Merjuma, J., Kiurula, M. and Laitinen, H. 2003. Accidents in Materials Handling at Construction Sites. Construction Management and Economics, (21), 729-736.

Pheng, L. S. and Chuan, Q. T. 2006. Environmental Factors and Work Performance of Project Managers in The Construction Industry. International Journal of Project Management, 24 (1), 24-37.

Ponpeng, J. and Liston, J. 2003. Contractor Ability Criteria: A Review from the Thai Construction Industry. Journal of Construction Management and Economics, (21), 267-282

Proverbs, D.C. and Holt, G.D. 2000. A Theoretical Model for Optimum Project (Time) Performance Based on European Best Practice. Construction Management and Economics, (17), 652-665.

Rees, W. D. and Porter, C. 2001. The Skill of Management. 5th Ed. Publishers: Thomas learning, London.

Scott-Young, C and Samson, D. 2009. Team Management for Fast Projects: An Empirical Study of Process Industries. International Journal of Operations and Production Management. 29 (6), 612-635.

Sing, T. F. 2002. Time to Build Options in Construction Processes. Construction Management and Economics, (20), 119-130.

Smallwood, J.J. 2006. The Practice of Construction Management. Acta Structilia, 13 (2), 25-42.

Toor, S. and Ofori, G. (2008). Leadership for future construction industry: agenda for autocratic leadership. International journal of project management, 26(6): 620-630.

Walker, D. H. T. and Shen, Y. J. (2002) Project Understanding, Planning, Flexibility of Management Action and Construction Time Performance: Two Australian Case Studies. Construction Management and Economics, (20), 31-44.

Yilmaz, F. 2015. Monitoring and Analysis of Construction Site Accidents by using Accidents Analysis Management System in Turkey. Journal of Sustainable Development. 8(2), 57-65.

JCBM (2019) 3(1). 45-61

University of Cape Town

Journal of Construction Business and Management

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

Frameworks for Material Waste Minimization on Nigerian Building Projects

O. J. Oladiran[1], O. E. Ogunsanmi[2] and M. O. Dada[3]

[1.2] Department of Building, University of Lagos, Nigeria.

Received 16 May 2018; received in revised form 27 July 2018; 18 January 2019; accepted 20 January 2019.
https://doi.org/10.15641/jcbm.3.1.2019.593

Abstract

A novel approach to solving waste incidence of materials on building projects is to framework the issues and processes that are involved in its minimization. The objective of the study is to develop and validate frameworks for material waste minimization in building projects. This study is a survey research in South West Nigeria. Define, Review, Identify, Verify and Execute (DRIVE) and Construction Process Improvement Methodology (CPIM) techniques were used to develop the proposed frameworks; while the validation was done by face validity and scoring model approaches. A pilot validation was done by five academics while the main validation involved 17 potential end users. Data were analysed with frequency and percentage. The study reveals that the frameworks are clear, informative, appropriate and applicable. It is concluded that the frameworks can minimize material waste at every stage of building projects. It is therefore recommended that the proposed FMWM should be adopted by all stakeholders to prevent and minimize material waste at all stages of building projects.
Keywords: CPIM, DRIVE, Frameworks, Minimization, Prevention, Waste.

1. Introduction

A framework is a schematic and interrelated processes, procedures or illustrations to achieve a goal. Material waste minimization requires a systematic arrangement of issues, such as sources and causes of waste, and minimization strategies to foster its attainment in building projects. Lu and Yuan (2011) indicate that although considerable researches have been carried out on waste management, little effort have been made in embracing all issues of waste management in form of framework. The study therefore developed an intuitive framework, not to minimize material wastage, but to understand the state of the art of the waste management studies in several journals. Dajadian and Koch (2014) also opine that construction waste potents financial and environmental problems for construction industry, which has drawn serious attention from all stakeholders globally. This has made a lot of countries to promulgate regulations geared toward minimization of waste, such as United Nations Framework Convention on Climate Change (UNFCCC), Ontario 3R Regulations (Recycling Council of Ontario (RCO), 2009), National Solid Waste Management Policy (NSWP) in Malaysia and so on. In the case of Nigeria, there are frameworks for several aspects of construction management, such as the framework for managing risk in privately financed markets projects (Awodele, 2012); but there is no framework or regulations for the minimization of material wastages in building projects. This study therefore endeavours to fill this gap, by developing and validating frameworks for the minimization of material waste on building projects in Nigeria. Building project stages in this study include client (i.e. clients' direct involvement stage), design, purchase/supply, handling and operation. Thus, the specific objective of the study is to develop and validate frameworks to minimize material waste at these five identified stages in the building projects of medium and large contractors. The problem that the study seeks to solve to minimize material wastages on construction projects through the instrumentality of frameworks. The frameworks are all encompassing and thus will be veritable tools for designers, contractors and project managers to procure projects at minimal waste generation. They will also be useful to public clients, project managers and waste managers.

2. Literature Review

2.1 Types and causes of material waste

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

Skoyles and Skoyles (1987) identify two types of construction waste, namely: structure and finishing waste. Material waste generated during the builder's work stage are termed structure waste such as concrete pieces, reinforcement and timber off-cuts, broken blocks and bricks, filtered nails and so on. Finishing wastes are those generated at the finishing stage, these include among others broken tiles and glass, smeared paints, excessive cement mortar, aluminium profiles, off-cuts of ceiling and wall finishes, packaging of public and household facilities such as gas cookers, bathtubs, washtubs, window frames and so on. Skoyles and Skoyles (1987) further group building material waste into direct and indirect waste. Direct waste is the loss of those materials which are damaged and cannot be repaired and subsequently used, or which are lost during the building process. Indirect waste is distinguished from direct waste because it normally represents only a monetary loss and the materials are not lost physically. Construction material waste can also be classified into unavoidable waste (or natural waste), in which the investment necessary for its reduction is higher than the economic benefit produced; and avoidable waste, when the cost of waste is significantly higher than the cost of preventing it. Avoidable waste is related to the level of technological development and hence the rate varies from companies to companies (Formoso, Isatto & Hirota, 1999).

Akinkurolere and Franklin (2005) revealed the sources of materials waste in South West Nigeria as storage system, transport and delivery to site, intra-site/transit, wrong specification, fixing, negligence, pilfering and theft, conversion, demolition, mismanagement of materials, wrong use, residual waste, over estimation and unskillful labourers. In the same vein, Wahab and Lawal (2011) identified over consumption of resources as the most occurred cause of material waste on other projects in South West Nigeria. This is followed in descending order by composite and the design of building, weather and inappropriate storage, mishandling or careless delivery, vandalism, rework/improve, lack of recording of materials supplied and used on site, and site office waste. Other causes identified in Wahab and Lawal (2011) include usage of wet-trade process instead of prefabricated elements and non-calculation of waste index. In another region of Nigeria, Adewuyi and Otali (2013) revealed 74 causes of waste generation in South-South Nigeria, out of which rework contrary to drawings and specifications is topmost and the least are inappropriate equipment and difficulties in obtaining work permits. Other causes in the study comprise design changes and revisions, waste from uneconomical shapes, severe weather conditions, purchase of materials contrary to specifications, using untrained labours, lack of on-site control, use of incorrect materials, overproduction, over ordering or under ordering, substitution of a material by a more expensive one, rework, poor workmanship, errors in contract documents, purchase of material contrary to specification, inadequate supervision and so on. The contractors and consultants considered all the 74 causes important in contributing to waste generation, but their degree of importance or contribution to waste generation varies.

2.2 Materials Waste Minimization

Li, Zhang, Ding and Feng (2015) posit that estimation of materials waste is sequel to its successful minimization for sustainable environment. In this regard, Dajadian and Koch (2014) highlight certain waste models to be used for waste estimation, which include average cost estimation model (ratio of total cost of waste with the total production for a period), equivalent method of cost estimation and activity-based costing model. Dajadian and Koch (2014) also posit that waste can be minimized by investment in waste management, on-site waste management or treatment locations, waste contractors, designing out waste, using the 3R's, prefabrication and Industrialized Building Systems (IBS). Investment in waste management is through assigning workers responsible for on-site waste collection, sorting and handling, purchasing equipment and machines for waste management, developing and implementing waste management plans, motivating practitioners to minimize waste and improving operatives' skills of waste handling through vocational training. On-site waste management location is required for collection and sorting to minimize waste on sites. Waste contractors are responsible for removal of waste from sites, after the waste have been collected in labeled bins according to the waste stream. Dajadian and Koch (2014) recommended having subcontractor solely meant for managing waste on a project. The waste contractor will estimate waste quantity and component in addition to periodic meeting to discuss waste. Designing out waste is designers' attempt to avoid, eliminate and reduce waste at sources. This is achievable via steel formworks; use of prefabrication and off-site prefabrication; standard component; realistic component size, capacity and specification; minimizing temporary works; optimizing design lives; specification of recycled materials in design; designing for recycling and ease of disassembly; identification of materials/products which create waste; and communication. This strategy offers the greatest opportunities for waste minimization.

Poon, Yu, Wong and Cheung (2004) note that design is the initial stage of the project that material control can be exerted to reduce large number of off-cuts during construction (Proverbs and Olomolaiye 1995; Otunola, 2004). Poon et al. (2004) observe that clients' requirements, cost effectiveness and aesthetics are factors that hinder designers from designing out waste on projects. According to Ekanayake and Ofori, (2000, 2004), and Enshassi (1996), improper designs are responsible for much of material waste on site. Akande (2000) notes that achieving minimum waste was never a priority in design in Nigeria. In the realization of this, Ekanayake and Ofori developed a Building Waste Assessment Score (BWAS) model for designers to design buildings of minimum waste generation on site. It serves as a basis to evaluate design on waste. However, the model is incomplete because it does not incorporate foundation, and mechanical and electrical (M and E) engineering works. Furthermore, Fuchs (2003) corroborated by CRiBE (2003) offers several ideas to design-out waste in construction. The 3Rs connote reduce, reuse and recycle. Tam and Tam (1994) posit that reuse, recycle and reduce are the only methods to recover waste generated, but they require coordination among

designers and constructors. Ng, Seow and Goh (2015) opine that weaknesses in the implementation on solid waste reduction through 3R among contractors in the construction industry will cause unsustainable construction waste management. Thus, Construction waste should be managed through the 3R as it is sustainable.

Ng et. al. (2015) indicate that the 3R practice is prevalent among contractors in Penang, but the percentage of construction waste that is managed through 3R practice is still very low. This is because contractors only reuse and recycle common materials like steel and wood, which make up very little of the overall amount of construction waste. The study recommends concerted efforts of all parties involved, in form of top-down approach, to overcome the challenges and practice 3R to reduce construction waste disposal in landfills. Top-down approach is a style of autocratic and hierarchical decision-making, where organizational and leadership changes in the strategy or plan are established from the top and passed down to the lower level for implementation. Government is to also enforce implementation of laws and policies to mandate contractors to implement 3R, via monitoring, guidelines, standards, incentives and penalties. Relevant bodies can also organize talks, courses, awareness campaigns, and education and training programs among contractors, in addition to the use of technology, to disseminate information and knowledge about 3R and to motivate the contractors to practice 3R. Reduce is the most effective and efficient because the cost of waste transportation and disposal are also reduced. Reusing materials reduces landfill disposal and saves cost. RCO (2009) opines that some of the wastes generated on sites have secondary market value, indicating that it is less costly to reuse them than disposal. Recycling protects the environment, thus, the Ontario 3Rs Regulations stipulates that new construction should have a definite program and efforts for reusing and recycling waste (RCO, 2009). Edwards (1999) states that the benefits of recycling include reducing the demand upon new resources; cutting down on transport and production energy costs; and using waste which would otherwise be lost to landfill sites. Manowong and Brockmann (nd) estimate that energy saving from recycling all construction waste could be 3, 553 kWh per year in Thailand. Although, some construction waste such as wood, plastic, paper and metal are used for recycling but a larger part such as concrete, cement, and bricks are sent to landfills because of lower cost and greater convenience. Tam and Tam (2006) reveal that recycling can increase contractors' competitiveness through lower production costs and a better public image. The study therefore proposes measures to improve recycling, comprising higher landfill charges, centralized recycling centre, governmental provision land for recycling plants, innovative demolition methods, locations to drop-off recyclable materials, flexible demolition periods, mobile recycling plants, reusable components, higher flexibility in receiving concrete waste in recycling plant, and balancing the supply and demand of recycled materials through legislations or incentive schemes.

Additional strategies to minimize material wastages that are apparent in previous works include waste management plan (Oladiran, 2008a; Poon et. al., 2004); waste handling methods (Motete, Mbachu & Nkado, 2003; Seydel, Wilson & Skitmore, 2002); good material ordering and storage (Ekanayake & Ofori, 2000); sub-contractor's responsibility (Proverbs & Olomolaiye, 1995) among others. This present study employs the sources and causes of materials waste indicated in this review, with all these strategies to develop and validate frameworks to minimize material waste in construction projects.

3. Research Method

3.1. Questionnaire Survey

An initial questionnaire survey was conducted in the study area, which was the entire South West Nigeria. The population of the study is spread across the South West, which consists of six states- Lagos, Ogun, Oyo, Osun, Ondo and Ekiti. The population for this study is the site managers of building projects under execution by medium and large contracting organizations in South West Nigeria. The projects used for the study were identified in the research area based on the specified requirements, since there is no list of such projects. A total of 167 building projects under execution by medium and large contracting organizations were identified and selected as sample in the research area through purposive sampling technique. A questionnaire was designed to elicit information from the site managers comprising three sections, namely, respondents' and organizations' general information (see Table 1); examination of the occurrence, impact and severity of 55 causes of material waste (severity was calculated as the product of occurrence and impact of each causes); and evaluation of the usage and effect of 40 minimization strategies. The questionnaire data were analyzed using mean, frequency, rank, and the result is presented in Table 2.

1: Project' organizations' and site managers' profile

Project Organizations.		
	Type	**Percentage**
	Indigenous	74
	Multinational	26
Age	0 – 5 years	8
	6 – 10 years	21
	11 – 15 years	31
	16 – 20 years	13
	Above 20 years	27
Staff Strength	8 – 114	90
	Above 114	10
Structure	Project	28
	Matrix	23
	Functional	28
	Mixed	21
Site Managers		
Profession	Architecture	13
	Building	32
	Civil Engineering	37
	Quantity Surveying	18
Academic Qualification	OND	2
	HND	24

	B.Sc	37
	M.Sc	35
	PGD	1
	PhD	1
Experience	0 – 5 years	18
	6 – 10 years	49
	11 – 15 years	16
	16 – 20 years	13
	Above 20 years	4
Professional Body	NIOB	33
	NIQS	14
	NIA	16
	NSE	28
	NATE	8
	ACEN	1
Grade of Membership	None	6
	Associates	25
	Graduates	49
	Corporate	16
	Fellow	4

Key: OND : Ordinary National Diploma, HND: Higher National Diploma, PGD: Post Graduate Diploma, NIOB: Nigerian Institute of Building, NIQS: Nigerian Institute of Quantity Surveying, NIA: Nigerian Institute of Architects, NSE: Nigerian Society of Engineers, NATE: Nigerian Association of Technologists in Engineering and ACEN: Association of Consulting Engineers in Nigeria

3.2. Development of the Proposed Frameworks for Material Waste Minimization (FMWM).

Problem solving methodologies are used to investigate issues by probing into existing structures and identifying areas of rectification and improvement (Straker, 1995). Define, Review, Identify, Verify and Execute (DRIVE) and Construction Process Improvement Methodology (CPIM) techniques are two of such methodologies that were used in this study to develop the proposed framework for material waste minimization (FMWM) of medium and large building projects. CPIM centers on improvement of construction process and waste reduction. The two techniques were used to set up and propose the FMWM logically and sequentially, in line with construction stages' category, based on the finding of the questionnaire survey presented in Table 2. The content of the frameworks, that is, causes, sources and minimization strategies of material waste were coined from literature and Table 2. The layout was constructed in line with the sequence of project stages reflected in Table 2. The research also explored a potential implementation strategy of the proposed frameworks.

Table 2: Severity of the causes of material waste.

SN	Causes of Materials Waste	Mean of Frequency	Mean of Impact	Severity(S)	R	OR
	Client Source.	**2.93**	**3.48**	**10.21**		**1**
1	Undue pressure to deliver	2.99	3.47	10.38	1	4
2	Expectations of too high standard	2.99	3.45	10.32	2	5
3	Delay decisions /changes	2.91	3.51	10.21	3	7
4	Undue interference with project's execution	2.84	3.49	9.91	4	9
	Design Source	**2.75**	**3.38**	**9.27**		**2**
1	Design changes and revisions	3.34	3.9	13.03	1	1
2	Lack of collaboration	3.24	3.51	11.37	2	2
3	Materials and component complexity	3.05	3.47	10.58	3	
4	Lack of or error in information on types and sizes of materials	2.83	3.61	10.22	4	6
5	Over Designing	2.74	3.51	9.62	5	11
6	Specifying materials' without considering standard sizes.	2.80	3.33	9.32	6	14
7	Lack of Contractors' influence	2.71	3.41	9.24	7	15
8	Design Coordination	2.76	3.34	9.22	8	16
9	Ineffective Communication	2.75	3.26	8.97	9	18
10	Delay in approval of drawings	2.58	3.20	8.26	10	25
11	Unfamiliarity with alternative Products	2.61	3.13	8.17	11	27
12	Incorrect /Inconclusive standard specification	2.48	3.29	8.16	12	28
13	Uncompleted Design	2.50	3.23	8.08	13	29
14	Poor site documentation	2.43	3.26	7.92	14	32
15	Designers' Inexperience	2.37	3.20	7.58	15	41
	Handling Source.	**2.52**	**3.38**	**8.51**		**3**
1	Unpacked supply i.e. loosed materials	2.81	3.61	10.14	1	8
2	Throwaway packaging	2.80	3.53	9.88	2	10
3	Poor site storage	2.50	3.49	8.73	3	21
4	Double handling	2.46	3.41	8.39	4	22
5	Too much material inventories	2.48	3.30	8.18	5	26

6	Imperfect planning of construction	2.41	3.28	7.90	6	33
7	Wrong equipment for materials' movement.	2.34	3.30	7.72	7	40
8	Unfriendly attitudes from personnel	2.35	3.11	7.31	8	47
	Purchase/Supply Source.	**2.48**	**3.28**	**8.14**		**4**
1	Delay in materials supply	2.65	3.38	8.96	1	10
2	Damage during transportation	2.60	3.44	8.94	2	20
3	Ordering that do not fulfill design	2.42	3.42	8.28	3	24
4	Lack of possibilities to order small quantities.	2.55	3.12	7.96	4	31
5	Delay in transportation and installation of equipment	2.46	3.19	7.85	5	36
6	Lack of coordination	2.39	3.26	7.79	6	38
7	Wrong ordering by Estimators.	2.32	3.14	7.28	7	48
	Operation Source.	**2.43**	**3.14**	**7.62**		**5**
1	Inclement weather	2.85	3.37	9.60	1	12
2	Workers mistake	2.65	3.40	9.01	2	17
3	Poor Workmanship	2.53	3.28	8.30	3	23
4	Equipment malfunction shortage.	2.47	3.27	8.08	4	29
5	Inappropriate /Misuse of materials	2.47	3.2	7.90	5	33
6	Damage caused by subsequent trades.	2.48	3.18	7.89	6	35
7	Too much over time for labour	2.55	3.06	7.80	7	37
8	Late information	2.48	3.14	7.79	8	38
9	Poor formwork	2.42	3.14	7.60	9	12
10	Improper planning and organization.	2.45	3.09	7.57	10	42
11	Improper sites record	2.38	3.18	7.57	10	42
12	Inexperienced inspectors	2.41	3.13	7.54	12	44
13	Poor material management practices	2.36	3.17	7.48	13	45
14	Lack of subcontractor's skills	2.40	3.07	7.37	14	46
15	Lack of supervision and skillful tradesmen	2.31	3.14	7.25	15	9
16	Misinterpretation of drawings	2.29	3.16	7.24	16	50
17	Accidents	2.36	3.06	7.22	17	51
18	Wrong construction methodology	2.27	3.16	7.17	18	52
19	Replacement occasioned by wrong materials	2.34	3.03	7.09	19	53
20	Poor site layout and setting out	2.31	2.95	6.81	20	54
21	Unnecessary people move	2.18	2.74	5.97	21	55

OR= overall rank; R = group rank; S = severity, calculated as the product of frequency and impact, also indexed as: "not sever" from 0.00 – 3.99; "low severity" from 4.00 – 8.99; "medium severity" from 9.00 – 25.00; "high severity" from above 25.00.

3.3. Validation and evaluation of proposed FMWM

A combination of face validity approach and scoring model approach was adopted in this study to validate and evaluate the proposed FMWM. Having chosen the approach, certain steps must be followed to ensure that the framework achieve its purpose (Chew & Sullivan, 2000). The first step is to identify the potential end users who will be involved in carrying out the validation and evaluation exercise. The following were the users identified: I. Indigenous contractors. II. Multinational contractors. III. Public organizations. IV. Consulting organizations. V. Client organizations. The second step is how to go about the exercise. Five academics modified the framework before proceeding to the real validation exercise by the identified users.

4. Results and discussions

4.1. The proposed FMWM for projects of medium and large contractors

The proposed FMWM pinpoints waste origins and waste routes with efforts to identify their respective waste minimization strategies. It is noteworthy that the proposed FMWM is applicable at every stage of building projects of medium and large organizations – preconstruction stage (i.e. client and design) and construction stage (purchase/supply, handling and operation).

4.2. Structure of the Proposed FMWM

The layout of the proposed FMWM is presented in Figure 1. The structure of the proposed frameworks entails two aspects:

1. FMWM levels: These comprise the main-level and subsidiary-level.

The main level outlays an overview of waste origin from all stages of building project and their waste minimization process. The subsidiary-levels comprise five components that are linked to the main-level.

2. FMWM axis: Horizontal and vertical axes representing waste origin from all stages of building project and waste minimization process respectively. The waste minimization process consists of three stages for both the main and subsidiary-levels (i.e. waste causes' identification; waste analysis and evaluation; and strategies for minimization).

The layout was constructed in line with the sequence of building project stages

4.3. Main-Level FMWM

The main-level FMWM shows waste origin from all stages of building project and waste minimization process as shown in Figure 2. The horizontal axis of the main-level FMWM comprises sources of waste from the five stages of building project, namely: client, design, purchase/supply, handling and operation. The vertical axis of the framework denotes the waste minimization process, which consists of three stages: identification of severe causes of waste; waste analysis and evaluation; and strategies for minimization. The main-level FMWM contents also link the sub-origins for each of the five sources of waste clusters and their respective strategies for minimization. The contents presented in the main-level are further elaborated within five subsidiary-level components.

4.4. Subsidiary-Level FMWM.

Each of the five low-level FMWM components presented in Figures 3,4,5,6 and 7 represents one source of waste from the five stages of building projects, namely: Figure 3: Client waste origin; Figure 4: Design waste origin; Figure 5: Purchase/supply waste origin; Figure 6: Handling waste origin; Figure 7: Operation waste origin.

The subsidiary components adopt the same structure of the main-level in terms of horizontal axis and vertical axis. All the subsidiary components and their contents emanate from Table 2. For instance, one of the client waste origin is "undue pressure to deliver" as shown in Figure 3. Table 2 reveals that undue pressure to deliver from clients is one of the most severe causes of waste on building projects (i.e. origin of waste). This occurs (i.e. the route) as a result of "prioritized targets" and "time constraints" according to experts' opinion. Therefore, the proposed strategies for minimization of "undue pressure" are "setting of good and reasonable targets" and "adequate project duration". This approach was employed to determine potential minimization strategies for each of the sub-waste origins listed in the "routes to waste origins" of all the subsidiary FMWM components.

It is very important to note that, the proposed FMWM suggests that, in addition to several lean construction techniques that have been included and explained in it already, more relevant lean construction techniques should be investigated and embedded as the need arise in all the five subsidiary components to minimize material waste. It is also noteworthy that the proposed FMWM suggests "waste analysis and evaluation" for purchase/supply, handling, operation waste origins, and also "design analysis and assessment for waste" for designs before the application of all the proposed minimization strategies. This is in accordance with the opinion that waste quantity and waste stream should be known before attempting to minimize it (Al-Moghany, 2007).

4.4.1. Client FMWM

The origin of material waste from client include undue pressure to deliver, expectation of too high standard, delay decision or changes and undue interference with projects' execution. This is presented in Figure 3.

Undue pressure: it occurs due to prioritized targets and time constraints. Therefore, good targets and adequate project duration were proposed as strategies to minimize them.

Expectation of too high standards: it occurs due to ignorance and unreasonable requirement of clients. Enlightenment of clients and setting of achievable objectives by the clients were proposed as strategies to minimize its occurrence. Delays: it occurs due to financial constraints; while realistic budget and cash flow was proposed as the strategy for minimizing its occurrence. Undue interference: it occurs due to late changes; while avoidance of late changes and project definition were proposed as the minimization strategies

4.4.2. Design FMWM

The origins of material waste from design include design changes, lack of collaboration, delay in approval of drawings, lack of standardization and others. This is presented in Figure 4.

Design changes: it occurs due to overdesign, lack of contractors' influence at design stages, non-coordination of designs, incorrect specification, designers' inexperience and site conditions. As a result, the framework proposes flexible design, collaborative design, experienced designers and site visits as strategies for minimization.

Lack of collaboration: it stems from ineffective communication, procurement method and nature of construction industry. The strategies proposed to minimize its occurrence are appropriate construction procurement, collaborative design, effective communication and reengineering.

Delay of approval of drawings: it is caused by incomplete designs, and poor site information and documentation. The strategies to handle them are timely designs and good documentation.

Lack of standardization: it occurs due to specifying materials without considering standard sizes, materials' and components' complexity, incorrect information about materials, unfamiliarity with alternative products and lack of code requirements for standard sizes. The corresponding proposed minimization strategies are designers' familiarity with and specification of standard sizes; inclusion of standard sizes in codes' requirement; compliance to codes' requirements; compatible design; and set-based design.

Others: design waste also originates from not incorporating recycling and reusage; and unnecessary temporary works. The proposed minimization strategies are concurrent design, designing for future, specifying recyclable and reusable materials and components; and elimination of unnecessary temporary works.

.

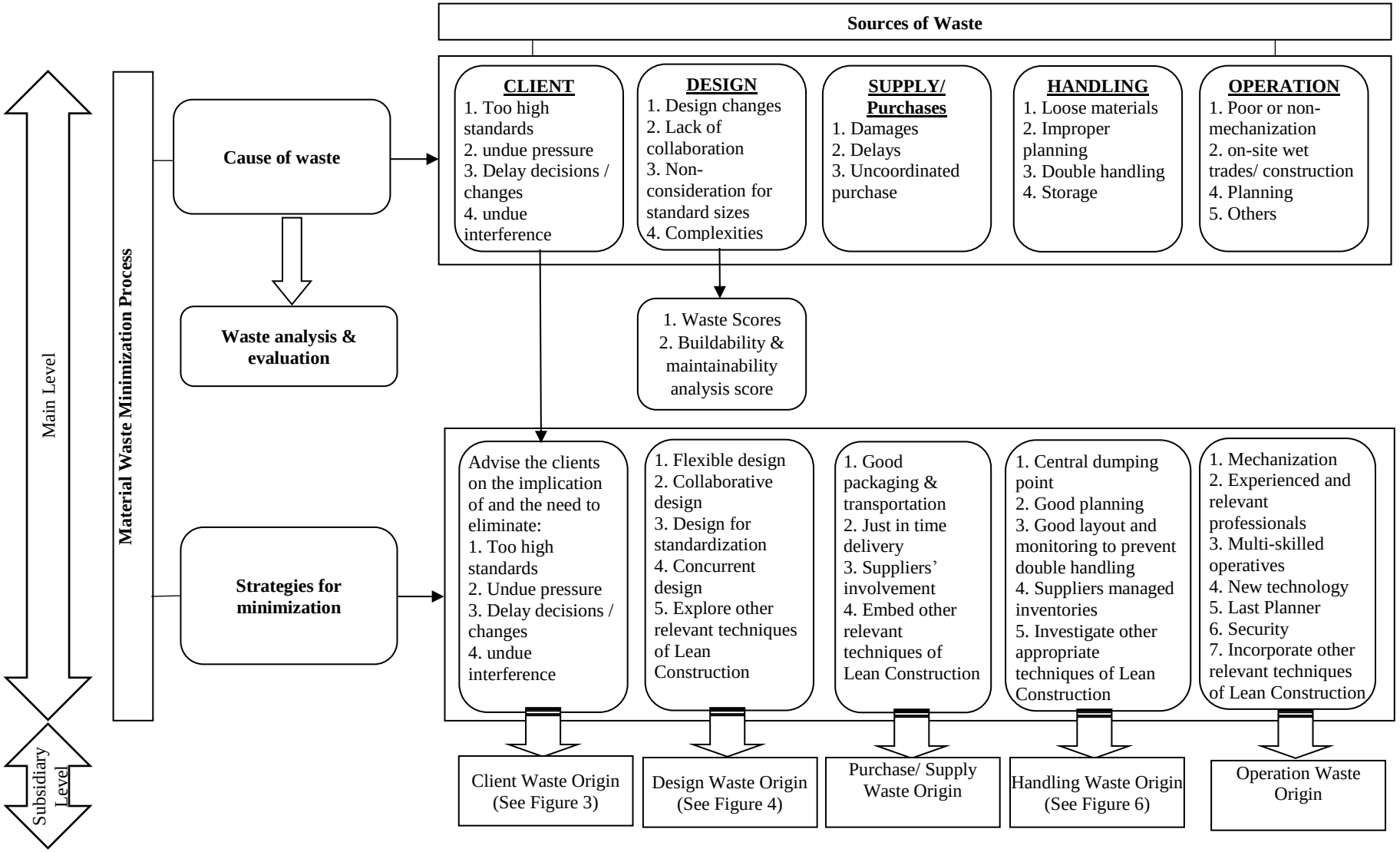

Figure 1: The link between main-level and subsidiary level of materials waste minimization framework for medium and large contracting organizations projects.

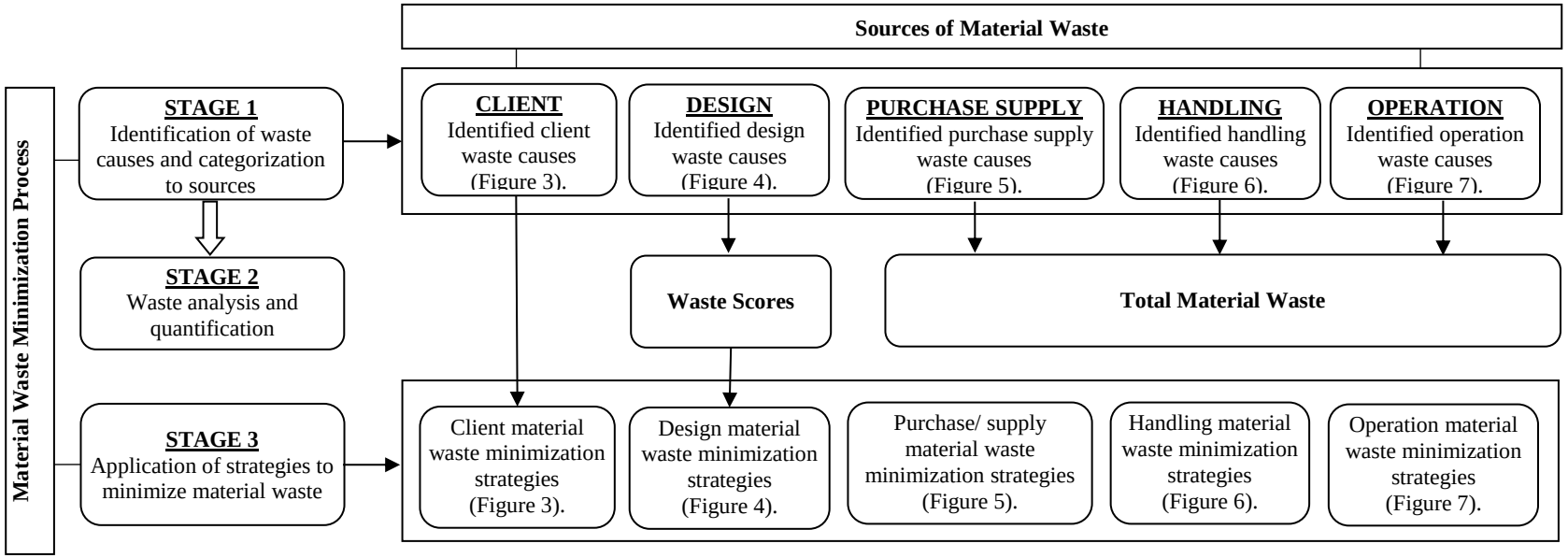

Figure 2: Framework for material waste minimization for medium and large contractors (main-level).

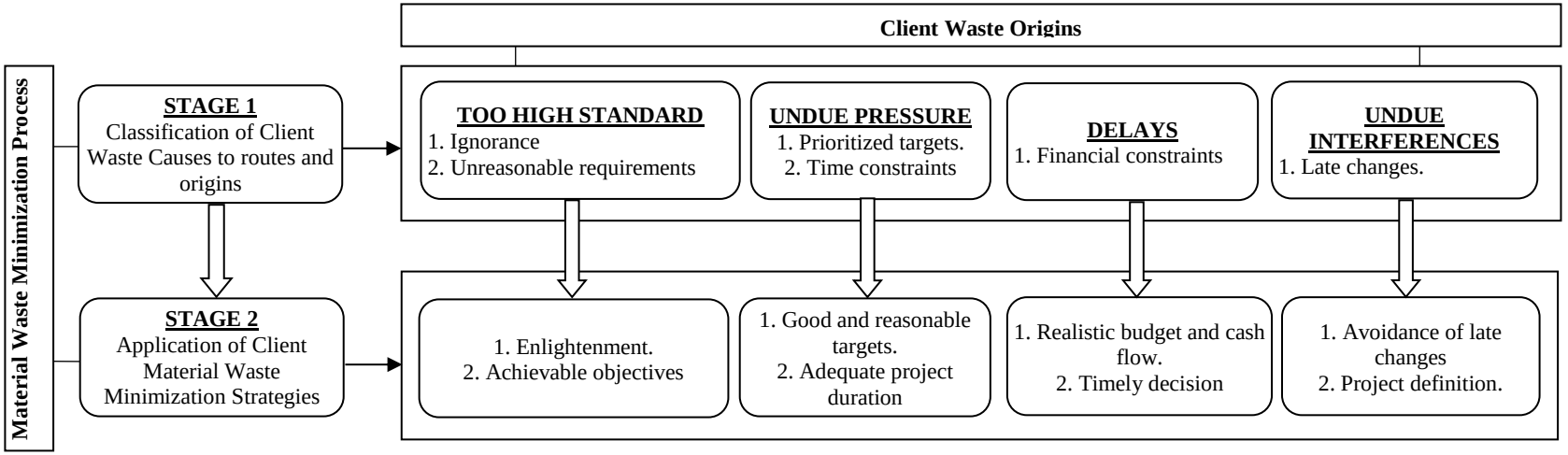

Figure 3: Client waste minimization subsidiary-level framework for medium and large contracting organizations projects.

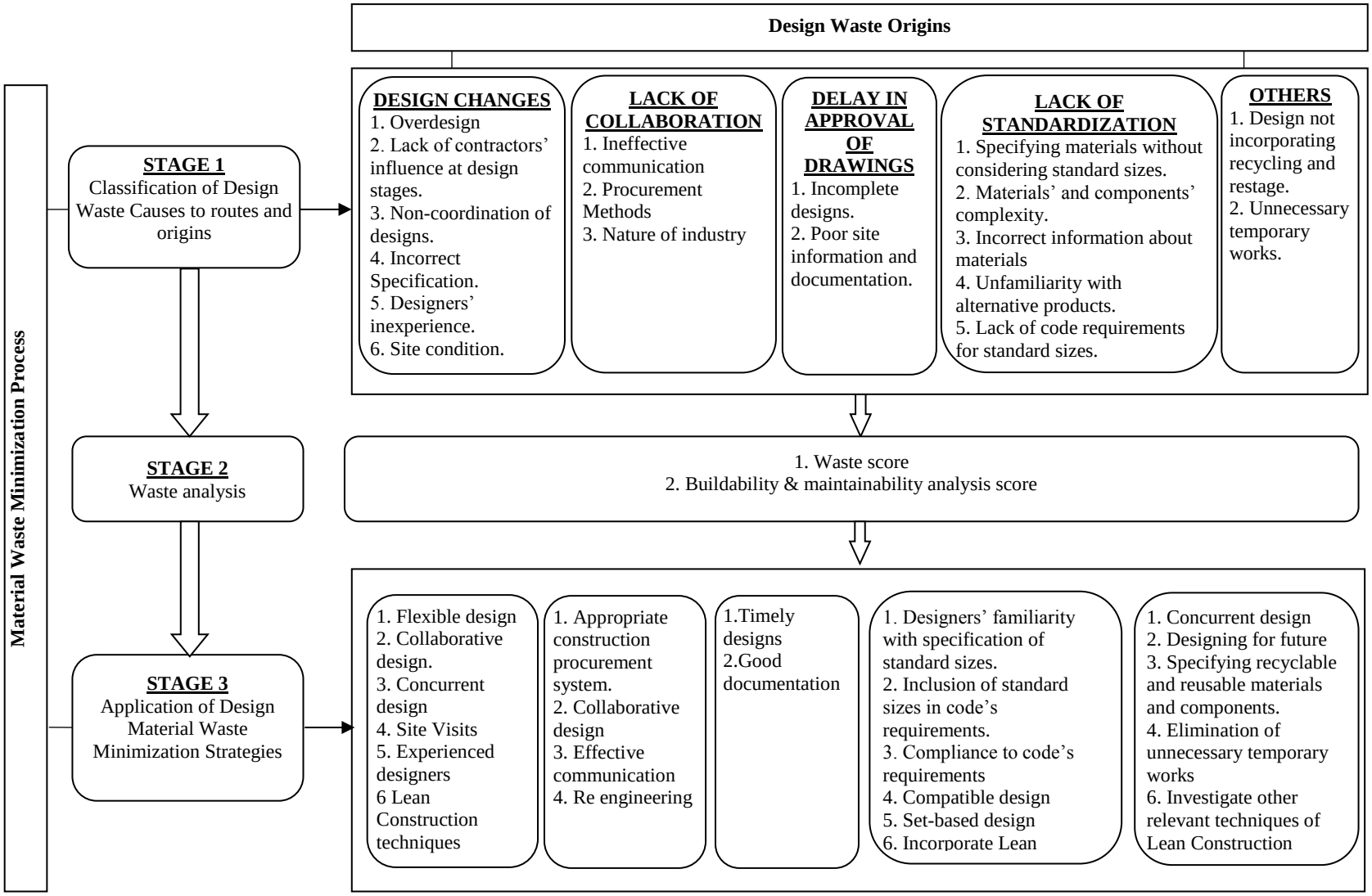

Figure 4: Design waste minimization subsidiary-level framework for medium and large contracting organizations projects.

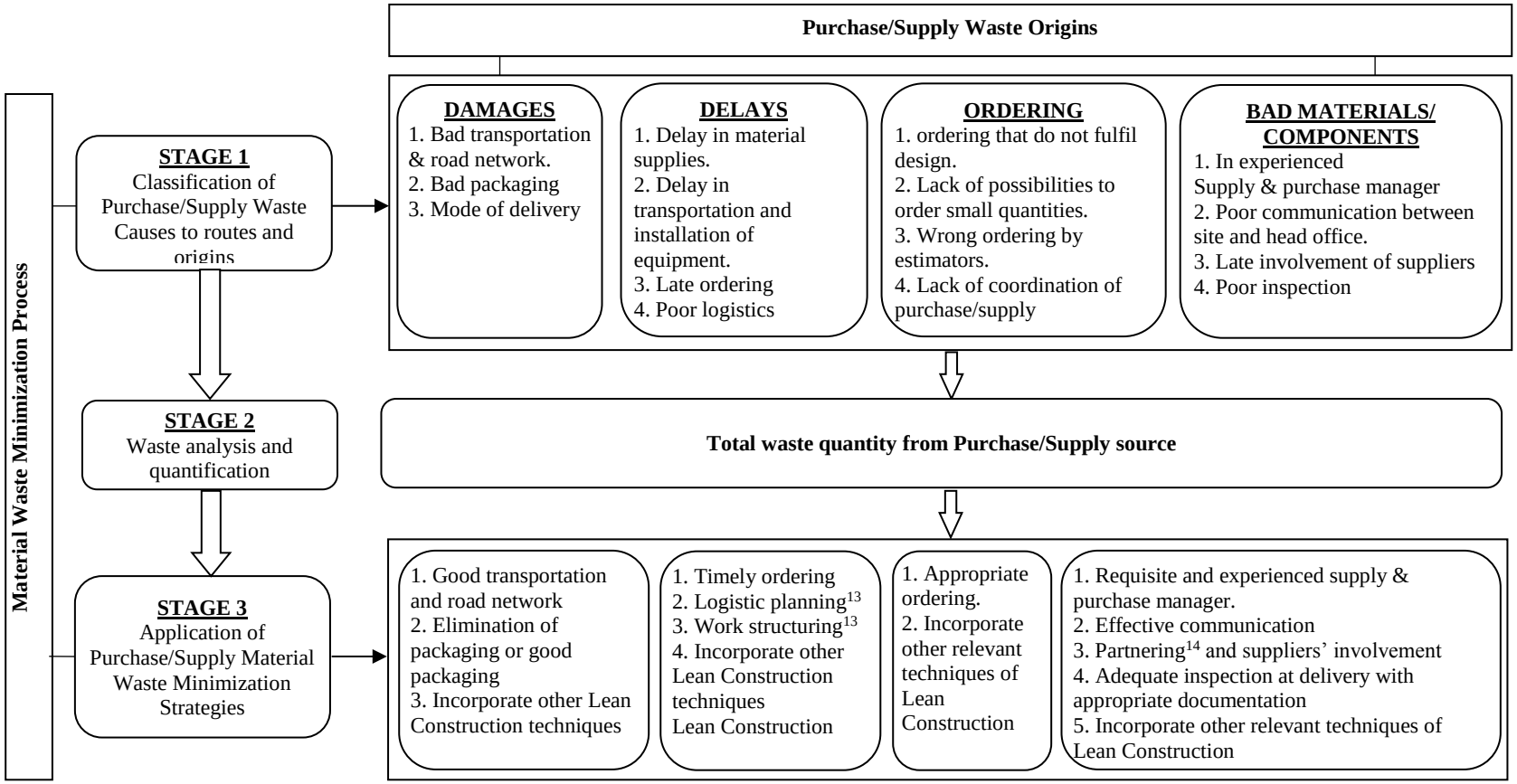

Figure 5: Purchase/Supply waste minimization subsidiary-level framework for medium and large contracting organizations projects

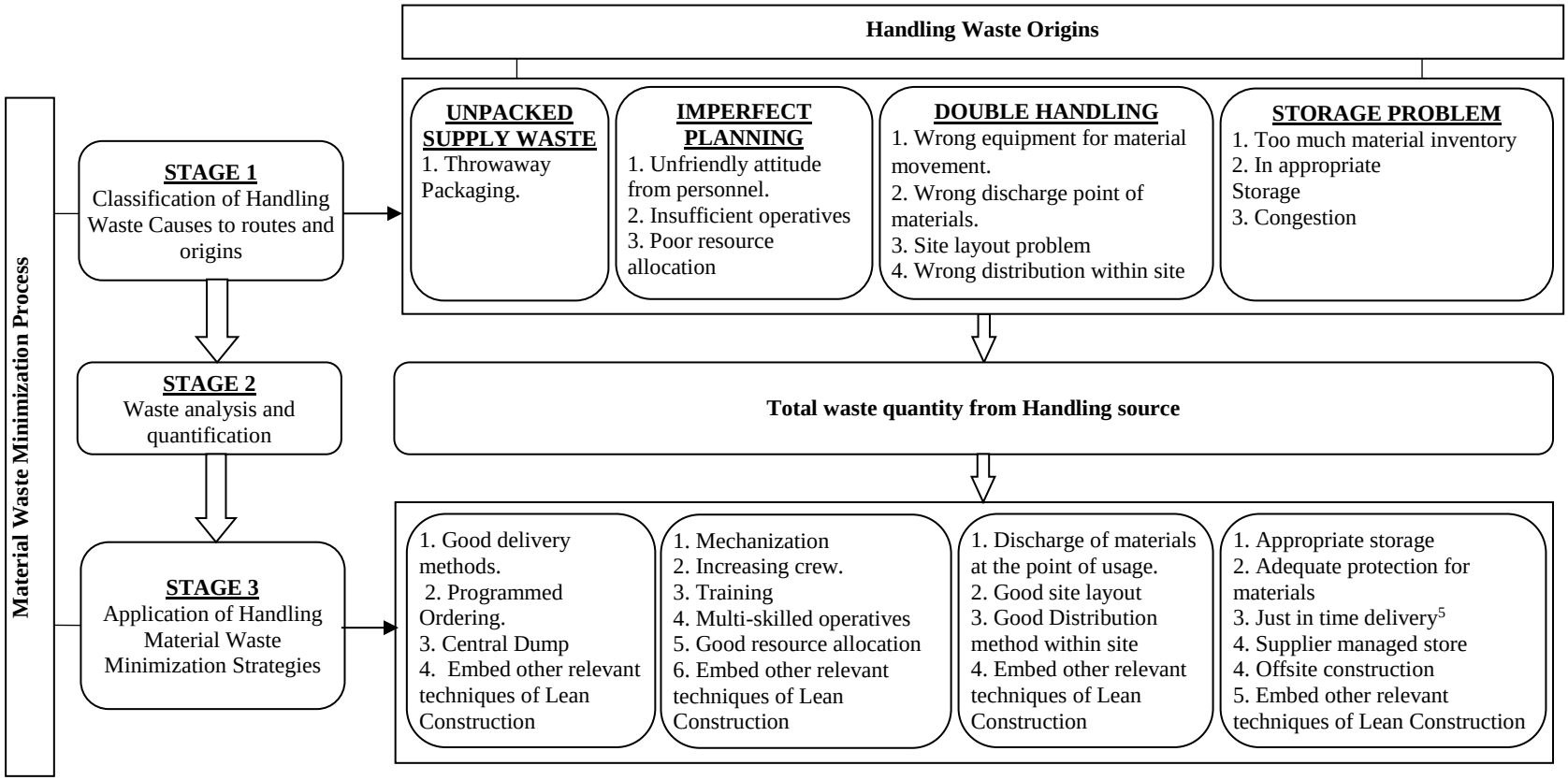

Figure 6: Handling waste minimization subsidiary-level framework for medium and large contracting organizations projects

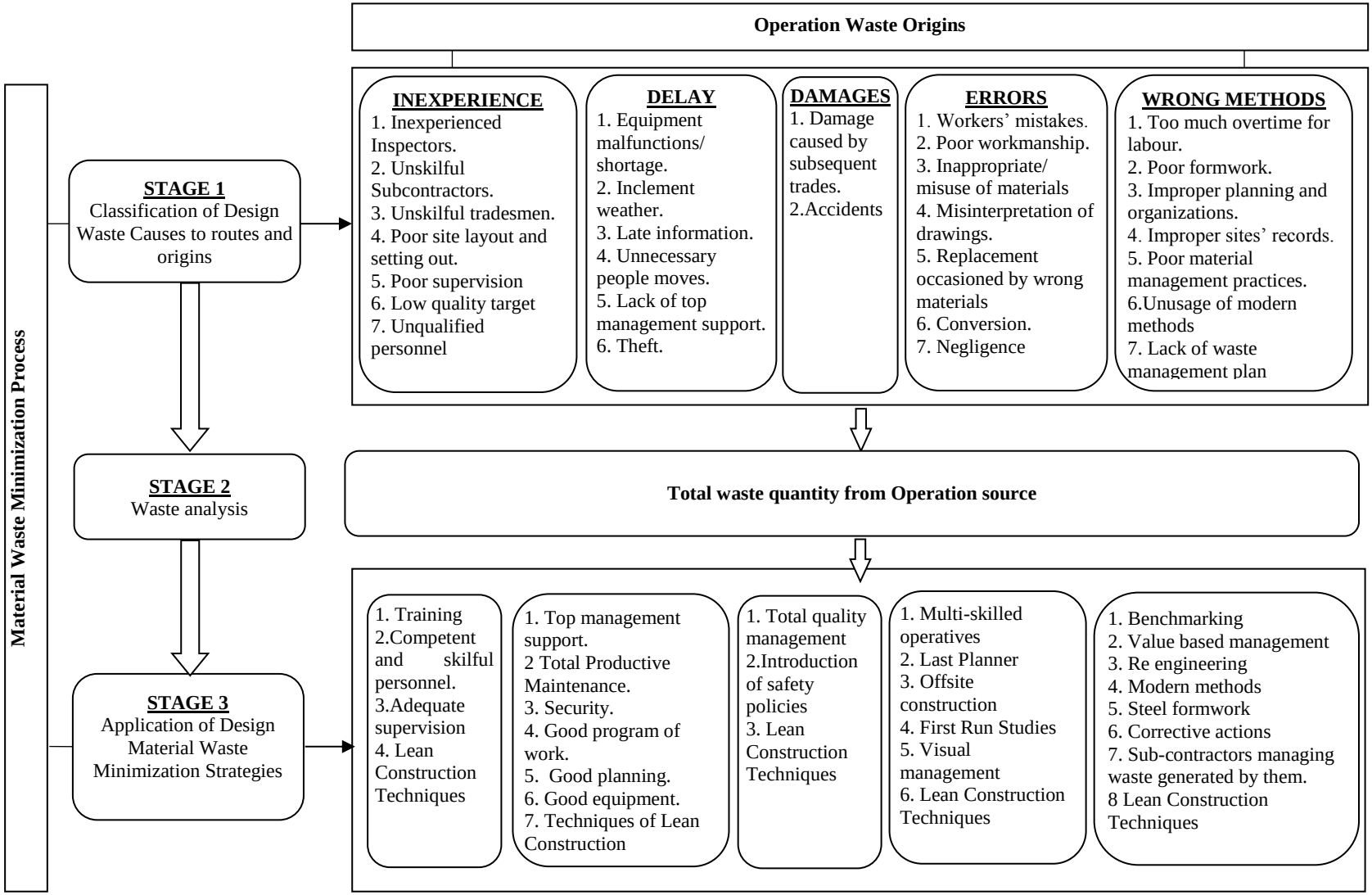

Figure 7: Operation waste minimization subsidiary-level framework for medium and large contracting organizations projects

4.4.3. Purchase/Supply FMWM

The origins of waste from purchase/supply are presented in Figure 5, which include damages, delays, bad materials or products and ordering problems.

Damages: it occurs due to bad transportation and road network, bad packaging and mode of delivery. The proposed minimization strategies consist of good transportation and road network; and elimination of packaging or good packaging. Delays: it occurs due to delay in material supplies, delay in transportation and installation of equipment, late ordering and poor logistics. The proposed minimization strategies are timely ordering, logistic planning and work structuring.

Bad materials or products: it stems from inexperienced supply and purchase manager; poor communication; late involvement of suppliers; and poor inspection. The proposed strategies for minimization are requisite and experienced supply/purchase manager, partnering and adequate inspection.

Ordering problems: they occur from ordering that do not fulfill design, lack of possibilities to order small quantities, wrong ordering by estimators and lack of coordination of purchase/supply. The proposed strategy is appropriate ordering.

4.4.4. Handling FMWM

Figure 6 presents the handling waste origins, which include unpacked supplies waste, imperfect planning, double handling and storage problems. Unpacked supplies: waste occurs through throwaway packaging. The proposed strategies for minimization in the framework are good delivery methods, programmed ordering and central dump.

Imperfect planning: it stems from unfriendly attitude from personnel, insufficient crew of workers and poor resource allocation. The proposed strategies are mechanization, increment of crews, training of operatives, multi-skilled operatives and good resource allocation.

Double handling: it occurs from wrong equipment, wrong discharge point of materials, site layouts' problems and wrong distribution of materials within site. The proposed strategies are discharge of materials at the point of usage, good site layout and good distribution method within sites.

Storage problem: it occurs from too much material inventory, inappropriate storage and congestion. The proposed strategies are appropriate storage, adequate protection for materials, just in time delivery, supplier-managed store and off-site construction.

4.4.5. Operation FMWM

The origins of operation waste presented in Figure 7 are inexperience, delay, damages, errors and wrong methods. Inexperience: it stems from inexperienced inspectors, unskillful subcontractors, unskillful tradesmen, poor site layout and setting out, poor supervision, low quality target and unqualified personnel. The proposed strategies for minimization include training, competent and skillful personnel, and adequate supervision.

Delay: it occurs from equipment malfunctions/ shortage; inclement weather; late information; unnecessary people moves; lack of top management support; and theft. The proposed strategies are top management support, security, good program of work, good planning and good equipment.

Damages: it occurs due to subsequent trades and accidents. The proposed strategies for minimization are total quality management and introduction of safety policies. Errors: they result from workers' mistakes, poor workmanship, inappropriate/ misuse of materials, misinterpretation of drawings, replacement occasioned by wrong materials, conversion and negligence. The proposed strategies for minimization are multi-skilled operatives, last planner, off site construction, first run studies and visual management.

Wrong methods: these are due to too much overtime for labour; poor formwork; improper planning and organizations; improper sites' records; poor material management practices; non-usage of modern methods; and lack of waste management plan. The proposed minimization strategies are benchmarking, value-based management, re-engineering, modern methods, steel formwork, corrective actions and sub-contractors managing waste generated by them.

4.5. Frameworks' validation.

4.5.1. Aim and objectives of the validation

The aim of the validation is to refine and assess the content and appropriateness of the proposed FMWM for medium and large contracting organizations.

The objectives of the validation are: -

1. To assess the clarity of the proposed FMWM.
2. To examine the information flow of the proposed FMWM.
3. To ascertain the appropriateness of the content and structure of the five subsidiary-level FMWM.
4. To examine the comprehensiveness of the content of the proposed FMWM.
5. To identify other waste routes, waste origins and minimization strategies that may not be contained in the proposed FMWM.
6. To identify potential implementation strategies for the proposed FMWM.
7. To find out the overall assessment and applicability of the proposed FMWM.

The validation was done in two stages, which are pilot validation and main validation.

4.5.2. Pilot Validation

Eleven academics in the University of Lagos were contacted to modify the framework out of which five of them participated. It involved them rigorously criticizing the proposed FMWM and also evaluate them via an instrument. The five researchers include a Professor, an Associate Professor, two Senior Lecturers and a Lecturer II of the University of Lagos, Nigeria. All of them hold PhD degree and their academic/research experiences range between six to over 20 years. Four of them either "agree" or "strongly agree" with the clarity of the main-level FMWM in terms of structure, content and process. Similarly, three of them either "agree" or "strongly agree" with the information flow of the main-level FMWM in terms of clarity and relationships. One each "disagree" and "neither agree/ disagree". Additionally, four of them either "agree" or "strongly agree" with the appropriateness of the five subsidiary- level FMWM in terms of clarity, familiarity and content. Again, one of

them "disagree". The opinion of the one person who disagreed was sought on improvement. His comment was that the arrow showing relationship should be improved to enhance understanding and interpretation of the frameworks. All the comments and suggestions of the academics were employed in the improvement of the proposed FMWM. One of them also commented that some of the minimization strategies (especially, lean construction techniques) should be explained in the proposed FMWM for the benefit of those who do not know them. All their suggestions were used to modify the proposed FMWM. Consequently, the proposed FMWM were sent to 25 potential end users (five each from the five categories of end users indicated earlier) with an evaluation instrument, out of which 17 were returned and found useful. The suggested measures from the pilot survey, which were used to improve the proposed FMWM prior to the main validation, are presented in Table 3.

Table 3: Improvement measures suggested from the pilot study and modification actions taken on the framework.

S/N	Proposed Improvement Measures	Modification Actions Taken
1.	Minimize the complexity arising from multiplicity of redundant elements/components.	Removal of redundant boxes.
2.	Additional indicative arrows to convey messages convincingly.	Introduction of arrows from waste quantification to strategies for waste minimization.
3.	Sequential arrangement of origins of waste under some sources of waste in the main-level framework.	Rearrangement of the design origins of waste in the main-level framework – design changes, uncollaboration, inconsideration for standard sizes were rearranged as inconsideration for standard sizes, uncollaboration, design changes.
4.	Rework some of the content.	Uncollaboration was changed to lack of collaboration,
5.	Inclusion of lean construction techniques	Additional lean construction techniques were included, with an instruction to investigate and embed relevant lean techniques in all the boxes for strategies for waste minimization.
6.	Explanation of some minimization strategies that may not be known to the respondents especially the lean construction techniques	Explanation of about 21 strategies is included as footnotes on the framework.

4.5.3. Main validation.

4.5.3.1. Demographic information of respondents

Table 4 shows the demographic information of the respondents that participated in the validation exercise. A total of 17 construction professionals were involved in the exercise out of the 25 that were contacted. 23% of them are project managers, 18% each are builders and architects while 35% and 6% are civil engineers and quantity surveyors respectively. Also, 64% have M.Sc degree, while 18% each has B.Sc degree and HND. 18% have less than 5 years construction experience, 29% have from 6 to 10 years and 53% have from 11 to 15 years.

Table 4: Demographic information of respondents

Respondents' information	Frequency	Percentage
Designation		
Project Managers	4	23
Builders	3	18
Architects	3	18
Civil Engineers	6	35
Quantity Surveyors	1	6
Profession		
Architecture	3	18
Quantity Surveying	2	12
Building	4	24
Civil Engineering	8	47
Academic qualification		
M.Sc	11	64
B.Sc	3	18
HND	3	18
Construction experience		
Less than 5 years	3	53
6 – 10 years	5	29
11 – 15 years	9	53
Category of organization		
Indigenous	12	71
Multinational	5	29
Type of organization		
Private	11	65
Public	6	35
Nature of organization		
Contracting	11	64
Consulting	3	18
Client	3	18

Moreover, 71% of the respondents are from indigenous construction organization while 29% are from multinational organization, 65% are from private organizations while 35% are from public. Also, 64% are from contracting organizations, 18% each from consulting and client organizations. The result shows that the targeted respondents are qualified to validate the proposed frameworks.

4.5.3.2. Clarity of the main-level FMWM

The respondents were asked to rate their agreement level (from strongly disagree to strongly agree) about the statements on clarity provided in the questionnaire. The result reveals that 94% of them either "agree" or "strongly agree" with the clarity of the framework in terms of structure, content, sources and causes of waste within the material waste minimization process in the main-level.

Only 6% "nether agree/disagree" just on familiarity with the content alone.

4.5.3.3. Information flow of the main-level FMWM

The respondents were asked to rate their agreement level (from strongly disagree to strongly agree) about the statements on information flow of the main-level FMWM provided in the questionnaire. The result reveals that at least 75% of the respondents either "agree" or strongly agree" with the information flow of the framework, in terms of clarity and relationship between the sources and causes of waste, and material waste minimization process in the main component.

4.5.3.4. Appropriateness of the Subsidiary-level FMWM clusters.

The respondents were also asked to indicate the appropriateness of the five subsidiary-level FMWM (from strongly disagree to strongly agree) on the statements provided in the questionnaire. The result sheds light that at least 75% of the respondents either "agree" or "strongly agree" with the five subsidiary components in terms of structures' clarity, contents' familiarity, contents' appropriateness and clarity of material waste minimization process.

4.5.3.5. Overall assessment and applicability of the FMWM

The respondents were asked to rate some framework assessment and applicability statements (FAAS), from extremely poor (1) to excellent (5), to indicate the overall assessment and applicability of the entire framework. The result is shown in Table 5. Interestingly, the result shows that all the respondents (i.e. 100%) either indicated "above average" or "excellent" for the assessment and applicability of the framework. Infact, 65% opined "excellent" on the comprehensiveness and practical relevance to material waste minimization, while over 75% also indicated "excellent" on the applicability in minimizing materials wastage.

4.6. Implementation Strategies of the FMWM

The following implementation strategies were suggested by various respondents:

1. Engagement of competent and requisite professionals for site works.
2. There is the need for usage of skillful workers.
3. Proper monitoring and coordination of material procurement.
4. Training and education on movement and storage of materials.
5. There is the need to allow suppliers to manage storage of materials.
6. Adequate planning for handling and good materials packaging.
7. Teamwork.
8. Educating workers on correct placement of materials.
9. Good material packaging and changing construction methods.
10. Mechanization or increasing crew on sites.
11. Total quality management.
12. Achievable objectives must be clearly stated for achievable goals.
13. Usage of waste audit.

The Nigerian building industry requires frameworks to forestall the incidence of material waste on building projects. Previous works on the issue of waste in Nigeria have not attempted to evolve a framework that can be used by construction practitioners to prevent and reduce material waste. Additionally, Wahab and Lawal (2011) indicate that there are no policies that mandate contractors to minimize material waste on projects. The introduction of policies will not be efficient, if there are no frameworks that synergize the key issues about waste, especially as it relates to the Nigerian context. The proposed FMWM in this study depicts factors that are germane to waste incidence and processes for their minimization. A major highlight in the framework for waste minimization apart from identifying routes of waste and minimization strategies is the analysis and evaluation of waste. This is seldom practiced in Nigeria. For instance, designs are not evaluated for waste in Nigeria. Thus, a lot of waste that could be prevented at the design stage occurs on site. Ekanayake and Ofori (2004) developed and recommended Building Waste Assessment Score (BWAS) model to evaluate designs for potential to generate waste, so as to produce designs that have less potential to generate waste. Contractors are also enjoined to employ the model to select site management techniques which help them to face the waste challenge posed by the design. Designs should also be subjected to 'buildability and maintainability analysis', which will reveal among other things, the inherent waste tendency in designs. Moreover, the frameworks suggest that clients need to be educated on the implication of their undue involvement in building projects. Additionally, a major advocate in the frameworks is the application of Lean Construction (LC) techniques in building projects in Nigeria. Polat and Ballard (2005) recommend the application of tools and techniques of LC to prevent waste from occurring by identifying the root-causes of waste and eliminating them at all stages of construction. However, Oladiran (2008b) reveals that LC is alien to the Nigerian building industry; while the study also indicates the barriers and implementation strategies for LC in Nigeria, of which is education and skill development on LC. Thus, there has been growing interest, research and development on LC in Nigeria; hence its inclusion in the frameworks. Furthermore, the validation exercise reinforces the need, relevance and appropriateness of the frameworks. The validation exercise highlights various implementation strategies for them. The practical relevance of the framework can be seen in the evaluation and comments of the potential end users. The following comments were made on the frameworks by some of the respondents:

i. If the frameworks are fully implemented on site, waste will be minimized on construction sites.
ii. The frameworks are implementable on construction sites and must be effectively practiced.
iii. They are good frameworks.
iv. The information and the flow is self explanatory.
v. There is thorough research and comprehensive details about the framework. The report surely is understandable and obtainable.
vi. They are satisfactory.

5. Conclusion and Recommendations

The study opined that frameworks that can be used to minimize material wastage on projects do not exist in Nigeria. This gap was filled by the frameworks provided in the study. The frameworks can be used to minimize material waste at every stage of building projects. They suggest that material waste minimization does not start from the sites, but from the clients to everyone involved in the execution of building projects. Thus, all stakeholders need an understanding of the issues, content and processes of the framework for effective minimization of material wastage. The study recommends that the proposed FMWM should be adopted by all stakeholders to minimize material waste at all stages of building projects. It should also be adopted to formulate policies for waste minimization. Practitioners should be sensitized to the potential gains of the proposed framework to minimize material wastage.

6. Further Area of Research

The proposed frameworks were validated using face validity and scoring model approaches as suggested and used in previous works (Sargent, 2005; Awodele, 2012; Gamage, 2011). It is important to validate them on real life projects for improved objective assessment. Future research will therefore focus on validating the frameworks on case projects to further ascertain its applicability and effectiveness.

References

Adewuyi, T.O., & Otali, M. (2013). Evaluation of causes of construction material waste -- case of Rivers State, Nigeria. Ethiopian Journal of Environmental Studies and Management, 6: 746 – 753.

Akande, O.A. (2000). Estimating the percentage wastage of materials in tendering- case of concretework and blockwork. (M.Sc project report). University of Lagos, Yaba, Lagos, Nigeria.

Akinkurolere, O.O. & Franklin, S.O. (2005), Investigation into Waste Management on Construction Sites in South Western Nigeria. American Journal of Applied Sciences 2 (5): 980-984.

Al-Moghany, S.S. (2006). Managing and minimizing construction waste in Gaza Strip. (M.Sc project report). Islamic University of Gaza – Palestine.

Awodele, O.A. (2012). Framework for managing risk in privately financed market projects in Nigeria. (Doctorate Thesis), Heriot-Watt University.

Centre for Research in the Built Environment (CRiBE) (2003). Construction waste minimization - Good Practice Guide."

Chew, J. & Sullivan, C. (2000). Verification, validation, and accreditation in the life cycle of models and simulations. In: Awodele, O.A. (2012). Framework for managing risk in privately financed market projects in Nigeria. (Doctorate Thesis), Heriot-Watt University.

Dajadian, A.D. & Koch, D.C. (2014). Waste management models and their applications on construction sites. International Journal of Construction Engineering and Management, 3(3), 91-98.

Edwards, B. (1999). Sustainable architecture: European directives and building design. 2nd ed., Oxford: Architectural Press.

Ekanayake, L.L., & Ofori, G. (2000). Construction material waste source evaluation. Proceedings from 2nd Southern African conference on sustainable development in the built environment: strategies for a sustainable built environment, Pretoria, South Africa, August 23 -25: 1 – 6.

Enshassi, A. (1996). Materials control and waste on building sites. Building Research Information, 24(1), 31-34.

Ekanayake, L. L., & Ofori, G. (2004). Building waste assessment score: design-based tool. Building and Environment, 39: 851-861.

Fuchs, R. (2003). Avoiding construction waste. New Zealand: Building Biology and Ecology Institute.

Formoso, C. T., Isatto, E. L., & Hirota, E. H. (1999). Method for waste control in the building industry. Proceedings of International Group for Lean Construction – 7, University of California, Berkeley, CA, USA, July 26 – 28, 325 – 334.

Gamage, I.S.W. (2011). A waste minimization framework for the procurement of design and build construction projects. (Doctorate Thesis), Loughborough University.

Li, Zhang, Ding & Feng (2015). Developing a quantitative construction waste estimation model forbuilding construction projects. Resources, Conservation and Recycling, 106 (2016) 9–20.

Lu, W. & Yuan, H. (2011). A framework for understanding waste management studies in construction. Waste Management, 31 (6), 1252-1260.

Manowong, E & Brockmann, C. (nd). Construction Waste Management in Newly industrialized countries. Retrieved on 26/07/2108 from: https://www.irbnet.de/daten/iconda/CIB_DC24555.pdf

Motete, L., Mbachu, J., & Nkado, R. (2003). Investigations into material wastage on building sites. Proceedings of CIDB 1st postgraduate conference, Port Elizabeth, South Africa, October 14, 1 – 10.

Ng, L. S., Seow, T. W. & Goh, K. C. (2015). Implementation on solid waste reduction through 3R (NSWM Policy) and elements to close gap between policy and contractors in construction industry in Penang. International Journal of Environmental Science and Development, 6(9), 668 – 675.

Oladiran, O.J. (2008a). Optimization of waste management plan for waste reduction on construction projects in Nigeria. Proceedings: International conference on innovation in Architecture, Engineering and construction, June 23-25, Antalya, Turkey.

Oladiran, O. J. (2008b). Lean -In- Nigerian Construction: State, Barriers, Strategies and "Go-To-Gemba" Approach. Proceedings of the IGLC –16, Manchester, UK..

Otunola, A.T. (2004). The use of waste recycled materials in the construction industry. (Unpublished M.Sc project report). University of Lagos, Yaba, Lagos, Nigeria.

Poon, C. S., Yu, A. T. W., Wong, S. W., & Cheung, E. (2004). Management of construction waste in public housing projects in Hong Kong. Construction Management and Economics, 22(7): 675-689.

Polat, G ., & Ballard, G . (2005). Waste in Turkish construction: Need for Lean Construction techniques. Proceedings of International Group for Lean Construction – 13, Sydney, Australia, July 18 – 20, 1 – 14.

Proverbs, D. , & Olomolaye, P. (1995). Organizational Productivity – A case study of materials management in UK construction firms. Proceeding of 1st International Conference on Construction project management, Singapore, January.

Recycling Council of Ontario (RCO) (2009). 3Rs for construction and demolition projects. Ontario: Queen's Printer

Sargent R. G. (2005). Verification and validation of simulation models. In: Awodele, O.A. (2012). Framework for managing risk in privately financed market projects in Nigeria. (Doctorate Thesis), Heriot-Watt University.

Seydel, A. Wilson O. D. , & Skitmore, R. M.(2002). Financial evaluation of waste management methods. Journal of Construction Research, 3(1): 161-167.

Skoyles, E.R.,& Skoyles, J.R. (1987). Waste prevention on site. London: Mitchell Publishing.

Straker, D.1 (995). A tool book for quality improvement and problem solving. London: Prentice Hall.

Tam, V.W.Y. & Tam, C.M. (2006). Evaluations of existing waste recycling methods: A Hong Kong study. Building and Environment, 41(12), 1649-1660.

Tam, V.W.Y. & Tam, C.M. (1994). A Review on the Viable Technology for Construction Waste Recycling. Proceedings of the first international conference of CIB TG 16 , Centre for Construction and Environment, Ganiesville, Florida

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