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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.

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Editorial

Welcome to the sixth issue of the Journal of Construction Business and Management. This issue will contribute scholarly discussion to the theoretical and methodical challenges impacting construction business management research and practice. The focus is to enhance the theoretical foundation for potential explanations to the various issues affecting construction operations towards assisting in the achievement of characteristics required for efficient construction organisations, projects, developments and resource use. The topics covered in this issue are related to corporate organisational effectiveness, quality management, maintenance performance, growth of the built environment professions, building regulations and contractor's risk attitudes. The issue contains six articles that were written by fifteen scholars based in Kenya, Malaysia, New Zealand, Nigeria and South Africa.

The first paper by Ogbu and Olatunde evaluates the measures of corporate Organisational Effectiveness (OE) of Small and Medium-sized Enterprise (SME) contractors. The study found out that the SME contractors' corporate OE can be measured by using corporate advantage, firm experience, certification and owner background. Also, a significant relationship was found between the OE of the firm and measures of project performance. They posit that better firm experience alone does not necessarily improve a contractor's project performance. Paper two by Abdullahi, Bustani, Hassan and Rotimi assessed the quality management practices of Nigerian construction firms. Their study revealed that inspections and statistical quality control techniques are the most widely used quality management tools by construction firms in Nigeria. Abdullahi et al. conclude that there is a low uptake of quality management practice principles within construction organisations in Nigeria and proffered solutions to mitigate these challenges. The paper by Ajayi, Koleoso, Ajayi and Faremi evaluates the satisfaction ratings of the maintenance performance of prison facilities in South-Western Nigeria. The study revealed that prison staff were satisfied with the level of cleanliness, quality of water and control of ventilation; and partially satisfied with twenty-nine other criteria that were assessed. Ajayi et al. conclude that there is a need for continuous evaluation of prison facilities to ascertain their condition and performance levels.

The fourth paper by Manchidi and Rwelamila examines the growth of professions as a consequence of the division of expert labour evolving to fill in knowledge gaps created by emergent social forces as other knowledge areas are rendered less relevant. The study shows how professional work negatively impacts on the delivery efficiencies in the project as a temporary organisation. Also, the study explains how boundary margins keep professions relational and how the dynamics of boundary work unfold in a territorial space in a project (meso) environment. The study by Omollo the author of the fifth paper investigates key barriers to the effective regulation of the building construction industry in Kenya. The article reveals that ineffective regulation of the construction industry was prompted by joint activities of building development contractors and the limitation of the National Construction Authority (the regulator). While building development contractors were found to be non-compliant with the building regulations, while the National Construction Authority fail to enforce the rules. Omollo concludes that regular monitoring and enhanced enforcement would promote compliance and sensitisation of contractors with applicable standards. Lastly, the paper by Taofeeq and Adeleke examines the factors affecting contractors' risk attitudes in the Malaysian construction industry. Taofeeq and Adeleke found that the four leading factors influencing contractors risk attitude in the Malaysian construction industry are project-related, working capital, human-related factors and the external environment. The findings suggest that knowledge of these factors will help contractors' decision-making processes in project management.

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

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Relationship Between Organisational Effectiveness and Project Performance of SME Contractors: a Developing Country Perspective

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Abstract

Organisational effectiveness (OE) theory provides a veritable framework for examining organisational performance. This theory has, however, made a very little inroad into construction management literature, and there are limited discussions on the domains within which construction firms can measure their OE. Besides this, the extent to which corporate OE determines a contractor's project performance is not fully understood, primarily, in the small and medium-sized enterprise (SME) contractor context. Based on data from 53 projects in higher institutions in Nigeria, this study evaluated the measures of corporate OE of SME contractors and examined the contributions of the corporate OE of the firms to their project performance. By factor analysis, it was discovered that the SME contractors' corporate OE can be measured using corporate advantage, firm experience, firm certification and firm owner background. Using canonical correlation, a significant relationship was found between the OE of the firms and the measures of project performance. The analysis further revealed that project cost and quality performances are bettered by increases in firm certification and experience, although time performance tends to worsen as a result. In addition to identifying the domains for measuring an SME contractor's OE, this study shows that better firm experience does not necessarily improve a contractors' project time performance. Construction stakeholders and the public should beware of firms that only boast of an excellent corporate advantage and ownership by prominent persons in the society, but without adequate experience and certification.

Keywords: Corporate Advantage, Firm Experience, Project Performance

1. Introduction

Organisational effectiveness (OE) is a critical concept in organisational theory (Upadhaya, Munir, & Blount, 2014). As the ultimate criterion variable in empirical organisational studies, OE is generally accepted to be a potent theoretical tool for evaluating firm processes, structures and outcomes (Martins & Coetzee, 2009; Upadhaya et al., 2014). The sparse use of OE theory in assessing construction firms' project performance in construction management literature partly motivated this study (e.g. Kiziltas, Dikmen, & Birgonul, 2003; Love & Skitmore, 1996). Construction firms are critical to the attainment of economic development by any nation, being the constructors of the infrastructure required to drive growth in other sectors of an economy. This genre of firms are often chided for being slow in the execution of projects (Aibinu & Jagboro, 2002), unethical (Alutu, 2007), having poor safety performance (Ng, Cheng & Skitmore, 2005), lagging in innovation (Winch, 1998; Dainty et al. 2017) and threatened by high employee turnover rates (Loosemore, Dainty & Lingard, 2003). A robust assessment of the effectiveness of construction industry firms that is grounded in OE theory will potentially point out the organisational traits responsible for the identified issues. This study was conceived to contribute in this regard.

Also, it is firmly established that the problem of low OE tend to be more prevalent in terms of spread and intensity among small and medium-sized enterprise (SME) construction firms (Dainty, et al. 2017; Acar et al. 2005; Nelson et al. 2007). Clough, Sears and Sears (2000) and Enshassi, Al-Hallaq, and Mohamed (2006) asserted that construction contracting businesses have the second-highest failure rate of any business, exceeded only by restaurants. In developing countries, the organisational deficiencies of SME contractors are often more pronounced due to the business environment of these

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nations (Ofori 2000; Kheni, Gibb & Dainty, 2010; Ogbu, 2018). Frequently, the firms are owner-managed; they show a preference for poorly trained labour (Dainty et al. 2017) and have low appurtenances of formality. Construction SMEs in developing countries are comparatively poorly studied (Kulemeka, Kululanga and Morton, 2015). Conceptually, the organisational deficiencies of SME contractors have implications for their levels of project performance. It is easily noticeable that irrespective of those deficiencies, most studies evaluating project performance in developing countries hardly consider the effectiveness of the contractor's organisation as a critical contributory factor (for instance Ameh, Soyingbe & Odusami, 2010; Kulemeka et al. 2015; Odediran & Windapo, 2014). This is unlike firms in developed countries for which Brush, Bromiley, and Hendrickx (1999) presented broad arguments for and against the explanatory relevance of corporate efficiency variables to business segment performance. It is intended to narrow this research gap in the context of developing countries in this study.

SMEs in developing economies are strategic to the development of the construction sector. They foster the spread of construction activities and the development of a country's construction industry (Ofori, 1991; Abor & Quartey, 2010). Construction SMEs are a good source of employment due to the ease with which they can be established, and their labour-intensive nature (Cook & Nixson, 2000). Usually, the definition of SMEs differs in different jurisdictions (Dainty et al. 2017). Based on the headcount of employees of the firms, European Commission (2003) divided firm sizes into the ranges of <10 (micro), <50 (small) and <250 (medium). In a Ghana-based study, Kheni et al. (2010) conceived SMEs as ≥30 ≤199 employees (medium), ≥10≤29 employees (small) and ≤9 employees (micro) firms. It may aid future studies to define SMEs differently for firms in different industries. For instance, Dainty et al. (2017) noted that the European Commission's (2003) definition renders almost all construction firms micro and small firms. For Nigeria, Bank of the Industry (2018) categorised SMEs as ≤10 employees (micro), >11≤50 employees (small) and >50≤ 200 employees (medium), which is not too different from the classification of the European Commission (2003). Employees in a typical indigenous construction firm in Nigeria hardly exceed 200 persons. Previous studies classified indigenous construction firms in Nigeria as SMEs as a result (Ogbu, 2011; Idoro, 2012).

Nigerian indigenous SMEs are given a preference in the award of public sector contracts (the Federal Republic of Nigeria, 2007). Yet, they are also known to have poor project outcomes in terms of quality, cost and speed, and to lack the capacity to handle complex projects (Ofori, 1991; Idoro, 2010; Ibrahim, Githae & Stephen, 2014). Most studies (Hwang et al. 2009; Song, Mohamed, and AbouRizk, 2009) investigating the project performance of construction firms focused on predicting only one variable at a time. This ignores the reality that these variables alter simultaneously and relatedly, rather than independently, and variations in one of the variables affect the others. For instance, when cost performance changes, it is likely to affect quality and time performances. In a United Kingdom-based study, Alzahrani and Emsley's (2013) modelled the probability of construction professionals' agreement that contractor attributes affect project success using ordinal logistic regression. A research gap exists to model the relationship between contractors' OE and project performance (measured at interval and ratio scales) using canonical correlation. Such an analysis will retain the relatedness among the performance measures (quality, time and cost), and offer insights into their behaviour under the influence of a construction SME's corporate level OE (based on the firms' owners' and the firms' characteristics). This result will be beneficial to construction clients in selecting contractors (Khosrowshahi, 1999), and to the contractors themselves in improving on their firm effectiveness. This research, therefore, evaluates the measures of corporate OE of SME contractors, and determines the contribution of the latter on the project performance of SME contractors.

2. Organisational Effectiveness

OE has been defined in different ways in literature. Georgopoulos and Tannenbaum (1957:2) explained that OE indicates how well an organisation is doing. The study defined OE as, "the extent to which an organisation as a social system, given certain resources and means, fulfils its objectives without incapacitating its means and resources and without placing undue strain upon its members." This view of OE emphasises goal achievement and aligns with Etzioni's (1964) assertion that OE is the degree of goal realisation. However, it also highlights the state of the organisation's "means" (processes) and "resources" at the time of goal realisation. Argyris (1964: 123) expressed OE as a condition where the firm increases its outputs with constant or decreasing inputs or has a continuous output with decreasing inputs. Holbeche (2012) did not dispute these definitions but suggested that the focus should not only be on the short-term results, but also on how the result is gotten through people.

Two distinctive perspectives to OE are revealed by the preceding definitions – the input perspective and the output perspective. These two perspectives shall be explored in this study. Yukl (2008) lumped these perspectives together by describing OE as the extent to which an organisation can survive, perform its mission, and maintain favourable earnings, financial resources, and asset value. The input side of OE comprises the firm's internal composition, resources and socio-economic system (corporate OE), while the output side consists of the results obtained from the deployment of those resources in the socio-economic context of the firm. In the end, a firm's bargaining position in a given environment is an expression of the efficiency of the firm's corporate OE (Yuchtman & Seashore, 1967). Kiziltas et al. (2003) noted that in the construction industry, the activities taking place in the firm at the corporation level usually is responsible for the value created at the site level. The effectiveness of a construction firm can be judged from three perspectives, namely: 1) efficiency and adequacy of internal processes relative to the competition, 2) firm performance, 3) project performance. Cameron (1980) christened these processes as the "system resource, internal process and organisation approaches", "goal-

oriented approach" and "strategic constituency approach" respectively. Using the system resource, internal process and organisation approach, for instance, one can carry out a study to investigate the adoption of best practices within a construction firm. Such a study will typically use multiple criteria to examine the efficiency of issues like leadership within the firm, human resource management, organisational culture and climate, and so on. Studies focusing on firm performance (goal-oriented approach) will probably look at annual turnover, a number of employees, profit to asset ratio, profit before tax, employee turnover, among others (Darwisha, Singh & Mohamed, 2013). These performance indicators do not reflect the firm's performance in any individual project but measure the aggregate outcome of the firm's business activities in a given period. Contrastingly, project performance measures relate to the outcome of individual projects handled by the firm from the client's (strategic constituency's) perspective. Common variables in this type of assessment include time, quality and cost. This study is interested in how corporate level resources relate to the project performance of SME contractors.

Kiziltas et al. (2003) used a plethora of variables classified as an organisation and its subsystems, business environment, macro environment and general characteristics in their assessment of the OE of Turkish construction firms. Contrastingly, it is argued here that the external environment influences a firm's project performance by affecting the firm at the corporate level given that entrepreneurs will usually select firm resources based on socio-economic constraints (Buyinza and Bbaale, 2013) (see Figure 1). Socio-economic context is a determinant of the characteristics of persons that can own firms and the characteristics of the firms themselves. In some climes, for example, women may not own construction firms due to their social status. Likewise, a certain level of industry work experience or educational qualification is required of persons seeking to register as contractors. Other choices in terms of a firm's internal resources will also be detected by the particular requirements of the industry in which the firm intends to operate. Thus, the impact of external factors on the project performance of firms is moderated by the firm's internal resources and corporate resilience. This research focuses on how the site level performance of the firms (OE measured from the client's perspective) is affected by the corporate OE of the SME contractors (measured from the contractor's perspective).

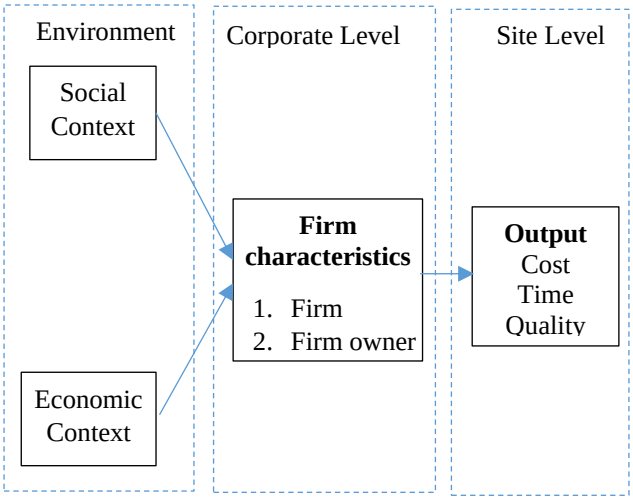

Figure 1 Conceptual Framework of the Study

3. Measures of SME Contractors' Organisational Effectiveness

Disagreements existed earlier in OE literature on the best domain of an organisation to focus OE assessment, (Cameron, 1986; Love and Skitmore, 1996), but this should no longer be the case. Organisations exist for certain purposes and are intended to affect and be affected by some stakeholders or constituencies. This heterogeneity in terms of "objects, subjects and outcomes" creates asymmetry in the applications of the OE theory for the assessment of firms in different industries (Cameron, 1980). Cameron and Whetten (1983) and Cameron (1986) posed seven questions to help evaluators to delimit their variables when assessing a firm's OE. The questions and their answers relative to this study have been stated in Table 1.

Table 1: Critical questions to answer before undertaking OE assessment

S/N	Question	Answers
1	From whose perspective is effectiveness being assessed?	From the client's perspective
2.	On what domain of activity is the assessment focused?	Firm internal (corporate level) resources and processes, and project performance
3.	What level of analysis is being used?	Firm and individual project levels
4.	What is the purpose for assessing effectiveness?	Determination of influence of firm corporate OE on project outcome
5.	What time frame is being employed?	Short term
6.	What type of data are being used for assessments?	Organisational and project data –measured at categorical and internal scale
7	What is the referent against which effectiveness is judged?	Project performance (client's perspective)

Source: Adapted from Cameron (1986)

Yuchtman and Seashore (1967) suggested that the assessment of OE must be in terms not of any single criterion but an open-ended multidimensional set of criteria. Kiziltas et al. (2003) followed this suggestion but focused on medium-to-big sized contractors, some of who operated in international markets, thus differentiating it from the context of this study. Sexton, Barrett and Aouad (2006) noted that small and large construction companies

are different species that live in different business habitats. An issue that usually constrains the study of developing country construction SMEs is the dearth of quality data for such an undertaking (Cook & Nixson, 2000). Undeniably, the problem posed by this challenge is outweighed by the need to understand how the internal workings of firms influence their project performance and guide future research investigations and policy decisions. The choice of variables included in this study was dictated by prior expectations based on theory, measurability, and previous empirical studies (Lopez-Garcia and Puente, 2006). A firm's corporate OE is regarded as decipherable from 1) the firm owner's characteristics (Madhoushi & Ghaedi, 2013) and 2) the firm's characteristics (Mohd, 2005; Dean, Bülent & Christopher, 2000) (see Table 2). First, in developing countries' construction SMEs, firm owners are hardly distinguishable from the firms themselves, and majority of the workers may be the family members of the owner (Kheni et al., 2010). This perspective is missing in some studies like Tam (1992). Clients tend to perceive SME contractors from the image of their owners, and firm owners' ethnicity and other qualities are sometimes considered necessary during tendering (see Madhoushi and Ghaedi, 2013; Le et al. 2014). Firm owners bear the firm's risks, and so are often constrained to innovate their firms in response to the dynamic market conditions (Barrett & Sexton, 2006). There is a dearth of literature evidence of the relationship between firm owner characteristics and construction project outcome. As a result of this, firm owner characteristics obtained from previous studies were used in this study as proxies for corporate OE.

Legally, the firms are different from their owners. Hence firm characteristics were also used as proxies of OE. Measures of firm characteristics are the attributes of the firms (for example firm age and size), which are considered important determinants of organisational performance in the general management literature (Cressy, 1996; Geroski, Mata & Portugal, 2003). Table 2 shows the firm and firm-owner characteristics used to proxy OE. Since OE is context-dependent, the choice of measures of corporate OE was extended to those that specifically relate with SME contractors. For example, the level to which a firm is categorised by the Bureau of Public Procurement (BPP) in Nigeria should correlate with the firm's performance at the site level. The BPP's categorisation and registration of companies in the construction industry are obtained by weighing the firms' manpower, equipment and financial capacities. The categories of registration range from A to E in descending order of capacity, and it is expected that firms in the higher categories will perform better at the site level (BPP, 2018) given their levels of resources. Besides this, Nigerian SME contractors are statutorily expected to be registered and to pay subscriptions to institutions like the National Pension Commission (NPC) and the Industrial Training Fund (ITF). Although registration with these bodies is not directly linked to the firms' ability to deliver projects at the site levels, they, nevertheless, matter in their corporate OE. Not registering with these bodies will severely limit a firm's ability to win jobs and, consequently, experience, because such firms are excluded from projects in which the Federal Government of Nigeria has a ≥30% stake. Likewise, such firms will hardly attract the highly experienced construction personnel needed for performance at the site level.

Firm owner characteristics such as the age of the owner of a firm affect the flow of construction activities on site, which will ultimately impact on project performance. Older persons tend to be slower and more risk-averse, so their behaviour may retard the speed of construction on site. Additionally, an SME contractor owned by an experienced manager who owns other businesses will have an edge over firms owned by individuals without similar ownership. SME contractor owners sometimes also own blocks, kerbs or paint making companies. Managers of SME contractors who own such other businesses will leverage those businesses to support the site-level performance of their construction companies when a need arises. Ljubojevic, Ljubojevic and Maksimovic (2013) noted that such capabilities could enable the firm to produce standard goods at a lower cost or produce higher-quality goods at the same standard cost. In another instance, projects being executed by firms owned by women will suffer hitches because of the socio-cultural status of women. It will be difficult, for example, for a woman to control the men-dominated construction artisans to influence project performance significantly.
Overall, a firm's "corporate advantage", that is, how its owner combines hard-to-imitate resources across different businesses to create an integrated whole will influence its performance at the project level (Collis & Montgomery, 1998; Rozemeijer, 2000). Firms will always differ in terms of their possession of the determinants of corporate OE discussed above, which will ultimately relate to their abilities to perform on site. Each firm's corporate advantage is unique and difficult to copy by its competitors (Chen, Lai & Wen, 2006).
It is hypothesized that the SME contractor variables in Table 2 will have a significant relationship with the firm performance variables presented in Table 4.

4. Project Performance

There are various project performance indices (De Wit, 1988; Sawacha, Naoum, & Fong, 1999; Bassioni, Price, & Hassan, 2004; Takim & Akintoye, 2002). Drawing from previous studies, Cheng, Li and Love (2000) listed the measures shown in Table 3 as indicators of project performance. Love and Holt (2000) noted that performance measures should focus on all company stakeholders' interests, not necessarily financial ones. Cho, Hong and Hyun (2009) explained project performance variables in terms of being either qualitative or quantitative. The qualitative performance indices measure the quality using turnover quality or system quality, while the quantitative performance indices evaluate project cost and time. This latter approach was adopted in this study (see Table 4). Variables for the measurement of project performance in this study were project cost, quality and time obtained from the clients as indicated in Table 1. Stare (2011) pointed out that these performance expectations are not achieved in most construction projects. Juxtaposing the contractor-provided OE of the firm (Table 2) against the client's data on the contractor's performance (Table 4) tells how the

firm's corporate OE has resulted in site-level performance. Given the dissatisfaction with the sole use of financial measures in performance measurement (Mbugua et al. 1999), a mix of financial and non-financial measures was used in this case. Table 4 shows the three project performance criteria used in this study, how they were measured and the benefits of their use.

Table 2: Proxies of construction SME organisational effectiveness

Characteristic	Code	Measurement	Sources
Firm Owner			
Age of owner	X1	Actual age at last birthday	Cressy (1996)
Education	X2	High = 2(for M.Sc holders and above), Intermediate = 1 (for HND/B.Sc holders), otherwise, 0	Egesa (2010)
Professional qualification	X3	NIQS=1, NIA=2, NIOB=3, NSE=4, NONE=0	BPP (2018).
Construction industry work experience	X4	Number of years of work in the construction industry	Coleman, Cotei and Farhat (2013); Madhoushi and Ghaedi (2013
Gender	X5	Male = 1 otherwise, 0	Kalleber and Leicht (1991)
Previous self-employment	X6	Yes = 1, no = 0	Frankish et al. (2007); Knut et al. (2007)
Ethnicity of owner	X7	"1" if the owner of firm is from the Edo State, "0" otherwise	Nafziger and Terrel (1996)
Ownership of other business(es)	X8	Yes = 1, no = 0	Kelleber and Leicht (1991)
CEO Duality	X9	If the owner of the firm is also the CEO =1, otherwise = 0	Yang and Zhao (2014); Baselga-Pascual et al. (2014)
Firm			
Firm age	X10	Actual age of business in years	Cressy, (1996), Geroski et al. (2003)
Firm Size	X11	Natural Logarithm of a firm's permanent staff in 2014	Cefis and Marsili (2004)
Technology use	X12	Amount spent on ICT per month	Egesa (2010)
Firm location	X13	Dummy variable:1 = if firm is located in the state capital, otherwise, 0;	Farinha (2005)
Firm experience	X14	Score based on types of projects in which the firm have participated	Shaver et al. (1997) Dimov and de Holan's (2010)
Personnel expertise	X15	Number of personnel that are fully registered with the professional body	
Number of registrations	X16	Number of organisations with which the firm is registered including: federal Inland Revenue Service, Pension Commission, Industrial Training Fund, Bureau of Public Procurement, Corporate affairs commission, private client bodies and public sector procuring entities, and others	Babajide (2012)
Group membership	X17	1 if the company is a member of a large group of companies, otherwise 0	Guariglia and Bridges (2008)
Founding condition/initial size	X18	Number of permanent staff at the start of the company	Geroski et al. (2003); Cook et al. (2012)
Organisational structure	X19	Vertical organisational structure = 1, Horizontal organisational structure=0	Borghesi et al. (2007)
Level of firm registration	X20	Class: A=5, B=4, C=3, D=2, E=1, None=0	BPP (2018).

Source: Various authors

NIQS=Nigerian Institute of Quantity Surveyors, NIA=Nigerian Institute of Architects, NIOB=Nigerian Institute of Building, NSE=Nigerian Society of Engineers, HND=Higher National Diploma, CEO=Chief executive officer, ICT=Information and Communication Technology

Table 3 Project performance measures and their benefits

S/N	Criterion	Measure	Measuring Unit	Benefit
1.	Cost-effectiveness	Cost variation	Actual cost/budgeted cost	Improve cost savings for client
2.	Quality	Rejection of work Client satisfaction Quality of work	% sample rejections Number of claims by client Number of claims by contractors	Improve client confidence Increase client satisfaction Increase construction durability
3.	Schedule	Schedule variation	Actual duration/planned duration	Reduce additional expenses
4.	Scope of work	Change in scope of work	Change orders/budgeted cost	Reduce additional expenses
5.	Profit	Profit variation	Actual profit/projected profit	Increase income
6.	Construction process	Safety Re-work	Number of accidents?100/Total number of workers Rework MH/total MH	Develop safety practice to manage risks Reduce wasted work
	Others	Litigation Tender efficiency	Expense of litigation Success rates	Reduce cost Generate income

Source: Cheng, Li and Love (2000)

Table 4: Project performance (OE) variables uses in the study

S/N	Criterion	Measure	Measuring Unit	Benefit
1.	Cost effectiveness	Cost variation	Final Account value/Initial contract sum	Improve cost savings for client
2.	Quality	Quality of Work	Number of re-works	Increased client satisfaction and project usefulness
3.	Time	Schedule variation	Planned duration/Actual duration	Early project use

5. Methodology

This study focused on contractors and projects in public tertiary institutions in Edo State Nigeria from which the required data could be obtained. BPP (2015) showed that most complaints on construction procurement emanate from projects in the Ministry of Education. Primarily, this study sought to relate measures of a construction firm's OE to its performance at the project site level. Both OE of the firms and their project performances exist independently of the social conceptions of them. In consequence, an objectivist ontological stance was adopted for this study (Grix, 2002; Panas & Pantouvakis, 2010), and only quantitative data were gathered for analyses to address the objectives of the study. The population of the study consisted of contractors and clients/consultants that participated in construction projects in the tertiary institutions. The contractors were requested to provide factual data on their firms, and the clients/consultants were requested to supply accurate data on project outcomes. It was, however, not possible to get already prepared sample frames containing the names of the projects, their consultants and contractors from the institutions covered by the study. This type of challenge is known to exist in the construction industry of most developing countries as a result of lapses in record-keeping (Cook & Nixson, 2000).

Consequently, the sample frame was formed from the data obtained on an ad hoc basis from the institutions' physical planning and estates divisions. In all, 76 projects were identified for which the names and verifiable contacts of the consultants and contractors could be found. The projects that met the criteria happened to be those completed between 2010 and 2017. The participants in the 76 projects formed the population of the study. Thus, an interpretivist epistemology was adopted in gathering the study's data. This aligns with Otokiti (2005), Dainty (2008) and Patton (1990) who posited that the design of a study depends on its context, and that research is an art of the possible.

The survey targeted all the firms involved. The questionnaire mainly sought the SME construction firms' OE measures shown in Table 2, while the consultants/clients for the projects were requested to fill out tables containing the project performance criteria using the measuring units stated in Table 4.

In the process of data collection, it was discovered that some construction firms had carried out more than one project in the study area. During the analysis, the firm owner and firm characteristics were repeated for the number of projects in which they participated. This made the criteria and explanatory variables to have the same number of cases, even though the number of projects covered was higher than the number of contractors.

6. Data Analysis

6.1 Factor analysis

Factor analysis reduces a set of variables into a fewer number of non-correlated factors that can represent the original variables (Fellows & Liu, 1997; Iyer & Jha, 2005). Before conducting the canonical correlation, the twenty OE variables were reduced to a more parsimonious set of variables using factor analysis. Two things were achieved with the process: first, the latent factors accounting for most of the variance in the data set were identified and named, and secondly, the factors were saved for use in the canonical correlation.

Although Costello and Osborne (2005) noted that the ratio of the number of cases to the number of variables for an excellent factor analysis should be large (≥5:1), noticeably, authors of construction management studies have tended to ignore this rule (Hardcastle, et al. 2005; Fox & Skitmore, 2007; Zhao et al. 2014). Plausibly, this is as a result of the low return of questionnaires in construction management studies. The factor analysis in this study was based on a case to variables ratio of 2.65:1.

The data were tested for factorability using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sampling sphericity. For good factor analysis, the KMO test should give ≥0.6, while Barlett's test of sphericity should be significant at α=0.05 ($p < 0.05$) (Fellows & Liu, 1997; Field 2005). The factor analysis was conducted by principal component method, with varimax rotation using the Statistical Package for Social Sciences (SPSS) version 22. Yong and Pearce (2013) and Costello and Osborne (2005) opined that the number of factors could be determined based on a threshold eigenvalue of 1, and that a structure loading of ≥0.3 can be considered strong enough for interpretation. However, following Leung et al. (2005), only variables with loadings of ≥0.50 were regarded as having loaded highly under each factor in this study. This also goes to compensate for the low cases-to-variables ratio of the study.

6.2 Canonical Correlation

Canonical correlation was used to analyse the relationship between OE of the SME contractors and their project performance. Canonical correlation analysis aims to find the best linear combination between two multivariate datasets that maximises the correlation coefficient between them (Malacarne, 2014). It extends bivariate correlations by allowing for two or more dependent variables (on the left-hand side) to be related with two or more independent variables (on the right-hand side).

Montabon, Sroufe, and Narasimhan (2007) used this technique in relating the environmental management practices of firms to their performance. Particularly, canonical correlation closely mimics the real-life situation where several criterion variables are being influenced by several independent variables simultaneously (Shafto, Degani & Kirlik, 1997). It is important to model project performance criteria simultaneously since the achievement of one criterion could affect the success of the others. For instance, when the cost is reduced, quality may be compromised, or schedule growth may occur. Canonical correlation tests the hypothesis that the two sets of data – the OE of the firms and their project performance are independent and shows the contribution of each variable to the relationship. Canonical correlation is flexible, and does not impose the type of data restrictions associated with multiple regression analysis; it allows for the use of both metric and non-metric data in the correlation (Hair, Anderson, Tatham and Black, 1998). Sherry and Henson (2005) observed that Wilk's Λ is the most widely used test criteria for the model fit in the canonical correlation analysis. For a significant relationship to be inferred, the p-value of the Wilk's Λ test must be <0.05. The contribution of the variables was interpreted based on redundancies and canonical loadings. Canonical structure (rs) and standardised coefficient loadings cut-off point of ≥0.30 was adopted (Crum, Lund & van Auken, 1987; Munro, 2005; Mendes, da Sylva & Santos, 2012). Hence, under each canonical root, variables not loading up to the cut-off point were considered insignificant. The squares of the canonical structure loadings (r^2) were also computed, which captured the proportion of linear variance shared between an observed variable and its group's canonical variate (Sherry & Henson, 2005). Redundancies of up to 0.25 were considered to be substantial, given previous studies (Montabon et al. 2007; Keramati, 2007), and the peculiarities of this research.

Rencher (2002) argued that standardised coefficients show the contribution of each variable in the presence of other variables. Hence, the standardised coefficients of the variables were equally reported. The stability of the canonical correlation result was tested by omitting the explanatory variables one after another, and checking the changes in their loadings under each significant canonical root (Hair et al. 1998; Dattalo, 2014).

7. Results

Out of the 76 pairs of the questionnaires sent out to the respondents, only 53 pairs of acceptably filled questionnaires were returned.

Table 5 shows the types of projects covered by the study and the procurement methods used. The number of projects using the design-bid-build approach was more in number (n=42), and most of the projects were new buildings (n=31). The projects covered the period 2010 to 2017, although this was not the yardstick used in the selection of projects for the study. Majority of the respondents were civil engineers (n=14), 15 were project engineers, and most (n=21) have >10≤20years construction industry work experience (Table 6). The profile of the respondents gave confidence that the respondents could offer reliable information for the study. Table 7 shows the means and standard deviations of the performance variables studies. The cost-effectiveness, which was measured as the ratio of the final account value to the initial contractor sum had a mean of 1.4509 and a standard deviation of 2.56307 which means that on the average, the projects covered exceeded the initial budget by about 45%. Likewise, on the average, about nine rework cases were reported per project, and planned-to-actual duration ratio averaged 0.66.

On testing the factorability of the data, the KMO measure of sampling adequacy and Bartlett's test of sampling sphericity yielded acceptable values: .819 and X2=859.714 (df=190, p=0.000) respectively. Four factors emerged, which cumulatively explain 71.540% of the variance in the data set (Table 8. The four factors were determined from the Eigenvalue of 1. The first factor is dominated by variables relating to an SME contractor's advantage over similar firms at the corporate level, such as ownership of other business, group membership, and organisational structure. For this reason, Factor 1 was labelled "corporate advantage" factor. Factor 2 was dominated by variables relating to experience such as firm age, firm experience, construction industry work experience of the owner, among others. Factor 2 was,

therefore named the "firm experience factor". Factor 3 was called the firm certification factor since the level of firm registration, and a number of records of firm loaded significantly under the factor. Lastly, Factor 4 under which ethnicity of owner loaded highly was christened "firm owner background" factor.

Given that some variables had factor loadings of <0.50, the factor analysis was repeated to test the stability of the loadings under the respective factors. This has been reported in Table 9. The KMO measure of sampling adequacy and Bartlett's test of sampling sphericity again yielded acceptable values: .774 and X2= 560.481 (df=105, p=0.000) respectively. Similarly, four factors emerged, which cumulatively explain 73.209% of the variance in the data set. As shown in Table 9, the result of this analysis substantially validates the result in the first factor analysis already reported on, with the exception that the founding condition/initial size (x18) which initially loaded positively under the first factor (corporate advantage) now loads negatively under the second factor (firm experience). Hence, while it is accepted that the variable is relevant in the assessment of the OE of the SME contractors, the exact domain of its contribution could not be ascertained in this study

Table 5: Type of projects covered by the study

S/N	***Project Type***	***Number***
1.	New Civil infrastructure	10
2.	New Building	31
3.	Maintenance/Repairs of buildings or civil infrastructure	12
Total		53
	Type of Procurement	
4.	Design-Bid-Build	42
5.	Design and Build	11
Total		53

Table 6: Respondent characteristics

S/N	***Respondent's Professions***	***Number***
1.	Civil Engineering	14
2.	Architecture	11
3.	Building	4
4.	Quantity Surveying	13
5.	Mechanical/Electrical Engineering	6
6.	None construction professions	5
Total		53
	Title/Position in the Firm	
1	Project Engineer	15
2	Project/contract Manager	12
3	Chief executive officer	13
4	Procurement Engineer	3
5	Cost manager/Quantity Surveyor	9
6.	Builder	1
Total		53
	Construction Industry Work Experience	
1	≤10 years	17
2	>10≤20years	21
3	>20years	15
Total		53
	Number of Years with the Present Firm	
1	≤5years	23
2	>5≤10years	14
3	>10≤20years	10
4.	>20years	6
Total		53

Table 7: Descriptive Statistics of the Criterion Variables

Performance Indices	**N**	**Mean**	**Std. Deviation**
Cost Effectiveness	53	1.4509	2.56307
Quality	53	8.9838	11.58406
Time	53	0.6646	0.68344
Valid N (listwise)	53		

Table 8: Factor Analysis Results

Code	**Variable**	**Component**			
		1: Corporate Advantage	**2:Firm Experience**	**3:Firm Certification**	**4: Firm Owner background**
x6	Previous self-employment	0.891			
x8	Ownership of other business(es)	0.861			
x17	Group membership	0.849			
x11	Firm Size	0.842			
x19	Organisational structure	0.834			
x1	Age of owner	-0.827			
x13	Firm location	-0.734			
x2	Owner's level of Education	-0.701			
x15	Personnel expertise	-0.64		-0.538	
x18	Founding condition/initial size	0.557			
x10	Firm age		0.934		
x14	Firm experience		0.898		
x9	CEO Duality		-0.869		
x4	Construction industry work experience		0.841		
x12	Technology use		0.64		

x3	Professional qualification of owner		0.53		
x20	Level of firm registration			0.737	
x16	Number of registrations			0.505	
x7	Ethnicity of owner				0.825
x5	Gender				
% of Variance		33.996	22.928	8.053%	6.563
% Cumulative		33.996	56.925	64.977	71.540
Eigenvalue		7.744	3.753	1.480	1.231

Table 9: Second Factor Analysis Results (after omission of some variables)

Code	**Variable**	**Component**			
		1: Corporate Advantage	**2: Firm Experience**	**3: Firm Certification**	**4: Firm Owner background**
x6	Previous self-employment	0.891			
x11	Firm Size	0.861			
x8	Ownership of other business(es)	0.849			
x17	Group membership	0.842			
x19	Organisational structure	0.834			
x14	Firm experience	-0.827			
x10	Firm age	-0.734			
x4	Construction industry work experience	-0.701			
x12	Technology use	-0.64		-0.538	
x18	Founding condition/initial size	0.557			
x3	Professional qualification of owner		0.934		
x20	Level of firm registration		0.898		
x16	Number of registrations		-0.869		
x7	Ethnicity of owner		0.841		
x5	Gender		0.64		
% of Variance		33.996	22.928	8.053%	6.563
% Cumulative		33.996	56.925	64.977	71.540
Eigenvalue		7.744	3.753	1.480	1.231

Using the SPSS, the factors from the first factor analysis were saved for use in the canonical correlation. A significant relationship was found to exist between the two sets of variables [Wilk's Λ=.560, F (12, 121.996) = 2.494, p=0.006], and two statistically significant canonical roots were derived from the analysis. Since Wilk's Λ indicates the unexplained variance within the data set, 1- Λ gives the strength of the relationship in the model in R^2 metric. Thus, the OE of the SME contractors accounted for 44% of the performance of the projects studied. Impliedly, 56% of the variance is accounted for by other factors.

The results show that Wilk's Λ=.560, F (12, 121.996) = 2.494, p=0.006 for the first canonical root, and Λ=.750, F (6, 94) = 2.426, p=0.036 for the second canonical root. The third canonical root was discarded for being insignificant (Λ=.993, F (2, 48) = 0.175, p=0.840). The canonical structure loadings (r), standardized coefficients (Coeff) and commonalities of the significant canonical roots have been reported in Table 10. Canonical root 1 shows a link between project quality (r=0.76, coeff=0.87) and time (r=-0.52, Coeff=-0.66) performances, and corporate advantage (r=0.92, coeff=1.02) and firm certification (r=-0.37, coeff=-0.24). Except for firm certification, these variables have both high canonical structure loading and standardised canonical coefficients which confirm their importance to the canonical variates to which they belong. The signs on the canonical loadings show that corporate advantage is inversely related to the measure of project time performance, but relates directly with project quality performance. Firms with better corporate advantage tended to have more schedule growth and more rework. Indicatively, firms with better structure have not shown superiority in terms of meeting project deadlines and avoiding rework.

Table 10: Canonical Correlation Result

Set 1 Canonical Loadings	**Canonical Root 1**			**Canonical Root 2**			
Variable	**Coeff**	**r**	**r^2**	**Coeff**	**r**	**r^2**	**h^2**
ORGANISATION EFFECTIVENESS							
Corporate Advantage	1.02	**0.92**	0.85	-0.01	**0.35**	0.12	0.97
Firm Experience	-0.27	0.14	0.02	0.83	**0.92**	0.85	0.87
Firm Certification	-0.24	**-0.37**	0.13	0.37	**0.54**	0.29	0.42
Firm owner background	0.08	0.17	0.03	0.15	0.25	0.06	0.09
Redundancies		***0.26***			***0.33***		
Rc^2 between the canonical variates		**25.40%**			**24.50%**		
Set 2 Canonical Loadings							
PROJECT PERFORMANCE							
Cost Effectiveness	0.02	-0.09	0.01	-0.61	**- 0.48**	0.23	0.24
Quality	0.87	**0.76**	0.57	-0.51	**- 0.52**	0.27	0.84
Time	-0.66	**-0.52**	0.27	-0.65	**- 0.69**	0.48	0.75
Redundancies		***0.28***			***0.33***		

Coeff=Standardised Canonical coefficient, r=canonical structure loading, h2=commonality, r2 = square of canonical structure loading

In canonical root 1, the redundancies of the criterion and explanatory variables are respectively 0.28 and 0.26, indicating the combined contributions of the variables to their respective variates. Impliedly, in R2 terms, 28% of the variance in the explanatory variate is explained by the criterion variate, while the explanatory variate explains 26% of the variation in the criterion variate.

In canonical root 2, corporate advantage has a significant canonical structure loading (r=0.35), but an insignificant coefficient (coeff=-0.01). Therefore, canonical root 2 mainly shows the nexus between firm experience (r=0.92, coeff=0.83) and firm certification (r=0.54, coeff=0.37) on the explanatory side, and cost-effectiveness (r=-0.48, coeff=-0.61), quality (r=-0.52, coeff=-0.51), and time (r=-0.69, coeff=-0.65). A look at the r2 shows that firm experience is the major explanatory variable in canonical root 2. Experienced and certificated firms here tend to have projects with time overruns. However, they perform better on cost and quality (both the ratio of the final account value to the initial contract sum and the number of re-works decrease as firm experience and certification increases). Table 11 shows the results of the stability test of the independent variables. It shows that corporate advantage remained consistently significant when the other variables were removed in canonical root 1, whereas firm certification became insignificant (r=0.191) when the firm experience was removed. In canonical root 2, however, both firm experience and firm certification were consistently significant ($r \geq 0.3$) when the other explanatory variables were removed in turns. The results in Table 11 support the interpretation of the data using the consistent variables as already done.

Table 11: Stability test of removal of independent variables

Variables	**Before Omission**	**After the Omission of:**			
		Corporate Advantage	**Firm Experience**	**Firm Certification**	**Firm Owner Background**
Canonical Root 1					
Corporate Advantage	0.92	VIR	-0.985	-0.981	-0.824
Firm Experience	0.14	-0.921	VIR	-0.554	0.064
Firm Certification	-0.37	-0.533	0.191	VIR	0.474
Firm owner background	0.17	-0.252	-0.237	-0.269	VIR
Canonical Root 2					
Corporate Advantage	0.35	VIR	-0.082	0.147	0.560
Firm Experience	0.92	0.315	VIR	-0.819	0.941
Firm Certification	0.54	-0.834	-0.947	VIR	0.443
Firm owner background	0.25	0.320	-0.299	-0.146	VIR

VIR=Variable of interest in the row

8. Discussion of Findings

Overall, a significant relationship exists between the firm OE factors and the three project performance variables. For the type of firms of interest here, OE can be

understood from ‘who the firm is' generally. OE centres on the internal resources, processes and organisation of the firm. The finding of this study that the OE of an SME contractor is related to its project performance supports findings in previous studies and justifies the prequalification of contractors by investigating their make-up as well as their efficiency as a firm (Khosrowshahi, 1999). Sawacha et al. (1999) identified organisational factors as among the group of factors affecting the project safety performance of projects. In this study, organisational factors, although differently measured, were found to be related to project quality, cost and time performance, which were not measured in Sawacha et al. (1999). This study additionally offers insights on the summary of the OE variables that are related to project performance, namely, corporate advantage, firm experience and firm certification. This finding generally aligns with that of Alzahrani and Emsley's (2013) who found that firm resources, expertise, and organisation are among firm-level variables that affect project success at the site-level. For instance, the variable firm size loaded highly under corporate advantage in this study and loaded highly under organisation in Alzahrani and Emsley (2013). This study, however, adds firm certification to the organisational factors required for the project-level performance of construction SMEs.

8.1 Corporate advantage of the firm and project performance

The significant loadings of previous self-employment, firm size, ownership of other businesses and group membership support the argument that corporate advantage is a latent variable in the set of explanatory variables of the study. Firms whose owners own other companies as well tend to be bigger and the owners tend to have previous self-employment. Collis and Montgomery (1998) viewed corporate advantage as centred around synergising resources across multiple businesses to optimise organizational performance. The study, however, referred to big corporations mostly outside of construction industry and developing country contexts. SME contractor owners who also own other businesses tend to form small "corporations" where the resources of the companies are synergistically pooled together. Resultantly, such contractors become better positioned than their peers to perform at the site level following Ljubojevic, Ljubojevic and Maksimovic's (2013) argument. Thus, ordinarily, the effectiveness of the firm should increase as the corporate advantage gets better. This study, however, indicated a negative association between project time and quality performance and a construction SME's corporate advantage. Brush, Bromiley, and Hendrickx (1999) found a sizable organizational effect on business segment performance, using data from the United States of America corporations. The companies used were not restricted to SMEs and the construction industry, and therefore, differ from the context of this study. In this case, firms with better corporate advantages had lower planned duration-actual duration ratios due to reworks. The SME contractors failed to replicate their organisational strengths at site levels. The data for this study shows that corporate advantage, as measured in this study, does not guarantee better project outcomes in terms of early completion and less rework.

8.2 Firm experience and project performance

Firms can only do what they know (Dimov & de Holan, 2010). Firm experience, as noted by Dimov and de Holan (2010), is the sum of what the firm knows by itself and what it has learned from others. Firm experience was the second factor identified through factor analysis and supported by variables such as firm experience and construction industry work experience of the company owner, among others. The explanatory variable "firm experience" was measured in this study based on the types of projects a firm has been involved in, while the "construction industry work experience" of the owner was measured in terms of years of construction industry work. Both measures are in tandem with Dimov and de Holan's (2010) view that firm experience depends both on length of time in the industry as well as on the spread of experience within the industry. Firm experience is vital in appraising the OE of an SME contractor since it aids the mitigation of risks (Akintoye & MacLeod, 1997). The findings of this study suggest that while firm experience aids cost and quality performances, schedule overruns grow worse as the experiences of the firms tended to increase. Time overruns have been a major problem for construction projects, which firm experience does not solve. As evidenced by the findings of this study, more experienced SME contractors make more claims for time than the relatively newer firms, which leads to schedule growths.

8.3 Firm experience and project performance

Firm certification in this study refers to the level of a firm's categorisation in its registration with the BPP. The BPP's classification is based on a contractor's equipment, personnel and financial capacities, and determines the Naira value of projects the federal government can award the firm. It also refers to the number of client organisations with which the firm is registered. Organisations (both private and public) often require prior registration for contractors to be included in a shortlist of firms that can tender for projects within such organisations. Besides this, contractors for federal government projects in Nigeria are expected to contribute to or be registered with several national institutions such as the Industrial Training Fund and the National Pension Commission (BPP, 2018). The ability of a contractor to be certified/registered by these institutions is a determinant of its OE because non-registration can negate the contractor's chances of success during pre-qualification to tender for projects. The firm certification was the third factor identified in the factor analysis and was supported by several registrations and level of firm registration. In canonical root 2, firm certification tended to be associated with time overruns, but lessened project cost and amount of rework. The stability test established that highly certificated SME contractors perform better on project cost and quality performances.

8.4 Firm owner-background and project performance

SMEs are often owned by individuals whose personalities have overbearing influence on the OE of the firms. An SME contractor may be awarded contracts based solely on the personality of its owner. Barrett and Sexton (2006) pointed out that owners of SME construction firms bear the burden of making quick decisions and creating innovative activities to counter shifting client demands and market conditions. Several studies found that firm owner qualities like firm age are tied to firm survival (Cressy, 1996; Madhoushi & Ghaedi, 2013). Despite this, this study shows no significant influence of firm owner background in terms of ethnicity of the owner on project performance for the studied SME contractors. It means that the ethnicity of a construction SME owner is irrelevant to the performance of a project, hence nepotism in contract awards (Le et al. 2014) do not lead to better project performance. Thus, considered entirely from the client's perspective, the firm owner background does not explain an SME contractor's performance on a project.

9. Conclusion

This study sought to evaluate the determinants of OE within SME construction firms, and to investigate the influence of these on the outcomes of projects executed by such firms. From the contractors' perspective, four firm domains were identified for investigating OE among the genre of firms covered by this study, namely: corporate advantage, firm experience, firm certification and firm owner background. These domains are the contractors' focus on rating their own OE. When viewed from the client's perspective, it was found that contractors who excelled in these domains still had schedule growths. Findings from this study, however, show that firm certification and experience enhance project performance in terms of quality and cost since more certificated and experienced firms have fewer rework and lower final account value-to-initial contract sum ratio in their projects.

Regarding the influences of corporate advantage, firm certification and experience on project performance, clients should show preference to firms with better certification and experience than to firms that merely have corporate advantage irrespective of the firm owner's background. Firms with better corporate advantage tend to re-do their work more often, and so last longer on projects with insignificant improvements on project cost performance. A firm's experience causes it to make fewer mistakes during construction and by so doing, make savings which favour the client.

Construction stakeholders, and indeed, the general public, should beware of SME contractors that only boast of good corporate advantage and ownership by prominent persons in the society, but without adequate certification and experience. Based on the results of this study, a highly performing SME contractor cannot be known by the extent of its corporate advantage and firm owner background, but by the level of its certification and experience. Public procuring entities engaging SME contractors should assess the firms based on firm experience and certification. The results of this study justify the requirements for registrations and certifications prior to tendering, and this should be retained, especially, by public tertiary institutions in the study area. SME contractors should explore every avenue of gaining experience, which will improve their OE and project performance.

It is acknowledged that the sample size of this research needs to be higher and accommodative of projects in other kinds of organisations other than educational institutions. Findings in this study, however, justify future studies on how the OE of contractors relates to other variables of project performance. Further studies should also explore the intercepts between construction project management and organisational effectiveness theories.

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Assessing Quality Management Practice in Nigerian Construction Industry

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Abstract

Several adverse reports on quality performance drive the need to assess quality management practice in the Nigerian construction industry. Incidences of building failures and in extreme cases, building collapse have been attributed to poor quality management among other factors. This paper assesses the quality management practices of Nigerian construction firms intending to suggest appropriate courses of action for improving quality performance. Data were collected through questionnaires administered to management staff in 20 construction firms in Abuja, Nigeria. Findings from the study show that inspections and statistical quality control techniques are the most widely used quality management tools by construction firms in Nigeria. However, the study found that the preparation of quality management plans (QMP) and quality auditing (a measure of quality assurance in building production), is not popular among Nigerian construction firms. Inadequate planning arrangements for quality, poor communication of quality requirements and lack of awareness of the benefits of quality management were identified as the most significant issues affecting quality management practice. Therefore there is a low uptake of quality management practice principles within construction organizations in Nigeria. Hence, the need to create awareness for implementing quality management principles and concepts in its construction industry.

Keywords: Assessment, Construction industry, Nigeria, Quality management, Quality standards

1. Introduction

A construction project is considered successful when it is completed on time, within budget, following specifications and to stakeholders' satisfaction. However, levels of project performance and project successes are low in the construction industry especially in developing countries such as Nigeria where owners are generally dissatisfied (Odediran, Babalola & Adebiyi, 2013; Isa, Jimoh & Achuenu, 2013). One of the significant reasons for owners' dissatisfaction with building projects is their poor quality (Abdulrahman, Wang & Wen, 2010; Achi, Onukwube & Ajayi, 2007). Every customer wants a quality product that meets its needs and worth the value of money it has invested unto the product (Achi et al., 2007). Therefore customers tend to be satisfied when quality product and service are delivered to them. Project executors need to understand customer's need and requirement so that both their stated and implied quality levels can be met at all times. Understanding customers need, and requirement could enable organisations to implement quality management practices and imbibe cultures which guarantee their customers' satisfaction. A strong commitment to quality and continuous company-wide quality improvement will lead to significant improvement in quality performance and increased profit margins for any construction organisation. Poor performance has adverse effects which transcend the industry to impact on national growth and sustainable development (Windapo, 2006). Structural failure seems to abound in developing countries (Aini et al., 2005; Taiwo & Afolami, 2010) with worst cases resulting in building collapse with major causalities (Windapo & Rotimi, 2012). In a nutshell, quality management practices have a direct impact on the level of client satisfaction, quality enhancement, elimination of rework, and the enabling

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synergy between different project parameters (Smallwood & Rossouw 2008; Alwi, Hampson & Mohamed, 1999).

Building construction has become more complex, partly due to project owners' increasing demands and expectations. Hoonakker (2006) reported that the construction industry's clients are demanding improved quality of service, faster buildings and innovations in technology. As a result, building products and systems have had to become more innovative to meet the owner's demands. However, newer and innovative procurement processes bring about challenges which building contractors need to manage effectively while delivering value to the project owner. Also, with the advent of globalization, construction firms are striving to achieve internationally accepted quality levels to ensure their forefront position in emerging international markets. Hence the need for a proper system that provides more quality when compared to other project objectives (Abdul Rahman et al.; 2010).

Burati, Matthews and Kalindi (1992) describe quality as the conformance to certain performance requirements. This entails meeting up the legal, aesthetic and functional requirements (Arditi & Gunaydin, 1997). A more universally accepted definition of quality, however, is the one provided by the International Standard Organization (ISO8042, 1994). The ISO defines quality as the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. From a construction perspective, quality could be defined as the totality of characteristics that a constructed facility and the process involved in its construction should have; and enables the facility to meet or exceed customers' needs, requirements and other performance criteria (Love & Irani, 2002). The preceding shows that determining and achieving customer requirements and expectations require proper quality management practice so that organisations can manage their current situation and future needs. Particularly in the new global economy, quality management practice has become a central issue for performance improvement within construction industries. However going by abysmal practices in developing economies such as Nigeria, it is pertinent that an assessment of quality management practices will benefit its construction industry. The current study investigation is, therefore, relevant as it provides a snapshot of current practices and identifies why and how quality management can be improved in the Nigerian context.

2. Literature Review

2.1 The characteristics of the construction industry

The construction industry has many characteristics that set it apart from other production environments, especially when compared with other sectors such as manufacturing (Kamal, Yusof & Iranmanesh, 2016). The characteristics that make construction project a complex undertaking include: its fragmented nature, uniqueness, dynamism, non-standardisation, communication difficulties and the lack of customer focus of the construction industry (Davis, 2007; Egan, 1998). A typical project has a combination of persons and organizations including architects, engineers, quantity surveyors, planners, contractors, suppliers and other associated persons and organisations (such as the local council, building control agencies). These large numbers of project participants with differing quality objectives are expected to work together towards a common goal of project success. Setiawan et al. (2012) note that the complexity of construction projects is as a result of the resources employed, the environment in which construction takes place, the level of scientific knowledge required, and the number and interaction of different workflows. This sometimes leads to difficulties in quality achievement throughout the supply chain. Rowlinson and Walker (1995) point out that the construction industry is also characterized by its non-standardization, where production processes are, to some extent, different from one another. Hence, no universal standard or specification can be applied to the product. According to Love, Holt, Shen and Irani, (2002), both the internal and the external environment of construction projects are dynamic and relatively unstable. Therefore such environments could hinder the smooth application of quality management practice. Within the context of the current study, some of these characteristics impacts on quality management practice hence affect the ability to meet quality objectives desired by project owners, users and compliance authorities. Very often, these characteristics make successful project outcomes ambiguous (Chan & Chan, 2004).

2.2 Building collapse in Nigeria

One of the most significant current discussions among building owners, governments, approving authorities and professional bodies is the increasing incidence of building collapse in Nigeria. Dimuna (2010) and Ede (2010) pointed out that the frequency of building failures and in extreme cases, building collapse in Nigeria has become alarming and worrisome. Several other studies have reported the continuous increase in building collapse in Nigeria, with the most affected areas being urban areas because of their population growth rate. For example, Windapo (2006) study on 61 cases of building collapse between 1974 and 2006 found that the highest incidents of building collapse occurred in Lagos State. Of the study cases, 40% were residential buildings (Windapo, 2006). Another analysis by Dimuna (2010) shows that between 1975 and 1995, of 26 incidences of building collapse recorded, 14 between 1982 and 1996, and ten occurrences were recorded between 2004 and 2006 in Lagos State alone. Ede (2010) investigated 47 cases of building collapse in Abuja, Lagos and Port Harcourt between the periods of 2000 to 2010. The study also found Lagos State to have the highest incidences of building collapse. These findings are unanimous about Lagos State having the highest rates of building collapse. In summary, building collapse is significant in the construction industry in Nigeria. These result in significant casualties and loss of lives that could be avoided. The implementation of efficient and effective quality management principles in construction organisation could bring an end to the needless loss of lives. There are suggestions for the construction industry to examine the competency and effectiveness of construction site workers as well as the standards of the materials and components used in

building construction (Oke & Abiola-Falemu, 2009; Taiwo & Afolami, 2010). Coupled with this is the establishment and implementation of sound quality management systems that would improve process performance across all construction activities (Rotimi & Tookey, 2012).

2.3 Quality management systems in construction

Quality management systems have therefore become the focal points in businesses within the construction industry (Smallwood & Rossouw, 2008) Quality management system according to the ISO 8402, (1994), refers to all management functions that determines quality policy, objectives and responsibilities, and implements them by means such as quality planning, quality control, quality assurance, and quality implementation within any quality system. The quality management system establishes a framework of reference points that ensure that every time a process is performed, the same information, methods, skills and controls are used and applied in a consistent manner (Dale, 2003). Essentially a quality management system standardises organisations' processes, helps to minimise waste and reworks, and increase organisations' profit margin (Wilkinson & Scofield, 2010). This management discipline is concerned with preventing problems from occurring by creating the attitudes and controls that could make prevention possible. According to Nicholas and Steyn (2008), a good quality management system is crucial in ensuring compliance with the quality criteria of projects. In other words, the quality management system is the criteria by which organisations' quality performance are measured and for which quality management standards were developed. It is now used by many in the construction industry to ensure that the right things are done right the first time. Abdulrahman (1996) suggests that minimizing errors/mistakes during the delivery of goods and services is possible with the introduction of formal quality management systems to plan, monitor and control production processes.

Toward this end, a series of international quality management standards have gained wide acceptance in the construction industry. The International Organisation for Standardisation (ISO) for example, emerged during the last two decades as a system that can be applied to different types of organisations in order to obtain improvements in quality procedures and products. The ISO's initial sets of standards have been progressively developed to be relevant to construction due to its generic nature (Chini and Valdex 2003). The ISO creates an assurance regime that provides confidence that an organisation has a quality process installed and that the organisation provides consistent products that will meet its customers' needs and other regulatory requirements. Love and Li (2000) state that such implementation leads to third party certification that a product / service performs to requirements and provides evidence that an optimal level of quality is achieved. Quality is about meeting standards and end user requirements. A quality management standard like the ISO has a customer focus in all its requirements (Rotimi, 2013). The probability of meeting customers' needs is higher when such a standard, guides quality management performance. ISO 9000 sets the minimum standard for quality management systems and many organisations have become ISO 9000 compliant as a result of pressure from their customers (Kumaraswamy & Dissanayaka, 2000); although these clients tend to be public sector based that build one-off projects.

In Nigeria, the Standards Organization of Nigeria (SON) has formally adopted the ISO 9000 for quality management in the country (Achi et al., 2007). Although there is anecdotal evidence,that suggest that its implementation is not clearly evident in the Nigerian construction industry. The current study assesses quality management practice and attempts to identify the factors that may be preventing its implementation in the Nigerian construction industry. The authors reflect that to achieve a quality assured construction performance, construction organisations need to be consistent in their pursuit of quality. However consistency can only be achieved through a documented quality management system, which effectively incorporates quality control, assurance and quality improvement.

2.4 Quality management process

According to Smallwood and Rossouw (2008), the quality management process commences with the production of a quality management plan which needs to be submitted along with tender documents during the initial stages of a construction project. There are three major processes involved in the management of quality in construction projects (Nicholas & Steyn, 2008; PMI, 1996). These are quality planning, quality assurance and quality control. Each of these processes is briefly described in the following sub-headings.

2.4.1 Quality Planning (QP)

QP is essentially a process that guides future quality activities. It sets the requirements and standards to be met as well as the actions necessary to meet those requirements and standards. The quality of a project is assessed by conformity to a quality plan designed to meet customer needs. According to Nicholas and Steyn (2008), quality planning provides the confidence that all steps necessary to ensure quality have been thought through. It involves identifying which quality standards are relevant to the project and determining how to satisfy them (PMI, 1996). The quality plan specifies the requirements to be met in each project phase, getting approvals before continuing to the next phase. For example, it specifies at what stage formal design reviews could be held, how quality assurance would be managed for work done by subcontractors, as well as when and how deliverables will be inspected (Nicholas & Steyn, 2008). The quality plan could also indicate the quality techniques that would be used and when. Checklists are usually incorporated as part of the quality planning process to verify that a set of required steps have been performed (PMI, 1996). Organisations in more developed economies have a standardized checklist for ensuring consistency in activities performed frequently.

2.4.2 Quality Control (QC)

Quality control (QC) describes an ongoing process of monitoring and appraising work, and taking corrective action so that quality outcomes that are planned for could be achieved (Nicholas & Steyn, 2008). QC is essentially the activities and techniques employed to achieve and

maintain the quality of a product, process, or service by monitoring activities, finding and eliminating causes of quality problems so that the requirements of the customer are continually met. QC is thus, primarily concerned with defect detection. The main QC techniques are related to inspection and statistical quality control (statistical sampling). The results of these processes are used in taking corrective actions and to inform the quality assurance (QA) process, so steps can be taken to prevent similar errors and defects (Kemp, 2006). Other QC techniques are control charts and flowcharts.

Inspections involve checking that what is produced is what was required (Harris & McCaffer, 2002). The inspection takes two forms in construction works: that which is quantifiable for example lines, levels, verticality and dimensions; and that which is open to inspectors' interpretation such as fitness, tolerance, cleanliness and visual checks (Harris and McCaffer, 2002). Quality checks for construction performance are undertaken by work supervisors to ensure they comply with specifications. Inspections do not of themselves prevent or correct mistakes unless appropriate corrective measures are taken subsequently. On the other hand, statistical sampling involves choosing a part of a population of interest and subjecting them to checks, tests or inspections (PMI, 1996). The result of tests on a small sample helps to establish the acceptability of an entire lot or batch of materials or work products (Hendrickson & Au, 2008). Each lot tested, determines whether they satisfy a minimum acceptable quality level (AQL). Testing the cube strength of concrete is a typical example of statistical sampling in construction. Appropriate sampling can often reduce the cost of quality control (PMI, 1996).

2.4.3 Quality Assurance (QA)

Quality Assurance is a more modern approach to quality achievement in production. It is a shift from the old inspection and quality control systems where a lasting and continuous improvement in quality is achieved by directing organizational efforts towards planning and preventing problems occurring at the source (that is a shift from detection towards the prevention of non-conformance). Thus quality assurance (QA) seeks to eliminate errors and mistakes that will give rise to wastes and defects and subsequently avoid reworks through replacement and making good the defects. QA is broadly the prevention of quality problems through planned and systematic activities. These include the establishment of sound quality management systems, the assessment of its adequacy, the audit of the operation of the system and the review of the system itself (Harris & McCaffer, 2002). The PMI (1996) describes QA as all the planned and systematic activities implemented within a quality system to provide confidence that projects will satisfy relevant quality standards. ‘Fitness for purpose' and ‘right first time' are the basic principles of QA to ensure that specifications are consistently met (Harris &d McCaffer, 2002). QA concentrates on production or construction management methods and procedural approaches to ensure that quality is built into the production system. QA may be provided to the project management team or management of performing organisation as internal quality assurance; or provided to customers and other parties not actively involved in project execution as external QA (PMI, 1996). Quality planning tools and quality audits are the basic techniques used for providing QA. Quality audit is simply a structured review of other quality management activities (PMI, 1996). A quality audit examines the elements of a quality system to evaluate how well these elements comply with quality system requirements. The elements of a quality system identified by Harris and McCaffer (2002) include responsibilities, authorities, relationships, functions, procedures, processes and resources. The main objective of any quality audit is to identify lessons learnt that could improve the performance of the project or other projects within an organisation (PMI, 1996). It helps to establish how well a system is working (Nicholas & Steyn, 2008).

2.5 Factors affecting the application of quality management practice

Quality management practices have fallen short of expectations in the construction industry. Love and Li (2000) affirm that the lack of attention to quality assurances within the construction industry has resulted in quality failures becoming endemic features of the industry. Poor quality management is profound in developing countries. For example, Joubert, Cruywagen and Basson(2005) found that a disregard of quality management implementation exists within the South African construction industry. In Nigeria, poor quality management within its construction industry has led to many years of poor customer satisfaction and service delivery (Achi et al., 2007). Some of the factors affecting the practice of quality management highlighted by Said et al. (2009) include lack of commitments to quality, inadequate support from management, poor attention to quality issues and poor planning for quality. There is no doubt that there is a current and indeed pressing need to examine the implementation of quality management in many construction industries. Considering the situation in Nigeria is relevant with particular emphasis on the level of implementation and factors that impact on the implementation of quality management practices.

3. Research Approach

There are various methods of data collection for a study, but the method adopted depends on the nature of the information required and other circumstances relevant to the topic or study area. There is no one perfect method; instead, any approach that will provide the required information is suitable. The literature review section of this paper shows that quality management practice in the Nigerian construction industry needs to improve and that there are factors that affect the proper implementation of quality management activities in construction organisations. The status of quality management practice is rarely surveyed or examined in the context of construction industry performance evaluation (Rotimi, 2013). To address the objective of assessing quality management practice, a survey of construction practitioners was deemed fit for the study. Questionnaires were used as a survey instrument to widen participation, as they are ideal instruments in survey research approaches (Kumar, 2011). Structured questionnaires

were administered to construction companies based in Abuja, the capital city of Nigeria. Abuja was selected for its proximity and because of the numerous housing development projects undergoing construction. The research participants were management staff within medium to large construction firms, as these could provide the necessary information on their respective organisations' quality management practices. A total of 76 questionnaires were administered, out of which 41 were returned in completed form for the analysis. The total number of completed questionnaires gives an overall response rate of 54%.

3.1 The questionnaire

The questionnaire comprises three key sections. The first section captures demographic information about the survey participants. The second section covers questions to determine the extent of the usage of some quality management tools within the construction industry. The questions were based on mostly four-point scales from 1 to 4, corresponding to 'Never Used', 'Occasionally', 'Usually' and 'Always Used' respectively. The third section elicited the participant's perceptions of the factors affecting quality management practice within the construction industry. The responses were measured on a five-point scale from 1 to 5, corresponding to 'Strongly Disagree', 'Disagree' 'Neutral', 'Agree', and 'Strongly Agree' respectively.

In analysing and evaluating the result of the study, descriptive statistics using frequencies, percentages and Mean Scores (MS) were used. To facilitate the use of the Mean Score formula, numerical values were assigned to the responses. The mean score was calculated using the formula::

$$MS = \frac{\sum Fx}{\sum F} \quad (1)$$

Where: MS = Mean Score, F =Frequency of response to each factor and x = Weighted score given to each rated factor.

4. Results and Discussion

4.1 Demography of research participants

Table 1 gives a breakdown of the demographic information collected from the research participants. From the table, it could be observed that five categories of management staff participated in the research. Their designations show that 12.20% are project managers, 26.83% are construction managers. Site engineers and site supervisors' constitute 21.95% and 29.27% of the respondents and 9.76% of the respondents are lower-level site management personnel (such as foremen). A large percentage of the respondents (58.53%) have over ten years of working experience in the construction industry.

Concerning their background qualifications, the table gives a breakdown showing that 36.59% of the respondents are builders by profession, and 24.39% are civil/structural engineers. Architects and quantity surveyors constitute 9.76 % each of the survey respondents. The majority (41.46%) of the respondents are Bachelor's degree holders, 26.83% with HND and 9.76% of them with Diploma qualifications. Only 7.32% have postgraduate qualifications. The demography presented shows that the respondents are qualified to provide valuable contributions to the research, due to their professional backgrounds, experience and education.

Table 1: Characteristics of the survey respondents

Respondents characteristics		**Frequency**	**Percentage**
Designation of respondents	Project Managers Construction	5	12.20
	Managers	11	26.83
	Site engineers	9	21.95
	Site supervisors	12	29.27
	Others	4	9.76
Working Experience	0-5 Years	7	17.07
	6-10 "	10	24.39
	11-15 "	7	17.07
	16-20 "	8	19.51
	Above 20 years	9	21.95
Profession	Architects	4	9.76
	Builders	15	36.59
	Civil/structural engineers	10	24.39
	Quantity surveyors	4	9.76
	Others	8	19.51
Education	M.Sc.	3	7.32
	PGD	6	14.63
	B.Sc.	17	41.46
	HND	11	26.83
	OND and others	4	9.76

4.2 The use of quality management tools

This section of the result shows the level of use of some quality management tools. Respondents in the survey were requested to indicate how well the tools were used on their respective construction projects.

Table 2 gives a summary of the responses and the respective ranking of quality management tools in line with their frequency of usage. The Mean score calculations facilitated the ranking for each quality management tool.

Table2: Frequency of using quality management tools in the Nigerian construction industry

S/n	Quality Management Tools	∑F	$\sum F_x$	Mean	Rank
1	Inspection (materials, components and construction processes)	41	143	3.49	1
2	Statistical sampling (Test on materials and component)	41	126	3.07	2
3	Quality Checklist (materials and processes)	41	109	2.66	3
4	Use of Quality management plans	41	101	2.46	4
5	Issuance of clear work instructions on site	41	93	2.27	5
6	Quality auditing	41	83	2.02	6

The results show that that inspection of materials/components and construction processes was ranked as the most commonly used quality tool by construction firms within the study area (mean = 3.49). The result agrees with the findings by Elsawalhi and Enshassi (2004) on the use of quality management tools within the Malaysian construction industry. Elsawalhi and Enshassi (2004) had identified that inspection was the most commonly used quality management tool by contractors in Malaysia.

The study result shows that statistical sampling (e.g. testing of materials and components) was ranked second, with mean value equals to 3.07. Quality checklist (for materials and construction processes) and use of quality management plans at the onset of every project were ranked third and fourth quality management tools consecutively. Quality auditing was ranked the least quality management tool by the survey respondents. The low ranking of the quality management plan and quality audit seem to suggest that construction firms have not yet fully imbibed the modern concept of quality assurance. Without quality audits, it is difficult to assess quality performance, talk less of being able to provide the necessary feedback that could improve practice. Thus quality improvement, which is the primary objective of quality assurance (PMI, 1996), may seem farfetched in the Nigerian construction industry.

4.2 Factors affecting quality management practice

The surveyed respondents were sought to rate the factors affecting quality management practice within the construction industry in Nigeria. The result and analysis are presented in Table 3. The result shows that inadequate / lack of planning for quality management in the construction industry was ranked as the most significant factor affecting quality management practice in the construction industry. The calculation of the mean score generated a value of 4.00. Hence it is perceived as the most significant factor. Immediately following planning inadequacies are poor communication of quality requirements among project team members (mean score = 3.73) and lack of awareness of the benefits of quality management (mean score = 3.71). Other factors affecting quality management practice include the high cost of implementing quality management (mean score = 3.51); inadequate motivation of workers to achieve desired quality levels (mean score = 3.49); and lack of commitment from top management (mean score = 3.41). Poor documentation procedures on quality issues (mean score = 3.17) and lack of continuous professional development among project team members (mean score = 3.27) were the least significant factors affecting quality management practices in the construction industry.

On the whole, the results suggest a generally poor quality management practice with numerous factors contributing to this situation. It would also seem that the priority attached to quality is low compared to other project objectives.

Table3: Factors affecting implementation of quality management in the construction industry

S/n	Factors affecting the application of quality management	∑F	∑Fx	Mean	Rank
1	Lack of awareness on the benefits of quality management	41	152	3.71	3
2	High cost of implementing quality management	41	144	3.51	4
3	Inadequate/Lack of planning for quality	41	164	4.00	1
4	Lack of commitment/support from top management	41	140	3.41	6
5	Poor documentation procedures on quality issues	41	130	3.17	10
6	Lack of attention to quality/ inadequate supervision	41	137	3.34	8
7	Poor communication of quality requirements among the project team	41	153	3.73	2
8	Inadequate motivation of workers for achieving desired quality level	41	143	3.49	5
9	Lack of clear assignment of responsibility among project members	41	134	3.27	9
10	Inadequate training/education of construction workers	41	138	3.37	7

5. Discussion of Findings

It seems apparent from the study findings that key quality management tools are not being used in the construction industry to achieve desired quality performances in Nigeria. The production of quality management plans should ideally be the rational starting point for any quality considerations in the execution of construction projects.

However, this is not the case as a quality management plan was ranked comparatively low to other quality management tools. Quality auditing that could provide useful feedback on quality performance was also ranked low, suggesting that there is no desire for improved performance within the Nigerian construction industry. Inspection of materials/components and construction processes is the most commonly applied quality tool by their construction firms. This could suggest that traditional quality management concepts (inspections and statistical sampling) still have wide applications within the industry. This may mean that quality considerations are essentially about the control of the effect rather than preventative and continuous improvement approaches that have been suggested as the way forward in quality management practice in more developed construction industries.

The study findings show that numerous factors affect quality management practice in the Nigerian construction industry. Chief of these factors was inadequate/lack of planning for quality, poor communication of quality requirements and lack of clear awareness on the benefits of quality management. These factors are significant and would require to be addressed by whole-of-industry. Quality planning deserves particular focus by construction professionals, government and its compliance agencies. Imbibing quality assurance principles would mean much more planning of quality issues before their actual performance in Nigeria. These practice inadequacies may be responsible for the incidences of building failure, reputation issues and the high levels of client dissatisfaction with the products of the industry.

6. Conclusion

The paper has as a key objective, an assessment of quality management practice within the construction industry in Nigeria. The study investigation also establishes the factors affecting the implementation of quality management principles within the industry. The study has primarily met these objectives. On the whole, the findings are suggestive of a generally poor quality management practice in Nigeria. Quality management plans are rarely produced for construction projects, talk less of follow on quality auditing to assure project owners. Numerous factors contribute to this situation, but chief amongst this poor quality planning and poor communication of quality requirements amongst project execution teams. Essentially quality management and control is pursued after the effect rather than preventative and continuous performance improvement. The priority attached to quality achievement seems low compared to other project objectives in Nigeria.

These are conclusions that may not be generalisable considering the relatively small size (and localized data from one Nigerian city) used for the study investigation. More extensive data could have enabled a more rigorous statistical analysis to have been undertaken from which more reliable inferences could have been generated. Simply the current study deserves further confirmatory investigations.

However, within the limitations of the current study findings, the study recommends improvement in quality management practices within the construction industry in Nigeria. The responsibility for this lies with project stakeholders. Everyone must play their part; the client must understand that they are a part of the building production process and clearly define their requirements. Designers must ensure they have interpreted those requirements and specify the criteria for quality achievement. The contractors must fully accept that all project scope/quality requirements are achievable and be committed to it. Quality management practices need to meet minimum benchmark requirements.

For any reasonable quality improvements to be visible in the Nigerian construction industry, contracting organisations need to set up quality departments that will plan, control and monitor quality on and off-site. Such departments that operate within the medium to large organisations in the sector will supervise all testing and control processes; take charge of all records on quality, and provide timely responses to operational teams. Furthermore, attitudinal changes are required of professionals within the construction industry. All project participants should recognise that implementing proper quality management will give them both a competitive advantage and also improve their collective reputation. Meeting clients' requirements the first time and every time within the complex processes of building production is achievable with right quality management practices.

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Maintenance Performance of Prison Facilities in Southwestern Nigeria

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Abstract

Maintenance performance measurement aims to assess and improve the value created after maintenance efforts, as it determines the impact of maintenance on the performance of a system or facility and its business process. As objects of maintenance, prison facilities ought to provide a safe and decent environment for prison staff and prisoners to work and live in, as well as for all others who interact with the facilities. This study evaluates the satisfaction ratings of maintenance performance of prison facilities in Southwestern, Nigeria. A survey approach was adopted to collect data from the relevant Nigerian prison staff population of 2,187 prison workers, excluding staff in the maintenance unit within a specific period. Stratified sampling technique was used to generate a sample of 1,094, which is representative of the entire population across the prisons. Three hundred and eighty (35%) out of the one thousand and ninety-four copies of the questionnaire were completed and returned. Data collected were analysed using the SPSS package. The study found that prison staff showed satisfaction with the level of cleanliness in the prison environment, quality of water and control of ventilation employing a window, as well as partial satisfaction with the twenty-nine other criterion assessed. Overall, the study indicated partial satisfaction for performance on prison facilities and established a significant agreement among prison staff regarding the perception of the performance of prison facilities. The research, therefore, suggests continuous evaluation of maintained prison facilities to ascertain their condition and performance levels.

Keywords: Maintenance Performance Criteria; Prison Facilities; Prison Staff; Satisfaction Ratings

1. Introduction

In the maintenance management of facilities, the planning, directing, organising and controlling of maintenance activities and services are mandatory (Zawawi, Kamaruzzaman, Ithnin, & Zulkarnain 2011). Also crucial are measures for evaluating the performance of the facilities to obtain maximum returns on investment. Abd Rani, Basharun, Akbar & Nawawi (2015) observe that maintenance management involves improving and sustaining facility functions, services and surrounding areas. Maintenance management adopts a systematic approach involving standard regulations to be implemented by competent personnel.

Prison facilities are expected to be fit for purpose, safe from attack, help in rehabilitating inmates before their discharge, and compliant with the current legal framework while meeting standard requirements regarding health, ventilation, floor space, heat and lighting (Consoli 2005; Office of the High Commissioner for Human Rights [OHCHR] 2008; United Nations Office on Drugs and Crime [UNODC] 2014). Many Nigerian prison facilities have maintenance-related challenges, such as facility decadence, sick building syndrome (itchy skin, headaches, stuffy nose etc.), poor ventilation, poor standard of cleanliness and lack of repairs in the cell blocks (Health and Safety Executive [HSE] 2000). It is mostly the case that maintenance of facilities is not done in line with actual maintenance needs, owing to inadequate funding by the relevant authorities (www.budgetoffice.gov.ng). These problems are primarily attributed to the reactive maintenance approach syndrome.

In recent times, studies on assessment of hostel facilities (Adewunmi, Omirin, Famuyiwa, & Farinloye 2010), banking buildings (Faremi 2012), the performance

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of hospital buildings (Adenuga 2008) and tenants' satisfaction in housing (Oladapo 2006) have emerged. There have also been studies on how well those buildings or facilities match users' needs and on ways to improve design, performance and fitness for purpose. While these previous studies offer useful insights that might be applied in the context of Nigerian prison facilities, an in-depth evaluation of prison facilities is necessary owing to their peculiarity and intensity of use (Oladapo 2005) as well as the basic standards expected from the usage of prison facilities lighting (UNODC 2014).

Consequently, the performance evaluation of prison facilities will involve systematic evaluation of opinions about facilities in use, especially from the viewpoint of the people who use them. Such critical appraisal enables facility owners, maintenance managers and designers to benchmark the quality of services ranging from maintenance and cleaning to the provision of office furniture (Wauter 2005). Critical appraisals also allow the provision of recommendations for improving facilities services (Adewunmi et al. 2011). This is likely to benefit the prison organisation and users of the prison facilities by extending the life span of prison facilities and the satisfaction derived from the quality of maintenance activities (Abd Rani et al. 2015). It is therefore imperative to have a structured programme which is capable of maintaining prison facilities to required standards, ensuring their availability and enhancing their performance (Her Majesty's Prison Service 2005). Against this backdrop, this study researches into the maintenance performance appraisal of prison facilities by assessing the perception of prison staff on their satisfaction ratings based on articulated maintenance performance criteria.

2. Literature Review

The maintenance objectives and activities of the prison maintenance unit must align with the overall prison reformative, corrective and rehabilitative functions (Parida & Chattopadhyay 2007). In Nigeria, the state headquarters of the prison service handles the management and administration of maintenance activities and decisions, while individual prisons control the deployment of maintenance staff. This type of administrative system is known as semi-centralised (Williams, 2004).

Maintenance management is an orderly and systematic approach to planning, organising, monitoring, and evaluating maintenance activities and their costs (Technical Information Document 2000). It also involves controlling and executing maintenance activities which ensure optimum levels of availability of facilities and overall performance of plants, buildings or facilities (Davies & Greenough 2001). The process involves clear maintenance policies and techniques which could be adopted to keep facilities serviceable while minimising cases of breakdown (Shohet, Lavy-Leibovich & Bar-On 2003; Abd Rani et al. 2015).

Technically speaking, the scope of maintenance management covers every stage in the life cycle of a system (i.e. plant, equipment or facility), as well as processes of acquisition, planning, operation, performance evaluation, replacement and disposal (Murray et al. cited in Tsang, Jardine & Kolodny, 1999). This implies that maintenance management ideas for prison facilities should be conceived right from the acquisition of the facilities and run through the stages of evaluating the performance of facilities to replacing of facilities due to wear and tear and disposing of obsolete prison facilities (Ajayi 2016). Consequently, having an effective maintenance management structure with competent maintenance staff will improve quality and extend the life span of prison facilities, while also enhancing the health, comfort and safety of occupants (Technical Information Document 2000; Abd Rani et al. 2015).

2.1 Maintenance efficiency

Efficiency is defined as a function of value and productivity. Karlof (cited in Then, 1995) described efficiency as "value created in relation to productivity." Value could be described as the relationship between utility and price, while productivity may be viewed as the relationship between the number of units, products or services produced and cost. In the context of this study, value is perceived as customer (prison staff or inmates) satisfaction while productivity is the number of maintenance services undertaken on prison facilities (Pun, Chin, Chow, & Lau 2002).

According to the United Nations Centre for Human Settlement [UNCH] (2003), efficiency is the amount of input resource, usually in monetary terms, per unit of maintenance service delivered. This might as well be described as all inputted maintenance resources such as human resource, equipment/plant/tools/spare parts and finances per unit of quality of maintenance activities provided by the maintenance unit of the Nigerian Prison Service. These resources are imputed to meet up with the prison staff requirements and expectations (Bleul 2004).

2.2 Maintenance performance measurement

Maintenance performance focuses on the condition of facilities in relation to customer service; it allows for duly recognising the impact of maintenance on the performance of a system and business (Murthy, Atrens, & Eccleston 2002). Maintenance Performance Indicators (MPIs) are sets of measures used for measurement of maintenance impact on the process. They are sets of metrics used to quantify the efficiency and effectiveness of maintenance actions (Parida & Uday 2009). These measures are equipped with baselines and realistic targets to facilitate prognostic and diagnostic processes and justify associated decisions and subsequent actions at appropriate levels in the organisation to create value in the business process (Liyanage & Kumar 2002).

Several performance indices on reliability, availability and productivity are widely used in relation to production plant/equipment and service industries. Overall system effectiveness measures whole organisations while individual system effectiveness measures items/components. Evaluating the performance of entire organisations or any items/components/facilities reveals whether there are substantial achievements in individual systems or there is a success in continuous improvement. Where a particular system/facility degrades rapidly,

overall system effectiveness deviates accordingly. Consequently, such deviation hastens organisations to implement correction (Pun et al. 2002). MPIs helps organisations to recognise what maintenance is doing, that is, the effect of maintenance on business (reformatory) performance and reliability of buildings/equipment /facilities within the organisation (Wardhaugh 2004). In essence, MPIs measure and identify performance gaps between current and desired performance, thereby providing improvement to close up the identified gaps.

In the literature, performance indicators which are suitable for measuring the performance of the business process and facilities of the organisation have been developed. Ellingsen, Kumar, Hamre, Waldeland, Nilsen, Dragesaet and Liyanage (2002) suggest a performance measurement framework for the Norwegian oil and gas industry which is based on a balanced scorecard model to include financial indicators, customer perspective, infrastructure and innovation. Hagerby and Johansson (2002) developed Key Performance Indicators, which were evaluated and benchmarked among six process industries in Norway and Sweden. These KPIs include total effective equipment productivity, the direct cost of maintenance, redundancy, customer satisfaction index of the maintenance service, rework direct cost due to maintenance, and health safety environment cost due to maintenance. Their study investigated the companies' strategies and processes as well as their influence on the indicators. The study confirmed difficulties in benchmarking maintenance organisations due to the poor and inconsistent classification of data as well as the diversity of operating conditions.

A study on practice of maintenance operations in six large-scale steel, public utility, transportation, and process industries in Hong Kong and Canada found that the most frequently used measures for performance are financial indicators such as operation cost, maintenance cost, equipment availability, labour productivity, and number of incidents caused by in-service failures (Tsang et al. 1999). These measures are primarily used for operational control purposes, and they reflect short-term performance outcomes. Further, the study also reveals the unawareness of organisation/management of the fact that measurement systems could achieve vertical alignment of goals and horizontal integration of activities. According to Wardhaugh (2004), the study identifies useful indicators for maintenance to include the reliability of equipment, quality and speed of execution/responses, maintenance costs, and prediction of failure. The study concludes that KPIs should drive a proactive maintenance performance that will fuse into the organisation's business. Parida and Chattopadhyay (2007) opine that performance measurement involves monitoring maintenance and employee satisfaction against a list of maintenance performance indicators. Among the list are equipment-related indicators, maintenance task-related indicators, cost-related indicators and impact on customer satisfaction. Other indicators affirmed by the study are learning and growth, health, safety, security and the environment (HSSE) as well as employee satisfaction.

Furthermore, studies by Kotze and Visser (2012) on the South African mining industry identified the extent of use of 32 maintenance performance indicators in maintenance organisations. The most frequently used indicators include safety audits score, reliability, frequency of breakdown, equipment utilisation, lost time frequency rate, cost per unit, total downtime, meantime repair, and schedule compliance. The least-used indicators include total productive maintenance, percentage of maintenance tasks done by operations, continuous improvement and customer satisfaction. Oladapo (2005; 2006) identifies some concepts in staff housing maintenance performance, such as customer satisfaction measures, reliability of building services, number of tenant complaints, and responsiveness of the maintenance unit to tenant's needs. Based on the overall maintenance of the staff house, the study established that 31.1% of the respondents rated their satisfaction below average, while 28.4% rated it above average. A more balanced approach to maintenance performance measurement emphasises the level of occurrences on maintenance performance measures. The most utilised measures include technical, economic and safety measure as well as human resources while the least used measures include training/learning, skills/competencies, work incentives, process performance, customer satisfaction and employee satisfaction (Simoes, Gomes & Yasin 2011).

Without doubt, the condition of buildings or facilities is a measurement maker and a typical way to measure and predict the performance of facilities (Wahida, Milton, Norazela, Nik Mohd & Abdul Hakim 2012). This suggests that for the maintenance management process to be completed in systems or facilities, the performance of such a system must be evaluated to ascertain its condition. In essence, assessing the performance of prison facilities will help in evaluating the impact of maintenance activities on the value of the facilities (Al-Najjar 1996; Parida & Uday 2009). Considering that the current study focuses on the performance of prison facilities, it is essential to categorise their performance variables for adaptability within the Nigerian prison context. The relevant variables are quality of space, response to complaints, maintenance-task related indicators, and cost-related indicators.

3. Research Method

This section explains the method of collecting data and the procedures taken to outline the steps addressing the study. The study adopts a survey approach for assessing the perception of prison staff on the satisfaction derived from maintenance performance of prison facilities. The population comprises prison staff in Southwestern Nigeria, while the sample frame includes prison staff with the exclusion of staff in the maintenance unit. As a relatively new area of interest within a prison context, the study examined customer satisfaction based on the consumer's perspective and the maintenance impact on the customer's business process, which means that the value generated for the customer is assessed and not the view of the maintenance service provider. The stratified sampling technique was used to determine the sample size (Columbia Centre for New Media and Teaching [CNMTL] 2012). The population of prison staff (non-maintenance) in Lagos (Ikoyi, Badagry, Maximum,

Minimum and Female prisons, Kirikiri), Ogun (Old Abeokuta, New Abeokuta, Ijebu-Ode, Ilaro and Shagamu prisons), Oyo (Oyo and Agbodi prisons), Osun (Ile-Ife and Ilesha), Ondo (Akure, Ondo male, Ondo Female, Owo, Okitipupa prisons) and Ekiti prison was investigated to determine the researchable sample at a 95% confidence level and a 0.05 precision level (Israel 2013). Data for the study was collected through copies of the questionnaire and analysis of the study data was done with the SPSS statistical package.

4. Discussion of Findings

Table 1: Sample size for prison non-maintenance staff in southwestern Nigeria

Prison (strata)	Population size	Sample size
Lagos prisons	624	244
Ogun prisons	331	181
Oyo prisons	338	183
Osun prisons	307	174
Ondo prisons	453	212
Ekiti Prison	134	100
Total	**2187**	**1094**

Source: www.gov.ng/prison-info

The minimum sample sizes needed for the study was 244, 181, 183, 174, 212 and 100, respectively (see Table 1). For this study, the accuracy of ±5% was desired; hence, the sample size of one thousand and ninety-four (1,094) was generated.

Table 2 describes the number of returned copies of the structured questionnaire from each prison locations. A total of 380 copies of the questionnaire (35%) were returned out of the 1,094 copies administered.

Table 2: Survey returns of copies of questionnaire

Prisons	Prison staff (Non-maintenance)		
	Sample size	Number returned	Response rate %
Lagos	244	93	38.11
Ogun	181	86	47.51
Oyo	183	46	25.41
Osun	174	38	21.83
Ondo	212	87	41.03
Ekiti	100	30	30
Total	**1094**	**380**	**34.73**

Table 3 presents information on the educational background of the prison staff. Results revealed that ninety-six (25%) members of the prison staff had the Ordinary National Diploma certificate. Seventy-two (19%) had Higher the National Diploma certificate and one hundred and one (27%) had first degree certificates. Furthermore, twenty-eight (7%) members of staff and one (less than 1%) member of staff had master's degrees and PhD qualifications respectively. The figures suggest that the data from the copies of the structured questionnaire would be useful and reliable to some extent. Also, Table 3 shows that two hundred and eight (55%) respondents had a length of service of fewer than ten years. One hundred and fifty-six (41%) respondents had a length of service between ten (10) years and twenty-nine (29) years, while eight (2%) respondents had been in service for more than thirty (30) years. This implies the availability of a reasonable number of respondents from whom data can be retrieved on the survey.

Table 3: Demographic profile of respondents

Demographic profile	Options	Frequency	Percentage
Educational qualification	OND	96	25
	HND	72	19
	B.Sc./ B.Tech	101	27
	M.Sc.	28	7
	PhD	1	1
	Others	74	19
	Missing	8	2
Length of service	Less than 10 years	208	55
	10 – 19 years	104	27
	20 – 29 years	52	14
	30 years and above	8	2
	Missing	8	2
Total		**380**	**100**

4.1 Prison staff satisfaction level in Southwestern Nigeria

The performance of prison facilities was assessed based on prison staff satisfaction ratings using maintenance performance criteria (Adewunmi et al., 2010) on a Likert scale. The finding were interpreted on a graduated scale of 1– 5: $1.00 \leq MS < 1.49$ means high dissatisfaction, $1.50 \leq MS < 2.49$ means dissatisfaction, $2.50 \leq MS < 3.49$ means partial satisfaction, $3.50 \leq MS < 4.49$ means satisfaction and $4.50 \leq MS \leq 5.00$ means high satisfaction. Some common variables were extracted from the literature and simplified for adaptation within the context of Nigerian prisons. The satisfaction survey instrument is a simple 32-item questionnaire. The questions relate to financials (money spent on reporting faults, spare parts), equipment efficiency (security, communication, fire safety gadget), labour productivity (maintenance unit response to complaints, quality of work done by maintenance staff), and infrastructure (vehicular access, adequacy of car park, meeting space, exterior and interior of buildings, quality of water). These also involve indicators related to maintenance tasks, such as quality and speed of execution, the responsiveness of workforce, as well as asset inventory and indicators related to maintenance costs (Oladapo, 2005; Adewunmi et al., 2010).

Table 4 presents the frequency count and the mean score of the level of satisfaction for each performance criterion. The mean scores for each criterion ranged from 3.82 to 2.66.

The results in Table 4 suggest satisfaction among the prison staff on some criteria. The aspects of the prison environs deemed as providing satisfaction to prison staff are highlighted as follows:

• Level of cleanliness in prison environment (3.82 mean score; 24.8 per cent highly satisfied and 46.4 per cent satisfied)

• Quality of water (3.57 mean score; 2.1 per cent highly satisfied and 39.1 per cent satisfied)

• Control of ventilation using windows (3.55 mean score; 17.8 per cent highly satisfied and 39.5 per cent satisfied)

Also, Table 4 suggests partial satisfaction among the prison staff on the following criteria:

• Quality of work done by maintenance staff (3.42 mean score; 15.7 per cent highly satisfied; 33.3 per cent satisfied and 33.3 per cent partially satisfied)

• Adequacy of the car park (3.41 mean score; 19.2 percent highly satisfied; 32.8 percent satisfied and 26.4 percent partially satisfied)

• Space for meetings (3.39 mean score; 17.2 percent highly satisfied; 35.5 percent satisfied and 24.5 percent partially satisfied)

• Waste removal (3.37 mean score; 13.7 percent highly satisfied; 38.3 percent satisfied and 25.6 percent partially satisfied)

• Adequacy of artificial and natural lighting (3.37 mean score; 12.2 percent highly satisfied; 35.6 percent satisfied and 34.5 percent partially satisfied)

• (3.37 mean score; 13.7 percent highly satisfied; 38.3 percent satisfied and 25.6 percent partially satisfied)

• Quality of building exterior (3.34 mean score; 13.2 percent highly satisfied; 33 percent satisfied and 32.4 percent partially satisfied)

• Quality of building interior (3.33 mean score; 15.3 percent highly satisfied; 27.8 percent satisfied and 35.1 percent partially satisfied)

• Vehicular access (3.31 mean score; 14.2 percent highly satisfied; 33.1 percent satisfied and 31.5 percent partially satisfied).

Furthermore, Table 4 lists the aspects of the prison environs which are deemed to provide the least partial satisfaction to prison staff:

• Security (CCTV, alarm system, digital video recorder etc.) (2.66 mean score; 14.2 percent highly satisfied; 33.1 percent satisfied and 31.5 percent partially satisfied)

• Ease of communication (telephone, internet facilities, voice speakers' etc.) (2.70 mean score; 11.4 percent highly satisfied; 22.7 percent satisfied and 18.3 percent partially satisfied)

• Fire safety (2.97 mean score; 10.9 percent highly satisfied; 25.4 percent satisfied and 29.3 percent partially satisfied)

• Exit route (2.98 mean score; 14.2 percent highly satisfied; 27.2 percent satisfied and 19.1 percent partially satisfied)

• Level of maintenance backlog (2.98 mean score; 8.4 percent highly satisfied; 25 percent satisfied and 31.8 percent partially satisfied).

In general, only three performance criteria recorded mean scores ranging from 3.82 to 3.55, while the remaining 29 criteria had scores ranging from 3.44 to 2.66. This implies that members of the prison staff are partially satisfied with the performance of prison facilities. This suggests the low performance of prison facilities and could be a cogent reason why Nigerian prison facilities are perceived as places of punishment ("Prison of Horror," 2000; Nyakaisiki, 2008).

Table 5 also presents the mean scores of the level of satisfaction for each performance criterion on a state by state level. In Lagos prisons, the mean scores for each criterion ranged from 3.75 to 2.64. Prison staff showed satisfaction with the level of cleanliness at a mean score of 3.75 and partial satisfaction with all other criteria including ventilation 3.45, meeting space 3.38, quality of water 3.37, quality of buildings 3.36, lighting 3.27, ability to perform routine maintenance 3.24, waste removal 3.23, car park 3.22, level of maintenance backlog 2.80, money spent on purchasing minor parts 2.79, ease of communication 2.77, and security at mean score of 2.64. In Ogun prisons, mean scores for each criterion ranged from 3.92 to 2.61. Prison staff were satisfied with the level of cleanliness of the environment at a mean score of 3.92, control of ventilation through Windows 3.62 and quality of water 3.51. The prison staff were partially satisfied with all other criteria including the adequacy of car park 3.49, the odour of environs 3.48, quality of work done 3.42, lighting 3.39, waste removal 3.34, money spent on reporting faults 3.30, ability to prioritise maintenance works 3.26, and cost of transporting maintenance staff 3.26.

In Oyo prisons, mean scores for each criterion ranged from 3.77 to 2.51. Prison staff showed satisfaction with the quality of water 3.77, level of cleanliness of prison environment 3.73, waste removal 3.62, and quality of maintenance works 3.52. They also showed partial satisfaction with all other criteria including vehicular access 3.43, cost of transporting maintenance staff 3.41, routine maintenance 3.40, the behaviour of staff 3.37, communication 2.51 and dissatisfaction with security gadgets 2.40. Mean scores for each criterion in Osun prisons ranged from 4.03 to 2.59. Prison staff showed satisfaction with level of cleanliness in the prison environs at a mean score of 4.03, quality of water 3.83, ventilation 3.74, quality of work done 3.72, meeting space 3.71, behaviour of maintenance staff 3.69, adequacy of car park 3.67, exterior of building 3.67, odour 3.63, comfort level 3.63, waste removal 3.54 and partial satisfaction with money spent reporting faults 3.46, routine maintenance 3.45, ability to prioritise maintenance works 3.39, reporting of defect 3.14, level of nuisance 3.40, level of backlog 3.14, sound 3.12, speed of work 3.03, security 2.79, and ease of communication 2.59.

The mean scores of criteria in Ondo prisons ranged from 3.91 to 2.87. Staff showed satisfaction with level of cleanliness 3.91, quality of water 3.70, ventilation 3.69, quality of work done by maintenance staff 3.66, interior of buildings 3.62, lighting 3.55, adequacy of car park 3.54, meeting space 3.52, comfort level 3.50 and partial

satisfaction with waste removal 3.48, vehicular access 3.47, money spent on reporting faults 3.46, routine maintenance 3.45, behaviour of maintenance staff 3.44, fire safety 3.30, sound 3.30, money spent on purchasing minor parts 3.27, maintenance backlog 3.24, response time 3.14, ease of communication 2.88, and security 2.87. In Ekiti prisons, mean scores for each criterion ranged from 3.37 to 2.41. Prison staff showed partial satisfaction with most criteria including lighting at a mean score of 3.37, ventilation 3.37, level of cleanliness 3.33, adequacy of car park 2.90, quality of water 3.21, meeting space 3.20, speed of work 3.10, quality of work done 3.07, comfort level 3.03, response time 3.00, interior of building 2.96, ease of communication 2.67, sound 2.63, odour of environs 2.60, money spent on purchasing minor parts 2.50, and dissatisfaction with cost of transporting maintenance staff 2.41.

Table 4: Prison staff perception on maintenance performance of prison facilities

No	Performance criteria	Prison staff responses %					MS
		HS	S	PS	D	HD	
Quality of space							
1	Level of cleanliness in the prison environment	24.8	46.4	19.7	3.7	5.3	3.82
2	Waste removal	13.7	38.3	25.6	16.2	6.2	3.37
3	Adequacy of artificial and natural lighting	12.2	35.6	34.5	12	5.7	3.37
4	Control of ventilation by means of windows	17.8	39.5	28.1	9.5	5.1	3.55
5	Odour of environment	13.7	32.8	27.7	15.6	10.2	3.24
6	Comfort level in building	11.3	29.6	36.3	19.1	3.8	3.26
7	Space for meeting with visitors	17.2	35.5	24.5	14.8	8.1	3.39
8	Sound insulation	6.7	33.5	29.1	16.8	14	3.02
9	Furniture arrangement	7.6	29	32.8	19.5	11.1	3.02
10	Quality of exterior of building	13.2	33	32.4	17	4.3	3.34
11	Quality of interior of building	15.3	27.8	35.1	18.3	3.5	3.33
12	Quality of water	2.1	39.1	22.4	10.4	7.1	3.57
13	Fire safety	10.9	25.4	29.3	19	15.4	2.97
14	Security (CCTV, alarm system, digital video recorder etc.)	9.7	21.4	21.7	19.4	27.8	2.66
15	Ease of communication (telephone, internet facilities, voice speakers' etc.)	11.4	22.7	18.3	19.9	27.7	2.70
16	Exit route in case of emergency	14.2	27.2	19.1	21.3	18.3	2.98
17	Vehicular access	14.2	33.1	31.5	12.3	8.9	3.31
18	Adequacy of car park	19.2	32.8	26.4	12.8	8.9	3.41
Response to complaints/repairs							
19	Procedure for reporting defects and getting work done	10.3	34	29.1	19	7.6	3.20
20	Time taken by maintenance unit to respond to complaints	8.4	28	30.5	21.6	11.6	3.00
21	Behaviour of maintenance unit staff	11.4	32.2	33.8	16.8	5.9	3.26
22	Level of maintenance backlog (i.e. defect you have reported but yet to be done)	8.4	25	31.8	25.3	9.5	2.98
23	Level of nuisance (i.e. disturbance and interference with your privacy by maintenance staff)	6.4	32.6	37.8	17.4	5.8	3.16
Maintenance task related indicators							
24	Asset inventory (i.e. the way maintenance staff identify physical features that require maintenance	8.7	31.4	35	19.5	5.4	3.18
25	Ability of maintenance department to prioritise maintenance needs with available resources	10.6	31.2	33.6	18.2	6.5	3.21
26	Speed of work (i.e. repairs time)	11.1	27.8	33.7	20.8	6.7	3.16
27	Quality of work done by maintenance staff	15.7	33.3	33.3	13.8	3.8	3.43
28	Ability to react to emergency maintenance	12.2	28.5	30.4	19.5	9.5	3.14
29	Ability to perform routine maintenance	15	26	36.3	16.6	6.1	3.27
Cost related indicators							
30	Money spent reporting faults	11.7	31.9	31.1	19.1	6.3	3.24
31	Cost of transporting maintenance staff	10.6	29.6	35.9	17.8	6	3.21
32	Money spent on purchasing minor parts	8.5	26.8	33.3	22	9	3.03
Grand mean							**3.21**

Where: MS=mean score

HS = highly satisfied, 5; S = satisfied, 4; P = partially satisfied, 3; D = dissatisfied, 2; HD = highly dissatisfied, 1. Interpretation scale: 1.00 ≤ MS < 1.49 means high dissatisfaction, 1.50 ≤ MS < 2.49 means dissatisfaction, 2.50 ≤ MS < 3.49 means partial satisfaction, 3.50 ≤ MS < 4.49 means satisfaction and 4.50 ≤ MS ≤ 5.0 means high satisfaction.

Table5: Prison staff perception on maintenance performance of prison facilities based on prisons state

No	Performance criteria	Prison staff responses						Pooled mean score
		Lagos prisons Ms	Ogun prisons Ms	Oyo prisons Ms	Osun prisons Ms	Ondo prisons Ms	Ekiti prison Ms	
Quality of space								
1	Level of cleanliness in the prison environment	3.75	3.92	3.73	4.03	3.91	3.33	3.82
2	Waste removal	3.23	3.34	3.62	3.54	3.48	3.00	3.37
3	Adequacy of artificial and natural lighting	3.27	3.39	3.18	3.37	3.55	3.37	3.37
4	Control of ventilation by means of windows	3.45	3.62	3.33	3.74	3.69	3.37	3.55
5	Odour of environment	3.12	3.48	2.96	3.63	3.34	2.60	3.24
6	Comfort level in building	3.13	3.10	3.16	3.63	3.50	3.03	3.26
7	Space for meeting with visitors	3.38	3.21	3.33	3.71	3.52	3.20	3.39
8	Sound insulation	3.01	2.87	2.98	3.12	3.30	2.63	3.02
9	Furniture arrangement	3.05	2.76	2.88	3.16	3.35	2.80	3.02
10	Quality of exterior of building	3.36	3.18	3.11	3.67	3.59	2.90	3.34
11	Quality of interior of building	3.31	3.24	3.14	3.42	3.62	2.96	3.33
12	Quality of water	3.37	3.54	3.77	3.83	3.70	3.21	3.57
13	Fire safety	2.84	2.70	2.91	3.35	3.30	2.83	2.97
14	Security (CCTV, alarm system, digital video recorder etc.)	2.64	2.51	2.40	2.79	2.87	2.76	2.66
15	Ease of communication (telephone, internet facilities, voice speakers' etc.)	2.77	2.61	2.51	2.59	2.88	2.67	2.70
16	Exit route in case of emergency	2.92	2.75	2.80	3.23	3.32	2.80	2.98
17	Vehicular access	3.20	3.24	3.43	3.61	2.90	3.31	3.31
18	Adequacy of car park	3.22	3.49	3.22	3.67	3.23	3.44	3.41
Response to complaints/repairs								
19	Procedure for reporting defects and getting work done	2.98	3.26	3.27	3.38	2.83	3.20	3.20
20	Time taken by maintenance unit to responds to complaints	2.90	2.87	2.95	3.28	3.00	3.00	3.00
21	Behaviour of maintenance unit staff	3.03	3.20	3.37	3.69	3.44	2.93	3.26
Response to complaints/repairs								
22	Level of maintenance backlog (i.e. defect you have reported but yet to be done)	2.80	2.96	2.88	3.14	3.24	2.87	2.98
23	Level of nuisance (i.e. disturbance and interference with your privacy by maintenance staff)	3.06	3.00	3.32	3.29	3.40	2.93	3.16
Maintenance task related indicators								
24	Asset inventory (i.e. the way maintenance staff identify physical features that require maintenance	3.02	3.14	3.30	3.24	3.40	2.79	3.18
25	Ability of maintenance department to prioritize maintenance needs with available resources	3.02	3.26	3.19	3.39	3.44	3.10	3.21
26	Speed of work (i.e. repairs time)	3.01	3.12	3.20	3.03	3.40	3.07	3.16
27	Quality of work done by maintenance staff	3.19	3.42	3.52	3.72	3.66	2.80	3.43
28	Ability to react to emergency maintenance	3.06	3.08	3.16	3.29	3.34	2.90	3.14
29	Ability to perform routine maintenance	3.24	3.12	3.40	3.42	3.45		3.27
Cost related indicators								
30	Money spent reporting faults	3.05	3.30	3.20	3.43	3.46	2.73	3.24
31	Cost of transporting maintenance staff	3.10	3.26	3.41	3.32	3.39	2.41	3.21
32	Money spent on purchasing minor parts	2.79	3.01	3.25	3.19	3.27	2.50	3.03
Grand mean		**3.09**	**3.15**	**3.18**	**3.40**	**3.41**	**2.91**	**3.21**

Where: HS = highly satisfied, 5; S = satisfied, 4; P = partially satisfied, 3; D = dissatisfied, 2; HD = highly dissatisfied, 1. Interpretation scale: 1.00 ≤ MS < 1.49 means high dissatisfaction, 1.50 ≤ MS < 2.49 means dissatisfaction, 2.50 ≤ MS < 3.49 means partial satisfaction, 3.50 ≤ MS < 4.49 means satisfaction and 4.50 ≤ MS ≤ 5.0 means high satisfaction.

Comparing prison staff satisfaction among the state prisons, Osun prisons staff showed satisfaction with the highest number (12) of assessed performance criteria, ranging from 4.03 to 3.54. Ondo prisons showed satisfaction with ten performance criteria, ranging from 3.91 to 3.5. Oyo prisons showed satisfaction with four performance criteria, ranging from 3.77 to 3.52. Ogun prisons showed satisfaction with three performance criteria, ranging from 3.92 to 3.54. Lagos prisons showed satisfaction with only one (1) performance criterion, while Ekiti showed no satisfaction with any of the assessed performance criteria. Largely, Ekiti prison showed partial satisfaction with the highest number (31) of performance criteria, ranging from 3.37 to 2.50. Lagos prisons showed partial satisfaction with 30 performance criteria, ranging from 3.45 to 2.64 and Ogun prisons showed partial satisfaction with 28 performance criteria, ranging from 3.49 to 2.40. While Oyo prison staff were partially satisfied with 27 performance criteria, ranging from 3.43 to 2.51, Osun and Ondo prison staff were partially satisfied with 20, and ten performance criteria, respectively. Also, Oyo prisons and Ekiti prisons showed dissatisfaction with only one (1) criterion each, with mean scores of 2.40 and 2.41, respectively.

4.2 Hypothesis testing

To affirm staff satisfaction as an index for measuring the maintenance performance of prison facilities, there is a need to confirm the significance of agreement in their assessment of various maintenance performance criteria. For this reason, the study, therefore, postulates the following hypothesis.

Null Hypothesis: There is no agreement among prison staff (non-maintenance) on satisfaction ratings of prison facilities in Southwestern Nigeria.

Alternative Hypothesis: There is agreement among prison staff (non-maintenance) on satisfaction ratings of prison facilities in Southwestern, Nigeria.

Table 6: Kendall's Coefficient of Concordance Test for Prison Staff Satisfaction with Maintenance Performance of Prison Facilities

Cases	Kendall's W	Chi-square	Df	P-value
255	0.75	596.115	31	0.001

A non-parametric Kendall's coefficient of concordance test for satisfaction ratings of prison facilities based on identified performance criteria was conducted. The result indicated that there was agreement among prison staff on the perception of maintenance performance of prison facilities at $P < 0.05$ levels; hence, the null hypothesis was rejected. This result is in agreement with findings on staff housing maintenance performance (Oladapo, 2006), the slight difference being the type of facility studied and the scale of measurements.

5. Conclusion and Recommendations

The study measured the impact of maintenance on prison facilities and value generated in terms of satisfaction from the use of facilities based on the performance criteria evaluated. The study revealed the satisfaction level for each assessed performance criterion. The study also showed partial satisfaction with maintenance performance of prison facilities and significant agreement among prison staff satisfaction ratings on the maintenance performance of prison facilities.

The study recommends continuous evaluation of maintained prison facilities to ascertain the condition and performance of facilities. The continuous assessment of prison facilities is a joint responsibility of the Nigerian Prison Service, Prison Works and Logistics Department, Maintenance Unit and users of prison facilities.

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A State Legitimation Approach of Reserved Built Environment Professional Work - A Case for South Africa – Part 1

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Abstract

This paper borrows from the lenses of the sociology of professions, sociology of science and temporary project organisations and construction reform to examine state legitimation of reserved built environment (BE) professional work as the first part of a two-part study. In doing so, it examines the growth of professions as a consequence of the division of expert labour evolving to fill in knowledge gaps created by emergent social forces as other knowledge areas are rendered less relevant. It shows how professional work negatively impacts on the delivery efficiencies in the project as a temporary organisation. In making this argument, it draws on the jurisdictional theory of professions to illustrate the relational and interactional relationship of professions in construction projects. To help focus on collaboration, a preliminary conceptual model for the legitimation of professions at the macro (policy) level is developed to explain how boundary margins keep professions relational, and how the dynamics of boundary work unfold in a territorial space in a project (meso) environment. Finally, it provides the scope of the second part of the study (the field study) by formulating the main research objective and research question and their respective specific research objectives and research questions, respectively.

Keywords: Built Environment Professions, Division of Expert Labour, Jurisdictional Boundaries, Legitimation, Professional Work, Temporary Organisations

1. Introduction

Construction industries (CIs) around the world, relative to other industries, face problems of inefficiency, ineffectiveness and sub-optimal performance. Improvement in the performance of the CIs that delivers infrastructure and facilities that forms the built environment is crucial for social and economic development, and environmental protection, especially in developing countries (WEF 2016; Gann and Salter 2000). In response, there has been calls for bold action for over half a century by governments, multilateral agencies; and other stakeholders, focusing on to improving construction productivity, quality of products and services, innovation; and reversing the negative trajectory facing the CI (Fox, 2003, Ofori, 2011, Hermans, van Zoest, and Volker, 2016).

Built Environment Professions (BEPs), as one of the significant constituents in the CI, deserve consideration, as they temporarily collaborate and integrate their specialised knowledge in the delivery of projects (D'Amour and Oandasan 2005; McMurtry 2013). They provide vital specialised knowledge and technical skills that are used in the planning, design, construction supervision, maintenance and eventual disposal of assets in the BE (Ampofo-Anti, 2007). However, questions have been raised as to the role of the BEPs in the poor performance of the CI. For example, Eccles (2009:68) queried whether "…whether they are part of the industry's economic problems". Such a question is not uncommon when addressing the role of any other professions. Equally, Dingwall and Fenn (1987: 51) asked: are these occupations monopolies whose anticompetitive effects distort the social and economic organisation of a society or are they institutions which have developed for reasons of public interest and are, therefore, worthy of preservation? The process of transforming from occupations to professions is referred to as professionalisation, and this reflects 'how modern societies institutionalize expertise' (Abbott, 1988; Evetts,

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2012). Various theories of professions, as shown later, maintains that the objectives of professionalisation differ from occupational closure to public interest. Noordegraaf (2006:765) notes that we lack widely available conceptual frameworks for understanding these complicated processes of professionalisation.

These are important questions that encourage the need to question the relevance of BEPs as the CI does not appear to fully benefit from the division of expert labour (DoEL), which is the core reason for the existence of specialisation through BEPs. While the role of professionalism in society is generally seen as relevant, its potential future in the CI is being challenged as not so much has surfaced from BEPs (Eccles 2009; Hughes and Hughes, 2013). It is in light of this that this study seeks new insight into the legitimation of any reserved professional work that could offer new avenues for addressing problems facing the CI as part of the broader CI reform agenda.

2. Literature Review

2.1 The concept of legitimation of BE professional work

The authors find it convenient to advance the discussion on existing models for professionalisation by referring to two processes of framing professionalisation that grants a different form of exclusivity.

• Reservation or protection of title where any member of the public can carry out the functions of a profession without being registered with the appropriate regulatory body provided s/he does not hold himself/herself under specific title reserved for the professional. Otherwise, it becomes a criminal offence to use the reserved title that is protected by the law.

• Reservation of professional work or protection of functions where reserved functions (also called controlled acts or reserved work) are the sole province of specific professionals registered with the regulatory body. By reserving the services, the state limits the practice of such professional work to the categories of registered persons who would have met specific requirements on the basis that they are protecting the public from incompetent and unethical practitioners. Where there is the protection of functions, it becomes a criminal offence to carry out, such without being registered with the relevant regulatory body.

Reservation of work, itself is not a widely practised tool, the reason being that it is often not possible to clearly define the functions which are to be limited to registered professionals without some ambiguity (http://www.hpc-uk.org/aboutregistration/protectedtitles/protectedfunction/; Hindle (1998, 2001). Identification of work (IDoW) is one such form of reservation of built environment professional functions in South Africa emanating from statutory regulation of BEPs. To date, fewer studies have accounted for the relational interaction in this fractal divide, and therefore, there is limited information about what occurs at the boundary margin of the BEPs.Though academic literature on professions argues a strong case for the structuring of expertise in society through professions (e.g. Adler et al., 2008) it does little to address the structure of their professional work.

The concept of legitimacy is defined by Suchman (1995:574) in Hughes an Hughes (2013) as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions".

Reservation or protection of functions deserves consideration in the construction reform agenda, especially in developing countries wherein the catalogue of problems facing CI include: lack of human resources, institutional capacity and limited human capacity development (Ofori, 2000,2011; van Wyk, 2006). This is accompanied by a lack of appropriate policies and strategies addressing the development of BEPs, which raises the question as to why very little attention is given to BEPs. This is important, as professions are one of the institutions through which the society hold the expertise, in addition to ‘organisations' and ‘commodification' (Abbott, 1988:323). Hence, BEP policy frameworks are devised and implemented as "machinery and mechanisms necessary to achieve reform" (CIB, 2011) in developing countries.

Given the above, the Anglo-American sociology of professions where the state is just an "actor" and part of "large social force" involved in endorsing the outcomes of the professionalisation process becomes redundant in the state-led construction reform. This is because governments in developing countries, through public policies actively define professional jurisdiction, as is the case in the continental European countries such as France, Italy and Germany where the state acts as a "creator of professional jurisdictions" by granting privileges through legislation (Le Bianc 2003). Such an approach is supported by Liu's (2016) argument that for developing countries, the social spaces of professions and [CI] development are overlapping ecologies that share some common actors. This study is done towards providing a possible conceptual model that will improve the state regulation of renewed and emerging BE professional work in South Africa, and by so doing improve the BEPs' performance in project delivery.

2.2 Built environment professions in the CI

There are many definitions of profession arising out of mostly sociology and economic literature are influenced by the theoretical approaches that different authors follow. The description of a profession is given in Langford and Hughes (2009) as a body of knowledge to ensure an evenness of standards of services to the public. For this paper, professions are defined as knowledge-based occupational groups that share tangential boundaries with other occupations, with abstract knowledge being one of the key distinguishing factors.

It is noteworthy that the term "BEPs" is inconsistently defined across the world. However, it is a noun mostly used as an umbrella name for construction, property and facilities management professions. The literature does not offer a definite list of BEPs as it is a drifting concept that varies from country to country and from period to period (Haigh and Amaratunga 2010, Muir and Rance 1995, Hartenberger et al., 2013). The BEPs are best defined by first defining the two terms: built environment (BE) and

professions; in addition to the concept of division of expert labour (DoEL) described herein.

The BE is as an interdisciplinary field, where each discipline is defined as a branch of scientific knowledge, that cuts across planning, design, production, adaptation, maintenance, restoration, conversation, management, evaluation and recycling of the BE (CIOB 2010, Chynoweth 2006 & 2009). These disciplines comprise specialisms, some of which share standard features, and the boundaries between disciplines and relationships amongst them are ill-defined and continuously changing (Wagner at al., 1991 cited in Ofori, 1994).

2.3 BEPs as a result of division of expert labour

Division of labour (DoL) in a society is both a classical social and economic phenomenon studied by several classic writers including Adam Smith in 'The Wealth of the Nation' (1779) and Emile Durkheim in 'The Division of Labour in Society' (1893). According to Smith 's division of labour theory, production efficiencies increase with task separation, where one worker is repeatedly performing each task as compared to where the functions are combined across the value chain and conducted by the same worker. Adam Smith's proposition was further qualified by saying that "the extent of the market" limits the division of labour means that the expansion of the scale of DoL is dependent upon the market. Put differently, the bigger the market, the more the DoL. In Smithian theory, therefore DoL is driven by pure economies of scale (not forgetting the opportunity cost of coordinating a long list of specialists in the value chain). Stigler (1951) echoed Smith's theory to say as an industry grows vertical disintegration occurs where different cost functions become involved in the different aspects of the production of goods.

BEPs can best be represented by the tracing of their historical path from craft guilds to master builders and ultimately to the modern professions as we know them. While such a review is outside the scope of this paper, there are, however, two views concerning the relationship between the development of modern BEPs in general and the craft guilds in particular that deserve attention. The first view is that modern BEPs is an extension of the medieval crafts where all major crafts were organised into guilds, which regulated their affairs and controlled entry to the crafts (Bellis, 2000; Krause, 1996). Just like BEPs, guilds practice monopolistic competition and occupational domination over the trades. The main difference, however, is that guilds included semi-professional occupations with fewer knowledge-ecologies than professions. The second and opposing view is that modern BEPs are not a continuity of the older guilds but rather a break from that tradition. The BEPs appeared in the 19th century as the powers of the guilds were slowly being eroded by significant shifts in political and economic institutions, such as the growth of centralised forms of government, erosion of monarchical powers and increasing commitment to free markets. These changes culminated into the industrial revolution, and different patterns of economic resource and wealth distribution from that in the middle ages (Dingwall, 1996). In the case of occupations, professionalism became a form of the modernisation process identified by "the advance of science and cognitive rationality and the progressive differentiation and rationalization of the division of labour in industrial societies" (Larson, 1977: xiii).

The evolution of BEPs thus seems to support the view that craft guilds were precursors to BEPs and that the emergence of professions was a response to the increasing complexity brought about by industrialisation and sustained by present-day technological, economic, environmental, social and sustainable challenges (Hughes and Hughes 2013). According to Krause (1999) cited in Henn (2013), craft guilds are said to have heralded the beginnings of claims of expertise and professionalism in BE. Thus, the CI experienced DoEL due to the growth of the market (Henn 2013). As the buildings became more complex, disciplines were developed in response and professionals acquired expert knowledge, standard credentials and status in the society.

Today, BEPs as a form of specialisation accompanied by DoEL continues to grow as organisational and technological changes continue to lead to move in the production process and render some knowledge requirements obsolete (Gann and Salter 1999). It also shifts the knowledge boundaries of professions and sometimes gives birth to new ones while continuing to fragment existing ones further (Abbott, 1988; Henn (2013) and Hughes and Hughes (2013).

2.4 Fragmentation as an impact of temporary project organisation structures

Projects- a sphere where BE professional work is practised- calls for better coordination of expertise to reduce enhance effective working relationships and benefit from specialisation. According to Jones & Lichtenstein (2008), a project is a nexus of activities that allows multiple and temporary project-based organisations to work together to achieve their individual and collective goals in a limited period. The temporariness is key as projects are resourced through professionals employed in firms and only come together to execute a one-time project. Hindle (1988) refers to Higgin and Jessop (1985) in arguing that the central problem facing the CI is that the relationship that exists among the resource controllers, professions included, is that of interdependent autonomy, with no match between technical and organisational interdependence. This suggests that the temporary organisation of the resources into a project structure is far removed from the organisations that employ the professionals. This temporary arrangement nullifies the benefits gained through DoEL and specialisation and perpetuates the following problems that do not appear in established ongoing production organisations.

As such, the institutionalised arrangements of organizing BE professional work in projects, deserve to be more widely recognised as for their role in shaping projects. Powell (1990) cited in Bechky (2006:327) proceeds further to reveal that "we know very little about the phenomenology of work within temporary organisations". As such Bechky (2006:327) picking on Powell (1990) raises a relevant question about "how people cope with circumstances in which control is not

direct and immediate, and conformity to well-established administrative routines not guaranteed".

Table 1: Problems with Temporary organisations

Problem	Reference
Inherent transaction costs	Turner and Müller (2003)
Working in new teams that constantly shift team membership and leadership	Demsetz (1991); Thomassen (2004); Bechky (2006)
lack of co-operation, trust, effective communication and adversarial relationships	Bresnen and Marshall (2000); Kadefors (2004); Wikforss and Logren (2007)
new disciplines render established ones obsolete	Gann and Salter (1999)

Bechky's (2006) observation points out a need to understand BE professional work in these short-lived project" settings due to the following features of functionally interdependent professional practice bringing in the fragmentation effects in the CI:

i. temporary collaboration and integration of their knowledge (McMurtry, 2013);

ii. Interconnection and intertwinement as they cannot deliver their functions independently (Abbott 1988; Bordass & Leaman, 2013); and

iii. The accomplishment of tasks is by forming an ecology of occupations (Janda and Killip, 2010).

Fragmentation is a common phenomenon blamed for inefficiencies in the CI. Many industry reports and studies (e.g. Emmerson, 1962; Latham, 1994; Egan, 1998; Construction Industry Review Committee, 2001) proximate fragmentation to a dirt work blamed for and a significant contributor to a wide range of problems facing the CI. Some of the problems facing the CI are listed in Table 2.

Table 2: Problems associated with fragmentation in the CI

Problem	Reference
lagging behind in absorption of new technologies and Innovation	Eichert and Kazi, 2007
poor quality, bad service and broken promises	Egan, 1998; Wood, McDermott, and Swan, 2002
Difficulties in communication, co-operation and integrated project practices	Kadefors, 2004; Dainty *et al.*, 2006; Winch, 2010; Gustavsson and Gohary, 2012).
Over the wall" syndrome – a disconnection between design and construction through a sequential approach to project development	Evbuomwan and Anumba 1998

In the practical sense fragmentation "means that the ownership and control of separate functions …resides in the hands of separate organisations with their own distinctive cultures and working practices" (Oranje et al., 2005:131). Just like in the case of DoEL, there is widespread agreement among scholars and practitioners that the root cause of fragmentation was grounded on the broader phenomenon of industrialization and increasing project size, scope and complexity (Henn, 2013). As a result, the CI does not fully enjoy the benefits of DoEL but instead suffer from the fragmentation, which defines boundaries, rules of interaction and division of responsibilities (Hoffman and Henn, 2008).

While horizontal fragmentation represents differentiation into specialist disciplines, the frustration, however, is that most of the occupational groups resulting from these disciplines do not see themselves as being part of a more extensive professional network responsible for delivering projects (Hartenberger, 2013). According to Alashwal and Abdul-Rahman (2013), the CI contains little network closures. As such, many structural holes are caused by fragmentation. Contrary to the sweeping view, Bresnen and Marshall (2001) supported by Tobin (2015) demonstrate that fragmentation itself is not necessarily a problem, but it is the lack of integration and coordination of the fragments that are a problem. A similar view is held by Zürn and Faude (2013) that it is not fragmentation per se, but rather the coordination (or lack of it) of fragmented or differentiated institutions. Specialism is, however, unavoidable as projects become more complex and become augmented by technological, economic and other external factors (Kallip and Jindal, 2013; Henn, 2013).

Hindle (1998 & 2015) blames professions and even questions as to whether professions create segmentation or specialisation. His position is supported by Eccles (2012) who views the Royal Charters and statutes establishing professions as encouraging fragmentation by creating jurisdiction. Their argument is supported by the fact that each profession acts independently and has a separate identity. They become defensive of their various professional turfs or institutions and want to maintain their independence (Fairclough, 2002). From this perspective, the root cause is the assertion of individual identity and independence, resulting in specialisation without proper coordination.

Hindle (2015) and Eccles (2012) argue that one way of realising collective identity and improving coordination in professions is to pursue similarities in work practice and procedures; in other words, finding a common way of perceiving the problems and their possible solutions and sharing methods, thus bringing in the normative value system of professionalism in professional work and workplaces. Consistent with the above view, Edwards (2010) argues that practice is a 'relation agency' phenomenon in a knowledge-driven institutional setting such as projects. It involves practitioners bringing their knowledge to complex problems, a capacity to negotiate what matters to other professionals and aligning with them in this collaborative, complex phenomenon. Therefore, a practice of professions means performance with professionalism by professionals, of their professional services in a work environment.

However, that being the case, Freidson (1989:439) suggests that we know little about professional practice - the organization of professional work and the way it is performed - is by far the weakest. Freidson (1989), therefore calls for a systematic look at a professional practice that we can understand what work is done, how

and why." Freidson (1989:439). Freidson views, therefore, practice as an organisation and regards the study of the various forms of professional practice as a critical requirement for developing not an only better understanding of the professions but also sensitive and intelligent social policies for dealing with them. To this effect, Gurrie (2009) advises that the organisation and management of professional work remains a significant area of analysis, which will be relevant to construction reform.

2.5 Sociological Theories of Professions

The sociological theories of professions can be explored from at least four different perspectives: trait, structural functionalism, power and lastly jurisdictional conflict as summarized in Table 3. These theories are not discussed in detail due to space limitations, except the jurisdictional/conflict theory, which forms the theoretical framework for this study. Briefly, trait and structural functionalism theories view professions as a positive aspect of modernism while power theory takes a negative view of professionalism and follows Weber's view that professions are a form of monopolization and social closure aimed at dominating the market.

Table 3: Perspectives on sociological theories of professions

Theoretical Perspective	Key Writers	Key Features
Traits	Carr-Saunders and Wilson (1933) Caplow (1954) Wilensky (1964)	• Distinguishing characteristics or attributes of modern professions from ordinary occupation. • key traits include possession of abstract knowledge and adherence to code of conduct to altruistic service to the public
Structural functionalism	Talcott Parson (1939)	• Concerned with how structural relationships interconnect and the functioning whole of the professions. • Justification of the professional – client relationship on the basis of the asymmetry of knowledge between the two.
Power	Everett Hughes (1971) Elliot Freidson (1970) (Johnson 1972 Magali Larson, 1977)	• Professions use their possession of scarce knowledge and skill to claim social recognition and economic rewards; • Professions use specialised knowledge for functional closure and monopolisation to enhance their private interest.
Jurisdictional Conflict	Bucher and Strauss (1961) Thomas Brante (1988) Andrew Abbott (1988) Edman (2001)	• Professions engage in power struggle with other professions in the same field for interactional and relational (territorial) space over professional work; • Regards professionalisation as a process of interprofessional competition for jurisdictional expansion

The jurisdictional conflict focuses on social interaction or the reciprocal relationship between professionals in the workplaces (Abbott, 1986, 1988; Liu, 2014). This approach is said to be interactional as it elevates the unit of analysis from individual professionals to competing for professional groups who coexist in an ecological system (Liu, 2013). The struggle to monopolize jurisdictions in professions is viewed as an inter-professional competition over control of professional work within the field in which they operate. According to jurisdictional theorists, professions engage in a boundary formation over turfs as they patrol their borders from being "invaded" or encroached by neighbours; expand their boundaries into the neighbouring professions' turf; or occupying unclaimed space (vacancies). Unlike power theorists, jurisdictional conflict theorists are not concerned with the monopoly of an individual profession but rather the interaction of competing professions within the same field that share some form of expertise. Professions do not engage in a power struggle for domination, but for interactional space (territory) to compete with one another and constitute various jurisdictional settlements.

Unlike other theorists who put an over-emphasis on macro-sociological processes and the institutional forms of professionalism, jurisdictional conflict theorists focus on control of professional work and link them within an evolving field or system. Just like structural functionalists, they are concerned with intra-group functioning and structures of differentiated professions in a whole of professions, rather than that of an individual profession. The jurisdictional theory considers differentiation of functions and a mechanism to bridge such structures to realise what Parsons (1968) calls a professional complex or what was later termed a system of professions by Abbott (1988). As suggested by Bechky (2003) that functional interaction at the level of work should be examined and shows how such negotiation of professional work boundaries occurs at the level of work.

The first jurisdictional theorists are said to be Bucher and Strauss (1961) who introduced the notion of professions as always in process, instead of static formations, and subject to divisions or segmentation when new specializations are developed. In particular. This study borrows Abbott' System of Profession as a theoretical lens to view such interaction and relation agency.

2.6 Abbott's system of professions as a theoretical lens

Abbott's System of Professions Model provides a three-level approach of 'thinking about division of labour" and" suggest a path to the study of work" (1988;317): He refers to the upper level, i.e. the broad social forces and how such forces affect individual professions under certain conditions; the middle/meso level where a system of profession is taken to be 'structures linking professions

with task' (1988:315); and the bottom/micro level i.e. differentiation within professions themselves.

His model is based on the legal concept of jurisdictions of professions within the same ecological space (biological and spatial concept) where domain provides a connection between a profession and its work. Jurisdiction is a concept defining the link between a profession and its work (Abbott 19988: 20). It is based on the idea that professions constitute an interactive ecology (Abbott 2005:246). Professions are seen as interacting in a limited social space called an ecological system where each profession is allocated a specialised area of professional work called jurisdiction in terms of the expert knowledge system that demarcates symbolic internal boundaries (Abbott 1988; 2005). This paves the way for a conception of an abstract social space borrowed from physical urban spaces and applied to sociology of professions. By an ecology, what is meant is a 'social interaction' that is best understood in terms of interactions between multiple elements that are neither fully constrained nor fully independent (Abbott 2005: 246).

Abbott argues that professions in the same ecological space do not exist alone but co-exist within a continuum in the system (i.e. act as a whole) where "Each profession is bound by a set of tasks and Jurisdiction" (1988:33). This 'system', is a complex, dynamic and interdependent structural network of a group of professions within a given domain of work, continually struggling over areas of knowledge and skill expertise (Abbott, 1988). The professions within the system are bonded or strained by "common work" or "common workplace" (1988:124) implying that they are both interactional and relational to another within the space provided". Since jurisdiction is exclusive, professions constitute an interdependent system (Abbott 1988: 86).

Accordingly, "professions are exclusive occupational groups applying somewhat abstract knowledge to particular cases" (Abbott 1988:8). Abbott argues that the power of professions is rooted in their body of knowledge, which should be sufficiently abstract to prevent appropriation by other professions. The jurisdiction establishment and claim process in Abbott's system of professions underlines a vital feature of any profession, which is that professions are interdependent and therefore must recognise each other to build a recognisable system of legitimate claims in the workplace. Abbott argues that the struggle to monopolise jurisdictions in professions is an inter-professional competition over control of professional work. Professions regularly engage in inter-professional turf battles with each other for jurisdictions. The conflict arises out of professions protecting the monopoly of their settled jurisdiction from invasion by outsiders or other professions within the system, crossing boundaries into their territories.

Abbott's System of Professions Model is seen as relevant to the study of BE professional work for several reasons. First, Abbott (1998:325) recommends that "[We] must stop studying single professions … and start studying work." This is because 'professions both 'created their work and created by it [work] 1998:325'. In Abbott (1988: p. 19)'s opinion

It is control of work that brings the professions into conflict with each other and makes their histories interdependent' It is differentiation in types of work that often leads to acute differentiation within the professions. By switching from a focus on the organisational structures of professions to a focus on groups with typical work, several assumptions are replaced at once.

Second, Abbott's System of Professions Model makes a substantial contribution to the better understanding of professional jurisdictions where professions are mutually dependent and form an ecological system. He recognises that "a profession's success reflects as much the situation of its competitors and the system structure as it does the profession's effects" (Abbott 1988:33). According to Liu (2009: 2014), Abbott's model is said to be a fundamental paradigm shift from previous sociological theories of professions because:

- It elevates the unit of analysis from single professions to a system of professions;
- It shifts from institutional structures of professions to professional work; and
- adopts an interactional and systematic relations approach (Liu, 2009; 2014).

Third, Abbott's (1988) model covers professions at the system level and further analyses the internal differentiation, structures and power of professions within the system as a result of how 'large social forces' affect the system and individual professions within the system. Abbott (1988) argues that organisational efficiency is a central value in the social-structural legitimation of professions." In doing so, he moves away from the institutional form of professionalism to focus on control of professional work within a constantly evolving system (Bureau and Suquet, 2009). He is concerned about structures and the intragroup functioning of differentiated professions in the system rather than of individual profession. He partially addresses Bechky (2003), who suggests that occupational interaction at the level of negotiation of work boundaries should be examined.

However, there are several weaknesses with Abbott (1988)'s model. Firstly, as construction literature on fragmentation demonstrates, boundaries of professions have continuously shifted and required incessant 'boundary work' by those who are interested in ascertaining the professional identity and the productive status of the boundary margins on professional work. Despite all of the above, Abbott still does not answer the question that begs to be asked: How does a system of interdependent professions organize its coordination? Here is where the jurisdictional conflict bias in Abbott's the System of Profession ceases posing questions about the characteristics of a system, that is working together as parts of an interrelated whole (displaying holism characteristics). Secondly, Abbott's theory focuses on conflicts arising out of jurisdictional boundaries and vacancies; and seems to lack a mechanism of articulation between different professions once they are created and competing for turf. While Abbott recognises the collective work as the basis of the conflict, he fails to recognise the potential of better co-ordination of such interdependence as a source of organisational efficiency in the legitimation of professions. Abbott is more concerned with social closure of one profession by another or monopolisation by expanding the boundaries of existing professions rather

than the actual cooperation required in the professional work.

In summary, the relevance and criticism of the Abbottian Model of the system of professions to BE professional work are summarised in Table 4. While this theory is relevant, it is not sufficient to understand the extent to which professional work in a temporary organisation environment occurs. Direct extrapolation from this theory that enables legitimation of reservation of professional practice in the built environment is therefore impossible as pinpointed by the limitation highlighted..

Table 3: Relevance and criticism of the Abbottian model of system of professions

Relevance	**Criticism and Limitations**
Abbott's theory was a fundamental paradigm shift from previous sociological theories of professions, as it: • Shifted the unit of analysis from single professions to a system of professions and focusing on professional work; • Shifted focus from institutional structures of professions to professional work; • Adopted an interactional and systematic relations approach • Analysed functional divisions and the forces behind jurisdictional change; • Considered the role of external factors in shaping a field as an area of practice.	Abbott's theory does not answer the following questions: • How does a system of interdependent professions organise its own coordination? • How do interdependent and differentiated BEPs in a ecological system positively work together to complete a whole? • How do mutual boundaries serve as a sight of interconnection rather than rivalry? • How do boundaries become a mode of production rather than source of conflict (Lamont and Molnar, 2002; Star and Giesemer, 1989)? • How do BEPs move from a retrograde culture of inter-professional competition and turf battles towards integration - relational analysis? • What is the role of the state in the structuring of professional work?

2.7 Gieryn's (1983) Boundary work as a Lens

Several writers have used boundary work as a tool for social and cultural distinctions (Gieryn, 1983; Liu, 2013). Because professional boundaries are always contested and transformed by tensions, Gieryn (1983) encourages a focus on their construction and negotiation. In a study of the science community, Gieryn(1983) examined "the discursive attribution of selected qualities to scientists, scientific method, and scientific claims for drawing a rhetorical boundary between science and some less authoritative, residual non-science" and "demarcating, defending, expanding, contesting the limits of legitimate science, the real scientist from the pseudo scientist" territory. So, if boundaries designate the beginning and the end of territories, jurisdictional boundaries indicate the presence of borderlines that confine professional work for each BEP.

According to Liu (2013), for both Abbott and Gieryn, boundary work is not only a symbolic concept for understanding social classifications but also a spatial concept. To do boundary work means to engage in the construction of social space, such as the space of knowledge (Gieryn, 1999) or the space of work and occupations (Abbott 1988). Accordingly, various patterns of boundary work all have spatial consequences.

Referring to the workplace, professions cannot deliver their functions independently. Instead, they become interconnected and intertwined in project organisations where they temporarily collaborate and integrate their knowledge in their delivery of projects (Abbott 1988; Bordass & Leaman, 2013; McMurtry 2013). They form an ecology of occupations to accomplish the tasks considered to be within their jurisdiction (Janda and Killip 2010).

So, if boundaries designate the beginning and the end of territories jurisdictional boundaries indicate the presence of borderlines that confine reserved work for each BEP. The competition for tasks from time to time also differentiates the internal division of professions, thus forming jurisdictional boundaries. The differentiation creates some form of specialisation that may be a vertical stratification, thus creating hierarchy and subordination or may be horizontal, thus creating functional differentiation. As such, professions engage in jurisdictional claims and settlements. The differentiation carves out areas of specialisation for each profession but at the same time reinforces inter-professional connections amongst professions. It also highlights that the professions become "interdependent", meaning that there cannot be specialisation with some form of complementarity. Since the professions in a system are interdependence they must integrate and collaborate of which their boundaries play a role.

3. Significance of the Theoretical Frameworks

While theories of temporary organization design are suggestive, there is little empirical evidence showing how coordination happens in legitimizing professional work where the internal functioning will be in temporary organizational forms. It is on this basis that the authors argue that the problem of professionalism in the CI should move from a retrograde culture of inter-professional competition, that is, turf battles over-controlling of professional work, towards integration-relational analysis. It is possible to identify boundaries as a mode of production that bridges two or more professions in a system in the interdependent profession. Both Lamont and Molnar (2002) and Star and Giesemer (1989) tread boundaries as boundary objects bridging two separate professions. This conceptual position has a role to play in the division of professions.

In summary, the theory of structuring professional work in the DoEL as successfully advanced by Abbott's

system of professions views professions as acting interdependently as wholly discrete units but does not address the coordination and integration required. This negates its full use as in addressing the implications for professionals in construction reform, and, as Banwell (1964:1, cited in Hindle 2000) observes, the addressing "the most urgent problem which confronts the CI, … the necessity of thinking and acting as a whole).

One justification for the regulation of professions is prescribed (positive) behaviour and improving the efficiency of markets in delivering goods and services (Den Hertog, 2010; Kogan and Unt, 2008). It, therefore, makes sense that any state intervention in the professions should move beyond conflict to the integration of professional work in projects under which long term enrichment of the BE could be realised. As observed by several writers (e.g. Dingwall & King, 1995; Dingwall 2004; Liu 2013), Abbott appears to be unable to signpost certainty concerning this factor, especially where the state is considered as another actor in the system of professions. However, Abbott proceeds to redeem this deficiency in his article on linked ecologies of professions (Abbott, 2005) where the influential roles of academisation are acknowledged and the state regulatory powers in the determination of territorial jurisdictions of each professional stake.

Lest it be assumed that Abbott's system of profession model re-emphasises and identifies power as a defining issue for professionalism, it can also mean that the state regulation of the professions and their legitimisation as enshrined in the legislation exists ostensibly to promote inefficiencies and perpetuate the 'problem of demarcation' as envisaged by Gieryn (1983;1995). The 'conflict perspective' advanced by Abbott inevitably negatively modifies attitudes towards differentiation and DoEL as well as the figuration of mutual boundaries running between interdependent professions to be a sight of rivalry rather than interconnection. Despite its profound challenges, Abbott's system of professions can offer rich insights and possibilities to professionalism for construction sector reform.

In conclusion, the theories of sociologies of professions and science attempt to assess the society's ability to hold expertise through BEPs as a form of division of expert labour in the CI. However, these fail to comprehensively analyse all the factors that influence professional work in projects as temporary organisations. The construction literature fails to assess the capacity of BEPs to behave as fragments comprehensively, hence inefficiencies in the CI. This paper helps to complete the existing arguments for professionalisation in the BE, thus enabling these theories to further inform the state legitimation of BE professional work and underpin construction reform and development. In this circumstance, there is a need to seek to relate the phenomenology of professional practice in the temporary organisation to state regulation of reserved BE professional work within the specific context of government-led- construction industry development in developing countries.

4. South African Case Study

As observed by Fox and Skitmore (2002), the South African approach to CI development (Department of Public Works, RSA 1998: 1-70) has placed much more emphasis on institutional infrastructure to address its human capacity challenges, BEPs included. While significant progress has been made in the establishment of these developmental and regulatory entities, the regulatory tools largely remain undeveloped for various reasons. For example, the Construction Industry Development Board (CIDB) has not made progress on the launching of the register of professional service providers, and the sections in the built environment professions acts that prohibit the undertaking of work reserved for professions with designated professional titles have still not been promulgated since 2000. The South African BEP policy and the machinery and mechanisms put in place to realise reform are briefly outlined below.

After the first democratic elections in South Africa in 1994, the Department of Public Works formulated construction sector policies in the White Paper entitled, Creating an enabling environment for reconstruction, growth and development in the construction industry (DPW) (1999). According to the White Paper,

"The strategic aim of a construction industry policy is to establish an enabling environment in which the objectives of reconstruction, development and growth are realised in the construction industry. The vision is of a construction industry policy and strategy that promotes stability, fosters economic growth and international competitiveness, creates sustainable employment and which addresses historic imbalances as it generates new industry capacity.

The Government of the Republic of South Africa also embarked on a plan to renew professions and professionalism in BE as it sought to rebuild the nation in the aftermath of apartheid. The Policy Framework on the Statutory Regulation of the Built Environment Professions (DPW: 1999) (BEPs Policy Framework justified the necessity of statutory regulation for the protection of the health, safety and pecuniary interests of the public and maintenance of quality standards. At the core, its statutory regulation in the BEP Policy lies a mechanism called reservation of work. The use of the term reservation of functions was subsequently changed to the identification of work (IDoW) in the Council for the Built Environment (CBE) Act, 2000 (Act No. 43 of 2000). Despite the change of terminology from the reservation of functions to IDoW, the explicit intentions remained the same, is to:

i. promote DoEL by recognising for emerging professions and creating new categories of registration within the existing professions; and ii. effect state regulation of BEPs that will contribute to the efficiency and competitiveness of the CI

As such IDoW is a mechanism arising out of the BEP Policy that is intended to provide a framework for the legitimation of the creation and renewal of professional work for BEPs in South Africa.

While the BEP Policy Documents identified IDoW as a mechanism to achieve reform, it also pointed out the common unintended and even undesirable consequences of orthodox professionalism, including the creation of monopolies and stifling of competition. In shaping the

future, a probing caution was thus raised in the BEP Policy Framework: that '…care must, therefore, be taken that reservation of functions is not a restrictive practice but rather an enabling provision' (DPW 1999, unnumbered). Though this notion is recognised in the policy framework, South Africa made policy choices to retain statutory regulation of BEPs to drive construction reform; and use IDoW as a regulatory mechanism to recognise emerging and renewed BEPs (Ministry of Public Works 1998: DPW policy, 1999).

Since the enactment of the relevant BEP legislation, the implementation of IDoW remains unenforceable; as the relevant section in the legislation which reserve work for specific categories of registration remains un-enacted. These teething problems on policy interpretation and implementation undermine the change and reform intent in the BEPs Policy Document, i.e. recognition of new professions and transformation of the existing ones by creating new categories of registration within them.

With South Africa having made these policy choices, the issue addressed here is not whether statutory regulation of BEPs is desired or not but a need to address the quality of state intervention. By quality, it is meant that there is a need to ensure that the well-intended actions of the State do not have unintended consequences or make things worse. This is critical as the positive intention of government intervention in achieving the desired change, is not always achieved. As observed by Luiz (2000:235), misdirected state intervention is possibly worse than no intervention".

5. A Preliminary Conceptual Model for Identification of Work Model

Having identified the abovementioned theories to guide the legitimation od BE professional work in SA, the authors attempt to respond to the overarching aim of CIB Task Group TG84 on Construction Reform by exploring and explaining IDoW as the machinery and mechanisms that can be put in place to achieve BEP reform as a case study.

The preliminary schematic conceptual model in Figure 1 provides various analytical concepts centred around boundary margins on and within a system of the profession in a construction project. The schematic conceptual model makes a move away from use of the word 'boundary' as seen in the lenses referred to earlier on 'boundary margin' to reflect the fact that the boundaries may not always be fused, that is interfaced but may overlap and sometimes leave gaps in between professions over and above what Abbott (1988) regards as 'vacancies'. Conceptualising the boundary zones of neighbouring professions as transition points at which transactions and exchanges take place is an essential step in understanding this constant process of birth and renewal of professions. The role and function of boundaries in configuring the fa system of BEPs needs to be understood relationally to capture the means of collaboration across these boundary zones.

To help focus on collaboration, the conceptual model for the identification of work at the project level focuses on time and space logic before considering the legitimation process at the macro (policy) level. The conceptual model is based on four analytical concepts - overlaps, vacancies, interstices, interfaces – overlaid in a territorial space (the fifth analytical concept) to explain how boundary margins keep professions relational, and how the dynamics of boundary work unfold in a system of professions occupying a territorial space in a project (meso) environment.

Territories

In creating territories, professional boundaries serve as external bounding structures and serve as internal demarcation elements of any enclosure. In case of BEPs, boundaries demarcate and separate the internal arrangement of each discipline into specific professions, besides giving the territorial configuration of the enclosure of BEP. Such BEPs create boundaries, thus guarding their territories against both the unqualified and the neighbouring professions. This postulates that, at any given time, the territory of each BEP is demarcated at some definite point in space, relative to the next profession. Their localization in that space may have some "causation" effect and hence can say that they are interdependent.

Overlaps

There are possible overlaps in knowledge and jurisdiction between two or more professions in the system. Overlaps are a potential source of conflicts between professions. Ironically, the overlapping not only confirms the mutual dependence of professions in the system but also become a source of conflict.

Despite recognition of commonalities, professions tend to be individualistic and, on occasion, face resistance arising out of overlaps, which ought to be a source of integration. Some professions consider their role as being infringed upon and their professional identity eroded. This creates a climate of uncertainty about the limits of their responsibilities.

Interstices

An interstitial space is the space in-between, underneath, beyond, enveloped, and outside our traditional spaces occupied by professions. In focusing on jurisdictional areas, 'small spaces' (referred to interstices) occur in between the professions. Their "smallness" inherently signifies a power issue. The 'in-between-ness' occurs because they are being surrounded by other spaces that are either more institutionalized, and therefore economically and legally powerful, or endowed with a stronger identity, and thus more recognizable or typical. Just like in the urban space analysis, rather than a mere small gap in between the BEPs, the interstice is, in fact, an active component. Interstitially also equates to emptiness. However, void also holds prospects for the birth of new professions.

Vacancy

Vacancy refers to a grey area in which any professions do not address a task and in which conflicts between two professions could arise as they compete for it. Vacancies are just like intervals in that they are not static but are continuously changing as they are being formed by ever-shifting demarcation within the system. The difference between vacancies and interstices being that vacancies are large enough to be occupied by emerging professions.

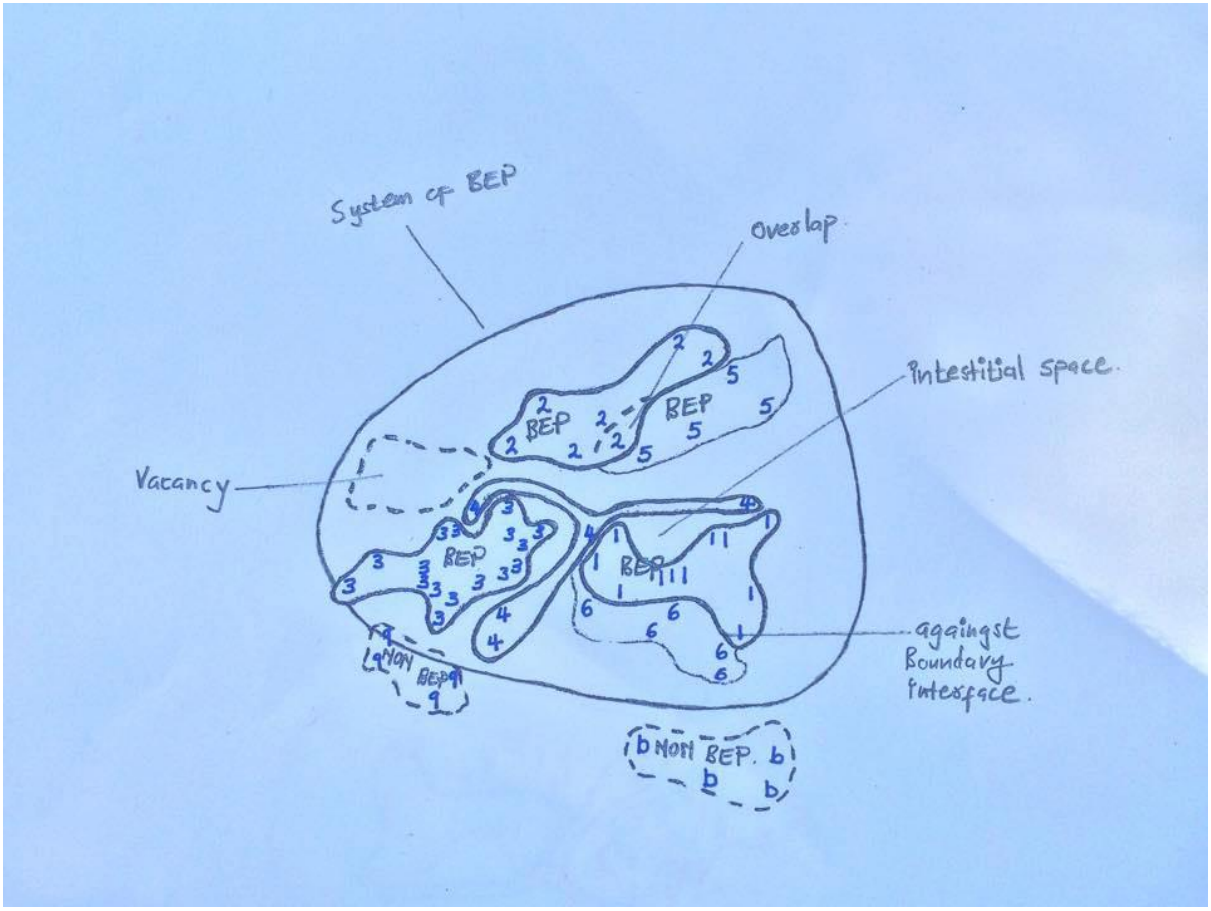

Figure 1: Preliminary conceptual model for IDoW
Please note BEP 1 to 6 represent various professions in the construction industry such as architecture, engineering, project management, etc

6. Concluding Discussion

The literature review shows that the CI cannot afford to institutionalise expert knowledge through BEPs without considering projects - a temporal organisation where professional work is practised- as secondary institutions, else fragmentation and poor co-ordination prevail.

Abbott's (1988) system of profession model was mobilised here as a jurisdictional sociological theory of professions to theoretically develop new insights into how professional boundary margins entangle relations and interaction of professions in space and time.

Given the pervasive role of boundaries in effecting coordination in the relations and interaction of professions, depending on the type of boundaries, the authors contend that the relationship between professions should not be left for market instruments such as contracts to define but should be part of the legitimation. Therefore, identification of work is about the legitimation of knowledge boundaries encapsulating emerging and renewed professions.

A preliminary conceptual model is proposed composed of five analytical concepts, i.e. overlaps, vacancies, interstices, interfaces, and the territorial space they exist within. Each analytical concept helps explain a unique process wherein boundaries of inter-dependent professions become legitimately entangled with another. The model highlights the process of boundary management at a project level. In this sense, collaboration potential must be worked at professional legitimation level rather than at project contracting level as the CI cannot afford to hold expert knowledge through the institution of professions without considering the temporary organisation form.

Table 4: Research questions and research objectives

Specific Research Questions	Specific Research Objectives
What is the theoretical construct behind IDoW?	To develop meaning and understanding of IDoW in the BE inter-professional work
What is the nature of boundary margins in and between BEPs?	To identify key issues and concerns regarding boundaries in BEPs
Why will overlaps, gaps and interstitial spaces at boundary margins matter?	To describe how boundary margins manifest and the extent to which some are more influential than others
How can a conceptual model for IDoW enable and support the renewal and creation of new BEPs?	To develop an explanatory theory and process to guide identification of BE inter-professional work

In seeking to understand the project-based professional work practices, this conceptual model opens up the black box of the legitimation of professional work. While it

reveals the process at the meso level, further empirical research is required to validate the conceptual model and provide a process map for the legitimation at the macro (policy level).

The thesis of this research is that IDoW should go beyond ruling on contested jurisdictional professional boundaries but should provide coordination and integration of differentiated but complementary functions arising out of DoEL in an interdependent and inter-BEP professional environment (rather than leave that to contractual arrangements at project stage).

Having considered the conceptual model, the main research question to be answered by the second and last phase of the study, of which the proposed conceptual model forms a part thereof, is:

What is the meaning of IDoW, and how should inter-professional work be identified for renewed and emerging professions in the CI?

The main research objective will be to:

To provide a theoretical understanding and conceptual framework for the identification of inter-professional work for BE Professions (BEPs)

The purpose of the study will, therefore be:

To develop a conceptual model that will assist in understanding better the intricacies involved in legitimising identified BE professional work. The specific research questions and research objectives to be answered are, therefore listed in Table 4.

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Barriers to the Effective Regulation of the Building Construction Industry: An Empirical Analysis

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Abstract

This study investigates key barriers to the effective regulation of the building construction industry in Kenya, a case study of Kisii Town. It was guided by the Public Interest Theory of Regulation, which provided the underpinning elucidating why the building construction industry in Kenya needs regulation. The target population comprised 84 registered building contractors with a sample size of 66 selected using simple random sampling by application of random number table. As regards limitation, the study does not measure the extent of quality assurance within the construction industry, but rather delve on the key factors impeding its effective regulation. The research findings show that ineffective regulation of the construction industry in Kisii Town was prompted by the joint activities of building development contractors and limitations of the National Construction Authority (NCA) (the regulator). Regarding the activities of building contractors, identified barriers included failure to refer to key legislation that regulates the construction industry, failure to obtain statutory approvals of building development, and laxity to invite supervision of ongoing projects by planning authorities. Conversely, factors elucidating why NCA was not successfully regulating the construction industry included inadequate multi-sectoral coordination, inadequate surveillance, and limited sensitization of key stakeholders. Drawing from these findings, the study recommends regular monitoring and enhanced enforcement that would promote compliance and sensitization of contractors with applicable standards and regular inspections of ongoing projects. Also, establishing a coordinating committee to harmonize institutions that deal with development control.

Keywords: Construction Industry, Kenya, Kisii Town, Regulation

1. Introduction

The global construction industry was in 2017, valued at US$ 10.4 trillion and projected to annually expand by 3.7% to the US $12.4 trillion by 2022 (Amiri and Bausman, 2018). The construction sector is widely acknowledged as among the top accelerators of prosperity owing to its role in the economic uplift through employment generation. The industry, in the same way, plays a vital role by being a leading source of income within the formal and informal sectors (Khan, 2008). By its nature, the construction industry has the prospective for mobilizing and efficiently exploiting human capital and physical resources towards the development and improvement of housing along with the attendant infrastructure to enhance economic efficiency (Oladrin et al., 2012). This makes it among the noticeable contributors to economic prosperity since its products provide indispensable public and private infrastructure that supports undertakings such as trade, amenities and services. As such, it remains significant on account of its end product, effectively making it a requisite for economic transformation (Wibowo, 2009).

However, notwithstanding its acclaimed significance, inadequate regulation of the industry may attract salient challenges which could potentially negate the much anticipated economic benefits. To cite an example (Gichana and Nyagesiba, 2016), on 11th October 2017, six people were left dead with several injured after a three-story building that was under construction in Kisii Town collapsed, a problem credited to poor workmanship and the disregard of building regulations by developers and their contractors. Unregulated developments in Kisii Town have also led to noncompliance with standards such

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as building coverage ratio and floor area ratio, leading to unsustainable development (Omollo et al., 2018). No country can, therefore, prosper if its construction industry is not well-regulated (Gacheru and Diang'a, 2015).

Regulation of the industry is, therefore, obligatory given that contractors and their clients are responsible for the development of structures occupied by millions of people. In this esteem, the construction industry in Kenya and by extension in Kisii Town is hence not an exception. The objective of this study was, therefore, to examine key barriers to the effective regulation of the building construction industry in Kenya using Kisii Town as a case study. In terms of rationale, the study provides policy formulating bodies in developing and developed countries with pragmatic options towards the effective regularization of their residential building construction industries, a strategy for attaining sustainable urban development. Furthermore, the study makes a methodological contribution to the literature on building development control by empirically elucidating the correlation of factors limiting the regulation of the construction industry using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

2. Barriers to the Regulation of Construction Industry: A Literature Review

Compliance with building regulations and laws is a legislative requisite in the construction industry (Windapo and Cattel, 2010). Notwithstanding this obligation, a growing body of literature suggests that the industry's regulation continues to emerge as one of the key challenges of achieving sustainable development.

A study of Mozambique's construction industry by Nhabinde et al. (2012) established that inadequate regulation was prompted by contractors who were not certified, insufficient policy and institutional coordination, and a lack of qualified personnel. These findings relate to that of Windapo and Cattel (2010) who argued that the South African construction industry had a skill and knowledge gap along with the fact that most supervisory positions were held by people who, although not well educated, were more experienced. As such, the extent of non-compliance with stipulated regulations was high amongst the unqualified and less experienced firms not registered with the country's Construction Industry Development Board. Further, some site managers were unaware of the legislation that regulate building construction industry. Regulation of the building construction industry may also be affected by noncompliance with approval conditions. For instance, Ngetich et al. (2014) found out that 38% of the applicants who obtained a development permit between 2005 and 2010 in Eldoret Town, Kenya, failed to comply with stipulated building regulations.

Above findings compares with that of by Hedidor and Bondinuba (2017) who averred that the informal construction sector in Ghana paid little attention to the approved regulations for the construction of buildings. This was elicited by low levels of training and competence of artisans within the industry. On account of inadequate regulation, low-quality training duped apprentices into thinking that they were fully qualified when they were not. In Mombasa, Kenya, Gacheru (2015) found out that barriers to the regulation of construction industry included the inadequate capacity by NCA to detect errant contractors through frequent surveys, weak enforcement of regulations, inadequate sensitization and poor attitude of contractors towards the regulatory bodies.

According to Ofori-Kuragu (2016), key challenges to effective regulation of the construction industry in Ghana included lack of coordination and a clear agenda to address the apparent problems that afflict performance within the industry. As additionally corroborated by Hedidor and Bondinuba (2017), the country lacked a multi-stakeholder representative body that could provide leadership in the pursuit of reforms in the Ghanaian construction industry. In their research, Callistus et al (2014) through a case study of small- scale contractors in Ghana demonstrated that some of the barriers to effective regulation of the industry were corruption, lack of coordination between designers and contractors, inadequate monitoring and feedback by relevant authorities, and lack of training on quality for staff.

In an attempt to further investigate compliance and enforcement challenges concerning the national building regulations process in South Africa, Twum-Darko and Mazibuko (2015) established that developers had a low level of awareness and understanding of the regulatory role of implementation of National Building Regulations. Other challenges included ineffective communication channels between the stakeholders and the regulator and also inconsistencies of the enforcement of the legislation by various local authorities.

A further study by Kumar and Pushplata (2015) on compliance with building regulations for the hill towns of India demonstrated that the enforcement and surveillance mechanism to ensure compliance was not adequate. Given this, there were fewer initiatives by regulatory authorities in an attempt to stop illegal and unplanned developments. Moreover, there was a shortage of technical experts in hill towns who could implement existing building regulations in addition to ensuring that construction activities were carried out in compliance with the approved regulations. These findings are further corroborated by Adebowale et al. (2016), who established that a key challenge within Nigeria's construction industry included poor workmanship and inadequate supervision. In this case, supervision should constantly aim to ensure that building developments are undertaken as approved by planning by authorities.

From the preceding literature review, key barriers to effective regulation of the construction industry may be summarised to include insufficient coordination, lack of qualified staff within firms, inadequate capacity by regulatory authorities, inadequate enforcement and surveillance, and lack of stakeholders' sensitization. The current study, however, examines the statistical relationship between key barriers that influence effective regulation of the construction industry.

3. Overview of the Construction Industry in Kenya

Kenya's construction industry is well-developed and characterised by established businesses that primarily engage in housing projects, engineering services such as

roads, and allied trade services (Competition Authority of Kenya 2017). Currently, the industry remains a significant multiplier in the country's economy through its remarkable impact on the country's Gross Domestic Product (GDP). In this way, it presents a key driver of economic prosperity. Kenya's construction industry respectively grew by 6.1%, 13.1%, 13.8%, 9.8% and 8.6% between 2013, 2014, 2015, 2016 and 2017 in that order, denoting a thriving sector. Noticeably, in 2015, the industry accounted for 7% of Kenya's GDP, further maintaining that the country has a well-developed construction industry (Kenya National Bureau of Statistics, 2018).

Kenya's economic outlook, in addition, suggests that the construction industry is ranked among the leading sectors that have continued to attract investors with a particular interest in areas such as transportation, upgrading of informal settlements and slums, the supply of construction materials, construction of housing, and manufacturing (Competition Authority of Kenya 2017). The construction industry in Kenya is regulated by the Government and its associated agencies through various legislations to ensure that this growth does not impact on the built environment.

The industry is regulated by the NCA, a state corporation established under section 3 of the NCA Act (2011). According to section 5 of the Act, the Authority has a mandate of regulating and building capacity within the construction industry. Further, it accredits site supervisors and skilled construction workers, in addition to monitoring the performance of all contractors. To attain this, the Authority has grouped construction companies depending on the contract cost they are permitted to handle together with the academic qualifications for the proprietors of the firms (the Republic of Kenya, 2011). The Act is operationalized through regulations that give NCA the mandate of regulating, promoting quality assurance and researching matters dealing with construction (the Republic of Kenya, 2014). A significant critique of the NCA Act is that it does not pay attention to the enforcement of planning standards during the inspection of construction projects. Moreover, the Act has not granted the NCA statutory powers of prosecuting errant contractors and developers.

Apart from NCA, building construction industry in Kenya is also regulated by county governments through development control following Section 36 of the Physical Planning Act of 1996 (The Republic of Kenya, 1996). This legislation, under Section 29, empowers the county governments with the mandate of developing bylaws which are essential in controlling zoning as concerns use and density of development, considering and approving all applications for development, prohibiting the use and development of land and buildings towards promoting orderly development and granting all permissions for development. Section 30 further prohibits any person from undertaking development within the area of a county government without a permit issued by the respective county government. A key limitation of the Physical Planning Act of 1996 is that it is too lenient when it comes to reprimanding developers who do not comply with the requirement of obtaining a development permit. For instance, section 30 (2) of the Act prescribes a penalty of only Kshs 130,000 (1,284.40 USD). This is low considering the impacts that may be brought by unregulated construction industry such as the collapse of buildings.

The requirements of the Physical Planning Act of 1996 are additionally augmented by the Building Code of 1968 where Section 16 (1) compels a person intending to develop a building in addition to first obtaining a development permit to also give the appropriate county government, a Notice of Inspection showing the date and time when the building construction, plumbing and drain laying will commence (the Republic of Kenya, 1968). Further, the following are required to be ready for inspection: foundation bed, foundation concrete, damp proof course, ceiling, concrete after shuttering is removed, concrete after shuttering is removed, drainage, plumbing installations, and sewer connection. In effect, the Code makes it obligatory for the inspection of buildings during the construction process in addition to issuing certificates of occupancy to ensure that completed buildings have complied with the stipulated quality assurance standards.

4. Study Objective, Scope, and Theoretical Underpinning

The objective of this study was to investigate the barriers towards effective regulation of the building construction industry in Kenya, a case study of Kisii Town. Although county governments in Kenya also regulate the construction industry, the scope of this study was, however, limited to NCA since it retains the exclusive mandate of registering and accrediting contractors in Kenya. Concerning theoretical orientation, it is anchored in the Public Interest Theory of Regulation (PITR). PITR postulates that unregulated economic markets have a predisposition of operating inadequately by focusing on the interests of individuals while overlooking the significance of society (Christensen, 2010). Hence, to monitor such markets, the state has to intercede through regulations.

As the leading statutory governing authority, the state consequently promotes the concern of the society at large instead of enacting laws that would favour it as an overarching regulator. In the context of the present study, the theory rightly supports why the construction industry in Kisii Town necessitated statutory regulation by NCA and other planning authorities to ensure compliance with set regulatory standards. This is because building development control is procedurally effected through compulsory directives dispensed and enforced by the agencies of the state. In this case, developers who do not comply consequently attract stiff penalties as may be specified in the applicable legislation.

5. Research Methods

5.1 Background to the study area

Kisii Town as the administrative capital of Kisii County lies about 120 km to the South of Kisumu city, the third-largest urban area in Kenya, and 320 km West of Nairobi city, Kenya's capital city. Spatially, the town covers an area of 34 km2. Kisii town has a topography that is typified by several valleys. While Nyanchwa Hills, which

lies at an altitude of approximately 1800 m above sea level is located in the Southern part of the town, Mwamosioma Hills, which similarly rises to around 1800 m above sea level is located in the Northern part of the town. Further, rising to 1950 m above sea level to the Southern part of the town is Bobaracho and Gesarara hills. The town is well drained by several rivers which collectively form the River Riana tributaries. The population of the Kisii Town in 2017 was estimated at 90,100 and projected to 140,118 by 2032 (Omollo, 2018). This increase is likely to intensify land use development, therefore attracting more investments in the construction industry. However, if this transpires in the absence of an effective regulatory framework by designated statutory authorities, challenges such as non-compliance by stakeholders in the built environment are bound to increase at the disadvantage of sustainable land use planning.

5.2 Target population, sample and sampling design

The target population for the study comprises of 84 registered contractors whose scope of operations covered building development obtained from the NCA regional office in Kisii Town. A Sample Size Determination Table that Krejcie and Morgan (1970) recommends was after that used in selecting the desired sample size of 64. Questionnaires with a thematic grouping of structured and unstructured questions were then administered to sampled registered building contractors after a pilot study.

5.3 Validity and Reliability

The study adopted content validity, defined by Kothari (2004) as the degree to which an instrument used in research offers sufficient coverage regarding the phenomenon under analysis. To comply with this requirement, two experts in building construction management were given the questionnaires. In this context, while one evaluated the concepts that the instruments were measuring, while the other considered if the items sufficiently embodied the notion under investigation. Research Instruments were in the end enriched based on the two expert opinions along with a pilot test that was successfully undertaken in Nyamira Town, 25 km from Kisii Town.

The current study adopted Cronbach Alpha in the testing of reliability. The test was developed by Lee Cronbach (1951) to offer a measure of internal consistency. According to Goforth (2015), in an attempt to provide a general computation of item consistency in a questionnaire, the reliability coefficient varieties from 0 to 1. In this case, if the alpha (α) coefficient is higher, the questions are more likely to share covariance and possibly measure the same fundamental concept.

5.4 Analysis of Data

Both descriptive (cross-tabulation and percentages) and inferential (Exploratory Factor Analysis (EFA), Pearson's bivariate correlation coefficient, and Confirmatory Factor Analysis (CFA)) statistics were used in data analysis. While cross-tabulation and percentages were used in exploring the descriptive relationship between categorical variables, Pearson's Bivariate Correlation was used in testing the relationships among selected variables.

Regarding EFA, the multivariate technique was used in identifying latent constructs or components through Principal Component Analysis (PCA) and reducing observed variables into smaller sets to facilitate easier interpretations. It was applied to determine why NCA could not effectively regulate the building construction industry in Kisii Town. CFA was employed alongside PCA to validate the factor structure of observed variables. This allowed testing of the proposition that relationships between observed variables and their latent constructs existed.

6. Results and Discussions

6.1 Survey response rate and reliability test

The obtained response rate for questionnaires administered to contractors was 70%. This was above the minimum of 50% recommended by Mugenda and Mugenda (2003). It was concluded that the responses were sufficiently representative for drawing logical deductions as well as in making key policy recommendations towards attaining an effective regulation of the building construction industry in Kisii Town. As suggested by Kothari (2004), the outcomes of pilot studies ought to be documented in research. After piloting, the questionnaire's reliability was tested using Cronbach's α. Consequential Cronbach's α was 0.834, which demonstrated very high levels of internal consistency. Consequently, no variables were dropped for that reason.

Having examined the response rate and results of the reliability test, the next subsections now present the research findings on barriers to the regulation of the construction industry in Kisii Town. In this setting, barriers to regulation are discussed under two subsections: factors induced by registered building contractors who have a duty of ensuring compliance and those prompted by NCA as their regulator.

6.2 Factors induced by building contractors

According to Anyanwu (2013), a contractor is a crucial expert at the centre of any building construction. The contractor's primary duties entail coordination of all activities and taking charge to ensure that the project is developed as per the specifications in the approved building plans. The contractor must ensure that the construction process complies with all statutory requirements at the pre-construction stage, construction and close-out phase.

6.2.1 Laws that guide building contractors

It is the responsibility of contractors to ensure that they make reference to applicable laws in the process of building development. The study as such sought to find out which laws guided them before commencing construction, during construction and in post-construction. Results showed that a majority (57.9%) made reference to the NCA Act of 2012, followed by the Environmental Management and Coordination Act (EMCA) of 1999 (10.5%), the Physical Planning Act (Cap. 286) and the Building Code (each 7%) and the Ministry of Public Works regulations (5.3%). Nevertheless, 10.5% were not aware of any such laws.

Findings suggest that 12.3% never referred to any law, while only 7% referred to the Physical Planning Act (Cap. 286). It draws attention to why 27% of developers never obtained development permission, thus providing room for flouting building regulations. Such inconsistency in the application of legislation related to development is, therefore, among the key challenges undermining effective regulation of the construction industry in Kisii Town.

6.2.2.Approvals obtained by contractors and guiding planning standards

Building contractors in the study area also have an obligation of ensuring that they obtain the correct approvals from clients before commencing development statutory process. Key approvals as per various legislations include notification of approval by the Physical Planning Department (PPD) through Form PPA2, permission by the National Environment Management Authority (NEMA) through Environmental Impact Assessment (EIA) license, and project registration by NCA (Table 1).

Table 1: Types of approvals contractors obtained from clients

Type of Approval Obtained from Client	Per cent
Approval by PPD	10.7
EIA license from NEMA	17.3
Approval by the Public Health Department	10.7
Approval by NCA	22.7
Site plan	13.3
Approved structural drawings	6.7
Contract with client	5.3
Client's permission	13.3

Results indicate that while most contractors (22.7%) were only keen to comply with NCA's approval, 17.3% prioritized obtaining EIA. Notably, 13.3% revealed that all they required was the client's permission to begin construction. At the same time, only 10.7% reported requiring approvals from PPD and PHD, respectively. This may suggest that NCA emerges as more stringent in the enforcement of construction quality assurance standards. It is also apparent that contractors place less emphasis on the building plans approved by PPD, which contains enforceable planning standards. This potentially attracts nonconformity with such standards (for example, floor area ratio), therefore contributing to unregulated land-use change. Drawing from the preceding insight, the study sought to find out which planning standards guided contractors. Results suggested that a majority (46%) cited building height regulation, 2% British Standards, 4% European Standards, and Water Resources Management Authority regulations, respectively. However, of great concern was that 44% reported not to be guided by any planning standard. The problem is compounded by the fact that 22% of the respondents were not aware of the existence of Kisii Town Physical Development Plan, which is used as a tool for undertaking development control in the study area.

6.2.3 Supervision of building developments during the construction process

Section 16 (1) of the Building Code (1968) requires a person who intends to develop a building to give the planning authority a "Notice of Inspection" card indicating the date and time when the development will begin. It is, therefore, the contractor's responsibility to ensure that the notice is issued to the planning authority. The study, as a result, sought to establish from building contractors, which office supervised their projects and frequency of supervision, an aspect considered necessary since supervision enhances monitoring, conformity, and enforcement. It emerged that only 20% of projects were supervised during all phases. This potentially creates a gap that encourages developers not to comply with recommended building regulations. Concerning projects which had been supervised, the study, as indicated in Figure 1, examined who supervised them.

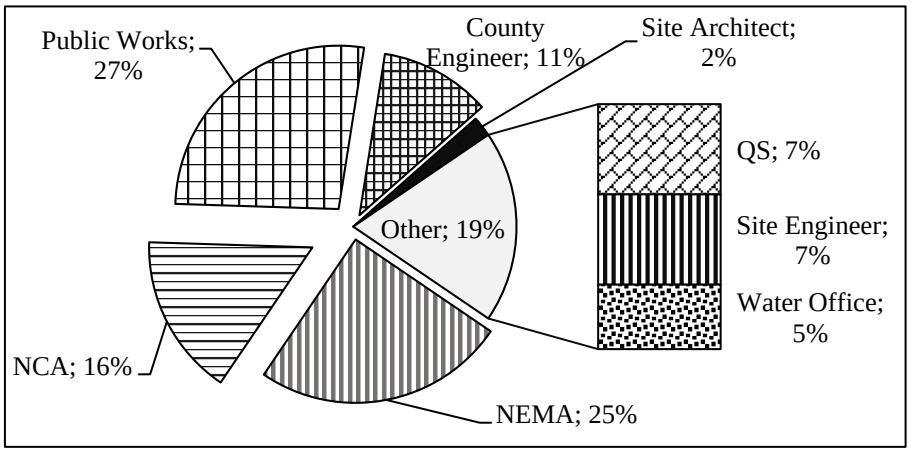

Figure 1: Responsibility for the inspection of building developments

It can be seen that the Public Works Office accounted for 27% of inspections, followed by NEMA at 25% to ensure implementation of Environmental Management Plans. NCA accounted for 16%, while Quantity Surveyor (QS) 7%. The frequency of supervision varied at a minimum of one and a maximum of four times. Overall mean was four. What these results denote was that although PPD and PHD approved building developments, they never inspected the same to ascertain compliance. This also creates a missing link that presents developers with an

opportunity of disregarding the sanctioned planning standards; consequently, a key driver of unplanned land-use change. All these problems occasioned mostly because contractors infrequently invited concerned departments to inspect buildings under construction.

6.3 Factors induced by NCA: an exploratory and confirmatory factor approach

After observing that most contractors were not versed with planning standards and laws in addition to the development control process, it was conjectured that the limitation was induced by institutional limitations of the regulator - NCA. This was informed by Section 5 (2) g and k of the NCA Act (2012), which grants the Authority powers to ensure quality assurance in the construction industry, accredit and register contractors, in addition to regulating their professional undertakings. Principal Component Analysis (PCA) was, therefore, used to determine which underlying factors (components) explained why the NCA was not adequately regulating the building construction industry in Kisii Town. PCA is a multivariate method that analyses a data table in which observations are described by several inter-correlated quantitative dependent variables (Abdi and Williams, 2010). Its objective is to summarize data to enable patterns and their associations to be easily comprehended and interpreted. It aims at summarizing data to allow patterns and relationships to be effortlessly deduced and understood. It is usually applied in rearranging variables into a limited set of groups constructed on common variance and assists to segregate concepts and constructs (Yong and Pearce, 2013). Examination of the appropriateness of Factor Analysis was attained using the Kaiser-Meyer Olkin (KMO) and Bartlett's Test, which is commonly applied in research. Reported Chi-square approximation was 345.249 with 91 degrees of freedom, which was significant, p = .000. The KMO of 0.727 was also larger (higher than 0.50, as recommended by Kaiser, 1974) (Table 2). This gave credibility to PCA as a suitable technique for further Factor Analysis.

Table 2: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.727
Bartlett's Test of Sphericity:	Approx. Chi-Square	345.249
	df	91
	Sig.	.000

Data collected from sampled building development contractors were subjected to a Principal Axis Factor (PAF) with an orthogonal Varimax rotation of the 15 Likert scale questions. Computation of the variance followed this accounting for the initial solution as well as the rotated components extracted (Table 3). The Initial Eigenvalues are captured in the first part of Table 3. While the total column highlights the amounts of variance in the original study variables accounted for by each component, the percentage of the variance column, reports the ratio, depicted as a percentage of the variance expounded by each component when compared to the aggregate variation within the variables. Additionally, the cumulative percentage column provides the percentage of variance accounted for by the first identified components. For example, the cumulative percentage for the third component is the sum of the percentage of actual variance for the first and second components. Because only the eigenvalues larger than one were extracted, the first three principal components formed the extracted solution, which explains nearly 63.78% of the variability in the original 14 variables (Table 3).

Table 3: Total variance explained by PCA

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.99	42.80	42.80	5.99	42.80	42.80
2	1.52	10.90	53.71	1.52	10.90	53.71
3	1.41	10.07	63.78	1.41	10.07	63.78
4	1.00	7.20	70.98			
5	.86	6.20	77.19			
6	.73	5.27	82.46			
7	.56	4.03	86.49			
8	.50	3.60	90.10			
9	.37	2.67	92.77			
10	.34	2.46	95.24			
11	.25	1.78	97.02			
12	.21	1.52	98.55			
13	.12	.87	99.43			
14	.07	.56	100.00			

Extraction Method: Principal Component Analysis

In addition to the total variance explained by the PCA (Table 3), outcomes relating to orthogonal rotation of the solution are further presented where Rotated Component

The matrix shows component loadings for each variable or correlation between a variable and a component extracted from the data (Table 4).

Four variables (TMPR, QUAL, COLA, and TRAC) strongly loaded into Component 1. When they were jointly considered, they seemed to address multi-sectoral coordination. The component was as a result labelled, "Extent of multi-sectoral coordination" because underlying issues could be best explained using a multi-sectoral coordination approach. Three variables (CMON,

TRAP, and ENFO) that loaded to Component 2 appeared to be addressing, "Extent of surveillance" since the three identified variables may only become effective if adequate surveillance is guaranteed. Three more variables (ADVI, TRAI, and SUSP) that strongly loaded into Component 3 jointly addressed sensitization. Because identified issues could be adequately addressed through enhanced sensitization. The component was thus labelled, "Extent of sensitization". The identified three principal components (factors elucidating why NCA was not successfully regulating the building construction industry) were further used as latent variables in Structured Equation Modelling (SEM) to test the significance of each component (latent variable) against the corresponding measured variables that loaded on them. This demonstrates the relationship between Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) (Figure 2).

Table 4: Rotated component matrix

Variable	Principal Components		
	1	2	3
Timely registration of construction projects (TMPR)	.777		
Promote quality assurance (QUAL)	.746		
Collaborating with other institutions (COLA)	.732		
Transparency in contractor registration (TRAC)	.692		
The capacity to monitor construction projects (CMON)		.812	
Transparency in project registration (TRAP)		.699	
Enforcement of regulations on construction (ENFO)		.680	
Advisory services to developers/contractors (ADVI)			.824
Training construction workers (TRAI)			.801
Suspension of non-complying contractors (SUSP)			.719

Rotation Method: Varimax with Kaiser Normalization

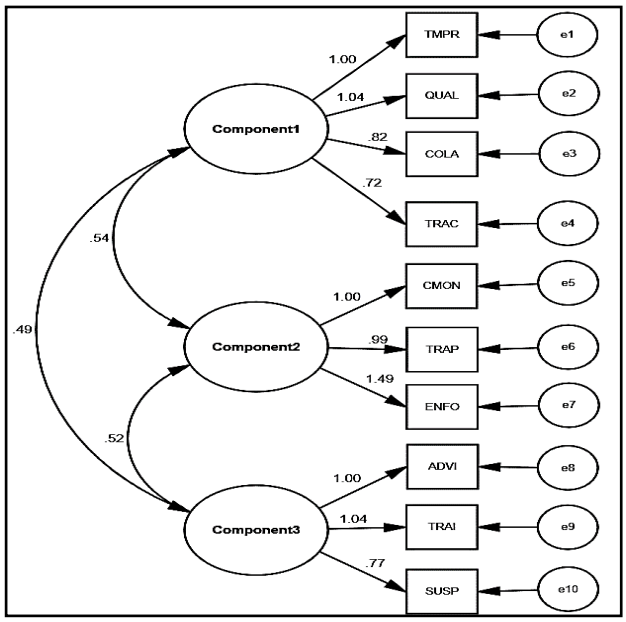

Figure 2 Structural model of the three principal components

The model shows the relationship between the three principal components (latent variables) and their respective measured variables, as well as the correlation between the principal components (Figure 4). SEM represents a statistical method that is used in developing and testing of causal models. It fundamentally represents a mixture of a method that incorporates both facets of CFA, path analysis and multiple regression analysis, and is extensively used by researchers in examining the operational association between measured variables and resultant latent concepts (Loehlin, 2004).

This technique was adopted because it has the advantage of approximating the interconnected and numerous dependency within a single line of inquiry. Among the advantages of SEM is its capability in modelling constructs as relevant latent variables. A latent variable is that variable which cannot be directly measured but customarily inferred by the covariances amongst two or more variables that are measured. According to Loehlin (2004) and Jensen and Janes (2012), principal components act as the latent variables of a PCA model. Measured variables are variables that can be directly measured. They consist of data that has been collected by directly mapping into the constructs of interest.

As a norm, SEM usually begins with a given hypothesis which is signified as a model, followed by the execution of the key paradigms which are being examined with an instrument of measurement and after that, the model testing. In the current study, the hypothesis derived was that the three principal components (latent variables) that occasioned did not influence measured variables that loaded into each of them (Figure 2 and Table 5).

As regards the first latent variable/principal component (multi-sectoral coordination), when it goes up by 1.000, TMPR, QUAL, COLA, and TRAC respectively go up by 1.000, 1.038, 0.816 and 0.716, thus significantly predicting its four measured variables, $p = .000$, $CR > 1.96$. This suggests that if multi-sectoral coordination that is currently inadequate improves, it will contribute to an equal improvement in TMPR, QUAL, COLA, and TRAC. The converse will follow if multi-sectoral co-ordination declines. Concerning the second principal component (extent of surveillance), it was further demonstrated that when it goes up by one unit, CMON, TRAP, and ENFO would respectively go up by 1.000, 0.985 and 1.493.

As the case of multi-sectoral coordination, extent of surveillance also predicted its three variables ($p = .000$, $CR > 1.96$). This implies that an increase in the surveillance of building developments in Kisii Town would significantly promote the enforcement of applicable standards. Equally, in the absence of adequate

surveillance, unregulated building development would ensue at the detriment of effective development control. Lastly, the third component (extent of sensitization) also significantly predicted its variables, p = .000, CR >1.96). Hence, if sensitization increases by one unit, ADVI, TRAI, and SUSP will respectively increase by 1.000, 1.039, and .773. This connotes that the improvement in the sensitization of building contractors and their sensitization through training would lead to capacity building. Therefore, providing an opportunity for reprimanding noncomplying contractors since most of them would be aware of the applicable standards within the construction industry. The model in the end passed the test for goodness of fit, where Chi-square, $\chi 2 = 55.594$, df = 32, p = .006.

Table 5: Regression weights and significance test for SEM

Measured Variable	Path Direction	Latent Variable/ Component	Estimated (Regression weights)	Critical Ratio (CR)	P
TMPR	<---	1	1.000		.000
QUAL	<---	1	1.038	4.858	.000
COLA	<---	1	.816	3.864	.000
TRAC	<---	1	.716	3.628	.000
CMON	<---	2	1.000		.000
TRAP	<---	2	.985	3.267	.000
ENFO	<---	2	1.493	3.741	.000
ADVI	<---	3	1.000		.000
TRAI	<---	3	1.039	5.398	.000
SUSP	<---	3	.773	4.339	.000

Given the observed relationships between each component and their respective measured variables, the model further tested the correlation between the three components. Results indicated that the correlation between multi-sectoral coordination and extent of sensitization was positive and significant, r = .491, p = .024, the same applied to the relationship between the degree of surveillance and extent of sensitization, r = .521, p =. 014 and so was the case of multi-sectoral coordination and extent of surveillance, r = .543, p = .012. These relationships infer that an increase in multi-sectoral coordination would result in an improved sensitization of building contractors and developers; likewise, improved surveillance will enhance sensitization of contractors and developers. At the same time, enhanced multi-sectoral coordination leads to analogous improvement in surveillance. These are construed as essential tenets in containing the unplanned land-use change.

The findings of this study align with that of Gacheru (2015), which established that factors limiting regulation of contractors in Kenya included inadequate human resource capacity, unsatisfactory enforcement of regulations and limited sensitization. The findings also agree with that of Ofori-Kuragu et al. (2016), who established that the fragmentation of stakeholders hinders regulation of the Ghanaian construction industry. However, unlike Gacheru (2015) and Ofori-Kuragu et al. (2016), the current study, through statistical quantifications determined the extent of association between key variables that impacts on the successful regulation of the building construction industry, therefore further contributing to the existing body of literature on the built environment.

7. Conclusion and Recommendations

7.1 Conclusion

Sustainable urban development may not be fully attained in Kenya if a lapse frequently occurs in the regulation of its vibrant construction industry. This study demonstrates that the barriers to the effective regulation of the building construction industry in the study area may be itemised as those induced by building contractors and those induced by NCA as their regulator. In this case, factors influenced by NCA comprised the low extent of multi-sectoral coordination, limited surveillance and inadequate sensitization of contractors and developers. Conversely, factors induced by contractors included inconsistencies in the application of relevant laws, failure to get prerequisite approvals before commencing construction, disregard of planning standards and failure to involve relevant government departments in the inspection of building development during constructions. As regards the implication of research findings, the study has validated the theorised interplay between the critical factors that may directly influence the regulation of building construction industry. This, in turn, can serve a learning outcome in addition to providing insight into the quest for achieving sustainable regulation of the building construction industry for both developing and developed countries.

Although this paper examined key barriers to the effective regulation of the building construction industry, its limitation was that data collection and subsequent analysis focused on residential building developments. However, this gap provides an opportunity for further research with a possible interrogation on how concerned planning authorities also regulate the construction of other categories of building developments (such as commercial, educational, public purpose, and industrial), a tactic for promoting sustainable urban development, and recently, attaining the objectives of the emerging concept of a ‘smart city.

7.2 Recommendations

Contractors should ensure that before the commencement of construction, their clients have obtained all applicable statutory approvals from respective approving authorities.

They should also ensure that the projects they are undertaking are supervised at all phases by relevant authorities.

There is a need to consistently undertake enforcement and surveillance audits that would promote compliance with approved building regulations by developers in Kisii Town. To attain this inquest, the function of building development control should be decentralized to the location levels. This will make NCA, and the County Government of Kisii have a direct presence at the neighbourhood levels leading to increased incidences in monitoring and enforcement. To actualise this strategy, NCA and the County Government should undertake regular public education campaigns targeting developers on the importance rather than punitive nature of building development control. Additionally, the two lead agencies should jointly prepare comprehensive legislation on building development control through a participatory approach by engaging key stakeholders. This will make the "regulated" to own and directly participate in the regulation process.

NCA should organize regular training workshops for building contractors to deepen their understanding of the benefits of building development regulations, including applicable legislation in the built environment.

All County Government departments involved in the inspection of development projects should have joint inspection schedules to ensure uniformity in the enforcement of compliance.

A Coordinating Committee should be established to harmonize various agencies (such as NEMA, NCA and Public Health) that undertake building development control, thus eliminating duplication in enforcement efforts.

As a long term strategy, the NCA should be wound up and its functions transferred to the county governments because it duplicates their development control function, an exclusive function of the county governments in Kenya. This is as provided for under Part XI of the County Governments Act (2012) as further read with Section 29 of the Physical Planning Act of 1996. The county governments in Kenya, through appropriate legislation, should, therefore, be further empowered to undertake the function of registration and accreditation of building contractors operating within their respective spatial jurisdictions.

The penalties of not complying with building development control requirements under the Physical Planning Act of 1996 should be reviewed upwards to deter developers from noncompliance. Further, the NCA Act of 2011 should also be examined to give NCA the powers to directly prosecute non-complying contractors and developers.

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Factor's Influencing Contractors Risk Attitude in the Malaysian Construction Industry

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Abstract

The Malaysian construction industry often acts as a vehicle that motivates' the development of the nation's economy. The industry is commonly referred to as a catalyst for development. However, poor performance in terms of productivity and quality systems has been the main issues of discussion from most of the government reports. In order to improve performance in the Malaysian construction industry, the introduction of the Occupational Safety and Health Act (OSHA) in 1994 has made all industries in Malaysia to identify hazards, conduct risk assessment and control those risk and at the same time implement an integrated system to ensure consistency and better performance of projects in Malaysian industries. Therefore, in this paper, the ranking of specific factors affecting contractors' risk attitudes in the Malaysian construction industry was assessed. A review of relevant literature was undertaken to identify the factors influencing contractors' risk attitudes. The study found that the four leading specific factors influencing contractors risk attitude in the Malaysian construction industry are; Project Related Factors, Working capital, Human-Related Factors, and External Environment. The study confirms the individual factors that affect the contractor's risk attitudes. Knowledge of these factors will facilitate contractors' decision-making process and serve as a useful reference for further studies in the field of construction project management.

Keywords: Contractor's risk attitude, Malaysia, Risk attitude, Risk management

1. Introduction

In Malaysia, the construction industry is one of the most significant sectors that have significantly and rapidly contributed to the country's economic growth. According to the Construction Industry Development Board (CIDB) in Malaysia, the construction industry attained RM170 billion and RM180 billion value of projects in the year 2017 and 2018, respectively. The projects included the construction sector, agriculture sector, mining and quarrying sector, manufacturing sector and services sector. Implementing projects on schedule is problematic in the undefined, complex, multiparty, and dynamic environment of construction projects (CIDB, 2017). Because of this, the industry is always open to conflicts and disputes. It is common for some stakeholders claiming for imperfect work, delayed completion and changes of scope (Adeleke et al., 2018).

The CIDB Malaysia, which is an organization established with the primary function of developing, improving and expanding the Malaysian construction industry, has identified risk and other sustainability-related issues as the top issues impacting the construction industry (CIDB Malaysia). Many construction projects in Malaysia in the process of initiating, planning, controlling, executing and closing have experienced high risks. Besides, the risk level during the construction phase is recognized as a risk higher than that of the economic sector. The Project Management Institute (PMI, 2008) stated that risk is an uncertain condition which has an undesirable influence on the goal of a project.

Risk management involves proactive means of combating possible future risks rather than being reactive. It is imperative to evaluate the main and common risks which could impact negatively on the goals of the construction project. To improve performance in the Malaysia construction industry, the government enacted the Occupational Safety and Health Act (OSHA) in 1994. Under this Act, all sectors in Malaysia are required to identify hazards, conduct a risk assessment and control those risk and at the same time implement an integrated system to ensure consistency and better performance of

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projects (Razak et al., 2013). Though there is a development of safety performance and increase in safety awareness in the construction industry, the risk level is still one of the highest across all sectors.

The Contractor's risk decision making is fundamental to construction risk management. Throughout construction projects development, particularly in the design stage, the participants are challenged with huge risk decision-making problems, which are addressed through recognizing, analysing and responding to possible risks, and eventually enhancing solutions (Jarkas & Haupt, 2015). Some researchers have identified a variety of approaches that enable a more objective risk decision-making process (Jarkas & Haupt, 2015; Jato-Espino et al., 2014; Pennings and Smidts 2017; Khan, Liew, & Ghazali, 2014)). The most generally useful approaches comprise of the predictable profit and loss value decision technique, the decision diagram technique, the matrix decision technique, the marginal decision technique, the Bayesian decision technique, and the Markov decision technique.

Also, most of the techniques presented above, are based on the predictable value principle, which needs iterative decision-making processes for satisfactory data collection. This is because the predictable value cannot be determined from a onetime risk decision-making circumstance. Jato-Espino, et al. (2014) also established that decision makers perceive risks differently in numerous circumstances, which is compounded by factors such as engineering experience, educational background, individual beliefs, and principles. Those particular individual observations cause differences in decision making, making it impossible for people to make the right decision in all the circumstances in pursuit of maximum expected value. It is implying that the maximum expected value theory is inadequate in explaining human behaviour in the risk-decision making process (Lee et al., 2016).

According to Jato-Espino et al. (2014), contractors risk attitudes is much related to the decision maker's sensitivities. Risk attitude is a chosen state of mind with a focus on those uncertainties that could have a positive or negative impact on construction activities. Therefore, people's risk attitudes reflect their characteristics and experiences; it also reflects the economic, procedure and management environment into which they fit. Even in similar decision-making circumstances, dissimilar decision-makers would make different, sometimes even the opposite decision and judgements(Taofeeq et al., 2019). The individual judgment related to personal issues in the decision-making procedure is presented as a risk attitude, which plays a significant part in decision making. Hence, decisions that are made with no knowledge of the decision maker's risk attitude might not be dependable. However, those issues that are influencing decision makers' risk attitudes in construction projects remains unsolved. Therefore, this paper aims to identify and rank the critical factors affecting contractors' risk attitudes in the Malaysian construction industry.

2. Literature Review

2.1 Risk management

No construction project is free of risks. These risks affect the schedule, costs, quality and in the long run, the project objectives. According to Jaskowski and Biruk (2011), the construction project is pretentious by various types of risk factors, such as accident, weather conditions, location, clients, contractors, subcontractors, staff, crew, labourers and defects affects the project. The studies of Sambas, Ivan and Soon (2007), revealed 28 main construction-related risks such as lack of effective communication between parties, lack of construction risk management, lack of material, unappropriated safety precautions and lack of equipment had been figured out as the primary factors. Risks related to the contractor's risk attitudes in the construction industry are broadly categorized as shown in Figure 1.

Risk management process starts with risk identification, which is identifying the type and the cause of risks. It continues by categorizing the types of risks and their impact on the project. Risk analysis will screen and import the recognized risks. Following the risk analysis, risk response design is then developed. During project operation, the risks identified, and their responses are monitored and studied (Shirolkar et al., 2017). Also, many researchers confirm that risk management is a set of procedures and tools combined with the project management processes (Kim et al., 2011; Hwang, Zhao & Toh, 2014; Lee et al., 2015).

Adeleke et al. (2016), also revealed that risk management is one of the significant knowledge areas in the project management body of knowledge because, many parties in the project such as engineers, architects, project managers, quantity surveyors, designers, contractors, subcontractors and clients monitor the risk during the project lifecycle. Risk management is an indispensable contributor to business and project achievement since its attention to effectively addressing uncertainties to minimize pressures, maximize chances, and optimize the performance of objectives (Shirodkar et al., 2017; Abulhakim et al., 2019). Besides, construction project becomes more complex and challenging when adopting new methods for responding to risk as the contractors need to consider how to treat and which method is suitable for their organization.

However, risk response approach remains the weakest part of the risk management process, where proper management requires the identification of risks in a well-defined manner, which can only be attained when "all" parties namely, clients, consultants, contractors, authorities and policymakers, comprehend their risk responsibilities, risk event conditions and risk handling capabilities (Mhetre et al., 2016). A response is needed in every stage to review the action plan. The risk response attitudes remains the weakest part of the risk management process in Malaysia construction project, where the proper management requires a practical identification of risks in a well-defined manner, which can only be attained when "all" parties involved in the construction project, namely, clients, consultants, contractors, authorities and policymakers, comprehend their risk responsibilities, risk event conditions and risk handling capabilities (Wang, et al., 2011).

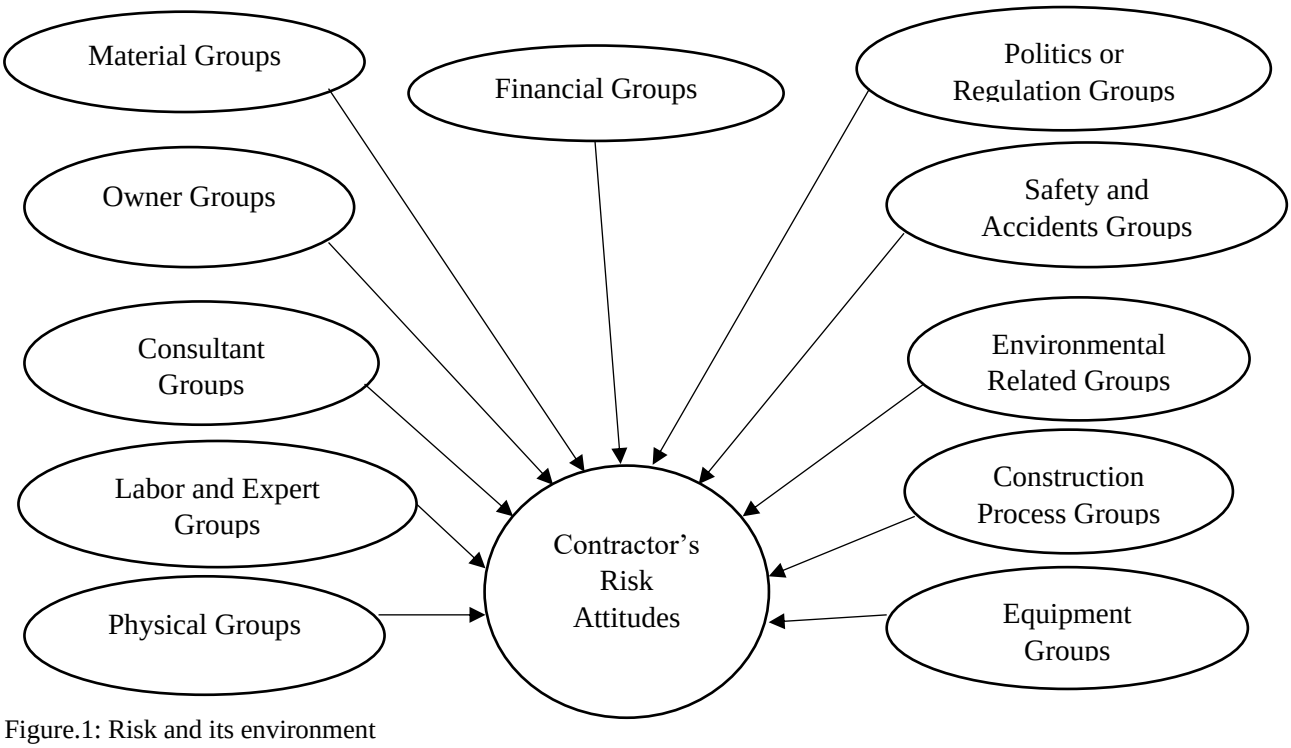

Figure.1: Risk and its environment

2.2 Factors influencing contractors risk attitudes in the Malaysian construction industry

Table 1 shows that the majority of the problems faced by contractors are due to resource issues (Paweł et al., 2017).

Table 1: Factors influencing contractor's risk attitudes in the Malaysian construction industry

Construction risk groups	Risk factors in Malaysian construction industry
Physical group	Natural disasters
	Land surface conditions
	Groundwater conditions
	Uncertainty conditions in the field
Labour and Experts group	Productivity and efficiency
	Less compact teamwork
	Argumentative workers
	Lack of workforce
	Labour strike
	Design errors
	Skills and expertise
	Design errors
Consultant group	Incomplete design data
	Late information from planners
Owner group	Financial Failure owner
	Change order
	Delay in delivery
Material group	Damage during shipment
	Damage during storage
	Low-quality material
Equipment group	Lack of equipment
	Unsuitable tools due to age
	Damage to equipment
Construction Process group	Changes in construction work due to implementation difficulty
	Poor quality of work
	Communication and Coordination problems
	Inappropriate method of project implementation
Environmental Related group	Access to the project site
	Traffic jam
	Disturbances
	Lack of equipment and material storage facilities
Safety and accidents group	The machine is not checked before operating
	Workers do not wear protective equipment
	Safety regulations are not implemented on site
Politics or Regulation group	Changes in government regulations
	Government policies that led to the cessation of the project
	Monetary instability
	Complicated licensing procedure
Financial group	Availability of funds
	Late payments by the owner
	Inflation
	Fluctuation
	The high cost of building materials
	The increase in the cost of leasing equipment
	Higher wage than the estimate
	The high cost of equipment maintenance

2.3 Contractor's risks attitudes

According to Wang, et al. (2016), the attitude is founded on the personality's positive or negative assessment of the consequences of a specific type of behaviour, as well as own principles or knowledge about the consequences.

Hence, numerous risk attitudes could be applied, and these would lead to different practices and outcomes (Hillson and Murray-Webster, 2007). Attitude can be described as the favourable/unfavourable moods towards a particular behaviour. Therefore, it is important to understand risk attitudes.

Some studies of risk management suggest that professional managers are relatively risk-averse; others question the assumption of global risk-aversion (Barr, & Feigenbaum, 2014). Many studies in organization and economics found the presence of heterogeneity in risk attitudes among organizations, even in homogeneous industries (Sathishkumar, 2015; Wang et al. 2011; Wang et al. 2016; Taofeeq et al., 2019). Wang et al. (2016) also found out that some contractors in the construction industries were risk-takers because the jobs they do are much riskier than other occupations. Nevertheless, this assumption is not compelling enough. For the fact that the jobs they do are hazardous does not mean that contractors are risk-takers. Many contractors consider themselves risk-averters, not risk-takers.

Seung et al. (2005) further prove that people tend to be risk-averse in predicting project return (conventional). They also tend to seek risk in approximating project cost (theoretical), which leads to the changes in individual risk insights and also produces the systematic biases in recasting both project cost and reappearance. Furthermore, it is designated that experts qualified in a specific area tend to be less error-prone in making estimates than it is in the case of the learner group.

Study of Wang et al. (2011) revealed that the connection between attitude and decision-making behaviour had been presented in many fields as well as in the construction management area. Theory of planned behaviour by (Ajzen 2000) is a dominant model that represents the relationship between attitude and decision-making behaviour. In Ajzen's model, attitudes, individual norms and perceived behaviour regulator influence behavioural purposes, which in turn control the possibility of behaviour that is yet to happen.

Besides, decision making plays a significant part in construction project management. Because of the project, participants' restricted motives. According to Zhang & Li (2015), what influences their adopted approaches are usually of more risk perception than the risk itself. The participant's judgement about risk is known as risk perception (Venkatesh et al., 2013). Chen et al. (2016) noted that a contractor's risk pricing behaviour could be affected in the decision-making process by their risk perception. However, there is limited research concerning the possibility of contractors becoming an opportunist in reducing possible loss once a high level of risk is perceived.

Furthermore, previous studies were unable to specify how the contractors' behavioural decision is affected by different types of perceived risks. Xiang et al. (2012) submitted that parties involved in construction projects have been experiencing not only objective risks (e.g. policy risks) but also behavioural risks (e.g. uncooperative behaviours by other parties) which have a high possibility of damaging the relationship between parties. Hence, the contractor needs to deal with two types of risk concerning owner-contractor relationships: personal risk and performance risk. The in-house relations amongst the parties results in personal risks while the performance risks are comprised of the entire risks apart from the individual risk (Renuka, Umarani, & Kamal, 2014).

The research of Sathishkumar, (2017) also showed that individuals with high levels of extroversion were inclined to engage in multiple, risky health behaviours and that extroverts can accept deviant acts more easily than introverts. Additionally, extroverts often take risks because of their generalized needs for sensation, which seems to be the goal of risk-taking behaviour. When facing multiple threats, extroverts will be at ease and perceive lower risk. Also, the experience was found to be closely related to how individuals see risk (Chauvin, Hermand, & Mullet, 2007). The concepts of interest, intellectuality and open-mindedness are essential traits in this dimension (Chauvin et al., 2007). Also, individuals tend to understand some complex types of hazards better and thus view certain technological risk as less risky. Besides, individual differences like the desire to control and tolerate uncertainty are essential in predicting variables of risk perception (Jepson, Kirytopoulos, & London, 2018).

Experience comprises the ability to demonstrate effective observation which has been gained through contribution and exposure to different issues in the process of working on various construction sites (Jayaram, Ahire, Nicolae, & Ataseven, 2012). Agreeableness has nine facets according to the personality model offered by Goldberg (1999): understanding, warmth, morality, pleasantness, empathy, cooperation, sympathy, tenderness, and nurturance. It is closely related to the concepts of nonviolence, caring for others and the environment (Jayaram et al., 2012). Individuals with high agreeableness show more sympathy and empathy to others and thus tend to see some threats as undesirable. They tend to choose safer solutions or schemes to reduce their uncomfortable feelings. Evidence from studies suggests that more agreeable individuals are likely to often engage in less risky behaviour than others with risky-health behaviours. Therefore, it is assumed in this study that high levels of agreeableness would bring about high levels of risk perception. The character of contractors signifies a planned, skilful, strong-minded, and operative persona, as well as facets like dutifulness, carefulness, level-headedness, and neatness (Jayaram et al., 2012; Taofeeq et al., 2019).

Additionally, careful people tend to involve in a lesser amount of risky behaviour than other people. Thus, careful persons are likely to be balanced in hazardous circumstances and to make appropriate decisions in dangerous situations. They can likewise regulate their risk-taking propensities better. The emotional stability dimension has different facets, such as stability, calmness, impulse control, cool-headedness, and tranquillity. The spirit lies in the idea of boldness in many circumstances (Jayaram et al., 2012; Bamgbade et al.,2019). Emotionally steady personalities are less probable to be anxious or to understand risky or unwary actions. Therefore, due to the characters linked to steadiness and calmness, individuals will be more risk evading and thus identify high levels of risk. It is hence expected in this study that individuals with

higher levels of emotional steadiness would observe higher levels of risk. (Dikmen, Birgonul, & Gur, 2007). Competition and risk are two elements that are regularly used to designate the building business. Competition in a marketplace is brought about by numerous participants, who may perform otherwise under indeterminate situations dependent on their risk attitudes.

Therefore, Contractors' risk attitudes affect their bidding decisions in which they are exposed to uncertainties and competition. The competing contractors may have different risk attitudes that are part of their own organizational culture that has been developed over time. Different risk attitudes can explain the differences in how firms do their business. Heterogeneity in risk attitude and resultant variations in the ways they do business leads to questions about the relationships between risk attitude and project performance. In a risky situation, individuals perceive the situation in their ways, which are affected by their risk attitude. Organizational risk attitude is subconscious within an organization, but it defines what risks can be accepted and what risks cannot be accepted within an organization (Kim, et al., 2011; Planning et al., 2017; cha et al., 2012; Chun and Bing Bing 2016; Hassan et al., 2019).

Usually, most individuals and small groups challenged with a danger with possibly grave penalties are risk-averse in their attitudes. Also, companies or management agencies with large capitals are inclined to show a more risk-neutral attitude. The significance of risk-aversion in the policymaking process has been documented in the literature. Risk-averse decision-makers are inclined to misjudge likely losses and limit state likelihoods, particularly for low-probability risks that are outside the realm of their experiences. They may resist selecting an alternate decision which a traditional measurable risk valuation (e.g. minimum expected cost analysis) proposes is near-optimal and tend to pay higher costs to decrease the risk, particularly when personal injury is involved (Kim et al., 2011, Chun & Bing Bing 2016; Waris et al., 2018).

According to Wang et al. (2011), men are generally less risk-averse than women. Contractors behave differently when dealing with small and large projects and when operating in good or bad periods. They are most times risk-averse toward larger projects in lean years and when the bid is relatively low. All of the studies mentioned above revealed that risk behaviour plays a central role in humans' decision making under uncertainty. It is, however, not surprising that previous research has mostly focused on how the risk attitude of decision-makers can vary under assumed risk situations represented by simple lotteries.

2.4 The conceptual framework

The Conceptual Framework describes how the variables (dependent and independent) identified in the study relate to each other. The independent variable affects and determines the effect of another variable. The independent variables in this study are Factors affecting risk attitudes; project-related factors, working capital, human-related factors and external environmental factors. The dependent variables are Contractors risk attitude; Risk-averse, Risk-neutral, Risk-taker. The research investigates the top four leading factors among the eleven factors outlined in Table 1 and Figure 1 to develop the conceptual framework shown in Figure 2 that is empirically tested in the study.

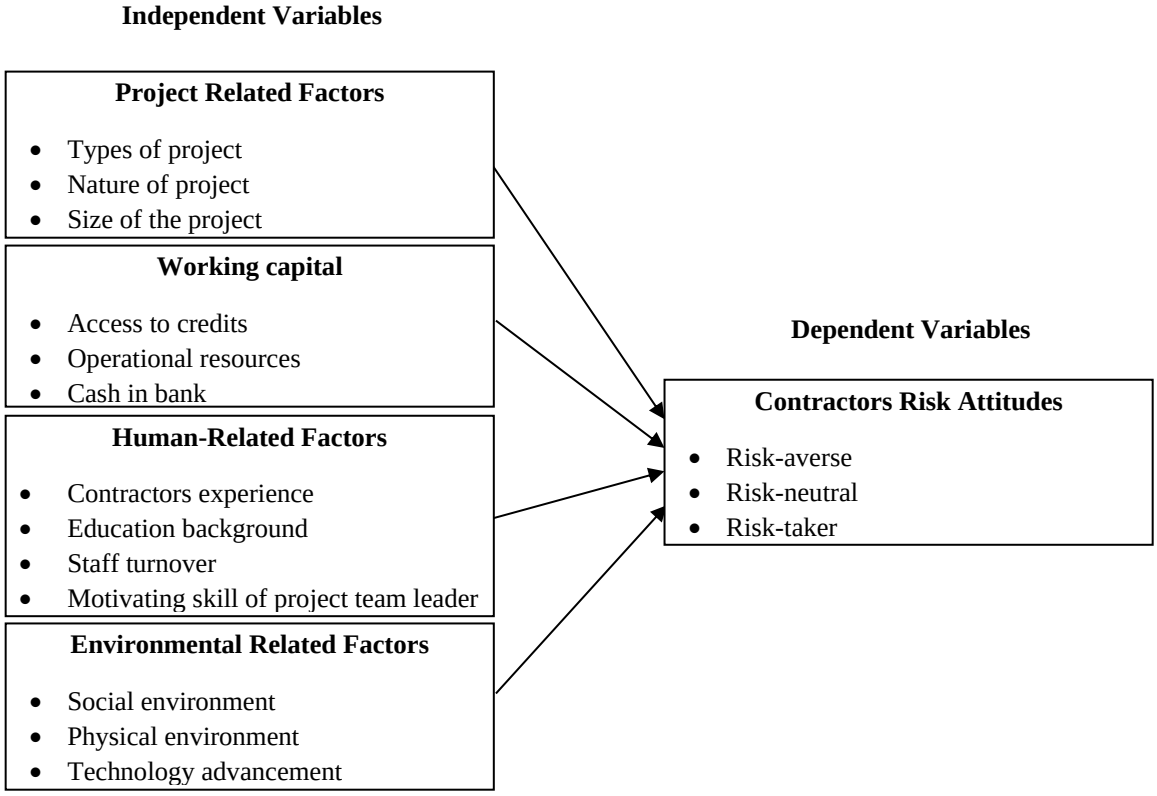

Figure. 2: Conceptual Framework

3. Methodology

This study adopts a quantitative research approach employing a cross-sectional survey research design. The preliminary data for this research was collected through a literature review and the use of a questionnaire survey targeted at Grade 7 contractors (G7) and the team member operating in the Malaysian construction industry that specialises in building, bridge and road construction projects. There are seven categories of contractors in the Malaysian construction industry, which are; G1, G2, G3, G4, G5, G6 and G7. The G7 contractors were selected as a survey sample due to their ability to undertake large projects in Malaysia. The study ranked the specific factors affecting the contractor's risk attitudes in the Malaysian construction industry and answers the research question: What is the leading factor influencing the contractor's risk attitude in the Malaysian construction industry? The data collected were analysed with descriptive statistics. The demographic profile of the companies and respondents were examined.

3.1 Scale of the questionnaire

A Likert scale was used in quantifying the risk attitudes of contractors on a scale ranging from 1 to 6 (very low to very high). In this study, the selection of an interval scale mainly the 6-point scale is appropriate because it will increase the reliability of the data as well as lessen social desirability bias. According to Kulatunga and Udayangani, (2006), Likert scales are proper and widely used in the attitudinal measurement.

3.2 Response rate

A total of 140 questionnaires were self-administered to the G& contractors operating in the Malaysian construction industry. A total of 132 questionnaires were received after the survey period, representing a response rate of 94%. Conversely, 13 questionnaires were found to be unusable due to missing data or provided the same responses to all the questions. Thus overall, 85% of the total questionnaires were found usable achieving an effective sample size of 119.

3.2 Reliability test

There are various types of reliability test, "convergent validity, discriminant validity, indicator reliability" however, the most used method by the researchers is "internal consistency reliability test." Reliability is the magnitude to which items of a specific construct assemble and are autonomously capable of measuring the actual construct, and at the same time, the items are correlated with each other. The internal consistency reliability test of Cronbach's alpha coefficient (Sekaran & Bougie, 2010) was adopted. As shown in Table 2, the results revealed that all measures achieved a high-reliability coefficient, ranging from 0.703 to 0.887. A reliability coefficient of 0.60 is regarded as average reliability while a coefficient of 0.70 and above are considered as high reliability. Therefore, the result of this study meets the threshold of reliability (Hair et al., 2017; Sekaran & Bougie, 2010).

Table 2: Summary of reliability results

Constructs	Dimensions	No. of Items	Cronbach's Alpha
Factors influence contractor's risk attitudes.	Project related factors	7	.887
	Working capital	7	.794
	Human-related factors	7	.771
	Environmental related factors	7	.703
Contractor risk attitudes	Risk-averse Risk-neutral Risk-taker	9	.737

4. Findings and Discussion

4.1 Demographic profile of the respondents

The findings show that in terms of their gender, age, education, job position, working experience, company location, the respondents were constituted of 15 (12.6%) female and 104 (87.4 %) males. The respondents are uniformly distributed across all age groups, age between 18-34 are 47 (39.5%), 35- 44 are 45 (37.8%), 45-60 are 21 (17.6%) and above 60 are (5.0%) respondents were 60 years above, whereas only four respondents contributed in this study were in-between 18 to 65 years of age.

The number of contractors that responded is 71 (59.7%), contract managers are 11 (9.2%), architects are 9 (7.6%), project managers are 16 (13.4%), and engineers are 12 (10.1%). Regarding the qualification attained, the majority of the respondents (65 (54.6%)) hold a master's degree, 32 (26.9%) have a bachelor's diploma while 22 (18.5%) have a PhD degree.

Concerning the experience level of the respondents, it was found that most of the respondents have moderate experience. A total of 53 with (44.5%) of respondents have experience of 4 to 6 years, followed by 43 with (36.1%), having less than 3 years,15 with (12.6%), having 7 to 9 years, and 8 with (6.7%), having above 10-year job experience.

Regarding job specialization and company location, more than half of the respondents 83 with (69.7%) specialized on building projects, followed by 23 with (19.3%) respondents specialized on the road project and only 13 with (10.9%) of respondents are specialized on the bridge project. The respondents are located nationally across Malaysia are 50 (42.0%), followed by 41 (34.5%) located within few states in Malaysia, 21 (17.6%) operate in the international market, and 7 (5.9%) of the respondents operate in the local market area.

4.2 Ranking of factors affecting the contractors' risk attitude

To determine the level of importance, the mean and standard deviation of each factor is derived from the total sample. If two or more factors happen to have the same mean value, the one with the lower standard deviation is considered more important. The factors with mean values that are greater than the average value of all mean values is classified as critical factors affecting contractors' risk attitudes. The ranking results of these factors are shown in Table 3.

Table 3: Ranking of factors affecting contractors' risk attitudes

Factors	**Mean**	**Standard Deviation**	**Rank**
Human-related factors	3.7407	.56656	1
Working capital	3.5616	.49852	2
Project related factors	3.5798	.60845	3
Environmental related factor	3.4970	.58425	4

The results of the statistical analysis show that the overall mean and standard deviation for human-related factors is: 3.7407, Std: .56656, which makes human-related factors to be ranked first among all four specific factors affecting contractors' risk attitudes considered in this study. This is in line with the previous research of Wang et al. (2011), whose findings affirmed that human-related factors are not well implemented within construction companies.

Working capital is ranked as the second critical factor affecting contractors' risk attitudes with a mean value of 3.5616, Std: .49852. The main contributors to cost overrun in the procurement of high-rise in construction projects. Working capital also relating to interest rates, credit ratings, capital supply, cash flows and rentals. Local objects reliability risk arises because projects involve local partners such as contractors, customers, suppliers and the success of these projects depends on their reliability and affluence.

Project Related Factors was ranked third place based on the survey results with a mean value of 3.5798, Std: .60845, among all important factors. The result is in line with the findings of Wilden et al. (2013) who recommended that a prerequisite for high-quality project risk management is the ability to have access to required information relating to the handling of risk during particular project construction. If contractors have adequate and accurate information when making decisions against threats, they are probably willing to be risk bearers, as they are confident and competent in making a good trade-off between risks and benefits. Otherwise, they cannot have the right perception of project risks or a clear understanding of the significant risks to their operation. The findings imply that taking a risk without adequate understanding and competence about that risk may lead to an unwillingness in bearing and managing the risk. Therefore, project professionals must develop their emotional intelligence since it has a direct impact on the effectiveness of risk management.

The Environmental Related Factors was ranked as the fourth critical factor affecting contractors' risk attitudes with this mean value: 3.4970, Std: .58425. The level of the risk is based on the probability of its occurrence, the possible severity of the risk, such as the population that may be affected and the health effects. Environmental risks comprise of natural disasters, weather, and seasonal implications.

5. Conclusion

This study has examined possible risks factors subcategorised based on their nature that impact contractors' risk attitude. This study is significant to all the relevant stakeholders in the construction industry. Furthermore, this study presents the ranking of the specific factors affecting contractors' risk attitudes in the Malaysian construction industry. Therefore, this research provides a ground for researchers with interest in this field, to further examine the relationships between the constructs in this study. This research provides a conceptual basis for understanding risk management in the construction industry. Contractors' risk attitudes are found to be influenced by human-related factors, working capital, project related factors and the external environment.

This study on factors influencing contractor risk attitudes is not the only essential to the academic world but also to the contractors, project managers, engineers who've required the controlling risk attitudes in every construction industry. Stakeholders in the construction industry can use the information in this research for developing a strategy on a contractor's risk attitude. Finally, this research is not without limitations. The data were collected through a questionnaire survey conducted in Malaysia Pahang, so the generalization of the findings should be made with caution. Future studies might carry out this research in other countries to ascertain if the results investigated in Malaysia will be similar.

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