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

C P Ogbu[1] and N. Olatunde[2]

[1 & 2] Department of Quantity Surveying, University of Benin, Benin-City, Nigeria

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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[1] Corresponding Author.
Email address: chukwuemeka.ogbu@uniben.edu

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).
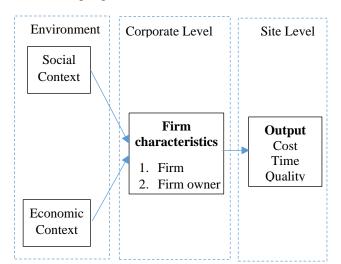

Figure 1 Conceptual Framework of the Study

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	% sample rejections	Improve client confidence
		Client satisfaction	Number of claims by client	Increase client satisfaction
		Quality of work	Number of claims by contractors	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 ʎ 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 ʎ test must be <0.05. The contribution of the variables was interpreted based on redundancies and canonical loadings.

Canonical structure (r_s) 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		

Code	Variable	1	2	3	4
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	r²	Coeff	r	r²	h²
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*		
Rc² 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≥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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