Influences of Firm Size, Age and Sector on Innovation Behaviour of Construction Consultancy Services Organizations in Developing Countries
Adinoyi Yaqoob Moohammad*, Yusof Nor’Aini*2 and Ernawati M. Kamal*3

Abstract
Many previous studies on the influences of firm characteristics on organizational innovation practices generated inconsistent results. These have led many innovation scholars to believe that firm characteristics, such as the firm size, firm age and firm sector, can be both enablers and inhibitors of innovation depending on circumstances and the environment of the firms concerned. The current study attempts to extend the study on the impacts of these variables on the construction consultancy services firms’ innovation practices where innovation studies have been scanty thereby generating research gap. The contribution of this study therefore includes establishing the extent to which these variables influence innovation practices of the construction consultancy services firms in Nigeria; and to confirm whether these variables influence them in the same way as in the other sectors or not thereby enriching the innovation literature that is scarce in this sector. The study used structured questionnaire to collect the primary data from the Nigerian construction consultancy services firms operating in Abuja and environs and the collected data were subjected to multiple regression analysis to determine the impacts of these variables on the innovation practices of the sampled consultancy firms. It was found that the three variables (firm size, age and sector), cumulatively explain 5% of the variance in the overall innovation practices of the consultancy firms indicated by R2 value of 4.9 significant at p< .01. However, only firm size among the firm characteristics had a significant positive impacts on the consultancy firms’ innovation practices with a beta value of .19 significant at p<.0; while the firm age and firm sector, both had negative but insignificant beta values, implying that they have no individual impact on the firms’ innovation practices. The results therefore justify the use of the firm size, age and sector as control factors.

Key words: Control variables, Construction consultancy services firms, Innovation, Organization characteristics

INTRODUCTION
Background
The need for organization innovation practices has been recognized as a vital process for the survival of organizations in the current globalized economy characterized by intense competition, perfect market information system, etc., have been well discussed and documented in literature. Relating innovation to the construction industry, Kong-Seng and Yusof et al. (2011) consider it as the key to success and survival in the competitive, fast-changing and uncertain business environment. In particular, scholars have widely recommended innovation as an important strategy to cope with the challenges of construction inefficiency problems (Dunigan, 1972; Terzungwe, 2013). According to Tavistock Institute, (1977), innovation is one of the key activities that can improve the performance of the construction industry; a determinant of the success of an organization (D.Wan et al, 2005); and a vital tool for maintaining the long term survival of organizations Aniona and Caldwell (1987). However, certain organizational and external factors influence firms’ innovation practices Yusof et al (2011). The internal factors include firm

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culture, firm resources and firm characteristics (which includes firm structure, size, age and sector, etc.) while the external factors include government innovation support, environmental uncertainty and market demand and competition (Kamaruddeen, 2011).

Among the firm characteristics, firm size, age and sector were found to have given controversial results in many previous studies (Roxas, et al, 2013). For example, while some scholars observed that larger organizations have greater propensity to innovate because of their better resources advantages and greater need to sustain and improve performance, others believe to the contrary Frambach and Schilleweart, (2002). In contrast to this, Etie (1983) believe that micro-and small-size firms may become more innovative because of their greater flexibility and younger and more growth-oriented personnel. Yusof, et al (2011) similarly noted that smaller firms have higher propensity to practice innovation on account of its greater flexibility. A similar argument also holds for the firm age and sector.

As a result of controversy of the results of previous studies a number of scholars (e.g., Lundval, 1992; Clearseate, 1998; Roxas et al., 2013) considered these variables (firm size, firm age and firm sector) as control variables in the analysis of their organization innovation studies. The reason for this is to avoid the variables’ inconsistencies from interacting with the findings of their studies. Hence, the control variables are held constant in their process of analysing the relationships between the major innovation factors and the firms’ innovation behaviours. The question that generates from this scenario is whether these firm characteristics variables has any significant influences on the innovation behaviours of construction industry consultancy services firms or not.

The paper therefore attempts to extend the study of the influences of the firms’ size, age and sector on the firms’ innovation practices to the construction industry consultancy services firms in developing countries, using Nigeria as a study area. The objectives of the study is therefore to assess the impacts of the firm size, age and sector on the innovation practices of the Nigerian construction industry consultancy services firms and to justify whether these variables should be considered as control variables or not in the construction organizations’ innovations studies.

MATERIALS AND METHODS

The Concept and Meaning of Innovation

It has been very difficult to arrive at a consensus of a single definition of innovation as a concept despite numerous studies on innovation topics (D’Wan, 2005). This is probably due to the varieties of the background from which innovation studies are carried out. Ravinchantran (1999) also attributed the lack of unified definition of innovation concept to vagaries of method of measuring innovation. D’Wan (2005) further notes that innovation research becomes even more complicated when broken into various types. Hence, various scholars and institutions have defined innovation from their respective backgrounds or perspectives. For example, innovation is considered as ‘a process that involves the generation of new ideas or practices within an organization’ (D.Wan et al., 2005); ‘an idea, practice or an object that is perceived as new by an individual or other unit of adoption’ (Rogers, 1995). Slaughter (1998), in her definition considers innovation as the application of a nontrivial change and improvement to an organization’s processes, products, or systems which is novel to the organization utilizing the change. Organization for Economic and Community Development (OECD)’s Oslo Manual (2003), which provides guidelines for collecting and interpreting innovation data, defined innovation as the implementation of products or production and delivery with new or significantly improved characteristics. The third edition of the Oslo Manual extends the definition to include new organizational methods in business practices, workplace organization, or external relations (OECD 2005). The United States’ Department of Commerce (DOC) similarly considers innovation as the design, development, and production of new or improved products, processes, services, institutional sets ups, and business systems that generates value for the customer as well as better return on investment to the owners of the innovation practicing firms (DOC, 2008).

There have been popular calls among scholars for innovation adoption by organizations in the construction industry in the face of its inefficiency and unsatisfactory performance (Cox and Thomson, 1997). Yusof et al, (2010) acknowledged the need for construction organizations’ innovation in order to meet the challenges of continuously increasing technological capabilities, changing clients’ needs, tighter
control over environmental regulations and quality standard, rising construction costs, increased competition and other challenges faced by the industry. Innovation is also considered as a strategic activity that oftentimes leads to better and competitive performance (Thornhill, 2006; Craighead, Holt and Ketchen, 2009). Hilmi and Ramaya (2008) similarly concluded that the one and most effective ways of enhancing firms’ performance and therefore competitive advantage of organizations is to effectively manage their resources and improve their innovation practices.

In their contribution to innovation debates, Calanstone, Cavusgil and Zaho (2002) also concluded that the most important determinant of firm performance is its ability to innovate. Innovation therefore enables firms to achieve competitive edge which is germane to organizational sustainability (Salavou, 2004; Roxas et al. 2013); survival and growth (Damanpour, 1991; Desphande, et al, 1993; Hult et al, 2004; and Knight and Cavusail, 2004). Innovation helps organization to overcome turbulent external environment and therefore the key factors for business survival especially in a dynamic markets (Baker and Sinkula, 2002; Darrch and McNaughton, 2002; and Jimenez-Jimenez, 2011). Therefore, organization with propensity to innovate can more readily respond to changes, and can take better advantages to generate new products and market opportunities than those that do not innovate (Brown and Eisenhard, 1995; Miles and Snow, 1978). A firm’s propensity to produce innovative products, services, processes or business models tailored to attract niches is an extra opportunity for firms to be competitively outstanding; and such offered innovative product can create new demand and avoid price competition, thereby facilitating the firm’s growth (Rosenbusch, Brinckmann and Bausch, 2011).

The above scholarly definitions of innovation, which generally associate innovation to organizational operational efficiency, sustainability and success, clearly points to the fact that innovation practices among consultancy firms is the practical panacea to the construction industry perennial inefficiency problems.

**Influences of the Organization Characteristics (firm size, firm age and firm sector) on Organization innovation practices**

Relationship between organization characteristics and its innovation practice have been found to exist and well documented in literature (Cohen and Turyn, 1984; Damanpour, 1991). Organizational factors have been identified in various innovation studies to include firm culture (Ahmed, 1998), firm resources (Abdulhamid, 2002 and firm structure (Zaltman, 1996, Subrahmanian and Nilakanta, 1996), firm size (Kenedy, 1983; Roxas et al., 2013), firm age (Schumpeter, 1934), firm sector (Urem, et al., 2008). Among these factors, the firm structure, size, age and sector are often termed organization’s characteristics (Roxas et al., 2013). While studies have found that some of the organizational factors influence firms innovation practices in a definite way, researches have also shown that the firm size, firm age and firm sector/ownership status, more often than not, give inconsistent or controversial results in many previous studies, as explained hereunder.

**Relationship between Organization Size and its innovation practice**

Organization Size refers to the staff strength, i.e., total number of employees in the organization (Roxas et al., 2013). The relationship between company size and innovation has been extensively studied (Antonelli and Calderini, 1999; Breschi, 1999, Le Bars et al., 1998). However, the debate on the relationship between company size and innovation is still ongoing due to inconsistent empirical studies results (Clarysseet, 1998; and Innvdvall, 1992). For example, firm size was repeatedly found to influence firms’ propensity to adopt innovation. In large firms, strong structure, investments in R&D and high quality of workers are important factors that influence firm’s readiness towards innovation. (Frambach and Schilleweart, 2002). It was however argued that in small firms, flexibility in structure, specialization and strong ties with clients are innovation influencing factors (Yusof et al., 2011). The inconsistencies in results were also attributed to the different measurement of innovation used (Grunert et al, 1997, Le Bars et al., 1998) and sampling methods (Clarysseet, 1998; and Innvdvall, 1992) because, many studies take data across industries and try to reach generalized conclusions rather than looking at industry-specific pattern of innovation. For the above reason, the size distributions of firms are often excluded from the analyses to avoid doubts (Clarysseet, 1998; and Innvdvall, 1992) or treated as control variables as in Becheikh, Landry, and Amara (2006).
Relationship between Organization Age and its innovation practice

Organization age is considered as firms’ period of operational existence, i.e., the number of years a firm is in operation from inception (Deakin and Massey, 2013). Studies on the relationship between organization age and its innovation is rather limited and traceable to Shumpeter (1934), who is considered to be the founding father of the theory of innovation dynamics (Malerba and Orsenigo, 1995). In his work, the theory of Economic Development, Shumpeter (1934) examined the European industrial structure that was dominated by small firms and found that entry tended to be easy for firms with new products, and new processes. Generally, the arguments with regards to firm age are two-folds; the creativity and entrepreneurial dynamism associated with start-ups and the liability of newness (Pablo et al., 2010). New firms are more likely to participate in innovation activities because it is less constrained by the risk of cannibalizing existing product portfolios or destabilizing core competencies (Tushman and Anderson, 1986; Henderson, 1993). On the other hand, new firms are completely more likely to confront barriers to innovation because of prior expertise, scarcity of financial resources (Schoonhoven et al., 1990; Tripas, 1997). In view of the controversies in the results of previous studies on the firm size and age in relation to innovation, plethora of empirical studies have considered firm age as one of the control variables in its analysis. For example, Becheikh, Landry, and Amara (2006).

Organization Sector/Ownership Type

The study conceptualized the firm sector as the ownership status which implies either a privately or a publicly owned enterprise, etc. Urem, Alcorta and An (2008) in their study of relationship between foreign ownership and novelty of product innovations in China, where they used R&D unit (which measures whether a firm is engaged in formal R&D activities) as moderator, found that foreign affiliates do not have higher odds than domestic firms to introduce product innovations of higher novelty. A number of empirical studies suggest that R&D expenditure (investment) is related, in varying degrees, to firm ownership type, size, organizational structure, industrial branches and location (Shefer, and Frenkel, 2005). It can therefore be assumed that the firm characteristics can support innovation the either ways depending on the perspective and circumstances of the firm. The question that generates from the above studies outcomes is: Does these firm characteristics (firm size, firm age and firm sector) significantly influence the innovation practices of construction industry consultancy services firms? This paper therefore seeks to examine the impacts of the firms’ size firms’ age and firm sector on the construction industry consultancy services firms’ innovation practices.

Research Hypothesis

The following hypotheses are proposed for the interaction between firm size and firm age and firm innovation practices.

H_{a1}: Organizational size has positive and significant effects on its innovation practises.

H_{a2}: Organizational age has positive and significant effects on its innovation practises.

H_{a3}: Organizational sector has positive and significant effects on its innovation practises.

Research Methodology

Research Design and Sampling procedure

The study is a quantitative survey research conducted on the construction industry consultancy firms operating in Abuja (Nigeria’s Federal Capital) and its neighbourhood (its four surrounding states). This study employed questionnaires as instrument for data collection and use a combination of descriptive statistics and hierarchical multiple regression analysis (HMRA). Probability random sampling was used for selecting each element in the population. A total of 500 samples were considered in line with Roscoe’s (1975) Rule of Thumb, cited in Sekaran (2006), who considers sample size of between 30 and 500 as sufficient.

Research Instrument and Data collection

This primary data on the perceptions of the respondents on the relationships between firm size, age and sector and firm’s innovation practices was collected through the use of structured questionnaires containing 5-point Likert scale items (based on previous similar studies) administered to the respondents to tick the item he/she considers to be appropriate. However, only 285 representing 57% of the 500 distributed questionnaires were returned duly completed and used for the study. The variables to be
measured in the study include the dependent (firm innovation practices) and the independent variables (i.e., firm size and firm age).

The collected data were subjected to statistical screening to verify psychometric properties of the instrument and to ascertain that they are suitable for SPSS regression analysis before the actual data analyses.

Data Analysis and Methods
A standard Multiple Regression Analysis (MRA) was performed on the data to determine how well firms’ size, age and sector predict firms’ innovations practices. The MRA also indicates which of the two factors best predicts firm innovation practices. The value of $R^2$ was used to indicate the predictive strength of the independent variables on the dependent variable. A higher $R^2$ indicates a higher predictive capability of the block of independent variables on the dependent variables. The Beta value signifies whether the relationship between the dependent and independent variables is positive or not when F value is found to be significant (Pallant, 2011).

RESULTS AND DISCUSSION
Assessment of the Influences of Firm size and firm age (Independent Variables) on Firm Innovation Practices (Dependent Variables)
As mentioned earlier, this study is aimed at investigating the influences organizational size, age and sector on construction industry consultancy firms’ innovation practices. To achieve this, the three hypotheses formulated for the study were tested by subjecting the associated data to a standard Multiple Regression Analysis described in 2.3.4 above, the result of which are presented as follows.

Table 1: Regression Model Summary

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.220c</td>
<td>.049</td>
<td>.038</td>
<td>12.05098</td>
</tr>
</tbody>
</table>

Predictors: (Constant) No of Employees, Firm Sector (Type of ownership), Company Age
Dependent Variable: Overall firm innovation Practices

Table 2: ANOVAa

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>2074.177</td>
<td>3</td>
<td>691.392</td>
<td>4.761</td>
<td>0.003b</td>
</tr>
<tr>
<td>Residual</td>
<td>40663.319</td>
<td>280</td>
<td>145.226</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>42737.496</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Predictors: (Constant) No of Employees, Firm Sector (Type of ownership), Company Age
Dependent Variable: Overall firm innovation Practices

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MRA on the Influences of Firms size, age and sector on Firms’ Innovation Practices.

From Table I (Model summary) show the $R^2$ for the three variables to be .049, suggesting that the three predictors variables together explained 5 percent in the variance of the consultancy firms’ innovation practices, significant by F value of 4.761, p< .01 (.003). The results of the Standard Multiple Regression Analysis (MRA) carried out for three variables (firm size, firm age and firm sector) involved in the study, presented in Table III, show that only firm size had significant effect on the overall firm innovation practices with Beta value=0.188 at p < 0.01 (0.002) in the model. This result statistically supports the Hypothesis $H_A1$: which states that ‘Firm size has positive and significant impact on the Firm Innovation Practices’. However, the MRA result showed that the other two variables (firm age with beta coefficient of .036 and firm sector with beta coefficient of -.093) were not have significant at p value > .05 in both cases. Therefore, hypothesis $H_A2$ which states that: ‘Firm age has significant and positive impact on the Firm Innovation Practices’ was not statistically supported. Similarly, hypothesis $H_A3$ which states that: ‘Firm sector has significant and positive impact on the Firm Innovation Practices’ was not statistically supported.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unstandardized Coefficients</th>
<th>Standard Error</th>
<th>Standardized Beta (β)</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>52.26</td>
<td>3.519</td>
<td></td>
<td>14.85</td>
<td>.000</td>
</tr>
<tr>
<td>Firm Sector</td>
<td>-1.781</td>
<td>1.102</td>
<td>-.094</td>
<td>-1.617</td>
<td>.107</td>
</tr>
<tr>
<td>Firm age</td>
<td>.425</td>
<td>.710</td>
<td>.036</td>
<td>.599</td>
<td>.549</td>
</tr>
<tr>
<td>Firm Size (No. of employees)</td>
<td>1.768</td>
<td>.566</td>
<td>.188</td>
<td>3.125</td>
<td>.002</td>
</tr>
</tbody>
</table>

Dependent Variable: Overall Firm innovation practices

DISCUSSION OF RESULTS

The results of the MRA conducted for the study presented in Table II above show that the three firm characteristics examined in the study (firm size, firm age and firm sector) cumulatively explained 3.9 percent of the variance in the innovation practices among Nigerian construction industry consultancy services firms. The results also show that firm size had positive and significant influence on the firm innovation practices indicated by a beta coefficient of .188 and significant at p< .01. On the other hand, the results show that firm age and firm sector with beta coefficient of .036 and -.094 respectively were both not significant at p value > .05 in both cases.

The results presented in Table II above imply that the firm size, with significant impact on the firms’ innovation practices can be used to predict the rate of adoption of innovation among the studied consultancy firms. Hence it can be concluded that larger firms will have higher propensity to innovate than the smaller firms. This result is consistent with the previous studies (Damanpour, 1992) which
indicated that larger firms tend to adopt innovation than the smaller firms. This, according to (Frammbach and Schilleweart, 2002) is due to due to the fact that larger firms are more capable of assessing the organization innovation resources, such as R&D and skilled specialist employees that assist in generating innovative ideas, approaches and products. Furthermore, since the three examined firm characteristics in this study (firm size, firm age and firm sector) have cumulative and significant influence on the firms innovation practices, it justify the need for considering them as control variables as done by a number of scholars (Roxas, et al. 2013) in their analysis of relationships between major innovation factors and the firms innovation adoption or practices.

On the other hand, the study results indicate that firm age and firm sector do not significantly influence firms’ innovation practices. This implies that firm’s innovation practices do not depend on its age. Hence, it is possible to find a new firm to have higher records of innovation practices than an older firm, and vice versa. In the same way, innovation practices of a consultancy firms is irrespective of forms of ownership; private or public, partnership or corporation, etc. These results were also found to be consistent with previous studies of Jesper et. al (2000).

CONCLUSION
Conclusion and Limitations
The study on the basis of the findings as discussed above concludes that innovation practices among Nigerian construction industry consultancy firms are positively and significantly affected by the organization size. Hence the larger the consultancy firms the greater its propensity to practice innovation. On the other hand, the consultancy firms’ innovation practices are not influenced by the firm’s age and sector. This implies that they do not have individual impact on the innovation practices of the studied consultancy services firms. However the three variables collectively have positive and significant impact on the consultancy firms’ innovation practices and therefore justify their use as control variables in the process of assessing the interaction between other major innovation factors and the firms’ innovation practices.

The study has a number of limitations which include its limited generalization to only the studied construction industry consultancy firms and possibly that of Nigeria. Therefore the study needs to be replicated in other sectors of the construction industry. Secondly, the study id a cross- sectional and therefore the causality of relationship could not be demonstrated completely and the feedback from the respondents could not be investigated. To achieve this, a longitudinal study is also needed to investigate the timeline (Zikmund, 2003) and to further confirm the direction of causality and test for feedback effects.

REFERENCES


OECD (2005), *The Measurement of Scientific and Technological Activities: Proposed Guidelines for Collecting and Interpreting*


Tavistock Institute (1997) *Effective Learning Networks in Construction.* The Tavistock Institute/CIRIA Workshop Briefing Paper


