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Assessment of Quantity Surveying Firms' Process and Product Innovation drive in Nigeria

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Abstract

Purpose- Innovation repositions and strengthens the competitive advantage and revenue drive of corporate businesses. The aim of this study is to assess the extent of the process and product innovation in Nigerian Quantity Surveying firms with a view to determining the innovative tools/concepts used.

Design/Methodology- The study adopted a questionnaire survey in which simple random sampling was used to collect data from Quantity Surveyors working with Quantity Surveying firms in the study area. Relative importance Index, mean score, frequencies, and percentages were used to analyze the data collected, and Rogers' innovation adopters categorization was employed to determine the level of adoption of innovation by Quantity Surveyors

Findings- The study found that Quantity Surveying firms do not engage the services of innovation specialist because of financial constraint. The most adopted innovative tools/concept by Quantity Surveying firms are MS Excel, Computer Aided Taking-off, CATO, and CA Estimating, and these firms are an early majority in the adoption of process and product/technological innovations.

Practical Implications-. The study would assist Quantity Surveying firms who have not embraced innovation to do so, by adopting and incorporating innovative practices in the running of the business transactions and operations to improve clients' satisfaction, profit generation, and company image.

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Introduction

The construction industry is a powerful sector that provides job and stimulates growth for other construction-related economic activities. Construction project consists of processes; a process consists of a series of actions and task which leads to certain goals. The construction system involves a careful, coordinated and the integration of scarce resource inputs such as finance, design know-how, construction materials and skilled and unskilled labor during the erection processes of the structure or building; while the finished building or completed structure is the product of the coordinated construction activities that meet clients need and the desired projects objectives (Chan, 2007). The environment of the construction industry is unique and it houses a lot of creative minds and stakeholders; this is so as no two projects are the same. The industry consists of diverse stakeholders with different expertise which encourages innovation and innovative problems solving at a practical level (Jamie, 2007). In the construction industry, there is a wide perception of the environment not offering opportunities to nurture creativity, even when studies have shown the existence of large volume and excellence ideas within the industry (Jamie, 2007). Many people perceive innovation as crucial to the future of many industries. Consequently, there has been a knowledge vacuum that exists, which has to be filled through an innovative process as the professionals in the construction projects continuously preoccupied with seeking idea on how the finished product is to be attained within a minimum time and cost and at an enhanced quality and function.

According to Winch (2003) and Taghizadeh et al. (2013), in their separate studies evaluated construction industry against other industry and noted that the main reason for low productivity and value in the construction industry is due to lack of innovation. All divisions in the construction industry with regard to the economy are faced with the pressure of expanding to offer a wide range of services that are innovative, value added, and in addition, to develop solutions on how to improve performance. Innovation is the fruitful utilization of new ideas. With regards to the pace of changes in the construction global market, innovation has become a prerequisite in the construction industry; organizations that may probably survive are those that are able to introduce novelties and device a more proactive and meaning ways of managing associated risks to meet market demand (Foust, 2008; Oyewobi, 2019). Thus, due to the low-profit drive of innovation, the construction industry now varying its procedures and processes to accommodate the environmental concerns of both the government and the public (Jamie, 2007).

Barrett et al. (2001) observed that successful innovation enables construction firms to well satisfy the aspiration and needs of society and clients. Also, Blayse and Manley (2004) added that the organization needs to innovate to win projects. Innovation practice is a vital issue for most firms or organization principally for those whose environment of operation is competitive and dynamic, as they need to device continuously new business model, products and services to survive. Innovative practices have operational existence in different stages of business; hence for sustained growth and survival of a firm or an organization, persistent innovative practices are essential which would enhance service delivery in the firms. Gopalakrishnan and Damanpour (1997) defined innovative practices as the introduction of new processes ideas, products in an organization or in a firm.

This has triggered the interest of many researchers to harness the practice of innovation. The practicing of innovation in Nigeria will require sophisticated construction technology, which will cover a wider range of modern methods and practices that encompass the latest development in procedures for design, materials technology, management of facilities, information and communication technology, services, analysis of structures, design, and management education. The practice of innovation also has its own inhibitors as noted by Hardie et al. (2005), who observed that the shortage of capital and time inhibits innovation among Quantity Surveyors. However, there is a need to try to adopt advanced and latest technologies if a sector-wide innovation is to be kept.

The different dimensions of innovation are viewed include; process innovation, product/technological innovation, and business innovation. These are aimed at exploring new ideas and concepts into an organizational system. Quantity Surveyors in the construction industry continually seek solutions to enhance their profession and provide efficient services to clients/employers. This is achieved through either creating its own idea or adopting already created ideas. Quantity Surveyors within the construction industry play an important role for both clients and other professionals in the industry (Perera et al., 2007). The uniqueness of Quantity Surveyors responsibility is saddled with continuous knowledge improvement in ensuring that projects meet client requirement in terms of cost, time and value. Over the years and recently, there has been a lot of innovative improvement in the construction industry. In addition, professionals in the industry have explored the growing technological trend in innovation to spur the efficient delivery of services to their clients. Despite the much impact of the Quantity Surveyors in the construction industry, more is still required in innovative advancement of Nigerian Quantity Surveying firms and organizations in the adoption of process and product/technological innovation for efficient services delivery.

Hardie et al., (2005) examined the role of Quantity Surveyors in the generation of innovation, adoption, and diffusion in the Construction industry of Australia, and reported that Quantity Surveyors perceived themselves not to be blockers but promoters of innovation, and they are usually not team leaders but excellent team contributors and players. Musa et al. (2010) evaluated the impact of information and communication technology on the quality of Quantity Surveying in Nigeria and revealed that ICT has been adopted in the Quantity Surveying firms. Moohamad et al. (2014) conducted an empirical assessment of the consultancy services innovation practices in the Nigerian construction industry and observed that they were adopters of the product/technological, process and business system innovation. Nor et al. (2015) in a study of innovation practices in Malaysian construction firms, innovation is categorized into two; adoption and creation. The study concluded that old and big firms with non- public clients try to create innovation while young and small firms with public clients adopt innovative processes. Owusu-Manu et al. (2017) carried out an empirical assessment of Quantity Surveying firms' innovation practices in Ghana and found that Ghana Quantity Surveying firms are early adopters of product/technological innovation, process innovation, and business system innovation. In Nigeria, there has not been an empirical study on the innovative practice of Quantity Surveying firms. It, therefore, becomes imperative, to explore the acceptability of such innovative practices in the Nigerian construction industry as well as to determine the pertinent tools invoked in improving the quality of the service delivery and the extent of adoption of process and product/technological innovation in Quantity Surveying firms in the Nigeria construction industry.

Therefore, the aim of this study is to assess the extent of the process and product innovation in Nigerian Quantity Surveyor firms with a view to determining the innovative tools/concepts used. The specific objectives are to determine the innovative tools/concept used by Nigerian Quantity Surveying firms and organization and to assess the extent of adoption of process and product/technological innovation in Quantity Surveying firms and organization.

The adoption of process and product/technological innovation are an essential tool as well as a means of achieving organizational goals which make services delivery very effective. However, the state of involvement in the process and product/technological innovation by the Nigeria Quantity Surveyors has not been empirically determined; hence, scholars have widely advocated important innovative strategies to survive the challenges faced in the construction industry (Terzungwe, 2013). It is, therefore, imperative that all sphere of innovative trend be examined to determine their relevance and the adoption of process and product/technological innovation are two of the dimensions of innovation require the attention of the Nigerian Quantity Surveyors for professional advancement and efficient service delivery. It is important that a study of this type will invoke the technological ideas, structural and financial ideas required in their firms and organization.

Literature Review

The Quantity Surveyors and Quantity Surveying Firms in Nigeria

A Quantity surveyor is a professional who is responsible for providing independent expert advice on the cost, financial, economic and commercial management services of a building or civil engineering construction projects (Dada and Jagboro, 2012). The Quantity Surveyor analyses the elemental and trade costs of the components of construction work; adopt its findings to proffering solutions to the problem found in each project (Badu and Amoah, 2003). Quantity surveying profession over time have transited from being a trade-based vocation into a well-developed profession that is widely recognized in the construction industry. Quantity surveyors assist developers and designers in solving financial and economic problems by carrying out a detailed cost analysis of the components of construction projects in a more refined and scientific way and providing professional advice. In addition to the roles of the Quantity Surveyors, they now administer contracts, act as witnesses on arbitrations/legal issues, play project manager roles, financial advisors and construction managers (Perara et al., 2007; Ashworth and Hogg, 2002; Leveson, 1999). However, the modern-day quantity surveyor is viewed as a client representative (or advocate) who is skilled in the design, planning, administration and management of construction contracts and projects from commencement to handing over (Moss, 2004).

Quantity surveying firms (QSFs) are business organizations inducted and registered by the Quantity Surveying Registration Board of Nigerian, QSRBN, to provide financial and construction project management consultancy services to their clients. Their functions are serviced-based as noted by (Abidin et al., 2011; Oyediran, 2011). QSFs are also required to register with corporate affairs commission, CAC, to be able to practice in Nigeria construction market. QSFs are knowledge-based, construction-based business organizations run by Quantity Surveyor(s) who transform their knowledge or expertise into services which are eventually delivered to clients/customers (Oyediran, 2011). The clients include government, private developers or investors among others. When in operation, the QSFs do not sell physical products but knowledge. It has been observed that only a very few of QSFs are involved in governments developmental projects, and this has resulted in their performance being adjudged less impressive (Kawu, 2011).

In recent times, QSFs are only considered for their cost management function in the procurement of building projects, which is the result of their reduced involvement by government in developmental projects across Nigeria. Also, the engineers argued that the Quantity surveyors lacks the capability to provide cost management function on engineering projects which form the bulk of government projects. This position was disproved by (Eze et al., 2017) who observed that Quantity Surveyors are not well patronized by the public because of the high cost of hiring the professionals. It was observed that other construction-based professionals are involved more in the conception and execution of public projects than the Quantity Surveyors (Jagun, 2006). This was attributed to poor performance, loss of value for monies suffered by clients and their low numerical strength. Thus, the QSFs have lost their position in the Nigerian construction market. It is widely recommended that the sure way to overcome these challenges is the adoption of innovative strategies (Terzungwe, 2013). This situation has changed in recent time as a result of the embracement of innovative concepts by most Quantity Surveying firms as reported by (Musa et al., 2010; Moohamad et al., 2014).

Innovation and its Importance

Examination of the innovation literature shows diversity in views and approaches to what innovation activities are. Innovation refers to the genuine use of significant improvement and change in a process, product or system that is unique to the firm developing and devising the change (Slaughter, 1998). Innovation is also seen as change, creative thinking, perception, invention, and entrepreneurial philosophies. Summarily,

it is the implementation of creative ideas within an organization. Innovation in most developing economies is the key determining factor for organizational growth, and it is at the center of organizational competitiveness in the economy (Goh, 2006). More so, for firms to achieve and sustain competitive advantage, the firm must balance and integrate innovation in their policy statement (Barrett & Sexton, 2006).

Reichstein et al. (2005) and Slaughter (1998) posits that the need for innovation is well recognized and plays a central and critical role in clarifying industry productivity, economic progression and foreign trade. Innovation contributes and strengthens firms' competitive advantage through the establishment of new value propositions, and offering novel or unique products or services and by continuously redefining the cost/performance boundary (Dodgson et al, 2005; Tidd, 2001; Shaw, 2010). It is observed that a significant substitute to the overwhelming cost-based competition that is facing the construction industry can be provided through innovation (Dulaimi et al, 2005; Shaw, 2010). It supports revenue generation and profits of firms in times of recession (Reichstein et al., 2005; Goh, 2006). It improves the chances of winning new jobs, and meeting and satisfying clients desire (Seaden et al., 2003; Dulaimi et al., 2005). Innovation is a major strategic tool of competition, which triggers wider market penetration and broadens profit generation (Seaden et al., 2003; Goh, 2006).

Dimensions of Innovation

Process innovation is one of the dimensions of innovation. Wang and Ahmed (2004) described process innovation as the improvement of the production and management process in an organization through the introduction of new production procedures, new management approaches, and new technologies. It is generally perceived as the introduction of new elements and features into an organization's services and production processes. These elements, according to Reichstein and Salter (2006) include materials input, information exchange mechanisms, workflows, task specifications, production or services rendering equipment with the major aim of achieving better product quality and lower cost.

Another dimension of innovation is Product/Technological innovation. This according to Wang and Ahmed (2004) has gained much attention because the success of a product and the sustainability of the success of business growth; and expansion into new areas depend on it. Polder et al. (2010) defined product innovation as a new or (significantly) improved good or service. The significance and ingenuity of new ideas or products introduced to the competitive market at a suitable period are referred to as Product innovation (Wang and Ahmed, 2004). This study, however, focuses on the product and process innovation among the Quantity Surveying firms in Nigeria.

The third dimension of Innovation is the Business system innovation, which is adjudged to have a broader scope than process and production innovations (Sawhney et al., 2011). In spite of this, Vilà and MacGregor (2007) confirmed that the business concept of innovation is neglected during the measurement of the overall innovation capacity of companies. Sawhney et al. (2011) defined business innovation as the establishment of substantial or radical novel value for customers and the firm by creatively changing one or more of the current business systems or completely establishing novel business systems. Business innovation is only germane if it creates value for customers (new value, not new things) and if the customers are willing to pay for it, thereby creating value for the firm (Sawhney et al., 2011).

Innovative tools/concepts and Information handling among Quantity Surveying Firms in Nigeria.

With the latest improvements in the industry coupled with the explosion in information technology, stakeholders in the industry find it practically impossible to handle and disseminate all available and relevant information (Perera et al., 2007). The fragmented nature of the Construction Industry, of which Quantity

Surveying firms are a major component (Oladapo, 2006), and the demand of heavy exchange of data and information between project participants on a daily basis (Maqsood et al., 2004) makes it more imperative to implement information technology (IT) and other innovative tools/concepts. Construction professionals are required to have the capability of managing and communicating projects information and documents; this is the general competency required of them (Oladapo, 2006). Thus, effective information management in the form of information flows enables rapid inter and intra-organizational communications. For Quantity Surveying practices, the most common Innovative tools/concepts for handling information flow including but not limited to QS Elite, Vector, Digitizers, AutoCAD, Autosketch, SuperProject, Master Bill, WinQs, QSlotus, Computer Aided Taking Off (CATO), Estimator Pro.MB3, QS Cad, RIPAC, CANDY, On-Screen Takeoff Pro, QS Plus2001 and Masterbill (MB3+) (Willis et al., 1994; Murray et al., 2001). These tools do not only reduce the length of time for discharge of Quantity Surveyors duties but also enhance the accuracy of their functions from the estimating stage to the preparation of final accounts. Although, not all have adopted these innovative tools because of operational inhibitors like educational problems, a high cost of software, poor return on investments among others (Oyediran and Odusami, 2005), a good number of the firms have overcome these challenges.

Rogers' Innovation Diffusion Theory

The relative speed with which an innovation is adopted by members of a social system is regarded as the rate of adoption (Rogers, 2003). Construction firms and consultancy firms (particularly the Quantity Surveying firms) have a relative rate of adopting new concepts. This uneven adoption rate of innovation has an effect on the survival of the firms, their advancement, and competitive advantages. Thus, the internal environment and dynamic forces of an organizational system, which is such that they respond readily to changes (Steel and Murray, 2004). The members of an organization or social system have been classified into 5 adopters' categorization by Rogers (2003) on the basis which an individual is relatively earlier in adopting new ideas than other members of a social system (organization). As shown in Table 1, the major classification is innovators, early adopters, early majority, late majority, and laggards.

Innovators are individuals (or organizations) who initiate new ideas by introducing innovation from outside the social system (Rogers, 2003; Steele and Murray, 2004). According to Steele and Murray (2004), the early adopters are the category that has the highest degree of leadership opinion in the social system, and from which prospective adopters get advice and guidance about innovative tools/concepts. Rogers (2003) states that the early majority adopters of innovation do not play a leadership role but interact effectively with other members of the organization or social system. The late majority feels safe to adopt innovation when most of their colleagues have adopted it (Rogers, 2003). The laggards' category is usually the last member to adopt an innovation. They always desire to maintain their positions and function according to tradition; however, their line of interaction in the social system is only with other laggards (Steele and Murray, 2004). This study adopted Roger's classification of the rate of adoption of innovation in its analysis.

Table 1 - Likert Scale Interpretation

Likert Scale Interpretation and Distribution of Value			Interpretation of Roger's Innovation Adoption classification based on the 5-point Likert Scale	
Likert Scale	Likert Description	Value Allocation	Value Range Allocation	Roger's Innovation Adoption Status
1	Not at all	1.0 - 1.49	0.1 – 1.0	Laggard
2	Slightly true	1.5 – 2.49	1.1 – 2.0	Late Majority
3	Moderately true	2.5 – 3.49	2.1 – 3.0	Early Majority
4	Mostly true	3.5 – 4.49	3.1 – 4.0	Early adopter
5	Completely true	4.5 – 5.00	4.1 – 5.0	Innovators

Source: Moohammad *et al.* (2014)

Research Methodology

The study sought to establish the level of adoption of process and product/technological innovation by Nigerian Quantity Surveying firms, using Rogers' adopters' categorization. The study adopted Abuja (the Nigerian capital) as the study area. Abuja was chosen for the study based on the premise that it is the administrative center of the country with lots of construction and consultancy firms having their head office or branches in the country's capital (Aje et al., 2015). In addition, there are many construction projects being executed on a daily basis. Furthermore, most of the professional bodies' construction-based consultants have either their head office or liaison office in Abuja. According to Saidu and Shakantu (2016a), Abuja is one of the metropolitan cities in Nigeria with the highest population of construction professionals practicing in either constructing or consulting firms within the built environment. Thus, being the administrative headquarters of Nigeria, Abuja attracts many Quantity Surveying firms and other Quantity Surveying related organizations from neighboring states, to practice for delivery of their services.

The study adopted a descriptive research design aimed at collecting data for the purpose of describing and interpreting the current and existing conditions regarding the innovative practices of Quantity Surveying firms. It involved the determination of the extent of innovative tools/concepts, adoption, and the creation of new ideas and concepts in the delivery of Quantity Surveying services. The study adopted a well-structured questionnaire in the collection of the data from Quantity Surveying firms and organization within Abuja. These firms and organizations ranging from small, medium to large in Federal Capital Territory (FCT), Abuja. The questionnaires were administered by the authors and through the help of trained field assistants who were well informed about the research topic and given the necessary materials and information to aid the administration of the questionnaires to target respondents.

The questionnaire was designed in three sections using information derived from the review of the related literature. Section A covered the general information of the target respondents. Information gathered from section A served as a quality check and verification of the data from the other part of the questionnaire. Section B focuses on the adoption of innovative tools/concept used in Quantity Surveying firms or organizations and this contains twenty-eight (28) tools/concepts. Section C concerns on adoption of process and product innovation in Quantity Surveying firms or organizations and this contains sixteen (16) variables.

A pilot survey was adopted to test the suitability and appropriateness of the questionnaire to meet the study objectives as suggested by Fellows and Liu (2008). Six (6) of the draft questionnaire were randomly distributed to the selected construction professionals and academics, and the final draft was adjusted based on their feedback. The details of the Quantity Surveyors within Abuja was obtained from the professional regulatory body. A total of 386 questionnaires were randomly distributed to Quantity Surveyors working with Quantity Surveying firms and related organizations within Abuja. 169 of the questionnaires were retrieved, of which 9 were discarded as a result of incomplete response. 160 of the questionnaires were deemed valid and used for the analysis, this represents a 41.45% effective response rate. This response is above the usual response rate of 20-30% for questionnaire surveys in construction management studies, as suggested by Akintoye (2000). Furthermore, the reliability and internal consistency of the questionnaire was carried out using Cronbach's alpha test. This test measured the reliability of each of the field of the questionnaire and the mean of the entire fields of the same questionnaire. The acceptable value range of Cronbach alpha is between 0.0 and +1.0 and as the value tends toward 1, the higher the degree of internal consistency. The Cronbach alpha value for the variables is 0.811 and 0.905, thereby implying that the questionnaire is credible and have a high degree of reliability. According to Moser and Kalton (1999), a research instrument is perfect as the value of the Cronbach alpha tends towards 1.0.

Frequencies, percentages, Relative Importance Index (RII) and mean score were used to analyze the collected data and in interpreting the scale of adoption using Rogers' adoptions categorization table. Frequencies and percentages were used to analyze the general information of the respondents; RII and Mean score were used to assess the adoption of tools/concepts and in determining the adoption level of processes and products/technological innovation. These analyses were carried using out a statistical package for social science (SPSS) Version 20.

Table 2 - Reliability Statistics

Case Processing Summary					
		N	%		
Case 1	Valid	160	100	Cronbach's Alpha	0.811
	Excludedᵃ	0	0	N of Items	28
	Total	160	100		
Case 2	Valid	160	100	Cronbach's Alpha	0.905
	Excludedᵃ	0	0	N of Items	16
	Total	160	100		

a. Listwise deletion based on all variables in the procedure.
Case 1- Innovative tools/concepts; Case 2 – Processes and product/technological Innovative

Result and Discussion

General Information of Respondents

The result of the analysis of the general information of the respondents is shown in Table 3. 31.25% of the respondents had 11-15years work experience, this is followed by 25.00% for 6-10years, 18.75% of the respondents have worked for between 16.20years and 21years and above respectively. Finally, only 6.25% of them have worked for 0.5years.

Table 3 - Demographic characteristics of Respondents

Category	Classification	Freq.	%
Years of experience	0-5years	10	6.25%
	6-10 years	40	25.00%
	11-15 years	50	31.25%
	16-20 years	30	18.75%
	21-above	30	18.75%
	Total	**160**	**100.00%**
Academic Qualification	Higher National Diploma	48	30.00%
	BSc / BTech	72	45.00%
	Master degree	36	22.50%
	Doctorate degree	4	2.50%
	Total	**160**	**100.00%**
Professional Qualification	Fellow member	8	5.00%
	Corporate member	127	79.38%
	Probationer member	25	15.63%
	Total	**160**	**100.00%**
Firm employment of innovation research specialist	Yes	33	20.63%
	No	127	79.38%
	Total	**160**	**100.00%**
Firms consider cost before embarking on the innovative practice	Yes	149	93.13%
	No	11	6.88%
	Total	**160**	**100.00%**

The average year of working experience of all the respondents was put at 11.56 years. Thus, this implies that information gathered from the respondents can be depended upon as they have a substantial number of years of working experience in the construction industry and in Quantity Surveying firms and organizations. In terms of academic qualification, 30% has a Higher National Diploma, 45% holds BSc/B. Tech, 22.5%, and 2.5% hold Master degree and Doctorate degree respectively. Furthermore, 79.38% are corporate members of the Quantity Surveying professional body. These imply that the respondents are both academically and professionally qualifies to give reliable information on the subject under consideration. On whether their firms employ the services of a specialist on innovative research, 20.63% indicated 'Yes' and 79.38% indicated 'No'. Thus, implying that attention is not on innovation, as specialist resources are not engaged to carry out researches on innovation. In addition, the respondents indicated that their organization considers cost before embarking on any innovative activities. This further means that cost could be a hindrance to the engagement of innovative research experts.

Adoption of Innovative tools/Concepts

Table 4 shows the result of the analysis respondents' perception regarding the degree of adoption of the sampled innovative tools/concept in their various organizations and when executing the Quantity Surveying functions.

Table 4 - Adoption of Innovative Tools/Concepts

S/No	Tool/Concept	M.S	RII	Rank
1	MS Excel	4.28	0.855	1st
2	CATO (Computer Aided Taking-off)	4.00	0.800	2nd
3	CA Estimating	3.69	0.739	3rd
4	Auto Sketch	3.69	0.738	4th
5	Digitizers	3.56	0.713	5th
6	Microsoft Project	3.30	0.660	6th
7	BIM	2.94	0.588	7th
8	CAD	2.94	0.588	7th
9	QS lotus	2.88	0.575	9th
10	Value Management	2.73	0.545	10th
11	Risk Management	2.70	0.540	11th
12	Estimator Pro	2.68	0.535	12th
13	Master Bill Cost Planner	2.65	0.530	13th
14	QS Plus	2.64	0.528	14th
15	RIPAC	2.64	0.528	14th
16	E-procurement	2.64	0.528	14th
17	Construction Computer Software	2.63	0.525	17th
18	Workmate 3.4/5.0 (Bill Maker)	2.56	0.513	18th
19	Vector	2.56	0.513	18th
20	Knowledge Management	2.55	0.510	20th
21	Q- Mate 1.1	2.50	0.500	21st
22	Master Bill Elite	2.49	0.498	22nd
23	Snape	2.48	0.495	23rd
24	Win QS	2.46	0.493	24th
25	Integrated Supply Chain	2.46	0.493	24th
26	Hard Dolar	2.45	0.490	26th
27	EVEREST	2.44	0.488	27th

| 28 | Quick Bid | | | | 2.39 | 0.478 | 28th |

The most commonly used or adopted innovative tools/concept are MS Excel (RII = 0.855), Computer Aided Taking-off, CATO (RII = 0.800), CA Estimating (RII = 0.739), Auto Sketch (RII = 0.738), Digitizers (RII = 0.713), Microsoft Project (RII = 0.660), BIM and CAD (RII = 0.588) each, QS Lotus (RII = 0.575) and Value Management (0.545). Furthermore, in determining the level of adoption and the adopters' categories of these innovative tools/concept, Rogers' (1995) innovation diffusion theory was employed. The means score items of the tools/concepts were used to relate and draw the meaning and interpretations from Rogers (1995) innovation adopters categorization. Rogers' (1995) interpretation equivalent shown in Table 5 indicates that 78.57% of the sampled innovative tools/concepts fell within the Early Majority adopters' category, and only 21.43% of the tools/concepts are within the early adopters' category. With an average mean score of 2.65 for the entire tools/concept sampled, Quantity Surveyors adopt innovative tools/concepts moderately. Thus, it was concluded that Quantity Surveyors in Nigeria are the early majority in the adoption of innovative tools/concepts in the discharge of their functions in their organization.

Table 5 - Likert Scale Interpretation using mean score

Likert Scale	Likert Description	Roger's adopters' categories	Value Range Allocation	Freq.	Percent	Mean
1	Not adopted	Laggard	0.1 – 1.0			
2	Slightly adapted	Late Majority	1.1 – 2.0			
3	Moderately adopted	Early Majority	2.1 – 3.0	154	96.25%	2.64
4	Mostly adopted	Early adopter	3.1 – 4.0	6	3.75%	
5	Completely adopted	Innovators	4.1 – 5.0			

The extent of Adoption of Process and Product/Technological Innovation

The result of the analysis of the extent of adoption of process and Product/technological Innovation by Quantity Surveying firms is shown in Table 6. Under process innovation, the Quantity Surveyors are of the opinion that; Within the firm, they are able to implement new processes of rendering service used by other organizations (RII = 0.805), Our firm actively develops in-house solutions to improve our process of rendering service (RII = 0.646), and they actively seek new process of rendering service from outside this organization (RII = 0.588). Thus, in terms of process innovation, it can be concluded that the Nigerian Quantity Surveyors adopt and implement new processes of rendering service in their organizations.

In terms of Product/Technological innovation, Quantity Surveying firms within the study area adopts innovation because they believe innovation is just a tool for getting things better, rather than end-product (RII = 0. 783), Within their firms, they are able to implement new services used by other organizations (RII = 0.775), Quantity Surveying forms usually introduce a familiar and well-known design to the client (RII = 0.630), and Quantity Surveying firms see creating new services as critical to their success (RII = 0.593).

Overall, Quantity Surveying Firms adopt innovation to a very large extent as they are aware of the importance of organizational success and performance. Quantity Surveying firms are able to implement new processes of rendering service used by others (RII = 0.805), Innovation is a tool for getting things better, rather than end-product (RII = 0.783), they actively develop in-house solutions to improve our process of rendering service (RII = 0.646), and Quantity Surveying firms usually introduce a familiar and well-known design to the client. (RII = 0.630). These imply that Quantity Surveying firms within the study area adopt process and product/technological innovations in all their dealings and operations.

Table 6 - The extent of adoption of Process and Product/Technological Innovation

S/N	Statement	M.S	RII	RANK	Overall Ranking
	Process Innovation				
1	Our firm actively develops in-house solutions to improve our process of rendering service	3.23	0.646	2nd	4th
2	Our firm sees creating a new process of rendering services as critical to our success.	2.93	0.585	4th	10th
3	When it comes to creating new processes, our firm is far better than the competition.	2.86	0.573	5th	13th
4	Our firm tends to be an early adopter of a new process of rendering service.	2.84	0.568	6th	15th
5	We actively seek a new process of rendering service from outside this organization.	2.94	0.588	3rd	8th
6	Within our firm, we are able to implement new processes of rendering service used by other organizations.	4.03	0.805	1st	1st
	Product/Technological Innovation				
7	Our firm actively develops new services in-house	2.90	0.580	7th	11th
8	Your organization/ firm usually introduce a familiar and well-known design to the client.	3.15	0.630	3rd	5th
9	Your organization/firm do not make modification based on the existing proven succeed product	2.84	0.568	10th	15th
10	For your organization/firm, innovation is just a tool for getting things better, rather than end-product	3.91	0.783	1st	2nd
11	Your organization is imitating designs from the market to minimizing the uncertainty of your product	2.89	0.578	8th	12th
12	It has been a culture to adopt a well-known design.	2.94	0.588	6th	8th
13	When it comes to creating new services, our firm is far better than the competition	2.85	0.570	9th	14th
14	Within our firm, we able to implement new service used by other organizations	3.88	0.775	2nd	3rd
15	Our firm sees creating new services as critical to our success	3.03	0.605	4th	6th
16	As long as the design/ product meets the client's criteria, proposing something extraordinary beyond expectation would not be necessary	2.96	0.593	5th	7th

In determining the extent of adoption of process and product/technological innovation, Rogers' (1995) innovation diffusion theory was employed. The means score items of the tools/concepts were used to relate and draw meaning and interpretations from Rogers' innovation diffusion theory for adopters categorization. As can be seen in Table 7 and 8, it was observed that the overall mean score for process innovation was 2.97 indicating that Nigerian Quantity Surveying firm is the Early Majority in process innovation, which means they hardly have leadership role but they have effective interaction with other members of the social system (Rogers, 2003). Similarly, the overall mean score for product/technological innovation was 2.98 indicating that Nigerian Quantity Surveying firms are the Early Majority in product innovation, which means they hardly have leadership role but they have effective interaction with other members of the social system (Rogers, 2003).

Table 7 - Likert Scale Interpretation Process Innovation

Likert Scale	Likert Description	Roger's Innovation Adoption Status	Value Range Allocation	Freq.	Percent	Mean
1	Not adopted	Laggard	0.1 – 1.0			
2	Slightly adapted	Late Majority	1.1 – 2.0			
3	Moderately adopted	Early Majority	2.1 – 3.0	106	66.25%	2.97
4	Mostly adopted	Early adopter	3.1 – 4.0	54	33.25%	
5	Completely adopted	Innovators	4.1 – 5.0			

Table 8 - Likert Scale Interpretation Product/Technological Innovation

Likert Scale	Likert Description	Roger's Innovation Adoption Status	Value Range Allocation	Freq.	Percent	Mean
1	Not adopted	Laggard	0.1 – 1.0			
2	Slightly adapted	Late Majority	1.1 – 2.0			
3	Moderately adopted	Early Majority	2.1 – 3.0	100	62.50%	2.98
4	Mostly adopted	Early adopter	3.1 – 4.0	60	37.50%	
5	Completely adopted	Innovators	4.1 – 5.0			

Discussion

The study reported that Quantity Surveyors in Nigeria are the early majority in the adoption of innovative tools/concepts in the discharge of their functions in their organization. This finding is in disagreement with the report of Moohammad et al. (2014), who reported that Nigerian construction industry consultancy services firms fell within Adopters' category of the Rogers (1995) innovation adoption classifications in all the dimensions of innovation (process, product/technological and business system). The findings of this study also are not in agreement with Owusu-Manu et al. (2017) and Fell (1998). Owusu-Manu et al. (2017) observed that Quantity Surveying firms in Ghana are early adopters of process innovation, product/technological innovation, and business system innovation. Fell (1998) reported that early adopters scored higher than later adopters, and the also indicated that the use of new products was a part of their firm's competitive premise. Ashiboe-Mensah (2012) further pointed out that the building construction industry is not new to innovation; however certain innovations are adopted whilst others are rejected. It was recommended that irrespective of the innovative characteristics identified in Quantity Surveying firms, there is needs to revolutionize and move strongly to other types of innovation like technological and product innovation so that their impact can be felt more in the construction industry.

For Quantity Surveyors to be in the early majority category in the adoption of the innovative tools/concepts, this implies that members of the profession are a step ahead of other sister professions in the built environment. The adoption of these tools/concepts is yet to reach average by the built environment professionals. According to Rogers (1995), the early majority adopts new ideas just before the average member of a social system. This social system could mean the professionals within the built environment who regularly interact with one another in the construction industry. The Quantity Surveyors in Nigeria are an important link for further dissemination of the use and application of these innovative tools and/or concepts by other construction professional. Thus, Quantity Surveyors encourage the use and spread of MS Excel, Computer Aided Taking-off (CATO), CA Estimating, Auto Sketch, and Digitizers in construction-related activities in the construction industry of Nigeria.

Musa et al. (2010) posit that Quantity Surveyors proactively think of ways of trying their skills in very important software packages like Master Bill, WinQS, Computer Aided Taking off (CATO), Super Project, RIPAC among others. Quantity Surveying firms strive to be leaders in the construction industry, thereby aspiring beyond their current capability and resources. The attitude of aspiring beyond current capability has been identified as the second most important attribute among innovators which capsulize the goal of progress and continuous improvement by finding better combinations of resources (Hamel et al., 1989; Stopford and Baden-fuller, 1994; Owusu-Mamu et al. (2018). Stopford and Baden-Fuller (1994) perceive proactiveness not to be the first to create something new but rather, thinking ahead and adopting the necessary changes for the unexpected future. Quantity Surveyors are proactive in renewal when they borrow other ideas as a means of breaking from past behavior. Quantity Surveyors are seen as been proactive by their usage of very important packages of software (Owusu-Mamu et al., 2018). Thus, Ekung and Okonkwo (2015) submitted that the Quantity Surveying profession is not static in responding to the changes in the construction market regarding the services it renders as the profession diversify its practices to meet the demand of both public and private clients in the industry. Preece et al. (2008) argued that organizations that are more likely to survive the turbulent construction business environment will be those that add value to clients' through innovative ideas and excellent performance. Therefore, for the Quantity Surveyors in the industry to remain champions in the process innovation, they should work hard to control vices such as corruption and ensure accountability, transparency, and continuing professional development of its members (Owusu-Manu et al., 2018).

Oyewobi (2019) posits that the adoption of innovation has created new opportunities for the Quantity Surveying profession and has well provided diverse ways in which Quantity Surveying businesses can benefit from its implementation. Competition among construction firms and consultant firms are increasing on a daily basis and Quantity Surveying firms have had to develop different strategies to be able to survive and achieve optimal market returns. However, it is only an adequate selection of a specific and suitable competitive strategy that determines an organization's desire for successful innovation. Thus, the integration of innovation activities with business strategy and processes in a manner that supports business goals will guarantee sustained competitive advantage for Quantity Surveyors (Oyewobi, 2019). There is a consensus among Quantity Surveying organizations that adoption of IT through innovation will assist them in gaining a competitive advantage over the industry's competitors.

Conclusion

The study sought to establish the level of adoption of process and product/technological innovation in Nigerian Quantity Surveying firms, using Rogers' adopters' categorization. The study found that the majority of Quantity Surveying forms do not employ the services of innovation specialist and the few that do consider cost before embarking on innovative activities. The most commonly used or adopted innovative tools/concept by Quantity Surveying firms are MS Excel, Computer Aided Taking-off, CATO, CA Estimating, Auto Sketch, and Digitizers. Quantity Surveyors are the early majority of innovative tools/concepts. In addition, Quantity Surveyors in Nigeria are the early majority in the adoption of innovative tools/concepts in the discharge of their functions in their organization. The extent of adoption of process and product/technological innovation is high, and Quantity Surveying Firms are able to implement new processes of rendering service used by other, they understand that Innovation is a tool for getting things better, rather than end-product, and they actively develop in-house solutions to improve the process of rendering service. Thus, Quantity Surveyors are an early majority in the adoption of process and product/technological innovations. Considering the importance of innovation in the operations and Runnings of corporate businesses, there is a need for all firms and organization to adopt the innovative practice in their firms to enhance performance and strengthen their competitive position in the corporate world. It is, therefore, recommended that similar studies should be carried out in other regions and states of the country so that comparison could be made.

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