Assessing the Status of E-Procurement System in Nigerian Construction Industry

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Abstract
The term E-Procurement refers to the process of using electronic technology to acquire goods and services. Various countries have adopted the technology at diverse levels in the procurement of construction projects. Previous studies showed that e-procurement (e-P) has the ability to improve economic performance if properly implemented in construction procurement; yet the developing countries lag behind in implementation. Very little is therefore known of e-P used in the construction sector of Africa. It is still unclear whether the concept, benefits and level of adoption of e-procurement is known in which this work sets to fill the gap. The aim of this paper therefore is to assess the status of e-Procurement system in Nigeria. Key parameters of the assessment are the understanding of the tool, level of application and barriers impeding the adoption. Data was collected using structured questionnaire through a purposive sampling of Quantity surveyors in Kaduna and Abuja Nigeria. Descriptive statistical tool was used to analyse the data. Findings showed that respondents have limited understanding of the components of e-procurement tools. Only e-tendering is well understood and adopted by the respondents. Respondents are only aware of the common aspects of the benefit of e-procurement implementation to the economy and are not aware of its benefits in terms of improvement of team work, payment efficiencies, quality management and marketing strategy. The result also showed that other than poor understanding of various tools of the technology, security and legal concerns still pose significant impediments to extended adoption of e-procurement in construction business. The general level of implementation of e-procurement is found to be low and slow, therefore the associated benefits not fully exploited. The concerns identified herein, create opportunity for the understanding of the right direction in the efforts by stakeholders to improve the level of adoption and strategy. More training and education is required in the sector to improve the awareness level and to motivate a wider implementation of e-Procurement in Nigeria becomes necessary at this level. The research therefore suggests an aggressive enlightenment programs to be directed on client organizations, on all professional consultants, contractors and relevant government agencies on the benefits of adopting e- Procurement in the construction industry.

Keywords: E-procurement; Construction; technology, Quantity Surveyors, stakeholders

Introduction
The web or internet has changed the traditional functions of computers from data storage, processing and data/information retrieval to include reducing distance barrier in business transactions (Bello & Iyagba, 2013). E-procurement (e-P) which uses the web, has been changing the way in which organizations acquire goods and services (Hassan, Tretiakov, Whiddett & Adon, 2014). The technology has many tools that can achieve activities like advertising tenders, acquiring and returning tenders

electronically, electronic ordering, internet sourcing via third parties, email communications between buyers and sellers, email communications related to contract management, and the integration of procurement within financial and inventory systems (Bakar, Peszynski, Azizan, & Sundram, 2016) with associated value. E-Procurement adoption refers to the actual use of web-based technologies, tools or processes to support the execution of some or all aspects of construction procurement activities (Ibem, Aduwo, Tunji-Olayeni, Ayo-Vaughan & Uwakonye, 2016). Previous studies show that better value for money in the construction sector has been achieved in countries that adopted e-P (Hashim, Said & Idris, 2013; Adzroe & Ingirige, 2014). Studies have also demonstrated the potentials of the technology to improving performance in firms (Hashim, Said and Idris, 2014). Invariably, findings have put it that developing nations are lagging behind in adopting the technology (Egbu, 2003 cited in Ateto *et al.*, 2013; Aduwo, Ibem, Uwakony, Tunji-Olayeni, & Ayo-Vuaghan, 2016). Ibem and Laryea, (2015) found that e-P technology is still at its infancy in Africa while Hassan *et al.* (2014) opined that the complex nature of the e-P practice is contributory. This complex nature has the construction projects characteristics playing major role. Other research works conducted at different locations attempted to avail other key barriers impeding e-P adoption in the African continent (Ateto, Hosndieki, & Okibo, 2013, Chilipunde 2013, Adebayo & Evans, 2016, Aduwo *et al.*, 2016). Yet it is believed that very little is still known of e-P use in the construction sectors due to several barriers in developing countries like Africa (Ibem & Laryea, 2015). This assertion suggests that more research work is still required in this field apart from the necessity to progressively monitor performance and the level of the impact of the identified barriers. Arising from the dismal description of the situation, it is doubtful if the concept of e-P, its varying tools and technologies or benefits is well understood in Africa, which becomes a subject for inquest. It is pertinent to make clear first the concept of e-P within the construction domain. This paper was therefore set to assess the status of e-Procurement system in the Nigerian construction sector. The objectives of which are to:

i. articulate the e-P concept within the construction domain
ii. assess the level of understanding of varying components, tools and technologies and also the level of application of these tools and technologies in the construction sector
iii. appraise the understanding of the benefits of e-P to the economy and to practicing firms and
iv. identify prominent barriers still impeding the rapid adoption of e-Technology

E-Procurement Concept in the Construction Sector

Procurement is not a unique case for the construction industry, rather a core activity in every business processes in all organizations. E-P fundamentally supports the way all organizations conduct traditional procurement activities, and it automates and simplifies many business processes and transactions (Aduwo *et al.*, 2016). However, construction differs significantly from other industries (Eadie, Perera, Heaney and Carlisle, 2007), as such, it is important to understand e-P within construction context. Proper conceptualization of e-P in construction perspective will facilitate the right implementation strategy and derive home optimum value associated. Proper conceptualisation allows optimum response to flow inefficiencies in acquisition processes.

Some distinct characteristics of construction, according to Eadie *et al.* (2007) are that it is a stationary product, the production line keeps changing locations, its complexity and the

economic value essentially differing from other industries. Dowsett and Harty, (2013) identified some characteristics as highly fragmented design and production process, differentiated stakeholders with discerned behaviours or approaches to issues, specific goals, and diverse influences or needs among others. Laryea and Ibem (2014) added that construction procurement process involves several steps, activities, people and organizations and yet, takes a long time, in most cases, to accomplish. The nature of construction is unique, the technology to adopt must therefore be relevant to its nature (Harty, 2005). It cause the industry to face different kinds of complex challenges (Eduwo *et al.,* 2016). Thus, suggesting why the construction e-P is not only unique but complex (Hassan *et al.*, 2014). E-P in construction has six basic activities namely: establish the need, strategise, solicit for offers, evaluate offers, award contract and then monitor implementation (Laryea & Ibem, 2014). The scholars then identified the pattern of technology involved in e- P relevant to construction in line with the six activities identified.

Bakar *et al.* (2016) found differences in the scope and details in the definitions of e-P after various definitions by diverse scholars were reviewed. While a single definition of e-P hardly reflects completely the complex array of activities in construction procurement, it can be conceptualized as the use of web-based technology to execute all or part of the phases of construction projects business transactions.

The E-P tools/technology

The pattern of e-P technology relevant at varying stages of the construction process was assessed by Laryea and Ibem (2014). The technology can be in form of processes or products which may include engineering and scientific concepts, new products, processing systems, production processes, physical equipment or tools (Laryea & Ibem, 2014). Similarly, McConnell (2009), Kamaruzamana and Mohamed (2013) and Bakar *et al.* (2016) identified and discussed the varying relevant tools or aspects of e-P in construction to include but not limited to E-Informing/E-notification, E-Sourcing, E-Tendering: E-Reverse auctioning, E-Awarding, E-Contract Management, E-Ordering, E-Markets, E-MRO (Maintenance, Repair and Operations) and Web based ERP (Enterprise Resource Planning), E-Invoicing, E-cataloguing, E-purchasing, E-negotiation. Table 1 listed and explained key tools or aspects of e-P.

Table 1: Tools of e-Procurement

	Tools	Definition
1	E-informing/E-notification	Process of gathering and distributing purchasing information both from and to internal and external parties
2	E-sourcing	Process of identifying potential new suppliers for a specific category of purchasing requirements
3	E-tendering	Concerns the process of sending requests for information and prices to suppliers, and receiving responses from suppliers using Internet technologies
4	E-reverse auctioning	Internet technology that enables purchasing companies to buy goods and services that either have the lowest price, or a combination of the lowest price and other conditions
5	E-Awarding	Involves secure tender opening (being able to only open tenders that have been submitted by closing date and time), tender evaluation and tender award. Typically this is facilitated using similar systems to those used for e-notification and e-tendering.

6	E- Contract Management	Use of information technology for improving the efficiency and effectiveness of contracting processes of companies. As a result of the e-notification, e-tendering and e-awarding stages agreement can be established with the suppliers. Unlike conventional auction where the prices generally increases, e-auction are commonly referred to as reverse auction as the price quoted by suppliers generally decreases
7	E-Ordering,	The use of Internet to facilitate operational purchasing process, including ordering (requisitioning), order approval, order receipt and payment process. This involves an organization raising orders of agreed contracts or catalogue (following on from the stages above) and the transmission and acceptance of this by suppliers
8	E-Markets	Meeting venues for component suppliers and purchasers, who use exchange mechanism to electronically support the procurement process. Early e-procurement solution focused on this aspect of e-procurement (e.g. electronic data interchange, e-catalogue and e-marketplaces) as this was perceived as the era where maximum efficiency could be achieved since it has a direct link with e-ordering.
9	E-MRO (Electronic Maintenance Repair and Operation) and Web-based ERP(Enterprise Resource Planning)	E-MRO focuses on the process of creating and approving purchasing requisitions, placing orders and receiving goods or services ordered using system software based on Internet technology. The system involves the use of electronic infrastructure to transfer purchase orders, invoices, payments and other relevant information for indirect products and services. While, Web-based ERP system involves the procurement of direct goods/product related items (goods that are directly used to produce finished products) and any related transactions such as purchase order, invoices, payments and other necessary documentation via online
10	E-Invoicing	A situation where an organization electronically receives invoices from suppliers and following electronic matching (e.g. against the purchase and goods received notes), making electronic payment via a Bank Automated Clearing system (BAC). This electronic payment of suppliers has been identified by many organizations as a quick win in relation to e-procurement, given the processes and activities. E-invoicing is performed alongside E-MRO and ERP.
11	E-cataloguing	Refers to the electronic presentation of information regarding the products and services of an organization.
12	E-purchasing	A series of tools used to help procurement professionals and end-users undertake more efficient processes, and receive more accurate order details. The tools include purchase-to-pay systems, purchasing cards and invoicing solutions
13	E- negotiation	refers to a mechanism that allows for a recursive interaction between a buyer and supplier, thereby allowing the resolution of a good deal
14	Web-based Electronic Data Interchange (Web-based E	Web-based EDI systems are a cost-effective way to automate the exchange of structured documents on business arrangements between trading partners as all transactions are done electronically. The system enables companies to replace expensive EDI communication with less costly web communication and provides them real time information about market conditions.
15	Electronic Auction (e-auction)	E-auction is the process of bidding products over the Internet and the auction is most often traded in real time. E-auction enables companies to purchase goods or services from suppliers who offer the lowest price or a combination of the lowest price and other aspects.

Adapted from: McConnell (2009), Kamaruzamana and Mohamed, (2013), Bakar *et al.* (2016)

Ateto *et al*. (2013) noted that as the ICT society continue to develop, there is the need to understand e-P practices and adopt it in the construction sector. Particularly, the study noted that its application in construction generally lags behind when compared with other industries. Considering the apparent shift from traditional to electronic procurement environment, Bakar *et al.* (2016) abridged the understanding of the traditional procurement and e-procurement. Various definitions of e-procurement were appraised, and the tools and benefits identified. Laryea and Ibem (2014), through an evidence-based literature review identified and analysed three patterns of technological innovations in the use of E-P in construction. The patterns of technological innovation

were also linked to the nature of construction procurement process. The research concluded that the industry is gradually moving towards fully computer-based virtual procurement method characterised by a high degree of integration and collaboration across the entire construction procurement lifecycle. However, the innovative use of e-P technologies in Africa manifested more at tendering and administration stages than in the other stages of construction procurement process (Laryea and Ibem, 2014). The benefits of e-tendering in construction were outlined by Chilipunde (2013). Earlier, Baladhandayutham and Venkatesh (2012) developed a list aimed at identifying how the benefits of e-P influence its adoption in the construction industry. The study by Baladhandayutham and Venkatesh (2012) did not specifically focused on the value propositions; instead it focused more on its influence on the decision to adopt e-P. Then, Hashim *et al*. (2013) explored the values with e-P in the Malaysian construction industry. More recently, Chebii (2016) made an inquest into determinants for successful implementation of e-procurement in the Kenyan public sector. Technology, government support, and supply chain responsiveness were found important. Similar study was carried out in Mombasa by Mohammed and Milimu (2016), the objectives of which were to determine the influence of technology on progress of e-procurement in the county government, to assess how organizational culture affects the implementation of e-procurement and to establish how environment influences the use of e-procurement system. The researchers found a strong correlation between the use of e-P and cost minimization, efficiency and organizational culture, and that there is a strong advocacy in favour of e-procurement. Chilipunde (2013) studied the drivers and barriers to e-tendering in Malawi. Acknowledging that e-tendering is just an aspect of e-procurement, the researcher found that there was ignorance in the benefits of e-tendering systems. This ignorance cannot guarantee motivation for the quick adoption of the technology

In South Africa, findings reveal that only four categories of e-Procurement namely: e-mail, static websites, web.2.0 technologies and portals that have capabilities of supporting the execution of functions limited to intra and inter firm communication and exchange of project information and data were used. Only between 11 and 12 percent of the respondents used these e-Procurement technologies for communication of information, exchange of bill of quantities, CAD drawings and project specifications (Ibem & Laryea 2015).

In Nigeria, several research works have also been conducted along the e-P development. Oladapo (2005) surveyed the use of information and communication technology (ICT) in the Nigerian construction industry. The study identified and grouped factors that significantly impact the level of ICT use. The groups constitute those that are internal and those external to the industry. The internal factors significantly correlated with the level of ICT use in the industry, while none of the external factors significantly correlated with the level of ICT use. Five main constraints to the use of ICT identified by Oladapo (2005) were insufficient/irregular power supply, high cost of ICT software and hardware, low job order for firms, fear of virus attacks and high rate of obsolescence of ICT software and hardware. Usman *et al.* (2012) in effort to conceptually synthesize the attitude of quantity surveyors towards ICT acceptance for construction cost management in Nigerian reviewed the causes and impact in the usage of information and communication devices. Array of impediments were identified which were related to economy, technology, motivation, ethics and bureaucracy. The researchers recommended for a more holistic investigation into impediments by practicing quantity surveyors while

putting into consideration all relevant factors, so that a better solution can emerge to solve the identified challenges. Aduwo *et al.* (2016) became concerned about slow and low uptake of e-P in developing countries when compared with the developed, and sought to avail the barriers against e-P uptake in Nigeria. Through a set of questionnaires the researcher surveyed professionals in consulting firms, contracting and client's organisations, and government establishments. The most adverse effects to the uptake similarly related to both economic, technical, political, social and cultural issues.

Ibem *et al*. (2016) sought to identify the factors influencing the adoption of e-P in the Nigerian building industry and included the external influence of other industries on the adoption of e-Procurement technologies and tools in the research, an aspect deficient in similar previous research works. Three factors with the highest influence on the decision to adopt e- Procurement by organizations were- the benefits of e-Procurement in enhancing efficiency in job delivery, eliminating geographic barriers to participation in construction procurement activities and effective communication among project team members. Also, Oyediran and Akintola (2011) surveyed the state of arts in e-tendering through a set of questionnaires and established different impediments to the adoption of e-tendering in the Nigerian construction industry. Findings also showed only fair level of knowledge about the process, lack of necessary facilities, minimal level of proficiency in its use, non-existence of a sound legal backing and low support from government. The scholars conceded that the obstacles are significant and the level of adoption still low, yet the prospect of e-tendering in the industry is high. Furthermore, there is lack of evidence of the benefits of e-P use in the Nigerian building industry. The researchers recommended a concerted effort for effective uptake of the technology in Nigeria.

From the literature reviewed, it can be deduced that more work has focused on benefits, enablers and impediments to e-P adoption in Nigeria. There is less attention on whether stakeholder who are expected to adopt the technology actually understand its concept and components, possibly accounts for the reason most researchers find poor state of implementation. It is possible that poor understanding impedes the zeal to fully adopt e-P which should become a point of focus to improve adoption level. As innovations in the technology progresses, it is pertinent for practitioners in Africa to update their knowledge so as to adopt various innovations more appropriately. This calls for an inquest on how much stakeholders understand the concept and tools for implementing e-P. This research therefore identified various tools or technologies of e-P and test the level of understanding of the Nigerian quantity surveyors among other objectives.

Research Method

Eadie, Perera and Heaney (2010) assert that the quantity surveying discipline is the likely proponents of e-P due to the procurement and cost management nature of their work. Quantity surveyors also administer the tender process and play major role in the entire procurement activities, thus, stand to benefit much if the technology is fully adopted. Therefore, to achieve the objectives of this research, Quantity Surveyors irrespective of the organization they work were targeted for the research. A quantitative research approach was adopted involving the use of questionnaires survey as the primary data collection strategy. Questionnaires have been used by some previous researchers to achieve similar research works (Eadie, Perera & Heaney, 2011, Ibem & Laryea, 2015; Aduwo *et al.*, 2016). The questions for response in the questionnaire were drafted based on findings from relevant literature reviewed. The first part of the

questionnaire informed the profile of the respondents like the qualification, years of experience, and position in the place of work, while the second part addressed the research objectives. A stratified sampling technique was used to identify respondents. A focus group comprising experienced quantity surveyors was subject for a purposive sampling. In order to control and hasten the response process, the questionnaires were self-delivered to respondents. Seventy seven (77) questionnaires were distributed in Kaduna and Abuja, and a total of 65 were returned while 59 sorted and used for analysis.

In order to assess the level of understanding of the e-P tools among respondents, a list of the e-P components were identified from literature, the relevancy of an item having based on the opinion of most researchers. The respondents assessed the tools by ticking a box against each tool, frequencies were generated and mean values computed. Further, a list of the benefits of e-P to the economy was similarly generated. The list of benefits were classified according to recommendation from literature. The same list was used to assess the relevance of the items in the performance of the professional quantity surveying practice. The assessment by respondents was done through the ranking of the items using a Likert scale of 1-5. The scale of 1 = to very low benefit, 2 = low benefit, 3= average benefit, 4 = high benefit and 5 = very high benefit was used. Lastly, a list of impediments against the adoption of e-P was collated from literature also. Respondents assessed the question using similar Likert Scale. Where the Likert Scale was used in the assessment the relative index value method of computation was adopted to compute the mean values scored by each factor. The relative index value (RIV) was computed as follows:

$$\mathbf{RIV = (n1*w1 + n2*w2 + n3*w3 + n4*w4 + n5*w5)/ (5*N)}$$

RIV = relative index value, n = number of respondents that ticked w, w = Likert's Scale from 1-5, N-total number of respondents.

The highest mean value in this case is 1.0, therefore values that fall between 0.10 and 0.49 were categorised as low, 0.50-0.69 categorised as moderate and 0.70 and above high.

Report on the Results

Profile of respondents

Table 2 below presents the profile of respondents that participated in the research and indicates that quantity surveyors at different management levels participated.

However, most respondents fall within the middle managerial levels in their organisations. Over 93% are either principal or senior quantity surveyors. To affirm this, respondents were between 5-15 years of experience in the quantity surveying profession. The implication is that the respondents are within a relatively young (76.27%) category. Therefore, having emerged within the era of the challenge and knowledge of e-technology, it is expected that they have acquired the knowledge of e-P in one way or another within their educational carrier. As such, are expected to better be ready and zealous to either adopt or agitate for and influence the adoption of the technology in their places of primary responsibilities. On the level of their qualifications, only 3.39 percent had national diploma (ND). All other respondents in Table2 were either qualified at BSc. level, its equivalent or above. Respondents therefore, possess relevant training to understand and respond adequately to the research demand.

Table 2: Respondent's profile

	Description		
	Position of respondent in the firm	Frequency	Percentage
1	Chief QS	1	1.69
2	Principal Qs	11	18.64
3	Senior Qs	44	74.58
4	Resident Qs	2	3.39
5	Others	1	1.69
	Total	**59**	**100.00**
	Qualification of respondents		
1	PhD	-	-
2	M.sc	10	16.95
3	B.sc	26	44.07
4	HND	21	35.59
5	ND	2	3.39
	Total	**59**	**100.00**
	Job experience		
1	1-5yrs	14	23.73
2	5-10yrs	35	59.32
3	10-15yrs	10	16.95
4	15-20yrs	-	-
5	Above 20 yrs.	-	-
	Total	**59**	**100**

Involvement of respondents in e-Procurement practice

Respondents were first asked if they are involved in e-P practice in their organisations. While 74.58% affirm to have been involved, up to 25.42% still responded in the negative, (see Fig.1).

This finding is in contrast to the finding of Aduwo *et al.* (2016) where only 34% of diverse professionals surveyed in Nigeria responded to have participated in projects involving the use of e-P and (52%) majority never got involved. Ibem and Laryea (2015) documented similar result in South Africa where only about 12% out of 603 professionals have used e-Procurement systems and applications to receive or disseminate information on tender opportunities, and only around 11 percent have engaged in the exchange and submission of construction project information and data electronically.

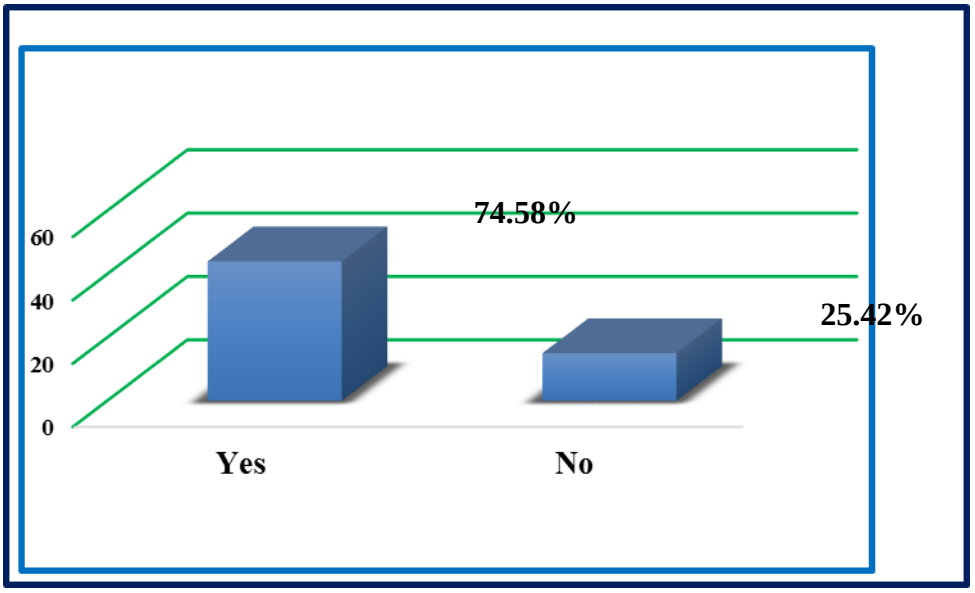

Figure 1: Organisations involved in e-procurement practice (Source: Field survey)

The level of awareness of e-P tools

Awareness is the first step in the adoption of any new technology (Aduwo *et al.*, 2016). Participants were therefore asked to identify the tools or aspects of e-P they are familiar with by simply ticking the box provided against each. The level of familiarity should suggest the extent of adoption in projects procurement delivery. Eight (8) did not participate in this question, possibly not being familiar with the aspects in question especially having earlier showed willingness to participate in the research. Table 3 reports findings which indicate that most respondents are only aware of e-tendering (89.09%). It contrast Oyediran and Akintola (2011) who found a low level of knowledge of the e-tendering process among respondents. It is suggestive that there is slight progress in the adoption of the technology in the tendering process.

Table 3: Level of awareness of various tools of E-procurement

E-P aspects	Number of respondents	Percentage	Level
E-Informing/E-notification	2	36.36	Low
E-Sourcing	1	20.00	Low
E-Tendering	4	89.09	Very high
E-Reverse auctioning	4	7.27	Very low
E-Awarding	1	23.64	Low
E-Contract Management	8	14.55	Very low
E-Ordering	1	18.18	Very low
E-Markets	9	16.36	Very low
E-MRO and Web based ERP	-	-	Very low
E-Invoicing	1	18.18	Very low
Total number of respondents	**5**		

(Source: Field survey)

Respondents only indicate slight degree of awareness level of E-information/e-notification, e- sourcing and e-awarding with 36.36%, 20% and 23.64% respectively. The awareness levels on the 5 other aspects are below 20%. No respondent however demonstrated any knowledge of E-MRO and Web-Based Enterprise Resource Planning (ERP). The possibility is that the 74.58% respondents in Figure1 do apply the technology mainly on e-tendering but resort to the traditional form of procurement process instead of the entire e-P process. This finding supports (Laryea & Ibem, 2014).

Length of time involved in e-P practice

Respondents were asked to indicate how long they have adopted the aspects of e-P in their organizations. Table 4 reports the results of the findings which indicate that most respondents (about 91%) adopted an aspect of e-P in their firms only about five years ago. About 7% adopted it between 5 to 10 years and only about 2% adopted between 10 to 15 years.

It can be concluded that the adoption of the technology in the quantity surveying practice in Nigeria is not long, even though the result could have been influenced by the young age bracket of the respondents. It however confirms the findings by (Ibem & Laryea, 2015) who observed that it is particularly evident in African countries that e-Procurement adoption in construction related areas appears to be at its nascent stage.

Benefits of e-P

On whether respondents are quite aware of the benefits of the technology to the economy as well as to their basic responsibilities become important at this level. The level of awareness of the benefit expects to motivate higher level of adoption. Therefore, deriving from the previous sections that finds the low level of awareness and application of e-P in construction business, it becomes imperative to find out if respondents know the benefits of e-P to the national economy and to their basic professional practicing responsibilities. Some benefits of e- Technology to the national economy were first identified and grouped into three sections under strategic, tactical and operational values for the survey-the grouping which was based on the reviewed of literature. Using the relative index values the mean of each item was computed and the result reported in Table 5 below.

Table 4: Period involved with e-procurement

Years	Number	Percentage
1-5yrs	40	90.91
5-10yrs	3	6.82
10-15yrs	1	2.27
15-20yrs	-	-
Above 20yrs	-	-
Total	**44**	**100.00**

(Source: Field survey)

Table 5: Benefits of e-procurement to the national economy

Variables	Level of importance					No. of	Σfx	RIV	Rank	Remarks
	1	2	3	4	5					
Strategic values										
Reduced marketing cost.	1	2	9	22	10	44	170	0.773	1	High
Increased ability to control cash flow.	0	9	14	18	3	44	147	0.668	2	Moderate
Improving organizational and process	8	6	6	17	7	44	141	0.641	3	Moderate
Improved firm growth and success.	4	11	14	11	4	44	132	0.6	4	Moderate
Reduced and eliminate problems with	4	16	12	11	1	44	121	0.55	5	Moderate
Realizing market leadership.	6	20	9	8	1	44	110	0.5	6	Moderate
Pooled mean of strategic value										
Tactical values										
Lower procurement cost.	0	4	5	17	18	44	181	0.823	1	High
Reduced time required to collect tenders	0	2	7	24	11	44	176	0.800	2	High
Faster payment process.	1	3	7	20	13	44	173	0.786	3	High
Improved teamwork.		3	9	22	10	44	171	0.777	4	High
Increased quality service	1	3	11	19	10	44	166	0.755	5	High
Improved contract administration.	0	4	14	22	4	44	158	0.718	6	High
Improving integration between different business functions	3	6	14	13	8	44	149	0.677	7	Moderate
Improved control and monitoring.	2	10	8	18	6	44	148	0.673	8	Moderate
Reduced time of preparing cost plans.	2	13	8	16	5	44	141	0.641	9	Moderate
Ability to search product/supplier more	7	9	15	6	7	44	129	0.586	10	Moderate
Promoting a proactive culture.	10	7	14	10	3	44	121	0.55	11	Moderate
Information received about supplier more	11	6	15	10	2	44	118	0.536	12	Moderate
Pooled mean of tactical values										
Operational values										
Improved communication	0	2	3	8	32	44	205	0.932	1	High
Reduced paperwork.	0	2	2	9	31	44	201	0.913	2	High
Improved data management	0	2	1	17	24	44	195	0.886	3	High
Reduced bottlenecks.	0	1	6	23	14	44	182	0.827	4	High
Reduced operational costs.	1	3	2	22	16	44	181	0.823	5	High
Improved response time to queries.	0	0	5	29	10	44	181	0.823	6	High
Improved procurement process.	0	1	10	21	12	44	176	0.800	7	High
Order process more efficient.	1	6	11	22	4	44	154	0.700	8	Medium
Increased ability to control and forecasting.	4	1	17	21	1	44	146	0.664	9	Moderate
Reduced lead time on financial planning.	5	10	10	16	3	44	134	0.609	10	Moderate
Improved partnership with suppliers.	7	6	11	19	1	44	133	0.604	11	Moderate
Improved supplier performance.	6	11	10	15	2	44	128	0.582	12	Moderate
Pooled mean of operational values										

The findings in Table 5 (concerning the level of awareness of the benefits) were further classified into low, moderate and high levels of awareness. Out of 30 benefits surveyed, 14 were ranked with high level of awareness (0.70 and above), the rest 16 factors were ranked with moderate values ranging from 0.50 to 0.699. It means that respondents agreed that all the factors are either highly beneficial or moderately beneficial to national economy. None of the factors identified was ranked as having low level of benefit to the national economy. The highest ranked in each of the three categories, namely strategic values,

tactical values and operational values are "reduced marketing cost" (0.773), "lower procurement cost" (0.823) and "improved communication" (0.932) respectively. As can be suggested here, cost and communication factors are key benefits that can influence the adoption of the technology. Respondents believe that e-P is most important to the country on operational value (0.764), followed by strategic value (0.695) and then tactical values (0.621). This finding concludes that quantity surveyors are generally aware that e-P has high value to the economy of the nation.

The next part was an inquest into the key benefits of e-P to the profession. The same factors previously identified in Table 5 were used in this case. The factors were ranked and categorised into low, moderate and high benefits and reported below in Table 6. Respondents were asked to rate the extent the listed factors assist in their service delivery.

Table 6: Benefits of e-procurement to quantity surveying profession in Nigeria

Variables	N	Mean	Std. Dev.	Rank	Remarks
Improved communication.	44	4.659	0.818	1st	High
Reduced paperwork.	44	4.568	0.789	2nd	High
Improving data management data.	44	4.432	0.759	3rd	High
Reduced bottlenecks.	44	4.136	0.734	4th	High
Reduced operational costs.	44	4.114	0.945	5th	High
Lower procurement cost.	44	4.114	0.945	5th	High
Improved response time to queries.	44	4.114	0.979	6th	High
Improved procurement process.	44	4.000	0.778	7th	High
Reduced time required to collect tenders	44	4.000	0.778	7th	High
Faster payment process.	44	3.932	0.974	8th	Moderate
Improved teamwork.	44	3.886	0.841	9th	Moderate
Reduced marketing cost.	44	3.864	0.905	10th	Moderate
Increased quality service	44	3.773	0.961	11th	Moderate
Improved contract administration.	44	3.591	0.787	12th	Moderate
Order process more efficient.	44	3.500	0.928	13th	Moderate
Improving integration between different business	44	3.386	1.146	14th	Moderate
Improved control and monitoring.	44	3.364	1.123	15th	Moderate
Increased ability to control cash flow.	44	3.341	0.888	16th	Moderate
Increased ability to control and forecasting.	44	3.318	0.934	17th	Moderate
Reduced time of preparing cost plans.	44	3.205	1.133	18th	Moderate
Improving organizational and process flexibility	44	3.205	1.374	19th	Moderate
Reduced lead time on financial planning.	44	3.045	1.160	20th	Moderate
Improved partnership with suppliers.	44	3.023	1.151	21st	Moderate
Improved firm growth and success.	44	3.000	1.121	22nd	Moderate
Ability to search product/supplier more effective.	44	2.932	1.283	23rd	Low
Improved supplier performance.	44	2.909	1.158	24th	Low
Reduced and eliminate problems with suppliers.	44	2.750	1.014	25th	Low
Promoting a proactive culture.	44	2.750	1.241	26th	Low
Information received about supplier more accurate.	44	2.682	1.216	27th	Low
Realizing market leadership.	44	2.500	1.023	28th	Low

(Source: Field survey)

Mean values were used in this case to analyse and rank the importance of each beneficial factor. Six factors were found to be of low importance, 15 factors were of moderate importance and nine factors were highly important. With 5.0 as the highest mean score, the highest ranked are, improved communications (4.659), reduced paper work (4.568), improved data management (4.432) and reduced bottlenecks (4.136). This finding confirms what Hashim *et al*. (2013) similarly found, that the greatest positive value of e-Procurement is on issues related to communication and work process. More than two-thirds of the respondents surveyed by Hashim *et al.* (2013) perceived the implementation of e-Procurement as positively affecting communication and work process. Also ranked high in this research are three factors, namely-reduced operational cost, lower procurement cost and improved response time to queries, each having mean value of 4.114. It can be deduced that the understanding of the benefit of e-P in this work is limited more to office management and traditional cost and time values which has not improved much since 2013. Quantity surveyors only moderately understand that the more complex advantage like improved team work, payment efficiencies, quality management etc. can also be derived. The items "supply performance management, improved proactive culture and market leadership advantage" were ranked low. Therefore, this understanding which limits e-P to the traditional services improvement is poor and might have also influenced poorly the zeal to adopting the e- Technology in a more complex undertaking.

Impediments to the adoption of the e-technology

What other challenges facing the adoption of e-P was also enquired. The factors identified from literature were categorised into cultural, knowledge, reliability, security, legal and cost related factors in line with suggestions from literature. These factors have also been found relevant in influencing e-P in different ways. The result is reported in Table 7 below as follows.

Security (0.738) and legal (0.832) related factors are still the main challenges to e-P which is in line with findings by (Laryea and Ibem, 2016). Cultural (0.599), knowledge (0.577), cost (0.595) and reliability (0.686) were lower. However, all the categories scored above average (above 0.50) which suggests that all of them remain significant impediments to e-P adoption. Five challenges ranked first from each category in Table 6 that highly affect the adoption of e-P are- lack of legal control (0.832); authenticity of documents submitted (0.832); interoperability issue, (0.805); original hard copies of documents wanted not electronic copies (0.773) and the lack of IT infrastructure (0.700). Generally, the challenges in Table 6 are still severe to the adoption of e- Technology in Nigeria which must be reduced to enhance speedy adoption.

Table 7: Challenges with e-procurement adoption in Nigeria.

Variables	Level of security					No.	Σfx	RIV	Rank	Remark
	1	2	3	4	5					
Cultural issues.										
Government agencies want original copies of documents not electronic copies.	2	5	7	13	17	44	170	0.773	1	High
Internet is impersonal	7	7	13	13	4	44	132	0.600	2	Moderat
People are slow in responding to emails	4	11	17	10	2	44	127	0.582	3	Moderat
Lack of understanding of benefits of e-procurement by parties.	3	14	19	6	2	44	122	0.555	4	Moderat e
Reluctance to change	7	23	6	3	5	44	108	0.491	5	Low
Pooled mean value of cultural issues										
Knowledge of e-procurement systems.										
Lack of skilled personnel	5	9	12	11	7	44	138	0.627	1	Moderat
Lack of business relationship with suppliers	7	14	9	9	5	44	123	0.559	2	Moderat
Lack of understanding on how e-	7	14	12	6	5	44	120	0.545	3	Moderat
Pooled mean value of knowledge of e-procurement systems										
Reliability of IT infrastructure										
Interoperability issues.	1	5	4	16	18	44	177	0.805	1	High
Lack of IT infrastructure	1	4	13	24	2	44	154	0.700	2	High
Remoteness of IT networks	3	7	20	10	4	44	137	0.623	3	Moderat
System failure	3	3	27	9	2	44	136	0.618	4	Moderat
Pooled mean value of reliability of IT infrastructure										
Security issues										
Lack of confidentiality	3	6	14	15	6	44	147	0.668	1	Moderat
Security of online transactions	2	8	16	15	3	44	141	0.641	2	Moderat
Problems with online scam	3	12	14	12	3	44	132	0.600	3	Moderat
Viruses on networks can compromise the integrity of data transmitted	8	8	12	9	7	44	131	0.595	4	Moderat e
System Hacking	6	12	16	9	1	44	119	0.541	5	Moderat
Pooled mean value of security issues										
Legal issues										
Lack of legal control systems	1	3	6	12	22	44	183	0.832	1	High
Authenticity of documents submitted		2	6	19	17	44	183	0.832	2	High
Pooled mean value of legal issues										
Cost issues										
Cost implication of systems	2	10	8	16	8	44	150	0.682	1	Moderat
Internet is expensive		411	10	14	5	44	137	0.623	2	Moderate
There is no business values realised		1213	10	7	2	44	106	0.482	3	Low
Pooled mean value of cost issues										

(Source: Field survey)

Discussion

The aim of the study was to determine the status of e-P system in Nigerian. The research first articulated the concept of e-P within the construction domain. The uniqueness and complexity of construction industry was expressed, and the construction e-P then conceptualised and distinguished from the e-P of other goods and services.

The second issue addressed relates to the level of awareness of the concept and the adoption of varying tools of the e-P technology. Understanding a new concept is the first step to its adoption. The first question was if respondents practice e-P in their organizations. Majority of respondents impressively affirmed such. When asked to identify the e-P tools or aspects they are aware of, the result shows that out of 10 aspects surveyed, only e-Tendering is widely known. Other aspects like the e-information/e-notification, e- sourcing and e-awarding only indicated a low level of awareness among quantity surveyors in Nigeria which is in line with the findings of Laryea and Ibem (2014).

On the benefits of the e-P, earlier studies have shown that the decision to adopt e-Procurement was influenced by the perceived direct and indirect benefits like time and cost savings, increased quality, efficiency and effective communication, reduction in paperwork and increased productivity among others (Rankin, Chen & Christian, 2006; Ibem *et al*., 2016). Despite that Table 3 indicates respondents being aware that adopting e-P technology in its fullest form will benefit the economy of the nation and their professional functions, the level of adoption is still low and slow. This is a mismatch where the adoption is low and slow, yet respondents believe that all the thirty (30) benefits surveyed are of high benefit to the economy. It can be explained that the understanding of the benefit is still within the context of the basic computer application. For example, two key benefits identified are -the lowering of procurement and marketing cost of projects and the improved communications. Regards the benefit to the firms that adopt the technology, eight out of the 30 benefits are highly important, among which are cost, management and communication related factors. Fifteen factors were found to be moderately important while the other 6 were of low importance. Factors like improved team work, improved control and monitoring payment efficiencies, promoting proactive culture and realising market leadership which are advancement of the traditional use of computers were ranked lower. Therefore the understanding of the benefits of e-P among quantity surveyors still tends towards the traditional understanding of computer applications. As such, even with the knowledge of the benefit to the economy and to the improved performance of the firms, the adoption of the technology is still low and slow. Other factors earlier identified to dampen the rate of adopting e-P was also a subjected to investigation. Twenty-three (23) other inhibiting factors to the adoption documented in literature were investigated and the key ones identified include- Governments agencies needing hard copies of documents instead of soft copies, lack of skilled personnel in the handling of the process, interoperability issue, lack of confidentiality, lack of legal control systems and the initial cost implication of the systems respectively. The legal and security concerns are still issues to address also.

Conclusion and Recommendations

This study assessed the status of e-P system among Quantity Surveyors in Nigeria. The choice of quantity surveying was informed by the view that their traditional role will most likely influence quick adoption of e-P. Therefore the researchers expected a high level of understanding and adoption in the industry. While there are some levels of adoption of the e-technology in the construction business, its adoption is rather slow and low. The e-P concept and tools are still not fully understood among Nigerian Quantity Surveyors which could have influenced the slow and low level of adoption. Respondents are found to be more familiar with e-tendering leaving out nine other tools studied. Thus, the tools not understood are not widely applied in the procurement of construction projects. Respondents are however aware of the

benefits of e-P to the performance of their work and to the national economy in general, yet no significant improvement in the adoption since previous studies. Legal and security challenges are still important concern to the adoption of e-P.

The findings in this study present a number of implications. For example, if quantity surveyors who are expected to pioneer e-P are still lacking in the understanding of the concept, then other professions may present worse situation. While noting that procurement is a teamwork involving all professionals at a time, poor adoption by Quantity Surveyors could imply poor adoption by other professionals also. Therefore, Nigeria still has much to do to raise the level of adoption of e-P in the construction sector of her economy. To improve the level of adoption of e-P in Nigeria, there is need to focus efforts on educating and updating stakeholders in the sector on all the relevant tools and their benefits in construction procurement. The kind of training in higher institutions and in the continued professional development after graduation should focus on e-P to a greater extent. There is also the need to appraise the existing laws and security matters on e-P to allay the fears of stakeholders on legal and security concerns. The relevance and adequacy of the legal framework to address these concerns could be reviewed and made available to the public. This may create confidence and trust on the e- P technology, and will enhance its quick acceptance and adoption in Nigeria.

This research has contributed to knowledge by availing the level of understanding of the concept, benefits and adoption of e-P among Nigerian Quantity Surveyors. Findings avail point of focus by stakeholders in the efforts to enhancing its adoption towards better economic performance. Further research should quantify the value of adopting e-P as against the traditional procurement method to avail the financial benefit so as to convince sceptics that e-P is actually significantly beneficial financially.

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