

Research Article

E – PROCUREMENT AND THE CONSTRUCTION INDUSTRY IN NIGERIA

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Received 27th September 2020; Accepted 20th October 2020; Published online 30th November 2020

ABSTRACT

The advent of internet technology has resulted to increasing use of e-Commerce applications, particularly e-Procurement systems in supply chain management by firms across the different industrial sectors. However, there is a paucity of empirical studies on e-Procurement use in the construction sector of African countries. This study therefore investigated the use of e-Procurement in the Nigerian construction industry. The data were derived from an online questionnaire survey involving 80 respondents and interviews with seven experts conducted in Nigeria. Descriptive statistical and content analyses were used to analyse the data. Findings show that the four categories of e-Procurement used were 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. Whereas the factors with the highest positive impact on the use of these technologies in the firms were the speed of transactions, lower transaction cost and ease of use; unreliable IT infrastructure, established cultures and security concerns were the main impediments to the uptake of these e-Procurement technologies in the Nigerian construction industry. The study implies that construction firms in Nigeria predominantly use e-mails and websites to support the execution of pre-award phase of construction procurement; and that the factors that affect the adoption of these e-Procurement technologies in the Nigerian construction industry explained. It also implies that in addition to technological issues, culturally related challenges are hampering the adoption of e-Procurement in the Nigerian construction industry. The study suggests that to accelerate the rate of uptake of e-Procurement and maximize its benefits in the Nigerian construction industry, there is a need to improve the quality and quantity of ICT infrastructure across the country; and to embark on aggressive enlightenment campaigns, training and skill development programmes in the use of e-Procurement in the construction industry in this country. It also suggests that future studies be carried out to identify how the existing e-Procurement technologies and tools can be innovatively used to suit the needs of the construction sector and people of diverse cultures.

Keywords: e-Procurement, e-Procurement Technologies and Tools, Construction industry, Nigeria.

INTRODUCTION

E-procurement is the use of electronic communications and transaction processes when buying supplies and services or conducting tendering for works (Bausaetal., 2013). The UN Procurement Practitioner's Handbook UN (2006) identified two main phases in the e-Procurement process. These are the pre-award phase comprising e-Notification; e-Submission; e-Evaluation; and e-Awarding; and the post-award phase consisting of activities such as e-Ordering; e-Invoicing; and e-Payment. Each activity in these two phases can be executed using a wide range of e-Commerce communication media and/or e-Procurement technologies and tools (Hashimetal., 2013; Laryea and Ibem, 2014). Studies (Puschmann and Alt, 2005; Gunasekaran and Ngai, 2008) have indicated that the use of e-Procurement to support the execution of procurement activities in the different industrial sectors has been on the increase since the mid-1990s when the web and e-mail services of the Internet became popular. Teetotal. (2009) linked this to the strategic, opportunistic and operational benefits of e-Procurement in supply chain management. In the construction industry, the existing studies (Rankin et al., 2006; Eadieetal., 2007; Eadieetal., 2011) provide insights into the actual use; benefits; and the challenges of e-Procurement in developed countries. Eadieetal. (2010a) however observed that the use of e-Procurement in the construction industry has not been adequately researched. This is particularly evident in African countries, where e-Procurement adoption is at its nascent stage.

Apart from the studies on the potential applications of e-Commerce in the South African construction industry (Chegeetal., 2001) and e-Tendering in Nigeria (Oyediran and Akintola, 2011), there is a paucity of published empirical studies on e-Procurement in construction supply chain management; and the key issues associated with it in the African context. As a result, very little is known of e-Procurement use in the construction sectors of African countries. Therefore, the aim of this study was to investigate the use of e-Procurement technologies and tools to conduct construction procurement activities related to e-Notification; e-Exchange of project information and data; and e-Submission of tender/bids or proposals by South African construction firms. The study sought to address the following research questions:

- Which categories of e-Procurement technologies and tools are more widely used to execution e-Notification, e-Exchange and e-Submission aspects of construction procurement by firms in South Africa;
- How are e-Procurement technologies and tools used to support the execution of these three construction procurement activities;
- What are the factors that have positive influence on the use of e-Procurement technologies; and
- What are the key challenges associated with the use of the identified e-Procurement systems and tools in the aforementioned aspects of construction procurement process in South Africa?

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This study contributes to knowledge by providing a fresh insight into the e-Procurement technologies most widely used; and how they are used to support the execution of three specific aspects of construction

procurement activities: e-Notification, e-Exchange and e-Submission in Nigeria. It also identifies and analyses the key factors and challenges associated with the adoption of e-Procurement in three specific areas of construction procurement process in South Africa. The remaining part of this paper is divided into four sections. The first section is the review of literature, followed by the presentation of the research methods. Next are the presentation of result, and discussion sections, respectively. The paper ends with some conclusions and recommendations.

REVIEW OF LITERATURE

The review of literature reveals that there are several categories of e-Procurement systems and tools in the market that can be used to support the execution of construction procurement activities (Laryea and Ibem, 2014). In terms of the number of functions e-Procurement technologies and tools can support, three broad categories of e-Procurement systems have been identified by Pearcy et al. (2008). The first category represents those that can support the execution of single function; the second group has the capabilities of facilitating integration across multiple functions within a firm; while the third

category provides integration and coordination of functions across firms. Also from the existing literature, several factors are known to influence the decision to adopt the different categories of e-Procurement technologies and tools by individuals and firms. These factors have been identified and explained from the perspective of different theories and models (Al-Qirim, 2007; Azadegan and Teich, 2010). Oliveira and Martins (2011) however noted that among the existing theories, the diffusion of innovation (DOI) theory has been used to investigate technology adoption at firm/organizational level.

Regarding the studies on e-Procurement use in the construction industry, evidence from the published literature shows that the existing literature on the subject can be classified into adoption studies (e.g. Issa et al., 2003; Rankin et al., 2006); impact studies (Alarcon et al., 2009); studies on the drivers and barriers (Eadie et al., 2007; 2010a); e-readiness (Tran et al., 2011); and e-Tendering (Oyediran and Akintola, 2011). In this section, we present a review of the existing literature on e-Procurement adoption in the construction industry. Table 1 presents a summary of the existing studies on e-Procurement use and the challenges associated with it in the construction sector.

Table 1: Summary of some studies on e-Procurement in Construction

| Authors | Studies | Countries | Findings |
|------------------------------|--|------------------|--|
| Issa <i>et al.</i> (2003) | Questionnaire survey of 91 Contracting firms to determine the level of adoption of e-Business within their project management systems. | USA | 70 percent used project management software packages, 65% used extranet/ intranet. Also 80% used e-mail and fax in communicating with their partners: and 55% used EDI for communication and exchange of data. |
| Rankin <i>et al.</i> (2006) | Questionnaire survey of 226 of General and trade contractors, Suppliers and associates on the use of e procurement. | Canada | E-procurement activities identified were (i) searching and finding production information (94% of the respondents); (ii) responding to bidding opportunities (77% of the respondents); (iii) transferring (70% of the respondent). The key challenges with e-procurement use were (i) integration of e-procurement system with the existing work process and procurement system (technical); (ii) cost; ownership of information used in tender process (copyright); responsibility, roles and responsibilities during tender process; and (iii) the capacity of the entire bidding. Community to adopt; connectivity of bidders, accessibility to documents unhindered, download time. |
| Zuo and Seo (2006) | A survey of 127 contractors, sub-contractors, clients, consulting engineers, suppliers, facility/asset managers and quantity surveyors on the application of e-Commerce technologies in construction supply chain. | Australia | All the respondents used e-mail, 37% used intranet and 30% used extranet. The activities executed by the use of these technologies were: online search; exchange of CAD drawings; project management; placement of orders; and receiving bid invitation and tender online. The challenges were: (i) reluctance/inability to adopt computer technologies among sub-contractors and suppliers; (ii) lack of in-house technical expertise and personnel (iii) different organisational culture; (iv) lack of integrated information management system; and (v) fear of implementing a business process change. |
| Chege <i>et al.</i> (2001). | The prospects and challenges of the applications of e-Commerce in value chain management in the construction industry. | South Africa | The challenges of e-Commerce adoption in construction were: (i) how to create an enabling environment to allow SMMEs to reap the benefits of e-Commerce; (ii) security concern; (iii) taxation; (iv) legal barriers; (v) accessibility to e-Commerce systems; (vi) lack of technical standardization of e-Commerce systems. |
| Eadie <i>et al.</i> (2007) | Web-based survey of 70 contracting firms, the use of two e-procurement systems: fully web-based system and the Compact Disk Write once (CDR) in construction. | Northern Ireland | The use of electronic technologies to support the exchange of contract documents between clients and contractors was identified. The challenges identified were: (1) legality e-procurement contracts, (ii) company culture, (iii) lack of upper management support (iv) lack of access to IT infrastructure and (v) high cost of IT systems, (vi) lack of technical expertise, (vii) lack of e-procurement knowledge, skilled personnel, (viii) lack of business relationship with suppliers providing e-procurement, (ix) security of transactions (x) interoperability of e-procurement systems. |
| Eadie <i>et al.</i> (2010a) | A cross discipline comparison of rankings for e-procurement drivers and barriers within the UK construction organizations using web-based survey of 775 construction organizations, including 483 surveyors, 42 public sector clients, 172 architects, 35 private sector clients and 43 consulting engineers | The UK | The UK public sector was found to be leading in using e-procurement with 74% of organizations involved in e-procurement. The study identified the three most important drivers for UK construction organizations in both public and private sectors were process transaction and administration cost savings, convenience of archiving completed work and increased quality through increased accuracy (i.e. elimination of errors through computer use). On the other hand the most important barriers for UK construction organizations were prevention of tampering with documents (i.e. changes to documents) followed by confidentiality of information (i.e. unauthorized viewing of documents), and resistance to change. |
| Eadie <i>et al.</i> (2010b) | Web-based survey 483 Quantity Surveyors in UK construction organizations on the drivers and barriers of e-procurement. | The UK | Quantity Surveyors in the UK identified the top four barriers in that country to include (i) prevention of tampering with document, (ii) reluctance to buy-into one off system, (iii) prove of intent-electronic signatures, (iv) enforceability of electronic contracts and (v) insufficient assessment of systems prior to installation |
| Oyediran and Akintola (2011) | Questionnaire survey of 66 Nigeria registered Quantity Surveyors, Architects, Engineers and Contractors registered on the state of the art of e-tendering in Nigeria. | Nigeria | 16% of the respondents used emails, websites and portals to exchange contract documents, receive/disseminate tender notifications, contract documents and tenders. The challenges were (i) irregular supply, (ii) high cost of e-procurement systems, (iii) poor ICT infrastructure, (iv) lack of ICT skill, (v) skepticism about the systems, (vi) reluctance to change, (vii) lack of interoperability of software used by construction professionals, (viii) security issues and (ix) general ignorance of the benefits of e-procurement. |

From Table 1, it is evident that most published works on e-Procurement in construction are from developed countries; and that the research focus has been skewed towards e-Procurement systems and tools in general; and the challenges associated with their use in construction supply chain management. It can also be seen from the Table that one of the earliest published works on e-Procurement in construction in South Africa was a conceptual paper on the prospects and challenges of e-Commerce in value chain management in the construction industry. Although that study is related to the current study by examining the challenges of e-Commerce adoption in the Nigerian construction industry, it is different from our study as it was based on the review of the existing literature. From the studies reviewed here, it can be inferred that most published works on e-Procurement use in construction are from the UK, USA, Australia, Canada and other developed countries. However, very little research attention has been given to e-Procurement in developing countries, which justifies the current research in Nigeria. In addition, it is also obvious that in these countries where significant progress has been made on e-Procurement research in construction, the e-Procurement systems and tools used in facilitating effective and efficient communication, exchange of project information and data among participants are mainly e-mail technology, websites and portals, while the key barriers to successful adoption of these electronic technologies and tools are related to technical, organizational, cultural, security and legal issues.

RESEARCH METHODS

This exploratory study was designed to provide a better understanding of the current state of e-Procurement use in three main areas: e-Announcing/ Notification/Informing/); e- Exchange of project information and data; and e-Submission of proposals, tenders or bids in Nigeria. Based on the research questions of the study, two strategies; namely, a questionnaire survey and semi-structured oral interviews were adopted in the collection of primary data for the research. The merits of this approach are well documented in the literature. For example, Creswell and Plano-Clark (2007) explained that mixed method allows collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. They further explained that the central premise of this method is that the use of both quantitative and qualitative approaches provides a better understanding of research problems than either approach alone. To this end, it was important for the current research to take advantage of the mixed method to enhance the validity of the findings. Moreover, the study by Isikdagetal. (2011) in Turkey had followed a similar approach. Therefore, in order to capture both quantitative and qualitative data in the current study, two instruments: questionnaire and interview guide assisted the researchers in collecting the primary data used for the research. The questionnaire instrument comprised both close and open-ended questions and was designed based on findings from the review of literature. It had 16 questions related to the professional background of the respondents; their level of awareness of e-Procurement in construction; the type of e-Procurement technologies and tools used; the extent of their use in notification/ informing/ and announcing of opportunities for tenders; exchange of project information; and submission of tender/bids and proposals. Others were questions on the factors influencing the adoption of e-Procurement technologies and tools; and the main issues of concern in the use of the identified e-Procurement technologies and tools. From the online survey, over 40 respondents indicated their willingness to further engage in the research. They were subsequently invited to participate in the oral interviews, but only 12 of them accepted the invitation. Seven respondents identified to be directly involved in construction procurement activities were then selected and interviewed. The essence of the oral interviews was to obtain in-

depth information from the actual users of e-Procurement on the types and descriptions of the e-Procurement systems used; how they use them, the processes and issues involved as well as their experience with the systems used. This information was not captured in detail in the online survey and was considered to be important in providing support to the data obtained through the questionnaire survey. The interviews, conducted between July and September 2016, were based on 12 questions in the interview guide shown in Appendix II. Each interview session lasted between 10 minutes and 30 minutes and was recorded using a digital recorder. After each of the interviews, the audio files were transcribed into word format. The descriptive statistical analysis (frequency; percentages; mean) was used in the analysis of data derived from the questionnaire. Content analysis was used to analyze the open-ended responses in the online questionnaire and the oral interviews. Specifically, this helped in identifying common factors as provided by the respondents and grouping them into themes for a better understanding of the key issues associated with the use of e-Procurement systems in three areas investigated.

RESULT

Professional profile of the Respondents and the Categories of e-Procurement technologies used

The result in Table 2 shows the distribution of the respondents according to their roles in the South African construction industry. From Table 2 it is evident that the survey covered key stakeholders in the South African construction industry. However, of the 603 respondents, the majority (55%) were contractors, while only 2% were members of clients' in-house professional team.

Table 2. Role of Respondents in the construction industry

| Respondents | Frequency (N=80) | Percentage (%) |
|-------------------------------------|------------------|----------------|
| Architects | 05 | 6 |
| Clients | 05 | 6 |
| Construction/Project Managers | 10 | 13 |
| Contractors | 031 | 38 |
| Engineers | 07 | 09 |
| Quantity Surveyors | 11 | 14 |
| Procurement / Supply Chain Official | 06 | 8 |
| Others | 05 | 6 |

Table 3. Categories of e-Procurement applications and tools used

| E-procurement Systems and Tools | n | % |
|---|-----------|--------------|
| E-Announcing Systems and Tools | 71 | 100.0 |
| E-mail-based system | 48 | 68.0 |
| Portals | 5 | 7.0 |
| Websites-based system | 18 | 25.4 |
| Web 2.0 technology-based System | 7 | 10.0 |
| E-exchange Systems and Applications | 64 | 100.0 |
| E-mail | 53 | 83.0 |
| Cloud systems (e.g Dropbox; Microsoft Share Point) | 7 | 11.0 |
| Portals | 2 | 3.1 |
| Websites | 13 | 20.3 |
| Web 2.0 technology | 14 | 22.0 |
| E-Submission Systems and Applications | 64 | 100.0 |
| E-mail only | 31 | 48.4 |
| E-mail and other web-based applications(e.g. fax, dropbox, Microsoft SharePoint) | 11 | 17.2 |

Table 3 is the result showing the different categories of e-Procurement technologies and tools used to support the execution of e-Notification, e-Exchange and e-Submission aspects of construction procurement by the respondents. It can be seen from the result that 71 (12%) of the respondents indicated that they have used e-Procurement systems and tools to receive or disseminate information on tender opportunities (e-Notification/Informing/Announcing); A majority of these respondents who claimed to have used these e-Procurement technologies and tools were in private sector organizations.

Table 4. Factors influencing the use of e-Procurement technologies and tools

| Factors | Mean Score | Stand Dev. | Rank | Influence |
|--|------------|------------|------------------|-----------|
| Greater speed of transaction in e-Procurement | 4.05 | 0.89 | 1st | High |
| Lower cost of transaction in e-Procurement | 3.97 | 0.91 | 2 nd | High |
| Easy for consultants and contractors to respond electronically to job requirements | 3.79 | 0.94 | 3 rd | High |
| It is easy to use electronic procurement systems and tools | 3.68 | 0.95 | 4 th | Medium |
| Availability of adequacy of technological and internet infrastructure to support the use of electronic procurement | 3.64 | 1.01 | 5 th | Medium |
| Reliability of electronic procurement systems and tools | 3.64 | 0.84 | 6 th | Medium |
| Compatibility of Electronic procurement systems and tools with the existing organizational policies and processes | 3.57 | 0.87 | 7 th | Medium |
| The ease of integration of e-Procurement systems and tools into the existing organizational processes | 3.53 | 0.93 | 8 th | Medium |
| Availability of good institutional and organizational infrastructure to promote the use of electronic procurement | 3.53 | 0.93 | 9 th | Medium |
| The ease at which consultants and contractors engage with electronic procurement systems and tools | 3.51 | 0.94 | 10 th | Low |
| Adaptability and willingness of people to switch to the use of electronic procurement systems and tools | 3.38 | 0.98 | 11 th | Low |
| Security and data protection challenges in the use of e-procurement | 3.23 | 0.94 | 12 th | Low |
| Ease of transitioning from paper-based procurement to electronic systems and tools | 3.19 | 1.01 | 13 th | Low |

This result suggests that the majority (88%) of the respondents in survey are not using e-Procurement systems and tools to receive or disseminate information on tender opportunities. It is also evident in Table 3 that 64 (11%) of the respondents had used e-Procurement systems and tools to exchange construction project information and data; and in the submission of tenders/bids or proposals. Specifically 83% of the respondents used e-mails, 22% used Web 2.0-based systems; 20% used websites, while 11% have used cloud-based systems such as drop box and Microsoft Share Point. This result also shows that there is a low utilization of e-Procurement technologies in the exchange of construction project information among the respondents. The study however reveals that the three most commonly used e-Procurement technologies for this purpose in Nigerian construction sector are e-mails, web-based applications and portals.

Factors and challenges associated with the use of e-Procurement in the firms

Table 4 presents a summary of the factors that influenced the adoption of the e-Procurement technologies and tools amongst the respondents arranged in the order of importance. Factors ranked 1st to 3rd in Table 4 are considered to have high positive influence; those ranked between 4th and 10th have medium positive influence, while those ranked from 11th to 13th are considered to be of low positive influence. This means of the 15 factors investigated, the speed, and lower cost of transactions associated with e-Procurement transactions; and ease of use of e-Procurement technologies have high positive influence on the adoption of e-Procurement technologies and tools in the South African construction industry. In contrast, factors, including the ease of transiting from paper-based to e-Procurement method; security and data protection challenges; and the availability of good public policy to support the adoption of e-procurement have high negative influence on the use of these technologies in this country.

DISCUSSION

From the result, three issues: (i) the categories of e-procurement systems and applications used to execute the three e-procurement activities: e-Notification; e-Exchange of project information and e-Submission of project data and information; (ii) how the identified e-procurement technologies support the execution of these activities; (iii) and the key issues of concern in the use of e-Procurement technologies to support the execution of these three procurement activities were identified and brought forward for discussion in this section of the paper. First, the study shows that of the 80 respondents who participated in the online survey, only around 12 percent of them have used e-Procurement systems and applications to receive or disseminate information on tender opportunities, while around 11 percent of them have engaged in the exchange and submission of

construction project information and data electronically. The four categories of e-Procurement technologies used were e-Mails; static websites, Web 2.0 technologies and portals. These categories of e-Procurement technologies are similar to those identified in previous studies (Issaetal., 2003; 2008; Oyediran and Akintola, 2011 and Laryea and Ibem, 2014) as previously highlighted. This result suggests that there is generally a low usage of e-Procurement systems and applications to support the execution of these three aspects of construction procurement activities in Nigeria; and the e-Procurement use in this country is at its infancy. Comparing this result with Eadieetal. (2011) that revealed 27% adoption rate; and that the private sector was lagging behind the public sector in the adoption of e-Procurement in the UK construction industry; it can be argued that there is 12% adoption rate of e-Notification aspect of e-Procurement in construction and that the private sector is taking the lead in Nigeria. The difference in socio-economic and technological contexts between the two countries may help to explain this variation in result. In addition, the result also reveals that among those who have used e-Procurement systems and applications to execute e-Notification, e-Exchange of information and e-Submission of project information and data, the most commonly used applications were e-mails recording 48%, 53% and 31% of the respondents, respectively followed by websites and portals. This shows that a greater percentage of the respondents used e-mails to exchange project information and data. Notably, e-mail and websites have been identified as network technologies that facilitate the transfer and/or exchange of project data and information among participants in construction projects. Therefore, this result appears to be in support of previous studies in the USA by Issaetal. (2003), Australia by Zuo and Seo (2006) and Nigeria by Oyediran and Akintola (2011) indicating the extensive use of e-mail in the communication and exchange of project information. It is also consistent with the finding by Rankin etal. (2006) in the Canadian AEC industry showing that e-mail and websites have been extensively used in responding to bidding opportunities and transferring bidding information and documents electronically. Apart from e-mail and websites, the study also identified the use of portals and cloud-based systems such as drop box and Microsoft Share Point and Web 2.0 technologies; suggesting that the respondents are using e-Procurement tools supported by systems located in their premises and those in the clouds. It was interesting to find that 10% of those who claimed to be using Web 2.0 technologies in construction procurement activities used applications such as blogs and instant messaging, mainly to communicate and share information on the availability of tender opportunities, construction materials and equipment. Second, the study also found that the respondents used the four categories of e-Procurement systems and applications identified in this study carry out two basic kinds of procurement tasks, namely; communication; and exchange seven different types of project data and information. The result specifically shows that 33% of the respondents indicated that they used these applications to exchange or submitted bill of quantities followed by 24 % and 16% of

the respondents who used them to exchange CAD drawings and project specifications, respectively. This suggests that the three basic of project information exchanged electronically are bill of quantities, CAD drawings and specifications. This finding is similar to the practice in the UK where Eadie et al. (2007 and 2011) reported the use of these e-Procurement technologies and tools in the exchange of project information between clients and contractors. Relating this result to the different categories of e-Procurement technologies identified by Pearce et al. (2008), it is obvious that the majority of e-Procurement technologies currently used in the South African construction industry are those that support the execution of tasks limited intra and inter firms communication and exchange of project information and data, with little or capabilities for integration and coordination of functions across firms. This was to be expected as the current study is focused three basic procurement activities: e-Notification; e-Exchange and e-Submission of project data and information. Furthermore, it is also evident from the study that of the 12 factors considered to have influence on the use of the identified e-Procurement technologies and tools, four of them (i.e. factors 1, 2, and 6) are related to the relative advantage of e-Procurement over paper-based method; three factors (7, 8 and 12) are related to compatibility of e-Procurement with the existing work process; while five factors (i.e. 3, 4, 10 and 11) deal with the ease of use (complexity) of e-Procurement technologies. This finding suggests that the main reasons who claimed to be using the identified e-Procurement technologies in the study area are linked to the advantages of these technologies over the paper-based method in terms of speed of transaction, lower transaction cost and ease of use. This finding provides support to that by Eadie et al. (2010a) on the drivers of e-procurement in the UK construction industry. As it relates to the speed of transaction, the majority of those who used these technologies were of the view that the reduction in the level of human interference in the transmission of data accounted for the speed in e-Procurement transactions. This view was clearly captured by one of those interviewed, who explained that: "We use these electronic systems because in other services like postal or courier, the reareno guarantees that the information will arrive on time". The respondents also identified transportation cost, timely delivery of information, less paper and administrative work, easy communication and exchange of information on real time basis and speed in the delivery of information as the aspects of e-Procurement that engender reduction in transaction cost in construction procurement process. In the words of one of those interviewed "e-procurement is a fast and reliable service that can reach a lot of people intended to in a short space of time thus ensuring prompt and fair service delivery. It saves time and energy because people in this industry have a tight schedule so it saves them time to do everything electronically instead of marching from this office to that one only to find that at the end of the day you were not assisted and you have wasted a lot of time". From this result, it can be inferred that the factors with high positive influence on the use of the identified e-Procurement technologies and tools are related to their relative advantage, compatibility and simplicity. This assertion appears to be in line with the submission by Rogers (1995) that relative advantage, compatibility and complexity are the three attributes most consistently connected to the adoption of new technologies, ideas and processes.

CONCLUSIONS AND RECOMMENDATIONS

In this study, we have examined and analyzed e-Procurement use in the Nigerian construction industry using data derived from a survey. From the result, the following conclusions can be made. The first conclusion is that although there is generally low adoption of e-Procurement systems and tools in the pre-award phase of construction procurement activities amongst firms in the Nigerian

construction industry when compared to other countries like the UK, the USA, Canada and Australia, the four categories of e-Procurement used in this country were e-Mail, static websites, Web 2.0 technologies and portals. The second one is that in support of the existing studies, the most widely used e-Procurement technologies and tools are e-mails and websites; and these are used for communication and exchange of bill of quantities, CAD drawings and project specifications; meaning that the majority of e-Procurement technology used are those that facilitate intra and inter firms communication and exchange of project information and data. The third conclusion is that the three factors with the highest positive influence on the use of e-Procurement technologies at the pre-award phase of construction procurement are the speed of transactions; lower transaction costs and ease of use of the technologies and tools. The fourth and last conclusion is that the four key areas of concern in the use of e-Procurement in three aspects of construction procurement activities investigated in Nigeria are related to unreliable and unequal access to IT infrastructure; cultural and security issues; and limited understanding of how e-Procurement systems work amongst industry stakeholders in this country. Findings of this study have a number of implications for successful adoption of e-Procurement in the construction industry in South Africa. The result indicates that the stakeholders in the South African construction industry are yet to derive the full benefits of e-Procurement in the areas of improving communication and exchange of project information and data due to obvious challenges. Although these challenges are developmental, they must be addressed if the construction sector in this country must develop its full potentials. Therefore, for the use of e-Procurement to be successfully diffused and its benefits maximized in the South African construction industry, the following recommendations are suggested.

- First, there is a need to improve the quality of, and access to ICT infrastructure across the country. With the migration of e-Procurement technologies to the cloud framework in multiple realms, manifesting in anywhere access and cost effective applications; improving access to Internet facilities must be considered as part of a core strategy to promote e-Procurement use in the Nigerian construction sector. Countries like the UK, USA, Australia and Canada known to be leading adopters of e-Procurement in construction have ubiquitous access to reliable internet facilities and this has contributed to critical mass uptake of e-Procurement in these countries
- Second, it has become imperative that e-Procurement technologies that meet the human relationship requirement of the construction industry be developed. This calls for research into new e-Procurement technologies that meet this requirement; and how the existing e-Procurement technologies can be innovatively used in meeting the peculiarities of the construction sector and the cultural imperatives of the different countries.
- Lastly, intended and current users of e-Procurement need to be aware of the existing security applications and strategies seek to ensure the safety, security and integrity of e-Procurement transactions. To this end, enlightenment campaigns, trainings and skill development programmes are needed in the *country's construction sector to improve the knowledge base of stakeholders on e-Procurement. This will on the one hand help to eliminate security concerns over e-Procurement transactions. On the other hand, it would also engender attitudinal change in favor of the use of e-Procurement by construction clients and other stakeholders. Above all, it is high time e-Procurement platform became the main channel for communicating procurement values and culture in this country as this would create more awareness*

and encourage a quick transition from the traditional paper-based to e-Procurement method in construction procurement.

REFERENCES

- Alarcon, L.F., Maturana, S. and Schonherr, I. (2009). Impact of Using and E-Marketplaces in the Construction Supply Process: Lesson from a Case Study. *ASCE Journal of Construction Engineering and Management*, 25:214-220.
- Al-Qirim, N. (2007). The adoption of ecommerce communications and applications technologies in small businesses in New Zealand. *Electronic Commerce Research and Applications*, 6(4), 462-473.
- Azadegun, A. and Reich, J. (2010). Effective Benchmarking of Innovation Adoptions- A Theoretical Framework for e-Procurement Technologies. *Benchmarking: An International Journal*, 17(4), 472-490
- Bauasa, P., O., Kourtidis, S., Liljemo, K., Loozen, N. Rodrigues F. J. and Snaprud, M. (2013). E-procurement Golden Book of Good Practice. Retrieved from www.pwc.be. On 15th May 2014
- Bello, W.A., and Iyagba, R.O. (2013). Comparative Analysis of Barriers to E-procurement among Quantity Surveyors in UK and Nigeria. *Scottish Journal of Arts, Social Sciences and Scientific Studies*, 14(2), 175-187
- Chege, L. W. and Coetzee, G. and Malachi, J. (2001) e-Commerce and value chain management – the prospects and challenges for the South African Construction Industry. *Proceedings, CIB-W78 International Conference IT in Construction in Africa*. Pretoria, 29th May – 1st June, pp.35.1-35.11. Pretoria, CSIR.
- Eadie, R., Perera, S., Heaney, G. and Carlisle, J. (2007). Drivers and Barriers to Public Sector e-procurement within Northern Ireland's Construction Industry. *Journal of Information Technology in Construction (ITcon)*, 12(2007), 103-120
- Eadie, R., Perera, S. and Heaney, G. (2010a). A cross -discipline comparison of rankings for e- procurement drivers and barriers within UK construction organisations, *Journal of Information Technology in Construction (ITcon)*, 15:217- 23
- Eadie, R., Perera, S. and Heaney, G. (2011). Analysis of the use of E-Procurement in the Public and Private Sectors of the UK construction Industry. *Journal of Information Technology in Construction (ITcon)*, 16: 669-686
- Issa, R.R.A., Flood, I. and Caglasin, G. (2003). Survey of E-Business Implementation in the US Construction Industry. *Journal of Information Technology in Construction (ITcon)*, 8(2003), 15-28.
- Isikdag, U., Underwood, J., Ezcan, V., and Arslan, S (2011). Barriers to e-procurement in Turkish AEC industry. *Proceedings of the CIB W78-W102 2011: International Conference –Sophia Antipolis, France, 26-28 October*
- IT Construction Forum (2004). Survey of IT in Construction Use, Intentions and Aspiration, [Online] Available: <http://www.itconstructionforum.org.uk/publications/publication.asp?id=1168>. [2004 September 30].
- Oyediran, O.S. and Akintola, A. A. (2011). A Survey of the State of the Art of E-Tendering in Nigeria. *Journal of Information Technology in Construction (ITcon)* 16: 557-576.
- Rankin, J.H., Chen, Y. and Christian, A.J. (2006). E-procurement in the Atlantic Canadian AE Industry. *Journal of Information Technology in Construction (ITcon)*, 11:75-87
- Teo, T.S.H, Lin, S. and Lai, K. (2009). Adopters and non-adopters of e-Procurement in Singapore: An Empirical Study. *Omega*, 37 (2009), 972-987.
- Zuo, P.X.W and Seo, Y. (2006). Effective Applications of E-Commerce Technologies in Construction Supply Chain: Current Practice and Future Improvement. *Journal of Information Technology in Construction (ITcon)*, 11(2006), 127-147.
