West Africa Built Environment Research (WABER) Conference
10th Anniversary Conference, 5-7 August 2019, Accra, Ghana
Proceedings Edited by Laryea, S. and Essah, E.
ISBN: 978 – 9988 – 2– 6010 – 1
DOI: https://doi.org/10.33796/waberconference2019.13

ASSESSMENT OF STAKEHOLDERS' PERCEPTION OF RISK FACTORS ASSOCIATED WITH THE ADOPTION OF E-PROCUREMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

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As the level of adoption of e-Procurement continues to increase in the Nigerian Construction Industry due to its perceived benefits in enhancing efficiency in project delivery, eliminating geographic barriers and enabling effective communication between project team members, the need for preparation of full participation of stakeholders' in e-Procurement arises. However, the industry becomes exposed to the potential risks associated with the adoption of this technology. Such exposure of the industry to the potential risks in adopting e-procurement is partly driven by the fragmented nature of stakeholders which increases the variability in the comprehension of risk in e-Procurement. Owning to such variability, this research assesses stakeholders' perception of the risks factors associated with the adoption of e-Procurement in the industry. The study adopted a quantitative research approach using structured questionnaire to assess the perception of key stakeholders' including Clients, Contracting and Consulting firms in the Nigerian Construction Industry. The data collected were analyzed using descriptive statistics. Furthermore analysis of variance (ANOVA) was used to assess the significant difference in the perception of the stakeholders'. Findings revealed that prominent risks factors associated with the adoption of e-Procurement include: lack of training on the adoption of e-Procurement techniques, unreliable Internet and telephone connectivity, lack of clear understanding of e-Procurement technologies and security. This study is expected to influence the policy makers strategies in improving the adoption and practice of e-Procurement in the Nigerian Construction Industry and also other developing and emerging markets.

Keywords: construction industry, e-procurement, Nigeria, risks

INTRODUCTION

The construction industry is very important in the economic development of any nation especially in an expanding economy like Nigeria (Oladipo, Fatuki & Aluko, 2015). As such, the volume of activities in the Industry serves as a gauge for measuring the overall development of the nation (Bayliss, Cheung, Suen & Wong, 2004). Construction projects are becoming increasingly complex thereby resulting in complex procurement processes. The more complex a project is, the harder it

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Muhammad Mustapha Gambo, Mansir Dodo and Hawwa Yusuf (2019) Assessment of stakeholders' perception of risk factors associated with the adoption of e-procurement in the Nigerian construction industry In: Laryea, S. and Essah, E. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 5-7 August 2019, Accra, Ghana, 188-199

becomes to follow all necessary procurement planning procedures (Fabi, Awolesi & Akinseide, 2015).

As a strategy to simplify yet improve traditional procurement in the construction industry, e-procurement is reported to have catalyzed and improved planning procedures and other matters of the procurement process. According to Makoba et al., (2017), electronic procurement (e-procurement) is the use of Information and Communication Technology (ICT) in conducting procurement functions. Laryea & Ibem (2015) claim that the adoption of e-Procurement has improved the integration of tasks and reduced the complexity of procurement process in construction.

The existing published articles have explored the adoption of e-Procurement in general (Maniam et al., 2006; Vijaykumar & Zonal Manager, 2013; Victor & Richard, 2015; Mohammad, 2015; Sammy et al., 2016), while others have assessed the barriers to the adoption of e-procurement (Robert et al., 2007; 2010; Ibem et al., 2016), the needs and benefits (Laryea & Ibem, 2015; Nawi et al., 2016; Akpehe, 2016; Nazima & Vani, 2017), and risk associated with e-Procurement in construction (Makoba et al., 2017; Hussain, 2017). While most of these researches delved on the procurement process, little empirical research exist on stakeholder's perception of risk factors in the adoption of e-Procurement in the Nigerian Construction Industry. This is in line with Priority 1 of the Sendai Framework for Disaster Risk Reduction (2015-2030) which stresses on the understanding of risks by stakeholders in all dimensions. It is against this background that this research assessed stakeholders' perception on risk factors associated with the adoption of e-procurement based on the following objectives:

- To identify the risks factors associated with the adoption of e-procurement
- To assess the risk factors associated with the adoption of e-procurement relative to stakeholders perception

The context of stakeholders in this research apply to those that are not only 'actively involved' in construction project delivery but whose interest may be positively or negatively affected as a result of executing the project.

LITERATURE REVIEW

Stakeholders in the construction industry

The construction industry is a very large and complex industry comprising of many types and diverse range of professionals and other representative stakeholders, clients, professional practices, and specialist firms that have their respective agenda and allegiances. In other words, the construction industry is highly fragmented.

According to the Association for Project Management (2006), stakeholders are all those who have interests or roles in the project or are impacted by the project. Similarly, The Project Management Institute (1996) defines project stakeholders as individuals or organizations who are actively involved in the project or whose interest may be positively or negatively affected as a result of executing the project. Eshofonie (as cited in Akinmusire & Ologunagba 2016) identified clients, consultants and contractors as major construction project stakeholders who participate in the realization of construction projects. In another study, Makoba et

al. (2017) considered the key stakeholders of the industry to be contractors, consultants, regulatory bodies and government agencies. They come together at the beginning of the project with different objectives, same goal and disengage at the completion of the project.

E-procurement

E-procurement is an automated, Internet-based way for a company to purchase the goods and services it needs to carry out businesses (Salkute, 2013). The systems facilitate direct links with suppliers of goods, thereby reducing the paperwork. Construction companies use E-procurement to reduce original procurement cost. In this study, the definition of e- Procurement adopted is in line with Regulation 340 of the Tanzania Public Procurement Regulation, in the study of Makoba et al., (2017), which defined e-procurement as the use of information and communication technology in conducting procurement functions such as e-Planning, e-Advertising, e-Submission, e-Tendering, e-Auction, e-Purchasing, e-Awarding, e-Contracting and e-Payment.

E-procurement is not about "electronic" but procurement because of its processes and end results. The use of the term "electronic" is more of a catalyst than a factor. The benefit of the system determines the level of its adoption. Nawi et al. (2016) in his research identified cost savings and increased efficiency, faster government procurement process and higher transparency compared to the traditional procurement and tendering methods, as the benefits derived from adopting the e-Procurement strategy in the Malaysian construction industry. Salkute et al. (2013) explored the adoption of the e-Procurement strategies in India and China with respect to the tangible benefits and the associated risks by using Indian and Chinese firms as a case study. The authors identified tangible cost benefits as the drivers for companies to implement the e-Procurement solution. In another research by Akpehe (2016) which explored the value benefits of e-Procurement in the Nigerian construction industry with emphasis on the quantity surveying firms operating in Nigeria, it was revealed that the majority of respondents demonstrated a good knowledge of e-Procurement especially e-tendering and e-notification. The benefits associated with these were identified to include improved communication, reduced paper work, improved data management, reduced bottle necks, operational costs and lower procurement cost. The drawback of the research was the restriction to only quantity surveying firms in the Nigerian construction industry.

Barriers to e-procurement refers to those factors that inhibit the uptake and smooth implementation of the e-Procurement technologies, tools, and processes by organizations (Ibem et al., 2016). Barriers to e-Procurement adoption include: lack of e-procurement knowledge; lack of a recognized legal frame work; lack of data exchange standards; lack of business relationships with suppliers; lack of capital; lack of technologies and tools; resistance to change; and lack of top management support; and security concerns (Hawkling et al., 2004; Gunasekaran, 2009). In Nigeria, internal and external interoperability of e-procurement software; complicated procedures and extended relationships; confidentiality of information; prevention of tampering with documents; resistance to changes; and enforceability of electronic contracts were considered barriers to the adoption of e-procurement in the construction industry (Bello and Iyagba as cited in Ibem et al., 2016).

Risks associated with e-Procurement and management of such Risks

The English word 'risk' originates from the French word risqué and can be viewed in different perspectives. The Merriam-Webster dictionary defines risk as "the possibility that something unpleasant (such as injury, or a loss) will happen". Hughes and Ferrett (as cited in Alhassan & Aminu, 2016) defined risk as "the likelihood of a substance, activity or process to cause harm". Risk cannot be avoided as no procurement system is risk free (Fabi et al., 2015). Among the 27 key risk factors affecting public construction projects from project stakeholder perspectives (clients, contractors and consultants), seven (7) of them are related to the clients, these includes tight project schedule; decision making process; payment for completion work; delay in site mobilization; design modification; financing project by client; and excessive change (Tipili & Ibrahim, 2015). This means that the client is an important stakeholder in the construction industry and shares part of the risk and benefit related to industry. There are two ways of classifying risks depending on the origin of the risk: internal risks are risks faced by a company from within its organization and arise during the normal operations of the company. They originate within the organization and this risk can be forecasted with some reliability, and therefore, a company has a good chance of reducing this risk. There are three types of internal risk factors: human factors, technological factors, and physical factors. The other is external risk, they come up due to economic events that arise from outside of a company's organization. External events that lead to external risk cannot be controlled by any company or cannot be forecasted with a high-level of reliability. There are three types of external risks: economic factor, natural factor and political factor.

In a study carried out by Makoba et al. (2017) in which they assessed potential risks of e-Procurement and identified strategies towards mitigating it, using Tanzania Construction companies as a case study. The research provides an insight into the industry's key stakeholders' views on e-Procurement potential risks to construction companies in Tanzania and suggests strategies for mitigating them. Prominent among the risks identified are: shortages of power supply; attacks by computer viruses, unreliable internet services, information leakage or hacking and incompatibility of technology, lack of assurance on confidentiality of information.

Risk management is the establishment of risk consciousness as well as organizational integration. It's a practice of identifying, evaluating, and controlling those factors to avoid or mitigate potential negative effects. The risk management process contains several steps such as: risk identification, risk analysis, risk assessment, risk control, risk monitoring, and goal control (Schieg, 2013). The risk management cycle also known as risk assessment can be viewed in three phases: identification, analysis and response (Smith, 2008).

Various paths can be followed to respond to risks. Larson and Gray (2011), stated that decisions must be made after identifying and assessing risks by choosing the appropriate solutions to the risks. According to that study, risks responses can be classified into the following:

1) Avoid: Is a prevention strategy that may involve changing the project schedule, strategy or scope. Risks can be avoided by minimizing project complexity, reducing quality requirements for end items or eliminating risk activities.

2) Transfer: Shifting the responsibility of responding to a risk or the negative impact of the risk to a third party. However, risk should be transferred to the party who can best control it.
3) Reduce: Stakeholders may decide to split the risk between them through a contractual agreement, and
4) Accept: This refers to accepting or retaining a risk in cases where it cannot be avoided or transferred. In these instances, a contingency response is implemented in case the risk becomes a reality. It is considered as an action to reduce the negative impact on the project if the risk materializes.

RESEARCH METHODS

The data used for the research were collected through literature review and questionnaire. The first was to facilitate the research work in achieving the first objective, "Identifying risk factors associated with the adoption of e-Procurement. Fifteen (15) risks of e-Procurement and four (4) response strategies were identified, which provided the basis for the formulation of the questionnaire.

Subsequently, a quantitative research approach was adopted for the conduct of the study. Quantitative research technique is described as an investigation into an identified problem, based on testing a theory, measured with numbers or other known numerical entities, and then the data obtained are analyzed using statistical techniques or methods (Saunders et al., 2007). As such, the approach adopted abides with the various states of scientific research and data analysis and subsequently having findings that are considered generalizable data as it relates to the practice of e – Procurement in the Nigerian construction industry.

Survey questionnaires were sent to 139 target respondents who were identified based on purposive sampling technique, where the respondents were selected based on their direct involvement in e procurement in the study area. The target population are the clients', contracting firms and consulting firms in Nigeria and specifically Kaduna state. Purposeful sampling is described as that which selects information rich and appropriate cases for the conduct of a study. The primary logic of purposeful sampling in research lies in selecting information-rich cases or sources of data. Sourcing data from information-rich cases or respondents yields more reliable data as the respondents are considered to be well versed, knowledgeable, and experienced with respect to the subject, and thus provides an opportunity of providing relevant and effective feedback (see Patton, 2002). The adoption of the purposive sampling in this research is borne out of the reason that with respect to the Nigerian practice of e-Procurement in the construction industry; it is considered a specialized research area, thereby limiting the population size.

Descriptive statistics is used to analyze the data collected. Furthermore, analysis of variance was used to know the significant difference in the perception the stakeholders. These analyses were conducted using the Statistical Package for Social sciences (SPSS version 20.0) software.

PRESENTATION AND DISCUSSION OF RESULTS

Response rate

A total number of 139 questionnaires were administered to clients', consulting and contracting firms, out of which 65 questionnaires were returned, giving a response rate of (47%). Although 65 questionnaires were returned, only 58 questionnaires were suitable for analysis as 7 questionnaires had incomplete data. This response rate is considered reliable as stated by Akintoye (2000); Moser and Kanltol (1971) that any response rate from 30% to 40% and above is acceptable for analysis and the results could be considered reliable.

Table 1; Questionnaire distribution

Questionnaires	Number	Percentage
Total Distributed	139	100%
Returned	65	47%
Usable	58	41%

Summary of background information of respondents

Results of Table 2 show that while (47%) of the respondents were Clients, (24%) are contracting firms. Furthermore, (29%) of the respondents were consulting firms.

Table 2; Type of organization

Type of Organization	Number	Percentage
Clients	27	47%
Contracting firms	14[MG1]	24%
Consulting firms	17	29%
Total	58	100%

Results of Table 3 show that majority of the organizations (40%) have 0 - 5 years' experience. Afterwards, while 21% have 6 - 10 years' experience, 16% have 11 - 15 years' experience. Furthermore, while 14% have 16 - 20 years' experience, 10% have over 20 years of experience, respectively.

Table 3; Years of experience of the organization

Years of Experience	Number	Percentage
0 - 5 years	23	40%
6 - 10 years	12	21%
11 - 15 years	6	10%
16 - 20 years	8	14%
over 20 years	9	16%
Total	58	100%

The respondents work section revealed that 33% of them work in the procurement unit, 22% work in physical planning, while 45% work in other section different from the ones listed in the questionnaire.

Table 4; Work section of respondents in the organization

Work Sections	Number	Percentage
Physical Planning	13	22%
Procurement Unit	19	33%
Others	26	45%
Total	58	100%

Awareness of e-procurement solution

The research deemed it's essential to know the level of awareness of e-Procurement solution amongst the respondents. The essence of this is to ensure that the respondents have the basic idea of the technological innovation of e-Procurement. It was observed that 32 (55.2%) of the respondents indicated they have good knowledge of e-Tendering; while 23 (39.7%) have knowledge of e-Information/Notification; 15 (25.9%) e-Contract Management and E-ordering; 14 (24.10%) e-Awarding; 12 (20.7%) e-Sourcing,; 11 (19.0%) e-markets; 9 (15.5%) e-invoicing; 4 (6.9%) E-MRO and Web-Based Enterprise Resource Planning (ERP) and the least with 2 (3.4%). E-Reverse Auctioning. This demonstration of significant awareness of E-Tendering was expected as it is an aspect of e-Procurement solutions that has attracted much attention by both researches and practitioners in the construction industry (Gandu, Musa, Chindo & Abdu, 2017). Aside from being aware of e-procurement, to further demonstrate knowledge of e-procurement tools, the respondents were also asked whether their organization exchange project data electronically. The result revealed that 55(94.83%) of the respondents admitted exchanging project data electronically, while 3(5.17%) responded to the contrary. The tools predominantly used for the electronic data exchange were: Email 55(94.83%); static website 43(74.14%); fax 2(3.45%); social media (0.00%); and others 12(20.69%).

Risk factors associated with the adoption of e-procurement

In line with objective 2 of this study, results of the impact of the risk factors associated with the adoption of the e-procurement by the individual stakeholders are presented in Table 5.

From Table 5, it can be deduced that the top risk factors associated with e-Procurement from the client perspective are: Lack of clear understanding of the e-Procurement technologies, unreliable power supply; lack of skilled personnel; lack of enough training on the use of e-Procurement; security and control of the e-Procurement process. While inadequate financial resources and software non-compatibility happens to be the least.

The top risk factors from the contractors perspective are: unreliable power supply, lack of enough training on the use of e-Procurement, lack of widely accepted standards, inadequate technological infrastructure, and unreliable internet and telephone connectivity. While, unsupportive organization, lack of suppliers capability, and software non-compatibility happens to be the least.

Table 5; Stakeholders assessment of risk factors associated with the adoption of e-procurement

Assesment of risk	Clients			Contractors			Consultants		
Risk factors	Mean	S.D	Rank	Mean	S.D	Rank	Mean	S.D	Rank
Inadequate technological infrastructure	3.14	1.156	9	3.50	1.345	4	3.53	1.060	5
Inadequate financial resources	3.07	1.100	14	2.93	1.385	13	3.20	0.941	11
Lack of enough training on the use of e-procurement	3.45	1.021	3	3.71	1.069	2	3.60	0.828	3
Lack of widely accepted standards	3.14	1.093	11	3.57	1.284	3	3.13	0.990	13
Unreliable internet and telephone connectivity	3.34	1.261	6	3.50	1.225	5	3.93	0.884	1
Unreliable power supply	3.45	1.270	2	3.79	1.251	1	3.80	1.265	2
Computer virus and worm attacks	3.07	1.361	13	3.07	1.328	9	2.93	1.072	15
Lack of clear Understanding of the E-procurement Technologies	3.55	0.948	1	3.21	1.188	8	3.47	1.187	6
High cost of training	3.17	1.002	8	3.00	1.301	12	2.87	0.990	16
Security and control of the e-procurement process	3.38	1.178	5	3.43	1.342	6	3.27	1.100	9
Insufficient/ lack of upper management commitment	3.21	0.774	7	3.00	0.961	11	3.20	0.862	10
Lack of skilled personne	3.45	0.827	3	3.07	1.207	10	3.40	0.986	7
Regulatory and legal control	2.76	0.951	16	3.43	1.284	6	3.20	1.082	11
Lack of supplier capability	3.14	1.187	11	2.64	1.151	15	3.00	1.254	14
Software non-compatibility	2.83	1.136	15	2.64	1.277	15	3.33	1.175	8
Unsupportive organization	3.14	0.953	9	2.71	1.267	14	3.60	1.404	3

The table also revealed that the top risk factors from the consultants perspective are: unreliable internet and telephone connectivity, unreliable power supply, lack of enough training on the use of e-Procurement, unsupportive of the organization and inadequate technological infrastructure. While, lack of suppliers capability and computer virus and worm attacks are the least.

Furthermore, it can deduced that the stakeholders have a related view on unreliable power supply and lack of enough training on the use of e-Procurement, as their

risk factors. Moreover, the client and contractor stakeholders do have a similar view on software non compatibility as the least risk factor associated with the adoption of e-Procurement.

Table 6; General Assessment of Risk Factors Associated with the Adoption of E-Procurement

Risk factor	Mean	Std. Deviation	Rank
Unreliable power supply	3.62	1.254	1
Lack of enough training on the use of e-procurement	3.55	0.976	2
Unreliable internet and telephone network	3.53	1.173	3
Lack of clear understanding of the e-Procurement Technologies	3.45	1.062	4
Security and control of e-procurement process	3.36	1.180	5
Lack of skilled personnel	3.34	0.965	6
Inadequate technological infrastructure	3.33	1.176	7
Lack of widely accepted standards	3.24	1.113	8
Insufficient/ lack of upper management commitment	3.16	0.841	9
Unsupportive organization	3.16	1.182	10
Inadequate financial resources	3.07	1.122	11
High cost of training	3.05	1.067	12
Computer virus and worm attacks	3.04	1.267	13
Regulatory and legal control	3.03	1.092	14
Lack of supplier capability	2.98	1.192	15
Software non- compatibility	2.91	1.189	16

From Table 6, it is evident that unreliable power supply (mean 3.62); lack of enough training on the use of e-procurement (mean 3.55); unreliable Internet and telephone connectivity (mean 3.53); clear understanding of the e-procurement technologies (mean 3.45) and security and control of e-procurement process (mean 3.36) are the most important factors that influence the implementation of e-Procurement while lack of supplier interest (mean 2.98) and software non-compatibility (mean 2.91) are the least.

Comparison of perception of major stakeholders on risk factors associated with the adoption of e-procurement in Nigerian construction industry

Table 7 presents a comparison of the perception of major stakeholders (clients, contractors and consultants) across the risk factors associated with adoption of e-Procurement in Nigerian Construction Industry using ANOVA.

Table 7: Comparison of the perception of major stakeholders

Anova: Single Factor

Summary

Groups	Count	Sum	Average	Variance
Clients	18	51.27586	3.204741	0.049698
Contractors	18	51.21429	3.200893	0.138244
Consultants	18	53.4619	3.341369	0.091446

Anova

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	0.204883	2	0.102441	1.099991	0.341657	3.204317
Within Groups	4.190815	45	0.093129			
Total	4.395698	47				

It can be seen that there is no significant different in the perception of all key stakeholders across the risk factors associated with adoption of e-Procurement in Nigerian construction industry as the significant value is greater than 0.05 (p = 0.34).

Discussion of findings

Findings revealed that 32(55.2%) of the respondents show good knowledge for E-Tendering; E-Information/Notification 23(39.7%); E-Contract Management and E-ordering 15 (25.9%); E-Awarding 14 (24.10%); E-Sourcing, 12(20.7%); E-markets 11 (19.0%); E-invoicing 9 (15.5%); E-MRO and Web-Based Enterprise Resource Planning (ERP) 4 (6.9%) and E-Reverse Auctioning as the least with 2 (3.4%).The demonstration of good awareness of E-Tendering has also been seen as 89.09% of respondents demonstrated good knowledge it in previous studies by (Akpehe, 2017; Gandu, Musa, Chindo & Abdu, 2017). It can also been seen that 55(94.83%) of the organizations exchange project data electronically, while 3(5.17%) do not. Findings revealed that 94.83% predominantly exchanged data through E-mail, 74.14% through a static website, 3.45% through fax, 20.69% used others such as flash drive, while none of the organization exchanged data through social networks. This tend to be different from the findings of Gandu, Musa, Chindo & Abdu, (2017) where 100% of respondents exchange data through E-mail. The risks in table 5 were ranked using Likert scale of 1 to 5; with 5 being the highest rating. It can be seen that the top ranked risk from the general assessment is, unreliable power supply; This finding concurs to that conducted by Makoba (2017) where shortage of power supply was identified among the prominent risks of e-Procurement in the Tanzanian construction industry.

Unreliable internet and telephone connectivity was also viewed as a risk factor in this study. This make organizations to feel discriminated against the use of e-Procurement due to its inaccessibility. Security and control of e-procurement process were also considered a prominent risk in the adoption of e-Procurement as identified by Hussain (2017). Significant concern exists over security and confidentiality of the data as the growth of internet has nevertheless brought serious challenges to business due to data hacking, internet fraud and cyber vandalism.

CONCLUSION

The prominent risks associated with the adoption of e-procurement are: unreliable power supply; lack of enough training on the use of e-procurement; unreliable internet and telephone connectivity; lack of clear understanding of the e-procurement technologies; security and control of e-procurement process. However, organization should accept technological changes and be conversant with e-procurement so as to gain from its inherent benefit of efficiency. Additionally, workshops and capacity building programs on e-Procurement should be organized by professional bodies and procuring authorities in order to improve the stakeholders' knowledge and understanding of the concept. Lastly, the curriculum of the built environment courses in the tertiary institutions should prioritize eProcurement strategies and implementation.

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