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E-Procurement Risks and Mitigation: The Case for Tanzania Construction Companies

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Abstract Electronic procurement (e-procurement) in the Tanzania construction industry is yet to take off as the Government is continuing to expand and strengthen the prerequisite infrastructure. In the course of preparation for participation of construction companies in e-procurement the paper has set to assess its potential risks of e-procurement. The study has sourced information from key stakeholders in the construction industry in Tanzania, building contractors, professional consultants and public and private procurement entities. Questionnaires and interviews were used to collect information. Out of 49 distributed questionnaires, 43 qualified for data analysis. 16 interviews were conducted from both public and private entities. Prominent risks identified as susceptible to construction companies included, attacks by computer viruses and worms, unreliable internet services, information leakage or hacking and incompatibility of technology. Strategies identified by the study towards mitigation of such risks include, construction companies exercising good management and monitoring of their ICT systems, support of the country's procurement guidelines to e-procurement by construction companies and possession of good e-procurement skills. To gain from the benefits of e-procurement and also curb its inherent challenges it is recommended that construction companies should accept technological changes and be conversant with e-procurement.

Keywords E-Procurement, Risks, Construction companies, Tanzania

1. Introduction

According to Regulation 340 of the Tanzania Public Procurement Regulation [1], electronic procurement (e-procurement) is the use of information and communication technology in conducting procurement functions. Such functions include e-Monitoring, e-Capacity building, e-Planning, e-Advertising, e-Submission, e-Tendering, e-Auction, e-Purchasing, e-Awarding, e-Contracting and e-Payment. Some of these are made possible through a single web portal called electronic Public Procurement System Portal (e-PPs portal). This is a powerful business tool that can modernize the buying function of an organization by restructuring and automating the labour intensive procurement routines which in turn enables employees to gain direct access to their suppliers' systems [2]. Although the benefits of e-procurement is by public bodies to invite tenders and obtain suppliers and service providers, e-procurement (e-purchasing) is used by construction firms to obtain their suppliers and subcontractors. Therefore e-procurement is used in world's construction companies to reduce costs and increase efficiency, as it enables volume purchases, wider choice of buyers and suppliers, brings better quality, improves delivery, reduces paper-work and lowers administrative costs. Kassim [3] had also echoed on the benefits of cost reduction, process efficiency and information quality identifying them as the main success criteria of e-procurement. Nawi et al., [4] had pointed benefits of cost reduction, improved contract fulfilment, quality bidding, time efficient and increase of supplier competition that may lead to competitive prices being offered by suppliers. The positive aspects of e-procurement as a facilitator of supply-chain management have also been identified [5].

Despite the fact that e-procurement use has received attention as a modern way of improving construction performance, efficiency and effectiveness, companies in the construction industry are seen to be slow in taking up the concept [6-8]. A majority of studies in the area of e-procurement have focused on implementation, adoption, tendering, challenges and prospects [9, 8, 7, 4]. Limited studies have focussed on the use of e-procurement and the potential risks so as to address specific problems and provide counter measures [10-13]. This paper provides an insight of the industry's key stakeholders' views on e-procurement use potential risks to construction companies in Tanzania and suggests strategies for mitigation of the risks.

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Tanzania just like many other African countries is enduring to achieve an e-government system as a driver for both efficiency and transparency. E-procurement interventions in place in Tanzania have included e-sharing, e-advertising and e-checking [13]. Meanwhile online tender advertisements and online award notifications are made possible through the tenders' portal [14]; and a trial run of public e-procurement system is planned to commence September 2017.

2. Literature Review

It has been stated [12] though e-procurement is a new phenomenon, what it intends to achieve is not new; stating as long as companies have been around, they have always sought to improve efficiency and effectiveness. E-procurement is an umbrella concept that backs up the same, improving efficiency and effectiveness. Neef on strategy and implementation of e-procurement [12] explained how, e-procurement system functions in reducing transaction costs by automating processes and replacing human labour with information technology. It also facilitates the breakdown of functional silos toward horizontal processes that facilitate increased integration. E-procurement is therefore not about "e" but procurement because of its processes and end results. "e" is more of a catalyst than a factor. Definition as given in Nawi et al., [4] of e-procurement has been adopted by the authors, that e-procurement is the automation of an organisation's procurement processes using web-based applications. Meaning, input factors for manual procurement are the same for e-procurement. A conceptualization of the framework of the research problem is shown on Figure 1.

According to the framework (Figure 1), stakeholders who work under traditional procurement fear the adoption and use of e-procurement due to different risks hence cling to traditional systems of procurement thus becoming detriment to a variety of shortcomings. For those that opt to use e-procurement on the other hand, become susceptible to certain risks. In the process of successfully adopting and using e-procurement, intervening factors such as legal, resources, technical and organisational factors are essential. The envisaged outcome is the successful use of e-procurement that shall hence create benefits as presented in Figure 1.

3. Methodology

Literature review, interviews and questionnaires were used to collect data for the study. Since the aim was to look at risks associated with e-procurement by construction companies, a relatively high number of questionnaires were issued to building contractors compared to other respondents. Other respondents included the Tanzania Procurement Regulatory body (PPRA), public bodies procuring services, Tanzania Building Agency (TBA), National Housing Corporation (NHC), Ministry of Education Science and Technology (MEST), Ministry of Transport and Telecommunication and professional consultants from the industry.

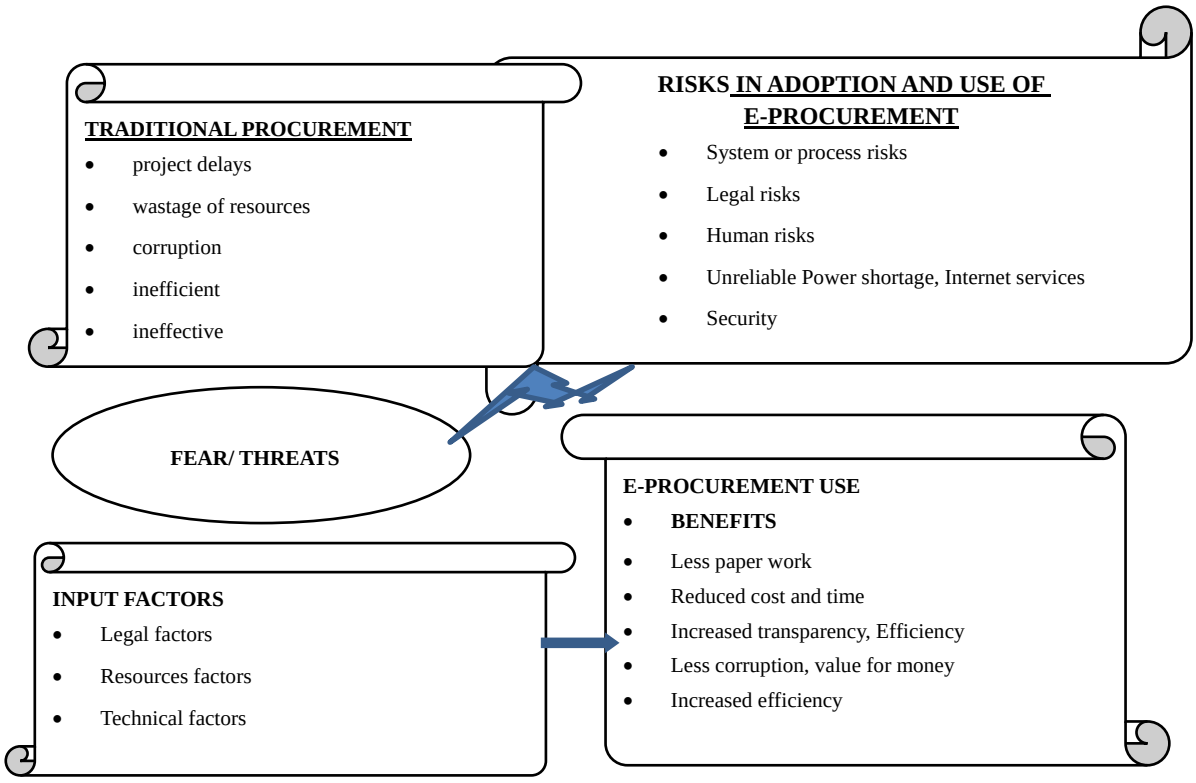

Figure 1. Conceptual framework for understanding the problem

Questionnaires consisted of both open and closed ended questions that were logically related to the research topic. The content, response of the structure, wording of the questions and question sequence were the same for all respondents. Out of 49 distributed questionnaires only 43 qualified for data analysis. Additionally, 14 interviews were conducted for both public and private entities. The response rate was 87% (Table 1).

A majority of respondents had experience in the construction industry of more than 10 years; with at least 80% over five years. This implies data was collected from experienced persons in the construction industry and thus information collected can be relied upon.

3.1. Data Analysis

Data collected was analyzed using Mean Quantity Score (MQS) to generate rating of the variables of interest as determined by the function below:

$$MQS = \sum K_i f_i / \sum N_i \quad (1)$$

Where: N_i = number of respondents.
K_i = rating for the i^{th} response.
f_i = frequency of the response.

The index measured risks of e-procurement as viewed by respondents. The MQS is a descriptive statistical tool that describes the variables of interests in terms of their central tendency [6]. Therefore this was considered adequate, as the study was largely descriptive and exploratory. Sources of risks of e-procurement use in Tanzania as obtained from respondents are as shown in Table 2.

From Table 2 it is observed that the four top ranked potential sources of risks are: a lack of reliable antiviruses that may cause important documents to be attacked and affected by virus and worms; lack of enough training on use of e-procurement with a potential of making wrong placements of orders or pay to wrong accounts; unreliable internet and telephone networks and unreliable power supply. What was considered as the least potential risk was the challenge that may be created by use of different software version that may create difficulties in managing documents. Medium ranked sources of risks ranged from the absence of a clear e-policy on security to users, computer literacy, lack of computer and internet facilities by construction companies, lack of computer skills and corruption.

Table 1. Distribution and response rate of respondents

Sample Selected	Respondents	Interviews	Distributed	Received	Total
(25 local, 15 foreign contractors)	Local companies	3	25	22	24
	Foreign companies	1	15	12	15
Consultants	Architects	1	3	3	4
	Engineers	2	3	3	5
	Quantity Surveyors	1	3	3	4
Government Agent	TBA	1	N/A	N/A	1
Regulatory body	PPRA	1	N/A	N/A	1
Other Procuring entities	TCRA, NHC, MEST MTC	4	N/A	N/A	4
Total		**14**	**49**	**43**	**58**

Table 2. Respondents' view on the potential sources of risks of e-procurement

Source of the risk	Responses					MQS	Rank
	5	4	3	2	1		
Lack of reliable anti-viruses	43	0	0	0	0	5	1.5
Lack of enough trainings on use of e-procurement	43	0	0	0	0	5	1.5
Unreliable internet and telephone networks	43	0	0	0	0	5	1.5
Unreliable power supply	43	0	0	0	0	5	1.5
Computer illiteracy; lack of computer and internet	33	10	0	0	0	4.77	5
Unclear e-procurement policy on security	33	6	4	0	0	4.67	6
Poor management skills	29	9	5	0	0	4.56	7
Corrupt personnel	24	15	5	0	0	4.53	8
Incompatible software technology	19	6	18	0	0	4.02	9
Total	**310**						

4. Results and Discussion

Respondents rated risks involved in e-procurement in Tanzania construction companies as shown in Table 3. The responses were ranked using Likert scale of 1 to 5; with 5 being the highest rating.

Table 3 shows the two top ranked risks are, computer virus and worm attacks and unreliable internet services. A feature identified a result of internet use or removable storages such as disks that damage systems and data [15]. This was similarly observed as serious threats to Korea's system stability [16]. The findings from the study and those of previous work hence implicate information security as a serious concern in the use of e- procurement. The issue of ICT security guidelines by the Ministry of Finance (Tanzania) is also viewed by the authors as a step towards addressing this concern [17].

Shortages in internet services were reported to be an overwhelming risk for Tanzania. As of year 2012, only 59 out of 169 districts [18] of Tanzania had fibre optic network connected [17]. Such a predicament has been viewed may result to some companies in Tanzania to feel discriminated against use of e-procurement due its inaccessibility [11]; a status not in favour to the public procurement authority aspiration. Hence poor network services in remote and poor infrastructure areas makes e-procurement inaccessible to companies in such areas.

Breach of confidentiality of information was also viewed by respondents to be a threat to most construction companies in Tanzania. This risk is explained as magnified by use of IT as leakage of electronic information is easily done [9]. The susceptibility of documents to meddling, theft and disclosure of confidential information has also been identified as risk of electronic media use [19]. The implication drawn by the study is that e-procurement may create mistrust and insecurity to users. Non-compatibility as a potential risk in this instance is ranked fourth. As stated in [16], non-compatibility may result into documents sent from tenderers failing to open in the computers of the tender evaluator or seller or buyer. Likewise, respondents acknowledged the risk for construction companies to experience difficulties opening electronic documents as a result of differences in software versions. Presently, there is no standard or widely accepted e-procurement software solution as most computer software in Tanzania is imported and only few in-house software are developed.

Results also indicated that respondents were of the view that companies feared the risks of unexpected liabilities due to legal issues. This is explained to occur as the user is subjected to unforeseen exposures when doing business electronically since different countries have different authorities and vary in their legal systems [9]. Each country could take a different approach in tackling e- procurement legal issues and companies that are unfamiliar with foreign laws may face unexpected liabilities. Furthermore the study indicated potential risk in variations of legal systems amongst different countries that could give different outcomes in a dispute. This implies that lack of universality of the legal system could be one of the risks to construction companies who lack experience and understanding in carrying out overseas construction projects.

It was further viewed that construction companies fear the absence of widely accepted standards and a clear understanding of which e-procurement technology best suits the needs of each company. This risk factor simply suggests the need for clear and open standards that would facilitate inter-organization of e-procurement technologies. Without widely accepted standards for coding, technical, and process specifications, fear of e- procurement risks will prevail making it fail to deliver the expected benefits [16, 20, and 4]. Also laws governing the use of internet can be observed from two different standpoints, one is for the relevant legislations dealing with or regulating telecommunications, the other is for those tackling the emerging cyber related crimes. This is because the terms or scope of cyber-laws is not clear in many countries. It is the authors' opinion that the Tanzania Cybercrimes Act 2015 may curb the problem.

Table 3. Rating risks of e-procurement use by construction companies

Risks of e-procurement	Responses					MQS	Ranks
	5	4	3	2	1		
Computer virus and worm attacks	43	0	0	0	0	5	1.5
Unreliable internet services	43	0	0	0	0	5	1.5
Confidentiality/ leakage/hacking	40	3	0	0	0	4.93	3
Software Non-compatibility	38	4	1	0	0	4.86	4
Legal liabilities; Interpretation of laws	36	6	1	0	0	4.81	5
Lack of widely accepted standards	36	5	2	0	0	4.79	6
Unreliable electric power supply	33	8	2	0	0	4.72	7
Dishonest attacks of financial transactions	30	10	3	0	0	4.63	8
Human resource risk	22	13	8	0	0	4.14	9
Time and money wastage	8	26	9	0	0	4	10
Unethical practices	6	18	10	9	0	3.49	11

A shortage of power supply in Tanzania was also viewed as a risk of e-procurement use by construction companies. Additionally, unreliable telephone and internet services in some parts of the country were found to be putting users at risk in remote areas. However, shortage of internet services was reported not to be a big problem to urban areas although ensuring its reliability was stated to be costly. This conforms to a study on e- procurement challenges in Tanzania that had delineated unreliable power supply as a challenge [21].

Dishonest attacks of financial transactions were also viewed as a risk factor in this study. This has been likewise acknowledged [9] as a risk factor through credit cards and database being leaked or hacked by unauthorized personnel resulting into financial attacks and thus financial loss. Risk of technical malfunctioning or failure of tenders' portal is a recognized threat [20]. Respondents also indicated that tenders have deadlines for submission and during submission, just like other websites, the system may be loaded or jammed to an extent that it fails to open to enable submission of tenders. However the PPRA, who is the public authority for procurement and one of the respondents, assured users through interview that once this system is implemented in Tanzania, proactive measure shall be in place to redress such incidences. The respondent stated that all tenderers that had tried submissions or logged in the tender portal during submission time and proven to encounter such problems will be given a chance to submit. However the authors' view such action has a potential of creating legal wrangles in its implementation.

Respondents' view was that corruption is not a risk at all to most construction companies. This they reiterated is based on the fact that that there is no face to face interaction among users from different areas, a situation which facilitates the rate of corruption in procurement. Time and money wastage was observed not to be a big threat by the study, contrary to what was observed in England [15].

Conclusively prominent risks of e-procurement use in Tanzania construction industry were viewed to include: computer virus and worm attacks, shortages in internet services, breach of confidentiality of information, non-compatibility issues, legal issues, lack of widely accepted e-procurement standards, shortages of power supply, dishonest attacks of financial transactions and human resource risks.

Strategies of managing risks of e-procurement by construction companies were established as viewed by the respondents (Table 4).

From Table 4, the top ranked strategies are for firms to have in place good management, monitoring and accountability system; a strategy also advocated in [10]. This is followed by the need to have procurement guidelines that adequately support e- procurement and possession of good e-procurement skills. Training in ICT and being conversant in e- procurement as a strategy concurred with studies of ICT adoption in the construction sector [22]. As also stated in a study of e-procurement adoption challenges in Tanzania [21], a reliable power supply through back-up power shall minimize risks associated with power shortages.

Table 4. Respondent's view on strategies for managing e-procurement risks by construction companies

Strategy of mitigating risks of e-procurement	**Responses**					**MQS**	**Rank**
	5	4	3	2	1		
Good Management, monitoring system	43	0	0	0	0	5	1
Procurement guidelines support e-procurement	40	3	0	0	0	4.93	2
Possession of good e-procurement skills	40	2	1	0	0	4.91	3.5
ICT trained actors; e-procurement conversant	39	4	0	0	0	4.91	3.5
Procurement Act supports e-procurement	40	1	2	0	0	4.88	5
Knowledge of products; services procured	39	2	2	0	0	4.86	6
An assured reliable power supply (electricity)	38	2	3	0	0	4.81	7.5
Hardware and software are availability	35	8	0	0	0	4.81	7.5
Accessibility to telecommunication system	33	6	4	0	0	4.67	10
Trustworthiness of actors	38	0	5	0	0	4.65	11.5
Improvement of Telephone and internet networks	30	11	2	0	0	4.65	11.5
Good network speed and quality	24	12	5	2	0	4.35	13
Maintenance and repair services availability	24	14	5	0	0	4.44	14
Rules of network errors are in place	25	9	4	5	0	4.25	15
Total	**488**					**≈ 5.00**	

5. Conclusions

The study has established that key stakeholders in the industry agree that, the use of electronic procurement in construction companies in Tanzania is associated with various risks. Prominent potential risks include, attacks by computer virus and worms, unreliable internet and electrical power supply, non-compatibility of technology, lack of assurance on confidentiality of information and dishonest attacks in financial transaction. These results conform to those on a case study of a Malaysian company that technology, infrastructure, legislation, environment, resource constraints, organizational and management characteristics contribute to the success of e-procurement implementation [4]. It is however acknowledged by the authors, though the barriers identified by the study for Tanzania companies seem to be similar to those of the Malaysia company case, the magnitude of the barrier is of a different scope. This is in reflection to the notion that correlates advancement of an economy to an advancement of information technology infrastructure [5]. The authors are of the view that the same applies for reaping the benefits of e-procurement. Where there are massive volumes of business transactions, there are higher transaction costs that may be saved through e-procurement. The challenge that may emerge for Tanzania is to weigh the cost of losing human labor [12] through the replacement of manual activities by automation and the gain on a reduced transaction costs.

The findings of the study have further validated the conceptualized framework (Figure 1). Essentially, a realization of potential risks that companies may face in e-procurement and the requirement to have interventions. These interventions have to be of legal, technical, resource and organizational nature.

The study has come up with strategies towards the mitigation of such risks and has made recommendations towards a successful use of e- procurement by construction companies in Tanzania. That, construction companies should engage IT professionals so as to curb risks associated with computer virus, worms and dishonest attacks of financial transactions. Construction companies should accept technological changes and be conversant with e- procurement so as to gain from its inherent benefits of efficiency through volume purchases, and reduction of transaction costs. Lastly, since the Government is the sole provider of electrical power supply in Tanzania, a factor external to companies, they are advised to have alternatives sources of power as back-ups such as the use of standby generators and solar energy.

5.1. Limitation and Contribution to the Study

The study has limited its scope to potential risk factors in the Tanzania construction industry hence the results are influenced by the nature and characteristics of the industry. However it is the authors belief that developing countries of similar economies and cultural set up could benefit as well as these are among the variables that shape e-commerce of which e-procurement belongs [5]. Since e-procurement is not as yet practiced by construction companies in Tanzania, there is a possibility that had the study been undertaken when companies have had the opportunity to use the system, different results could have been obtained or a relatively firm affirmation of what has been found could have been done.

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