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Adoption Of E-
Procurement Technology
In Uganda: Migration
From The Manual Public
Procurement Systems To
The Internet

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ABSTRACT

Many public sector entities in Uganda face the challenge of delivering goods and services to consumers due to procurement constraints. The increased losses in the public procurement processes have been attributed to low adoption level of e-procurement as the ordinary manual procurement process has been blamed to be time consuming and has consistently scored low on achievement of value for money and transparency. Most Public Procuring and Disposing Entities (PDE's) do not know how to adopt electronic procurement systems due to lack of understanding of procurement process automation. Yet, with the increased level of technology and automation, e-procurement is a necessary innovation that can increase level of efficiency and effectiveness of PDE's. This study examines the e-procurement practices for adoption, the willingness and readiness to adopt e-procurement and investigates the challenges to the adoption of e-procurement practices in Uganda's PDE's. A quantitative and cross sectional survey was conducted using simple random sampling to select respondents from whom data was collected using self-administered questionnaires. The research enhances our understanding of e-procurement systems as the best practice technique in modern e-procurement system, an area which has been given less attention. Practical contributions are also discussed.

1. INTRODUCTION

Electronic procurement or e-procurement is the use of various forms of Information Technology (IT), such as electronic mail, Electronic Data Interchange (EDI) and electronic market place to automate and streamline the procurement process in government entities, improving efficiency and transparency and thereby reducing costs of operation within and between government entities (Joyce & Chan, 2002). Thus, e-procurement is the application of electronic commerce in procurement.

E-procurement adoption refers the ability of procurement entities to use the Internet and Internet technologies to support their procurement processes. It encompasses the willingness and the level of acceptance to use e-procurement. These practices range from identification, evaluation, negotiation and configuration of optimal groupings of trading partners into a supply chain network which can then respond to changing market demands with greater efficiency (Hawkins & Wyld, 2003). Other benefits include: increased compliance with the law, for instance, Ugandan Public Procurement and Disposal of Assets-(PPDA) Act (2003); supply base rationalization, as e-Procurement allows managing the supply base in a more efficient and effective way. E-Procurement also provides higher transparency to both customers and suppliers on the overall purchasing process. The increasing losses in the procurement processes in the PDEs have been attributed to low adoption level of e-procurement as the ordinary procurement process has been blamed to be time consuming and has consistently scored low on achievement of value for money and transparency (National Procurement Baseline Survey, 2010). Thus, the adoption of e-procurement practices in Uganda's PDEs needs to be treated as a

matter of urgency in order to achieve reduction in purchasing process costs through maverick buying reduction.

The manual procurement practices remain the most widely used in Uganda's public entities. These manual systems have a significant input on the transaction costs of sourcing and payment for goods and services and therefore there is a need for transformation with a dynamic swing to an e-procurement system which can be used for improved and swift delivery of services to citizens.

The PPDA Act (2003), provides for e-procurement in article 224 (3), and article 225 (3) where a notice of the evaluated bidders have to be displayed on the Public Procuring and Disposing Entities' (PDEs') notice boards and on their websites and that a contract award shall be displayed on the PDEs notice boards and their websites respectively. Additionally, the PPDA regulation 39 (2) requires every PDE to display on their notice boards and websites bid notices, best evaluated bidder notices, shortlists and awarded contracts among others. Despite these legal provisions the bid notices and contract award notices are rarely displayed on the PDE websites, moreover many PDEs lack websites.

Further, the Government of Uganda in 2010 drafted and passed the National Electronic Government Framework where e-procurement is high-lighted as one of the key result areas. It envisions improved transparency, accountability and making credible timely information available to all citizens while providing services in an efficient and effective manner (National Electronic Government Framework, 2010). However, the National Electronic Government Framework (2010) has not helped much.

Again, in April 2011, government developed a tender portal containing tender related information including tender notices, best evaluated bidders and contract awards for both procurements and disposals, on which PDE's are supposed to upload relevant information. PPDA Authority compliance checks (2009-2014) have consistently indicated most PDEs do not upload relevant information on their websites.

For instance, despite the regulatory framework providing support for the adoption of e-procurement, the Procurement Compliance Check Report (2009) undertaken on 25 PDE's indicate that level of e-procurement adoption in most PDEs is critically low and lacking in most cases. Subsequently, the report strongly recommends that the PDE's should always post the Best Evaluated Bidder notices and notices of contract award on the procurement notice board and PPDA website or statutory display period in accordance with PPDA Regulation 224 (3) and PPDA Regulation 225 (3). However, up to now most PDEs never display their notices on their websites of best or any evaluated bidders as approved by contracts committee regarding the award of contract.

Yet, an empirical study by Brack (2000) found that the conversion from paper based to e-purchasing resulted into a reduction of 5-10% purchasing price, 25-50% reduction in inventory level, a 5 day reduction in procurement cycle time and US \$ 77 savings in requisition and administrative costs. These findings were

justified by Min & Galle (2003), and Roth (2001) who found that the major e-procurement benefits include: cost savings and subsequent increase in Return on Investment (ROI) as a result of reduced paper transactions, shorter order cycle time and reduced inventory due to faster transmission of order related information among others. The adoption of e-procurement is therefore, potentially meant to enable PDEs enjoy the above benefits.

Each PDE through its Procuring and Disposing Unit (PDU) is mandated to procure supplies and services for the public in its PDE in the country. Although each PDE has a well laid ICT infrastructure in terms of computers and an internet platform, most entities are yet to adopt e-procurement system and practices. A review of the procurement and contracting activities of each entity by the PPDA Authority revealed that performance was very poor.

According to the PPDA Audit Report (2010/2011), of the aggregated value of 46 procurement files reviewed, 98.6% was rated high risk, 1.2% was rated as medium risk, and 0.1% was rated as low risk while only 0.2% was rated satisfactory. The key underlying factor for the poor performance was poor record keeping, where it was found that only two procurement action files had completed records and eighteen files were not available for audit. Other indicators of poor performance were; failure to have a procurement plan, failure to conduct evaluation processes as per the methodology stated in the solicitation documents, failure to issue notice of best evaluated bidder and failure to keep contracting and contract performance documentation. As a result, most of the procurements were delayed by the manual approval of procurement requisitions, evaluation bids and delays in award decision making causing low absorption of funds leading to poor service delivery in the public sector and failure to achieve the targeted goals for the population and the country.

For instance, the Auditor General's report (2010/2011) on Ministry of Education and Sports reported that 47% of procurements were not completed on time due to delays caused by the manual approval of procurement requisitions, evaluation bids and delays in award decision making. The report also noted that, there was low absorption of funds for example under APL1 World Bank Project for construction of schools, where UGX 38 billion shillings was allocated for the year ended 30th June 2010 but only UGX 14 billion was spent representing 37.2 percent of the budgeted expenditure. Given the public sector expenditure on purchasing processes characterized by procurement delays, alternative methods of procurement should be considered and it is urged that e-procurement adoption can free resources from purchasing tasks and improve efficiency.

While research concerning adoption and practices of e-procurement by public organizations located in what may be referred to as more developed economies seemingly continues to grow and mature, most of the existing literature involving less developed countries is relatively young, speculative and anecdotal, and still lacks sound theoretical explanations for limitations of adopting e-procurement. In addition, the paucity of

empirical research coupled with the absence of comparative studies make understanding the basis for the aforementioned problems, difficult. Consequently e-procurement in less developed countries like Uganda is clearly understudied and not well understood. The purpose of this study is to examine the e-procurement practices for adoption, the willingness and readiness to adopt e-procurement and investigate the challenges to the adoption of e-procurement practices in Uganda's PDE's. In doing so, this research makes a contribution to an area of study clearly in need of additional research.

2. LITERATURE REVIEW

Much of the literature in user adoption and acceptance research investigates user attitudes and beliefs to predict user adoption and user acceptance of specific information systems and technologies. Four key theories have been reviewed and will be the basis of this study: the Diffusion of Innovations, Theory of Reasoned Action, the Technology Acceptance Model as well as the Unified Theory of Acceptance and Use of Technology.

2.1. E-PROCUREMENT PRACTICES FOR ADOPTION

Information and Communication Technologies are changing the way organizations do business, particularly the adoption of e-business and e-commerce. E-procurement is an example of e-business and e-commercial activity. It has been defined as the use of information technologies to facilitate business-to-business (B2B) purchase transactions for materials and services (Wu et al., 2007). The scope of e-business includes information exchange, commercial transactions and knowledge sharing between organizations (Croom, 2007), whereas e-commerce focuses only on commercial transactions (Cullen & Webster, 2007). Some of the technologies associated with e-commerce include websites, e-mail, extranets, intranets and EDI (Mclvor & Humphreys, 2004). The following are the e-procurement practices for adoption.

Registration process of users

According to the State of the Art Report a full tender documentation should be possible to be browsed and/or downloaded by suppliers with the minimum effort. If a Contracting Authority requires a supplier to be registered before viewing /downloading the full tender documentation, the registration process should be as simple as possible. Apart from the registration process as such, registered users need to be given the appropriate access rights to the stored data, as well as, the actions they can perform on that data. The registration details of suppliers need to remain secure in order to satisfy the confidentiality and equal treatment principles.

Electronic submission of tenders

The e-tendering phase primarily consists of the electronic submission of tenders. In the restricted procedures, a preliminary selection stage is involved, when only qualified suppliers are invited to submit a tender.

According to the State of the Art Report the system needs to be in a position to identify and authenticate a supplier during the submission process. The authentication of suppliers is a very sensitive area, as stakeholders need to find a balance between two slightly contrasting issues; interoperability and security. The first principle implies the creation of an operational environment where all suppliers can participate to competitions using interoperable tools, satisfying minimum requirements. The second principle implies the possibility to verify suppliers' identity in an electronically secure way. A crucial functionality for an e-Procurement system is its ability to "lock" all submitted tenders until the pre-defined tender opening time and/or until designated procurement officers authorize the opening of Tenders following simultaneous action.

Mechanism for encrypting and locking submitted tenders

According to the State of the Art Report, the French DPSM system has developed a mechanism for securing the transmission and storage of supplier tenders. Through this mechanism, when a supplier uploads a tender to the e-Procurement system, a virus check is performed first. Assuming no detection of a virus, the document is encrypted according to a private key which is created for each competition. Subsequently, the tender documents are stored in a secure hosting environment, until their opening time. Only the president of the contract awarding committee can obtain the private key for decrypting the tender documents, which in turn can be obtained from the system only after the expiration of the e-tendering deadline.

Functionality of updating a tender

Further to the submission of tenders, and assuming the deadline for tender submission has not expired, a supplier can be provided with the functionality to update his submitted tender documentation. A version control mechanism may be used in this area, so that previous versions of documents are not completely discarded from the system, as this may be in use in cases of disputes or reporting purposes by the Contracting Authority.

Tender opening

The opening of bids is a sensitive phase of the e-procurement procedure, as during this process the Contracting Authority gains access for the first time to the full tender documentation from all tenderers. According to the State of the Art Report the European legislation defines that the access to data transmitted electronically by tenderers' can be possible only through simultaneous action of different authorized persons. The Contracting Authority can have a dedicated space for each tender, where the submitted tenders are stored until the opening phase. A crucial procedure that needs to be followed during tender opening is to analyze the system logs and identify any attempts for accessing the tender documents during the locking period, as well as, if these attempts have been successful. If such an incident is captured, the Contracting Authority may have plans in place for handling the situation.

Publishing Notices

According to the State of the Art Report this involves preparation and publication of notices to official electronic notice boards. The e-notification phase mainly consists of the publication of Preliminary Information Notices (PINs), Contract Notices (informing suppliers of new business opportunities), Corrigenda and Contract Award Notices (reporting the result of a competition). The publication notification requirements depend on the chosen awarding procedure.

Electronic signatures

Electronic signatures are used for ensuring the proof of origin of electronically transmitted documents. According to Schlosbon (2014) an electronic signature is referred to as a person's electronic expression of his or her agreement to the terms of a particular document. According to the State of the Art Report Advanced electronic certificates are issued by Certification Authorities (CA) and are used for producing electronic signatures by their possessors. An electronically signed document guarantees the identity of the person who signed it. Furthermore, electronically signed documents ensure the consistency of the data of an electronically transmitted document. If a signed document is tampered, the signature is automatically invalidated. Therefore, the usage of advanced electronic signatures could be the ideal medium for ensuring the authenticity of tenderers and the integrity of data submitted by tenderers.

Audit trailing and tracking

According to the State of the Art Report, a cornerstone principle on e-Procurement imposed by the EU legislation is that of traceability; the ability of the system to record all its interactions with users in system logs. The objective is to enhance the desired security aspect, as such logs can be analyzed and provide legal evidence on system failures or irregular activities.

Reporting and timely updates

The EU legislation requires Member States (ME) to be in a position to report the ongoing or completed procurement competitions upon request from the EU. Reports should normally include details of the contract notice, the details of the admitted tenderers (including reasons for their selection), the rejected tenderers (and reasons), the successful tenderer (and reasons). Reports should provide details about the negotiation procedure, reasons for pausing an e-Auction and reasons for not awarding a contract. Suppliers wish to know their performance in one-off competitions and sales through their e-Catalogues. Contracting Authorities want to understand their spending policy, as well as, the savings achieved through the use of the e-Procurement system.

Integration with financial systems for automated invoicing and payment

Significant benefits can be achieved by integrating an e-procurement repetitive purchasing system to the financial systems of Contracting Authorities and suppliers. Such integration can facilitate automated invoicing and payment, through constant status monitoring and automated settlement processes. Such integration can achieve significant benefits for both buyers and suppliers, not only in terms of time saving, but also by allowing the error-free storage and analysis of Contract Authorities' spending and suppliers' sales.

Capability to manage volume Capacity for concurrent submissions at the closing time

A common issue with e-procurement is the submission of tenders very close to the e-tendering deadline. Suppliers usually define their best offer for a business opportunity until the closing hours of the e-tendering phase and they submit their offers almost simultaneously a few hours or even minutes before the closing time. This in turn can potentially generate difficulties, as the IT infrastructure needs to cope with the concurrent submissions, without creating unavailability or disruption problems. According to the State of the Art Report there is need to establish submission deadline extension policies, which detail precisely the conditions and actions to be taken when system failures occur during the closing stages of e-tendering, due to volume capacity problems and to use monitoring tools to closely supervise the behavior of the system (residing servers, underlying network functioning) in order to identify potential and actual problems and be in a position to take appropriate actions. If an extension to the submission phase is given, all participating suppliers need to be promptly notified of the new deadline.

Platform for Supplier Contacts

This another e-procurement activity identified in literature. In this case the buyers' request for quotes, Request For Proposals (RFP), request for information and bids are all contained in supplier contact. Rink and Fox (1999), include supplier contact as part of the procurement activities in any stage of a product-life cycle, from requesting for quotes, to requesting for volume discounts and bids. Segev et al (1998), report that the RFP ranked third in frequency-of-use as a negotiation technique, after face-to-face contact and bids.

2.2 WILLINGNESS AND READINESS TO ADOPT E-PROCUREMENT

The willingness and readiness to adopt e-procurement has several indicators among organizations. While some these indicators are organization specific, others are strategy inclined while some are policy related. Despite the great benefits of e-procurement technologies, their adoption is still at their early stages (Davila et al. 2003). A variety of factors may affect a firm's decision to adopt and implement a particular ICT. Kwon and Zmud (1987), classified the variables that potentially influence ICT adoption into five broad categories; individual, task and innovation related, organizational and environmental characteristics. Petterson et al., (2003), also showed that the following organizational and positively affected the adoption of ICT in SCM: organization size, decentralized organizational structure; supply chain strategy integration; transactional

climate and supply chain member pressure and environmental uncertainty. Kwon & Zmud (2987), also suggested that these factors may be important to differing degrees depending on the context or technology. Literature further raises the following willingness and readiness factors in adoption of e-procurement.

Organizational factors

The main organizational factors that appear to impact on the likely adoption of e-procurement are size of the organization and type of operation. Frohlich, (2002), found that e-Procurement is more evident in bigger organizations than smaller ones. Small to Medium Enterprises (SMEs) often lag behind larger organizations in e-procurement adoption. Harland et al. (2007), and Berlak and Weber (2004), attributed this to owners' attitude, resource poverty, limited IT infrastructure, limited knowledge and expertise with information systems. Nonetheless, Harland et al. (2007), argued that e-procurement adoption can be viable for SMEs through either web-based enterprise cooperation or if the SMEs can see the business case for e-adoption.

It is also argued by Melville et al. (2004), that some types of organizational operations seem to lend themselves to e-procurement. The use of e-procurement applications often goes hand-in-hand with repetitive purchases from suppliers, reducing human intervention and paperwork and often resulting in improved performance for buyers and suppliers (Sanders, 2005; Subramani, 2004). Therefore, it is likely that in organizations where the use computers is common and there is readily available internet, the adoption of e-procurement would become easier than in organizations where there is no computer and internet usage.

Readiness factors

Mehrtens et al. (2001b) argue that organizational readiness and external pressure impact on e-business strategy. Many firms are experiencing a number of major problems in implementing e-business projects, due to hasty decisions in the presence of considerable media and software vendor hype, and often no theoretical basis behind the determination of which applications are most appropriate (Cox et al., 2001). To attain the greatest benefits, purchasing processes should be evaluated and improved before adopting e-procurement tools (Presutti, 2003). Internet technologies enable integration with trading partners, yet amplify the need for fundamental organizational change (Power & Singh, 2007). B2B seller competence depends on change disposition (Rosenzweig & Roth, 2007) within the organization.

Some organizational change fundamentalists have argued that there is need to integrate the need for e-procurement adoption amongst the solutions to the dissatisfier in the organization. Usually e-procurement is viewed as a solution to a common implanted or genuine dissatisfier in the organization, the rate of consideration and adoption of the technology is likely to be high. While Osmonbekov et al. (2002) argue that lack of readiness has been attributed mainly to human readiness, there is need for procurement managers to ensure their own organizations are ready for e-adoption (Hartley et al., 2006). This is because Frohlich (2002) found that internal barriers to e-adoption are more significant than customer or supplier barriers. This

argument further points to how procurement managers in the PDEs have guided the entity in preparation of all stakeholders to adopt changes in the procurement process. It is not surprising therefore that e-procurement adoption sometimes gets shot down from the procurement departments for lack of readiness even amongst the procurement officers.

Supply factors

E-procurement is more likely to be beneficial in dispersed supply chains as it helps coordination (Liao et al., 2003). Different actors in supply chains have got different power, legitimacy and urgency to implement e-procurement and e-procurement can have an effect on trust in supply chain relationships (Gattiker et al., 2007; Klein, 2007). Lack of assistance and the structural inertia of large organizations in supply chains can be a disincentive to implement e-business (Zhu et al., 2006). Different industries show different propensities to e-procurement adoption, related to existing use of information exchange infrastructures prior to the advent of the internet (Cagliano et al., 2005).

The greatest benefits of e-business occur when its application is fully integrated throughout the supply chain (Currie, 2000). Some literature has pointed to the possibilities of greater integration and collaboration across e-business-supported supply chains (McIvor & Humphreys, 2004). E-procurement is more likely to be adopted if it is perceived that suppliers have capability to deal with it; there are difficulties in integrating information systems across firm boundaries in supply chains if suppliers lack capability (Bagchi & Skjoett-Larsen, 2003).

Strategic factors

There is a growing adoption of e-values amongst organizations that want to take poll position in the industry they operate on. A company may adopt e-technologies as part of its overarching business strategy, contributing to improving firm performance and increasing competitive advantage. Wu et al (2003) argues that the strategic use of e-business has been considered in several studies, and how e-business strategy aligns with the overarching business strategy of a firm. As argued by Porter (2001), this means that the Internet has become a powerful source of competitive advantage if it is integrated in firms' overall strategies.

Soliman and Youssef, (2001) posit that an e-business strategy should specify the aims, goals and context of the application; these choices should be aligned with other organizational and managerial choices, and integrated with the organization's processes. This is supported by studies by Graham & Hardaker (2000), who suggest that if organizations are being strategic in their e-procurement adoption, they may have a specific e-procurement strategy, and that this will align with broader organizational strategy. In the long run organizations shall avoid over riding strategic direction competences. However, what is most important is to ensure that there is organizational buy in from all stakeholders to avoid implementation shortfalls.

Policy factors

Policy factors relate to the environmental guidelines provide by the oversight bodies in relation to the e-procurement adoption. Though public procurement can be used to support broader government policies, through both traditional and e-procurement processes an electronic procurement can be seen as a policy tool to support the delivery of public procurement policy, improving transparency and efficiency (Carayannis & Popescu, 2005; Croom & Brandon-Jones, 2005). A favourable environment needs to be provided by policy to ensure its success. This is because e-procurement can assist a government in the way it does business by reducing transaction cost, making better decisions and getting more value (Panayiotou et al., 2004). The National Electronic Governance Framework (2010) also recommends e-procurement adoption in Uganda. Therefore, with ever-advancing capabilities of technology being an important driver of e-procurement implementation for PDEs and businesses, there is no doubt that e-procurement can facilitate improved accuracy, reduced clerical work, reduced order-cycle time, and increased productivity (Hayword et al., 2001). Therefore, an important driver towards e-procurement adoption and implementation is the realization of the potential benefits that may be achieved with its adoption especially by PDEs where the biggest expense of taxpayer revenue is.

2.3 CHALLENGES TO E-PROCUREMENT ADOPTION

The PDEs' adoption to e-procurement is certainly one of the grounds where the digital divide is more pronounced globally. Even with the high public expenditure on ICTs to aide procurement in the developing countries, there has not been commensurate adoption of e-procurement in their PDEs. This is attributed to several e-procurement adoption challenges including these highlighted below:

Reluctance to Change

Users' reluctance to changes in business processes was identified by Day et al. (2003) as a major barrier to the implementation of e-procurement systems. Whenever change is proposed in most institutions, there is a high level of reluctance from the members (employees) in these institutions. The reluctance is born out of the uncertainty associated with the change. Change Management literature has identified lack of mass buy-in to the proposed changes as a critical cause of such reluctance by employees to adopt proposed changes.

Perceived Risks

In another study, Saeed and Leith (2003) examined buyers' perceptions of e-procurement risks and arrived at three dimensions: Transaction risks resulting from wrong products purchased due to incomplete or misleading information; Security risks resulting from unauthorized penetration of trading platforms and failure to protect transaction related data while being transmitted or stored; and Privacy risks arising from inappropriate information collection and information transparency. It is possible these risks limit the adoption of E-procurement in PDEs because these perceptions apply to suppliers and buyers alike. One such perception is

the worker apprehensions about being replaced by automated procurement systems. Therefore until there is certainty about the above perceptions, it is possible e-procurement adoption shall remain a myth.

Fear of Competition

Dai and Kauffman (2002) uncovered a number of issues relating to whether the market place was ready to take on B2B services, particularly those of e-procurement exchanges. In their findings they realized that there were inequities in power valence between and among trading partners participating in electronic environments like B2B exchanges. They realized that since most of the power was held by channel masters there would be challenges accompanying building a single point-of contact between a large multi-unit business firms that want to offer a single B2B interface to its corporate customers. They found that trading partners would have to make changes in the way they manage their customers and the way its customer relationship management functions work. This usually breaks the trust and the resultant reluctance to share data and information.

Transaction Costs

Lee and Clark (1997) identified transaction cost economics as a challenge to adoption of e-procurement. They also argued that there are several associated risks in setting up electronic market mechanisms such as opportunism by unscrupulous market participants and asset specificity. The latter has to do with the need for a firm to commit certain resources to deploy IT applications and infrastructures needed to link its internal business processes with those of the e-marketplace trading platform. They note that sometimes these integration links are complex which makes it difficult to transfer use of such connections with other trading platforms or trading partner networks.

Establishment costs

Attracting suppliers to an e-procurement service can be a significant obstacle, as this signifies changes to the way they conduct business with the public sector. This most probably involves significant costs. In particular SMEs that are often lacking funds or IT expertise, might consider e-procurement as a significant obstacle in conducting business with the public sector. This can result in exactly the opposite outcome from what the country wishes to achieve. Rather than creating an open-competition and equal-treatment-to-all environment, it can create procurement environment where only certain types of suppliers participate in the process.

Privacy and security

While investigating the adoption of e-procurement in Singapore, Kheng and Al-Hawandeh (2002) found that there were concerns over security and privacy of procurement transaction data. Secondly security requires significant investments in hardware, software, and personnel training to participate in e-procurement are prohibitive. Third, the laws governing B2B commerce, crossing over to e-procurement, are still undeveloped. For instance, questions concerning the legality and force of e-mail contracts, role of electronic signatures, and

application of copyright laws to electronically copied documents are still unresolved. Fourth, technical difficulties related to information and data exchange and conversion such as inefficiencies in locating information over the internet using search engines and the lack of common standards that get in the way of the easy integration of electronic catalogs from multiple suppliers.

Virus protection & protection from malicious attacks

An e-procurement system usually involves the execution of several activities outside of the context of the system. In particular, during the e-tendering phase, most reviewed e-procurement systems allow for the preparation of supplier tenders in document processing applications, usually using the MS Office software, or similar popular applications. This in turn means that a supplier computer infected by a virus can potentially generate tender documentation which includes dangerous computer viruses. Although it is relatively straightforward for a computer system to virus -check the tender documentation when received by a supplier, the complication arises with regards to the validity of a virus infected offer. Another major threat for Internet based systems is that of malicious attacks. In the recent years, there are numerous examples of malicious attacks to the most prestigious Internet systems. It appears that no matter the provisions in place, attackers can still achieve their aims in breaking into systems, or making them unavailable for a period of time.

Electronic signatures

The drawback in utilizing this technology is the limitations in interoperability. Each Certification authority (CA) establishes its own methods for modelling this technology, usually abiding to local or national rules. The various CAs do not necessarily interconnect and therefore suppliers that have a certificate from a CA are not necessarily trusted by another CA. This in turn means that a fully interoperable system needs to trust all CA, which is difficult to achieve. Furthermore, the time for obtaining the necessary software or hardware from a CA is usually lengthy and may require the physical presence of a supplier in the CA premises for approval. These issues make the utilization of certificates and electronic signatures in an e-procurement system a significant hurdle for interoperability, potentially excluding suppliers from taking part in a business opportunity.

3. RESEARCH METHODS

3.1 INTRODUCTION

This section describes the procedure for carrying out the study including; the research design, study population, sample size and sampling procedure, data collection procedures, and data analysis procedures.

3.2 RESEARCH DESIGN

The study adopts a quantitative and cross sectional survey design since it aims at considering information at a specific period of time. This is in line with the researchers' plan aiming at; getting to know issues relating to

the e-procurement practices for adoption, the willingness and readiness to adopt e-procurement and the challenges to the adoption of e-procurement practices in Uganda's PDE's.

3.3 DATA TYPE AND SOURCE

The research study was carried out with a focus on mainly primary data of research. This was considered to be the case because of the little (scarce) information available in report form or any other form of data storage in the places selected as case study for the research. The researcher was able to get the necessary primary data from the different state owned PDEs in Uganda.

3.4 STUDY POPULATION

A total of 177 central government PDEs were considered in this study as the population. These have been selected basing on the records of PPDA in relation to the list of PDEs all over Uganda (PPDA, 2014). The PDEs are in categories of commissions, hospitals, ministries and parastatals, etc. In addition, 177 pre-qualified suppliers were identified and one supplier per PDE was considered.

3.5 SAMPLE SIZE AND SAMPLING DESIGN

All the 177 central PDE's were studied. The Census method has been recommended for public procurement research projects where there are limited numbers of entities. For each central PDE, the accounting officer, at least one member of the contracts committee and at least one member of procurement and disposal unit (PDU) were interviewed. These are considered to be more knowledgeable in the issues of the research, as they are responsible to manage procurements on an on-going basis. In addition at least three heads of any three user departments (US) were considered because they constitute the main users of the services provided and are more informed on procurement process. Likewise, 177 suppliers were examined considering at least one approved supplier per PDE. Suppliers can greatly influence adoption of e-procurement.

3.6 DATA COLLECTION

Questionnaires were issued to staff of the selected PDEs so that they were able to provide information in relation to the study on behalf of the entity. The questionnaires were designed according to the objectives of the study to enable the researcher to elicit information from respondents on all the aspects of study.

The questionnaires was closed ended questions designed according to the objectives of the study. The questionnaire approach was selected because it was anticipated to give the respondents freedom to fill at their convenience. The instrument has a capacity to motivate the respondents to participate in the research survey with ease. Additionally, the instrument enables the researcher to get information from a wide geographical area. The questionnaires enabled the researcher to reach many respondents in a short time. The questions were designed using a 5-point Likert Scale from 1 (strongly disagree) to 5 (strongly agree). This requires the respondents to select the most appropriate response and tick.

3.7 MEASUREMENT OF VARIABLES

The variables were quantified on a five scale likert scale and the e-procurement practices adoption, use and limitations were measured using the e-procurement provisions of the PPDA Act (2003).

3.8 RELIABILITY AND VALIDITY OF THE INSTRUMENTS

For quality control, the research instrument was pre-tested to ensure validity and reliability. Pretesting was done to show whether the instruments are valid, have no repetitions, not bulky, simple to interpret and easy to understand.

3.9 DATA MANAGEMENT AND ANALYSIS

Collected data was compiled, sorted edited and coded to have the required quality, accuracy and completeness. It was later entered into the computer for analysis using Statistical Package for Social Sciences (SPSS) to generate results and findings. Tabulations for means and standard deviation were used to show the degree to which respondents agreed with the asked questions.

4. FINDINGS

4.1 RESPONSE RATE

Of the 708 copies of the questionnaires that were initially sent out, 604 usable questionnaires representing 85.3% response rate were returned and analyzed using SPSS version 17.0.

4.2 DEMOGRAPHICS

According to gender 32.6% of the respondents were females while 64.4% were males. This suggests that the Ministry employs more male staff than females. In terms of age bracket, the results that majority of the respondents to the study were aged between 31-40 years of age (40%), followed by those aged 41-50 years (31.1%). Those aged between 20-30 were 17.8% followed by respondents above 50 years of age (11.1%) who constituted the least number of participants. Additionally, majority of the respondents were Bachelor's degree holders accounting for 51%. These were followed by Master's degree holders who constituted 22.4% of the respondents. Only 12.5% consented to being professional programs holders, 8.1% being diploma graduates, 4% as PhD holders and the least being UACE holders at 2%. The results further indicate that majority of the respondents were Staff in the User departments (60%), followed by the prequalified suppliers (15.6%), closely followed by the heads of User departments (13.3%). The least respondents were the Procurement and Disposal Unit staffs who were 11.1% while no Accounting Officer was found to participate in the study.

4.3 THE E-PROCUREMENT PRACTICES FOR ADOPTION AT THE MINISTRY OF EDUCATION AND SPORTS

The results in the table 1 show the e-procurement practices for adoption at various central government PDEs in Uganda. Mean values ranging from 2.99 and below reflect disagreement with the assertion, 3.00-3.99

reflect uncertainty, while Mean values of 4.00 and above reflect respondents' agreement with the phrases raised in the questionnaires.

Table 1: The e-procurement practices for adoption

The e-procurement practices for adoption	No	Min	Max	Mean	SD
PDE has invested a lot of resources in trying to identify the best e-procurement strategy	604	1	5	1.92	0.42
The PDE is cautious about adopting to e-procurement measures until a better strategy has been identified for PDEs	604	1	5	2.66	0.65
The PDE acquired a specific software that enables all stakeholders to participate in the procurement process on line	604	1	5	3.41	0.77
Software developers were contracted to develop an in house platform to facilitate e-procurement	604	1	5	2.09	0.70
There is a website portal that enables e-procurement processes at the PDE	604	1	5	3.30	0.59
Requirements by the Ministry are posted on their web sites to inform providers	604	1	5	2.78	0.54
PDE user departments place their bids to acquire goods or services online for suppliers to supply	604	1	5	2.24	0.69
Service providers are caused to compete against each other to get a contract via an online facility	604	1	5	3.31	0.74
PDE joins other entities for a joint negotiation to get aggressive discounts	604	1	5	3.78	0.66
PDE has attempted to vet providers against quality service and delivery standards	604	1	5	4.18	0.61
E-procurement may lead to downward price pressure on providers that may in turn create quality issues	604	1	5	3.88	0.54
E-procurement provides opportunities for hackers to paralyze entity operations	604	1	5	3.63	0.60
Benefits far exceed expenses of moving to E-procurement (cost benefit analysis)	604	1	5	4.39	0.83
E-procurement will improve efficiency, faith in transactions, data integrity and security.	604	1	5	4.13	0.60
It is easy to integrate E-procurement solutions with the legacy and financial system.	604	1	5	3.30	0.59

The results from Table 1 indicate that the PDEs have not invested a lot of resources in trying to identify the best e-procurement strategy (M=1.92), that the PDEs are cautious about adopting to e-procurement measures until a better strategy has been identified (M=2.66) and uncertainty was expressed by the respondents regarding whether PDEs acquired a specific software that enables all stakeholders to participate in the procurement process on line (M=3.41). The study results also reveal that no software developers were contracted to develop an in house platform to facilitate e-procurement in most PDEs (M=2.09), uncertainty was expressed regarding whether a website portal that enables e-procurement processes at PDEs exist (M=3.30) and that the PDEs not post on its web sites her requirements to inform providers (M=2.78). This study further reveal that the PDEs user departments do not place their bids to acquire goods or services online for suppliers to supply (M=2.24), uncertainty was expressed on whether service providers are caused to compete against each other to get a contract via an online facility (M=3.31) and further uncertainty was revealed on whether PDEs join other entities for a joint negotiation to get aggressive discounts (M=3.78). This study revealed that PDEs have vetted providers against quality service and delivery standards (M=4.18). This study revealed uncertainty whether E-procurement may lead to downward price pressure on providers that may in turn create quality issues. (M=3.88). This study revealed that respondents were positive about the

benefits of moving to E-procurement (M=4.39) and also that E-procurement will improve efficiency, faith in procurement transactions, data integrity and security (M=4.13). The study results also revealed that respondents were uncertain about hackers being able to paralyze entity operations through E-procurement transactions (M=3.63) and the ability to integrate easily E-procurement solutions with the legacy and financial system (M=3.30).

Table 2: Willingness and readiness to adopt e-procurement

	No	Min	Max	Mean	SD
PDE has several departments (User departments) adoption of ICT related working procedure would be very expensive	604	1	5	4.54	0.93
The PDE has adequate resource to adopt to an e- procurement platform	604	1	5	2.66	0.65
The Internet rollout across the whole PDE favors the adoption of e-procurement in all user departments	604	1	5	3.52	0.86
I am competent in Internet and computer know how and usage	604	1	5	4.11	0.91
There is common usage of computers and internet platform at the PDE	604	1	5	2.64	0.77
Procurement at the PDE is a routinized and repetitively practiced by the procurement section	604	1	5	4.39	0.83
The need for e-procurement adoption by the PDE officials is recognized by all staff as an urgent need	604	1	5	2.45	0.69
The PDE Suppliers have the capacity to implement e-procurement procedures	604	1	5	2.75	0.28
The suppliers to the PDE have not integrated e-procurement technologies in their daily business practices	604	1	5	3.63	0.60
There is a likelihood for the PDE to support her suppliers with e-procurement platform technologies to enable them easily adopt to it	604	1	5	2.77	0.44
There is a growing positive adoption of e-values at the PDE amongst the staff like e-mailing, e-meeting s etc	604	1	5	4.28	0.91
E-procurement is part of a grand goal by the PDE to integrate ICTs in their daily works for efficiency	604	1	5	3.88	0.54
The PDE is under pressure from the government to adopt the e-procurement strategies as part of a grand e-government adoption strategy	604	1	5	4.08	0.68
The PDE plans to adopt to e-procurement is born out of the institution being social outcome conscious.	604	1	5	4.48	0.93

The results from Table 2 indicate that most PDEs very large with several departments (User departments) adoption of ICT related working procedure would be very expensive (M=4.54), that most PDEs do not have adequate resource to adopt to an e- procurement platform (M=2.66) and uncertainty was expressed by the respondents on whether Internet rollout across the whole PDE favors the adoption of e-procurement in all user department. (M=3.52). This study revealed that the respondents were competent in Internet and computer know how and usage (M=4.11), that there was no common usage of computers and internet platform at the MOES (M=2.64) and that procurement at the most PDEs is routinized and repetitively practiced by the procurement section (M=4.39). The study results further reveal that the need for e-procurement adoption by the PDEs officials is not recognized by all staff as an urgent need (M=2.45) that the PDEs Suppliers have no capacity to implement e-procurement procedures (M=2.75) and uncertainty was expressed regarding the suppliers to the PDEs having not integrated e-procurement technologies in their daily business practices (M=3.63). Further, the results indicate that there was no likelihood for the PDEs to support her suppliers with e-procurement platform technologies to enable them easily adopt to it (M=2.77) while a growing positive

adoption of e-values at the ministry amongst the staff like e-mailing, e-meeting s etc were found to determine willingness and readiness to adopt the e-procurement adoption at the PDEs (M=4.28). uncertainty was expressed by the respondents on whether E-procurement was part of a grand goal by the PDEs to integrate ICTs in their daily works for efficiency (M=3.88), that the PDEs were under pressure from the government to adopt the e-procurement strategies as part of a grand e-government adoption strategy (M=4.08) and that the MOES plans to adopt to e-procurement is born out of the institution being social outcome conscious (M=4.48).

Table 3: Challenges to e-procurement adoption

	No	Min	Max	Mean	SD
The User Departments' reluctance to changes is major challenge to e-procurement adoption processes	604	1	5	4.50	0.88
The transaction risks associated with the e-procurement processes are a challenge to e-procurement adoption	604	1	5	4.33	0.67
Security risks resulting from unauthorized penetration of trading platforms and failure to protect transaction related data while being transmitted or stored challenge e-procurement adoption	604	1	5	4.00	0.49
Privacy risks arising from inappropriate information collection and information transparency poses a challenge to e-procurement adoption	604	1	5	3.78	0.79
The costs and development time required to set up online procurement systems has been a challenge to e-procurement adoption	604	1	5	4.09	0.81
General un-preparedness and readiness by the market for adoption of e-procurement sets back e-procurement adoption practices	604	1	5	4.44	0.56
The required significant investments in hardware, software, and personnel training to participate in e-procurement are prohibitive to its adoption	604	1	5	3.99	0.72
The laws governing e-procurement have not been effectively developed	604	1	5	4.39	0.79
Technical difficulties related to information and data exchange and conversion e.g inefficiencies in locating information over the internet using search engines	604	1	5	4.08	0.62
The "wait-and-see" attitude among firms in selecting e-market places and procurement service providers makes the adoption of e-procurement very slow	604	1	5	4.41	0.62
The already existing laws and other platforms affect the level of e-procurement adoption since there are very many laws to be put into consideration	604	1	5	2.26	0.81

The results from Table 3 above indicate that User Departments' reluctance to changes is major challenge to e-procurement adoption processes (M=4.50), that the transaction risks associated with the e-procurement processes are a challenge to e-procurement adoption (M=4.33) and that Security risks resulting from unauthorized penetration of trading platforms and failure to protect transaction related data while being transmitted or stored challenge e-procurement adoption (M=4.00). The respondents were uncertain whether the privacy risks arising from inappropriate information collection and information transparency posed a challenge to e-procurement adoption (M=3.78), yet the costs and development time required to set up online procurement systems was found as been a challenge to e-procurement adoption (M=4.09) and the general un-preparedness and readiness by the market for adoption of e-procurement set back e-procurement adoption practices (M=4.44). It was also revealed the required significant investments in hardware, software, and personnel training to participate in e-procurement were prohibitive to its adoption (M=3.99), that laws governing e-procurement have not been effectively developed (M=4.39), that the technical difficulties related

to information and data exchange and conversion for example inefficiencies in locating information over the internet using search engines hindered adoption (M=4.08) and that the “wait-and-see” attitude among firms in selecting e-market places and procurement service providers made the adoption of e-procurement very slow (M=4.41). However, the respondents refuted the assertion that the already existing laws and other platforms affected the level of e-procurement adoption since there were very many laws to be put into consideration (M=2.26).

Table 4: Possible strategies to overcome the challenges to e-procurement adoption

	%
PPDA should set standards, rules and regulations especially to improve online security	51.1%
Flag off all taxes on e-procurement software and hardware equipment	57.8%
Amend PPDA Act to cater for mandatory for PDEs to adoption by e-Procurement technology	77.8%
Quicken internet and other infrastructure roll out across all parts of the country	42.2%
Integrate ICT skills in the education system in the country to create mass ICT appreciation	77.8%
Promote local software developers to avail appropriate cheap software platforms	66.2%
Create dissatisfier factor to justify the need for change amongst PDEs	66.2%
Train procurement officers and other PDE employees in user e-procurement enabling technologies like (computer applications and internet usage)	68.9%
Budget allocations to PDEs need to be increased to cater for initial cost like ICT infrastructure set up, training and other acquisitions.	77.8%

Table 4 indicates results for the measures to overcome the challenges to e-procurement adoption at the PDEs. Majority of the respondents indicated that increased budget allocations to PDEs to cater for initial cost like ICT infrastructure set up, training and other acquisitions; Integration of ICT skills into the education system in the country to create mass ICT appreciation and Amending PPDA Act make it mandatory for PDEs to adopt e-Procurement technology were the most suggested by the respondents at 77.8% each. The respondents also suggested training procurement officers and other PDE employees in User Departments e-procurement enabling technologies like (computer applications and internet usage) (68.9%), Creating a dissatisfier factor to justify the need for change amongst PDEs and promoting local software developers to avail appropriate cheap software platforms were also suggested at rate of 66.2% each. Flagging off all taxes on e-procurement software and hardware equipment (57.8%), PPDA setting standards, rules and regulations especially to improve online security (51.1%), quickening the internet and other ICT infrastructure roll out across all parts of the country (42.2%) were the other suggested measures to improving the adoption of e-procurement in the PDEs.

5. DISCUSSION AND CONTRIBUTION

The purpose of this study is to identify the e-procurement practices for adoption, the willingness and readiness to adopt e-procurement and the challenges to the adoption of e-procurement practices in Uganda's PDE's. Although e-procurement has many benefits like increased level of efficiency and effectiveness, most PDE's have not adopted it. One possible reason generally appears to be that most PDE's do not know how to

adopt electronic procurement systems due to lack of understanding of procurement process automation. The findings further indicate that most PDEs have attempted to vet providers against quality service and delivery standards but have not been success as expected. This implies there is still a long way to go. The results also suggest that most respondents strongly agree that benefits far exceed expenses of moving to E-procurement (cost benefit analysis). They also agree that E-procurement can improve efficiency, faith in transactions, data integrity and security.

Although most PDEs appear willing and ready to adopt e-procurement, most PDE have several departments (User departments) and adoption of ICT related working procedure would be very expensive. The results also suggest that most staffs are competent in Internet and computer know how and usage. This is possibly due to the procurement at the PDEs which is a routinized and repetitively practiced by the staff in various departments. There is consensus about the growing positive adoption of e-values at the PDE amongst the staff like e-mailing, e-meeting s etc. The PDES are also under pressure from the government to adopt the e-procurement strategies as part of a grand e-government adoption strategy.

The key challenges that were also found to constrain the adoption of e-procurement include: User Departments' reluctance to changes, the transaction risks associated with the e-procurement processes, the security risks resulting from unauthorized penetration of trading platforms and failure to protect transaction related data while being transmitted or stored challenge e-procurement adoption. The costs and development time required to set up online procurement systems has been another challenge to e-procurement adoption as well as the general un-preparedness and readiness by the market for adoption of e-procurement sets back e-procurement adoption practices. However, the results indicated that the laws governing e-procurement have not been effectively developed; this possibly requires more effort on the side of government. Others included: technical difficulties related to information and data exchange and conversion e.g. inefficiencies in locating information over the internet using search engines and the "wait-and-see" attitude among firms in selecting e-market places and procurement service providers which makes the adoption of e-procurement very slow.

The key strategies for adoption of e-procurement in Uganda PDEs were: amending PPDA Act to cater for mandatory for PDEs to adoption by e-procurement technology, integrating ICT skills in the education system in the country to create mass ICT appreciation, promoting local software developers to avail appropriate cheap software platforms, creating dissatisfier factor to justify the need for change amongst PDEs, training procurement officers and other PDE employees in user e-procurement enabling technologies like (computer applications and internet usage) and budgeting allocations to PDEs need to be increased to cater for initial cost like ICT infrastructure set up, training and other acquisitions.

This research enhances our understanding of e-procurement systems as the best practice technique in modern e-procurement system, an area which has been given less attention. In doing so, this research makes a

contribution to an area of study clearly in need of additional research. The research also provides recommendations on how e-procurement can be improved in Uganda's PDE's.

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