



# Electronic Government Procurement Adoption in Ghana: Critical Success Factors

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## Authors' contributions

This work was carried out in collaboration between both authors. Author DO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author OIF managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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## ABSTRACT

**Aims:** The study investigated the critical success factors for adopting an e-procurement in public sector procurement activities in Ghana.

**Study Design:** The study used descriptive survey design.

**Place and Duration of Study:** The study was carried out among some selected public sector organisations in Ghana from October 2019-January 2020.

**Methodology:** A total sample size of 215 procurement staff from public entities including: Department of Feeder Roads, Ghana Cocoa Board, Ghana Health Service, Koforidua Technical University and Tema Metropolitan Assembly. The data collection instruments were interview guide and questionnaires. Both descriptive and inferential statistics were used as the analytical tools. Specifically, Principal Component Analysis (PCA) was used.

**Results:** The study found that users and stakeholders of the e-procurement perceive the availability of reliable, affordable and fast Internet services as the most critical success factor for the adoption of e-Procurement technologies. Furthermore, the study discovered that the critical success factors (CSFs) for e-procurement adoption can be categorized into organisational support for infrastructure set-up, system features, Monitoring and control and supportive human factors.

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**Conclusion:** For e-Procurement technologies to adequately permeate the fabrics of the Ghanaian public procurement system, the government and stakeholders should put in place mechanisms that can help measure the metrics of physical ICT infrastructure provision; attract adequate internet infrastructure into the country and provide the necessary ICT infrastructure and leadership role in using e-Procurement technologies in their public procurement process.

*Keywords: E-procurement; technology adoption; critical success factors.*

## 1. INTRODUCTION

In our modern business environment, the procurement function is significant to any organisation and as such, its strategies have become a key part of organisations' success more than ever [1]. The procurement function ensures that goods, works and services acquired are of the right price, place, quality and quantity [2]. Governments across the globe spend a large portion of their operational budget in acquiring goods, works or service [3,4]. Consequently, inefficient procurement processes can lead to loss of huge investment which could be detrimental to the survival and development of any economy. In most economies across the globe, there exists formal procurement units in the public sector who solely carry out procurement activities in a manner that ensures proper disbursement of state funds [5]. These procurement units are made to operate under various formal processes and strategies in order to achieve value for money and meet stakeholder expectations. The Public Financial Management (PFM) Act 2016 is aimed at ensuring judicious use of public funds. These expectations, in this electronic age, can never be attained without leveraging the benefits of information and communication technology (ICT) to improve public procurement activities. The contribution of ICT to organisations' growth cannot be under estimated [6]. In the public sector as a whole, ICT resources are being deployed in governance, security, health and education. In Ghana, public expenditure on goods and services and is a major component of the GDP accounting for about 21.5% [7]. So, development and advances in ICT presents new opportunities which should be leveraged to bring about efficiency, transparency and better monitoring in Ghana public sector expenditure procurement.

For the concept of e-procurement to be well appreciated, the study was underpinned by the Technology Acceptance Theory and the Disruptive innovation theory respectively. Technology acceptance theory, for instance,

provides predictions for the acceptance and use of an information and communication technology by adopters [8]. The Technology Acceptance Theory (TAM) focuses on two key factors comprising perceived ease of use and perceived usefulness of technology. In most developed countries, for instance, e-procurement is common in the government sector contributing immensely to waste management, efficient resource utilisation and invariably improved performances [9].

A critical assessment of the importance of an e-Procurement platform in the public sector procurement system reveals that it is an innovative tool that has the ability to combat the numerous challenges associated with the traditional procurement system of Ghana [10]. E-Procurement platforms build on the traditional procurement activities to deliver a seamless process for the public procurement system and all the various parties [11]. Shakya [12] consented that e-Procurement platforms enhance productivity in the procurement system while empowering all stakeholders to closely follow and monitor the procurement process. Also, they asserted that cost-saving and efficiency are major benefits that come with fewer paper-based transactions in the procurement cycle. Suvil [13] stated that e-enabled structures enhance competitiveness and opportunities among stakeholders including supplying and procuring entity.

In Ghana, the adoption of e-Procurement in the government sector is to minimize cost, heighten transparency and enhance accountability in the traditional procurement system [14]. In the midst of these benefits, it is relevant to explore, understand and assess the enablers and inhibitors of any electronic infrastructure [15]. These enablers and inhibitors are described as Critical Success Factors (CSFs).

In the context of this paper, CSFs are seen as those factors that are very essential to the successful implementation and use of e-

procurement system [15]. By this, the various participants in the public procurement system are furnished with the focus metrics in terms of activities and priorities that should be achieved for the successful integration of web-based systems in the public procurement process. As highlighted in this study, these CSFs can be internal or external in relation to the organization's operations.

The integration and execution of e-procurement project in Ghana is in its introductory stage and as such requires more efforts in a bid to ensure its success. Evidently, this project relies heavily on investment in IT systems, adequate internet coverage and access by all stakeholders [16]. In spite of efforts from incumbent governments, its agencies and even academic researchers to help overcome this challenge, scanty literature exists with regard to CSFs for e-procurement adoption among public entities in Ghana. Moreover, existing literature do not have theoretical underpinnings which affect the foundations on which those studies were built. It was against this backdrop that the study sought to explore the critical success factors of e-procurement implementation among public sector organisations in Ghana. Specifically, the study sought to: examine the benefits of e-procurement, explore the challenges in adopting the e-procurement platform, and investigate the critical success factors for adopting e-procurement system.

## 2. LITERATURE REVIEW

This section of the study presents the theoretical foundation, empirical and conceptual review of the study.

### 2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Fred Davis in 1986 to explain users' acceptance of information technologies [17]. TAM is basically used to explain, "the general determinants of computer acceptance that lead to explaining users' behaviour across a broad range of end-user computing technologies and user populations" [18]. This model has two (2) basic beliefs: perceived ease of use (PEU) and perceived usefulness (PU). According to Venkatesh and Davis [19], PEU is the extent to which potential users expect a system to work effortlessly while PU is the likelihood of the potential user to use a given system. It therefore gives predictions for the use and acceptance of

technology and information systems by users [20].

Moreover, Christensen [21] came out with the current phase of TAM after it was found that both PEU and PU have direct influence on behaviour intention and as such, eliminates the need for attitude construct. This was known as TAM 2 which theorizes that, users' perceptions in regards to the usefulness of a system are prompted by their mental evaluation of the relationship between work objectives and the outcomes of carrying out job duties using a given system [21]. In relation to this study, the general assumption of TAM is to explain users' perceived ease of use and perceived usefulness of electronics in procuring goods, construction works and consultancy services. It therefore supports users' perceptions toward e-GP in Ghana. The perceived usefulness and ease of use will serve as a facilitating condition to the adoption of the system among stakeholders.

### 2.2 Disruptive Innovation Theory (DIT)

This theory was propounded by Christensen in 1997 as 'disruption technology' which was subsequently changed to 'disruption innovation' in 2003 by Christensen and Raynor. The theory explains that innovation makes expensive and complicated products or services cheaper and simpler thus lead to improved organisational performance [22]. DIT assumes that, the disconnection between product capabilities and customers' ability to use them creates opportunities for disruption innovation (DI). As such, the pursuits of DI are majorly decision and knowledge-based activities [10]. The influence of DI can be so extreme that a dominant firm can cease to exist while an almost non-existing firm can rise to dominance [23]. Thus, these extreme results highlight the contributions of information systems and technology in the occurrence of disruptive innovation.

Moreover, most incumbent organisations' view DI as unfavourable to their key customers since a non-existent customer can rise 'up market' and become a key market leader [10]. Simply put, the theory explains that, IT plays tremendous roles in organisations' due to its dynamism and as such, failure to embrace it would be detrimental to the survival of organisations' or companies.

In relation the study, the theory explains that, IT can play crucial role in Ghana's public sector in terms of procurement. As such, to overcome the

difficulties that come with the procurement processes in the government sector, public organisations' need to embrace procuring electronically in a bid to make the processes simpler, easy, cost effective, curb corruption and sustainable. The theory further explains that, implementing e-GP in Ghanaian public organisations could be displeasing to current customers due to inferior performances on the attributes of these customers value, however, a new set of customers may value this platform and subsequently attract more of the mainstream market overtime.

### **2.3 E-procurement in the Public Sector**

The presence of advancement of internet connectivity has driven both private and public sectors towards digitisation of modern procurement processes partly due to inefficiencies in the traditional manual process marred with corruption, fraudulent practices, delays, lack of transparency and accountability, among others [17,24]. Kannan [24] stressed that, the presence of an internet facility has led to the accomplishment of challenging work processes. Mostly, these processes consist of establishing information systems that connect buyers, manufacturers, retailers and other business functions together in bid to ensure value addition to organisations' physical assets [25].

E-procurement in simple terms is described as the use of internet facilities and web-based systems to promote the procurement processes in relation to contract awards [25]. This concept is regarded as example of e-business since it helps firms or organisations' to procure goods and services through electronic means. In the public sector, for instance, Khalil and Waly [26] describes e-procurement as, "end-to-end digitisation of public procurement processes, from the sourcing phase (pre-award) to the purchases phase (post-award)". It therefore involves the application of electronic tools when acquiring goods, public work and/or services. E-procurement is also seen as an inter-organisational information system which automatizes the procurement processes in a bid to enhance quality, transparency and efficiency in public procurement [38].

Studies have revealed that, e-procurement is popular among developed countries including Belgium, Italy, Austria, Canada, United Kingdom (UK) and United States of America (USA) [25]. In their public sectors, specifically, the adoption of

e-procurement has generated numerous benefits such as reduction in corrupt activities, ensure adequacy of information, reduced transaction cost, minimised maverick purchase, ensures value for money, increases competition and enhance accountability and transparency [25,28,14]. In light of these benefits, several developing countries including Ghana have embraced this concept and currently in the initial stages of its implementation.

### **2.4 Processes Involved in Ghana's E-procurement**

"Ghanaeps" is currently the proposed name given to Ghana's e-procurement system. This name according to the IT department at PPA is likely to change before the system is fully rolled out. As at now, there are still a number of system engineering processes in consolidation of several systems requirement specifications (SRS) that are expected to enable effective configuration, parameterisation and adaptations of the electronic procurement system. According to the PPA's IT Department, the e-procurement system will be rolled out in 3 phases. The first phase known as the Pilot Project has already taken place which involved only 6 public entities and lasted for four weeks. The second phase will include 40 public entities in six months after the pilot project. The third and last phase is expected to add 600 public entities in two years.

The Procurement Act (Act 663) did not make provision for the application electronic transactions in the public procurement activities and processes. This brought about the amendment of the Act 663 (Procurement Act, 2016, Act 914) to make room for the use of electronic tools in public procurement processes. "Ghanaeps" provide among other things the platform for public organisations to showcase their tenders online, suppliers to submit their bids online, and finally contract award process could be conducted online.

### **2.5 Benefits of E-procurement to Ghana**

With support from literature, the implementation of E-procurement in the Ghanaian public sector is currently been rolled out and as such PPA envisages the following major benefits:

#### **2.6 Reduce Transaction Cost**

The cost that comes with the traditional system of procurement have been found to be very huge

due to the number of expenses the procurement unit in a public sector have to incur [29]. These expenses include cost of printing tender documents, cost of advertisement, cost of printing documents of contract awards, transportation costs, costs associated with evaluation committee meeting and other indirect costs [30]. However, the full implementation of e-GP would eradicate these expenses since the entire processes would be done online and as such minimise costs associated with traditional procurement [31].

## 2.7 Information Sharing

An integration of e-procurement in the Ghanaian public sector will allow the use of a single portal where the registered agencies under the government sector can exchange information among themselves in relation to procurement processes [32]. This allows for greater visibility of public procurement processes in bid to provide opportunities for negotiation [33]. Also, computerized transactions present inclusive, precise assessment and audit which gives room for users to monitor orders and address challenges as and when the need arises [34].

## 2.8 Increased Supplier Base

An integration of e-procurement facility will enable the public sector to have access to a wider market instead of a small local market [34]. It will also lead to unbiased procurement processes where interested parties can obtain equal opportunity to apply [29]. Most suppliers, over the years, have perceived the traditional procurement process as sometimes discriminatory on “whom you know” and as such decline to participate in most public procurement processes [35]. However, the full integration of e-procurement will ensure transparency and accountability thus minimise corruption and invariably induce more suppliers to participate in the exercise [36].

## 2.9 Reduce Procurement Cycle Times

Full implementation of E-procurement in Ghana's public sector will help public organisations' to reduce procurement lead times and the resources associated with the traditional procurement processes [37]. Decreased cycle times and enhanced payment processes [38] will also lead to better relationship management. Moreover, saving time allows for reduced inventory levels [39] leading to cost reduction

through reduced inventory carrying cost and improved cash flow.

## 2.10 Improve Efficiency and Transparency

Full implementation of e-procurement is anticipated to provide efficient and effective procurement processes leading to reduced government overhead costs associated with contract awards by the public sectors [40]. According to Kaliannan et al. [27], the adoption of online procurement provides avenues for more involvement of service/goods providers and in turn increase healthy competition. Frimpong [32] adds that, easy accessibility to information through e-procurement allows stakeholders to acquire information with each tender and award process.

These benefits of e-procurement can also be seen as factors that calls for the implementation of e-procurement systems. Furthermore, a study in Ghana by Korir et al. [41] on e-procurement revealed major factors to include the need to ensure efficiency, fairness, transparency, competitiveness and accountability in government sector procurement so as to eradicate unsound practices among practitioners.

## 2.11 Challenges to E-procurement

Despite the anticipated benefits of the e-procurement system, studies have revealed some probable challenges are likely to be faced during its full implementation [26]. Hashim et al. [42] noted that, the challenges to e-procurement inhibit the use of this platform and thus yield negative outcomes. Eadie et al. [43] added that, these challenges should be eliminated since they prevent the smooth implementation of the e-procurement system. A study by Isikdag et al. [44] revealed that, the challenges to e-procurement globally include lack of awareness, lack of requisite skills, security and legal issues and uncertainty in financial returns. A study by Lavelle and Bardon [45] in the Atlantic Canadian AE Industry revealed key challenges such as poor technical expertise, lack of standardized procurement systems and issues in integrating e-procurement systems.

Moreover, a study by Isikdag et al. [44] revealed major e-procurement challenges which include: cultural, legal, compatibility (interoperability) and security issues. In England, Oyediran and Akintola [46] conducted a study on e-

procurement and identified some challenges to e-procurement to include: poor systems, high complexity, difficulty in sharing information, poor reliability and security issues. In Nigeria, Laryea and Ibem [47] carried out a study on the e-tendering and found irregular power supply, absence of legal backing, low accessibility of technology, absence of legal backing and lack of basic infrastructure as the possible e-procurement challenges. Smart [48] conducted a study in a South African construction industry and identified challenges to include: cultural, cost, compatibility, magnitude of change, legal, security, lack of training, lack of best practices and lack of forum to exchange ideas.

Additionally, a study by Siita [49] revealed several e-procurement challenges to include the need for change management, high training requirements, difficulty in minimizing supplier base, difficulty in integrating with external platform, poor visibility and poor legal systems. In Ghana, although the implementation of e-procurement is in its introductory stage, it has equally been exposed to challenges such as lack of security, resistance to change, infrastructural constraints, lack of strategic plans, privacy of information, lack of partnership and collaboration, and low knowledge about the e-government program [32]. Similarly, Chomchaiya [50] revealed major e-GP challenges to comprise human resource capacity, availability of financial resources, technology adoption, availability of supporting facilities and infrastructure and support from stakeholders.

Furthermore, Kidd [25] revealed some of these challenges to include inadequacy of human resource capacity, high cost of technology, lack of stakeholder support, inadequate supporting infrastructure and facilities, lack of technology adoption, resistance to adoption, security and authentication issues. Other studies have revealed the key challenges to include: poor supplier relationship, lack of standard data formats, lack of technical expertise, low priority, lack of e-procurement competency, perceived lack of real benefit and high cost of initial setup [40,51,24].

## **2.12 Critical Success Factors of E-procurement**

Critical success factors are conceptualized as resources that provide enabling and facilitating conditions for successful implementation and adoption of any system. Accordingly, studies

have revealed critical success factors to include trust, information quality, staff training and development, user acceptance to change, top management support, compliance with best practices, re-designing affected business processes, continuous measurement of key benefits, technology and risk management [52,53]. Also, a study by Mose et al. [54] revealed e-procurement critical success factors such as: compliance with rules and regulations, improving performance, using performance report, willingness of employees to use the system, stakeholders' readiness to make the system a success, availability of e-procurement instructions, changing systems and financial capabilities.

Further, some studies have also highlighted e-procurement critical success factors to include: reliability of information available on the site, training of suppliers on e-procurement, competitiveness, efficient risk management, regular e-procurement performance measurement, trust of the system by buyers and training of personnel on e-procurement [55,56]. Additionally, some other factors include system collaborating with suppliers, senior management commitment to e-procurement, establishment of e-procurement guidelines and new processes designed for automation [48,30].

Moreover, Obat [30] revealed major critical success factors to comprise security and authentication measures, documentation of e-procurement policy manual, reliability of internet, commitment of key stakeholders, change management programs, staff training and capacity, existence of project management team to handle e-procurement systems, provision of adequate resources, early supplier involvement and top management leadership and commitment to the implementation of the e-procurement platform.

It must be noted that these CSFs may differ from one region to another on the basis of socio-cultural and political structures. In view of this, the paper was limited to the following CSFs for e-procurement implementation and adoption.

## **2.13 Strong Security of Transactions**

When it comes to working on the internet, security is very essential to users. This is same in e-procurement operations since it makes use of the internet. It is this reality that makes security of transactions a critical success factor

for the success of an e-procurement system [52]. It has also been emphasized in a study that strong security of transactions is a key factor for the effective operations of an e-procurement system, hence it is a must for every organization which intends to build an e-procurement infrastructure.

#### **2.14 Early Supplier Involvement in the E-procurement Process**

Engaging suppliers early in the e-procurement process is an important success factor [57]. supplier involvement has been described as an important element for the success of e-procurement adoption [58]. Another study on e-procurement operation that was conducted in Canada revealed that suppliers' engagement in the developing of an e-procurement facility was a great contributing factor towards its success [58].

#### **2.15 Integration of Business Process**

Deraman [59] posited that for e-procurement system to achieve its intended objectives, organization must be well integrated with the e-procurement technologies. Furthermore, the coordination and integration of departmental units and systems will also remove inconsistencies among the systems and efficiency in the use of government scarce resources in implementing an e-enabled procurement system [55]. The system integration consists of the integration of all information systems, related software and hardware platforms.

#### **2.16 Proper Audit Control and Proper Authority of Purchase**

Computerized transactions present an inclusive, and far more precise assessment and audit that allows supervisor to follow the status of orders, and remedy circumstances as and when they occur [53,30].

#### **2.17 E-procurement Policy Manual within the Organization to Guide Procurement Process**

In the implementation of an e-procurement system, there is a need for a well-developed and documented e-procurement policy manual to guide the step-by-step processes in the entire procurement cycle. According to Frimpong [32], such policy manual must contain the vision and

strategy of e-procurement, definition of task and assigning of roles, and the appropriate legal environment. The policy manual must also capture awareness and capacity building programs for all stakeholders in the public procurement cycle [52].

#### **2.18 Compliance with Rules, Regulations and Guidelines in the Procurement Act**

Procurement activities are usually guided by rule and regulations in either to bring sanity, transparency and accountability in the procurement cycle. In most countries, there are enacted statutes which governs procurement activities [56]. These statutes are usually captured under one umbrella term called "Procurement Act." In Bangladesh, the government expects all activities of the e-GP Portal to be carried out within the confines of the e-procurement statutes. To make this a reality, the government of Bangladesh and the CPTU reserves the mandate to issue any legal action against any user who might violate these terms and conditions e-GP System User agreement [60].

#### **2.19 Trust of System by Buyers**

In the case of an e-procurement implementation system, security of online transactions is a key determinant of trust in the system. According to Kanyambo [57] government procurement data is very sensitive and the legal nature of orders and online payments, hence security of these data is key success factor for an e-procurement implementation. Suppliers and buyers (government entities) will only trust a system that keep their transaction data safe, and that buyers trust in a system also influences the system acceptability.

#### **2.20 Availability of the Needed Information Technology**

A study by Hawking et al. [58] revealed that for e-procurement to be a success in an organization there is the need for the presence of technological infrastructure as well as the ability to operate it. Studies have shown that the organization's ability to afford the needed information technology is an important element of this critical resource [61].

#### **2.21 Skilled E-procurement Personnel**

A study on e-procurement adoption by Nawi et al. [61] showed that the move for an e-

procurement demands human resource with information technology skills. Their study further stated that for e-procurement system to be successfully operated, it requires "Internet human resource." Kanyambo [57] also stated that an e-procurement system needs trained personnel who are not only acquainted with procurement wisdom but also with the necessary IT knowledge for an e-enabled procurement system.

## **2.22 Internet Connectivity**

An e-enabled procurement system cannot be a success without the necessary active internet service. As a matter of fact, an active internet service is a necessity for an e-procurement facility. Nawi et al. [61] put forth in their study an e-procurement facility needs an active internet service as well as sufficient broadband coverage to be a success. Successful initiation and subsequently the progress of an e-procurement project requires a strong internet coverage [62].

## **2.23 Senior Management Support**

Carayannis and Popescu [63] stated that traditional public procurement is bedevilled with deficiencies like excessive state intervention, absence of a clearly defined national information technology policy, excessive bureaucratic layers, presence of a rigid central control and resistance to change. A study on e-procurement implementation in the USA discovered that support from the top/senior management is an important factor for a successful e-procurement adoption in the public sector [64]. Kanyambo [57] also stated that lack of managerial support can serve as a key resistance to an e-procurement technology.

## **2.24 Monitor and Evaluate Progress of E-procurement Activities**

According to Kanyambo [57], continuous performance evaluation and enhancement of business/organization systems is an important step for the effective delivery of the intended business case. According to a report by [60], such measurement indicators are described as key performance indicators (KPIs) and such indicators must be considered early in the e-procurement process in order to establish a successful benefit tracking mode in the system.

## **2.25 Employees' Commitment to E-procurement Activities**

Staff commitment is key for the adoption of information technology system [65]. This commitment on the part of employees is seen in their task performance, contribution to overall organizational performance, loyalty and identification to the organization [54]. Positive employee behaviors and attitudes toward the implementation process [56], and employee cooperation [66] are important success factors.

# **3. MATERIALS AND METHODS**

## **3.1 Research Design and Approach**

The study used the descriptive survey design. The descriptive research design seeks to describe, explain and interpret conditions or trends, and also allows for the examination of a phenomenon that is occurring at a particular place and time. In terms of approach, the study made use of the mixed method because it is believed that the collection and analysis of both qualitative and quantitative data will provide a better picture [67]. The qualitative data was analysed separately to provide insight into other behavioural factors that could inhibit and enable e-procurement implementation and adoption.

## **3.2 Population and Sample Size**

The study population included procurement staff from the public sector organisations where the e-procurement is being rolled out. Those organisations were the Volta River Authority (VRA), Ghana Cocoa Board (GCB), Ghana Health Service (GHS), Ghana Cocoa Board (COCOBOD), Ghana Grid Company Limited (GRIDCo), Social Security and National Insurance Trust (SSNIT)). Guided by Kotlik and Higgins [68] sample size determination approach, 380 procurement staff were sampled for the study.

## **3.3 Data Collection Instrument and Sampling**

The study made use of primary data, and in terms of instrument, the study used both structured questionnaire and interview guide. The Structured questionnaire captured questions pertaining to the benefits and critical success factor for e-procurement system. 215 useable questionnaires were retrieved (56.6% response



rate), which meet the benchmark sample size for the principal component analysis technique [69]. An IT expert in charge of the e-procurement at PPA, and two representatives, from two of the piloted organizations were interviewed on the challenges of the platform. The five respondents for the interview were determined on the basis of data saturation [70].

### 3.4 Validity, Reliability and Data Analysis

Reliability of the study instrument was tested using Cronbach alpha. The reliability coefficient of 0.70 or higher was considered acceptable [69]. A pre-test was carried out among thirty (30) procurement officers to check the reliability of the instrument. The result from that survey revealed Cronbach alpha of 0.869. Validity of the study was achieved through expert review and peer review. Quantitative data was analysed using percentages, means and the principal component analysis (PCA); while qualitative data was analysed using open coding and presented in narratives [67].

## 4. RESULTS AND DISCUSSION

### 4.1 Benefits of E-procurement in Ghana

The results in Table 1 revealed that the top five benefits of e-procurement system to public entities where the infrastructure is been piloted were: improved communication; better monitoring of procurement expenditure; greater management control; improved customer

satisfaction and enhance decision making and market intelligence.

Moreover, in an interview with an IT personnel in charge of e-procurement at PPA, he confirmed these drivers in Table 1.

E-procurement which is also known as e-GP is an electronic platform which is in its initial stage. This platform was introduced in the country due to the need to adopt technology in our modern-day procurement processes. Also, the authority, at all times, receive several complains about lack of transparency, fairness, fraud, corruption, discrimination, among others in the procurement processes. This always result to legal issues and poor relationships among parties which speaks ill of us as an institution.

### 4.2 Descriptive Statistics of Critical Success Factors of E-procurement in Ghana

From the statistics in Table 2 the top ten ranked critical success factors were perceived trust and integrity of the e-procurement system by users; compliance with rules, regulations and guidelines in the procurement act; proper audit control and proper authority of purchase; existence of a project management team to spearhead, monitor and evaluate progress of e-procurement activities; a documented e-procurement policy or manual within the organization to guide procurement process; common procedure standards; availability of the needed information

**Table 1. Benefits of E-procurement in Ghana**

	N	Mean	Std. Deviation	Mean Ranking
Improved communication	215	3.84	1.075	1 <sup>st</sup>
Better monitoring of procurement expenditure	215	3.82	.984	2 <sup>nd</sup>
Greater management control	215	3.74	.979	3 <sup>rd</sup>
Improved customer satisfaction	215	3.73	.957	4 <sup>th</sup>
Enhance decision making and market intelligence	215	3.57	.992	5 <sup>th</sup>
Reduced administration cost	215	3.55	1.026	6 <sup>th</sup>
Reduced operating and inventory cost	215	3.54	1.017	7 <sup>th</sup>
Reduced staffing level in procurement	215	3.54	1.049	7 <sup>th</sup>
Reduction in time to source materials	215	3.47	1.003	8 <sup>th</sup>
Price reduction in tender	215	3.41	1.111	9 <sup>th</sup>

Source: Field Data, Ofori and Fuseini (2019)

**Table 2. Descriptive statistics of critical success factors of E-procurement in Ghana**

	<b>N</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>Mean ranking</b>
Perceived trust and integrity of the e-procurement system by users	215	3.90	.932	1 <sup>st</sup>
Compliance with rules, regulations and guidelines in the procurement act	215	3.86	.985	2 <sup>nd</sup>
Proper audit control and proper authority of purchase	215	3.80	1.041	3 <sup>rd</sup>
Existence of a project management team to spearhead, monitor and evaluate progress of e-procurement activities	215	3.73	.968	4 <sup>th</sup>
A documented e-procurement policy or manual within the organization to guide procurement process	215	3.69	1.018	5 <sup>th</sup>
Common procedure standards	215	3.69	.912	5 <sup>th</sup>
Availability of the needed information technology	215	3.67	1.035	6 <sup>th</sup>
Senior management Support	215	3.64	1.041	7 <sup>th</sup>
Early supplier involvement in the e-procurement process	215	3.62	.973	8 <sup>th</sup>
Strong security of transaction	215	3.62	1.043	9 <sup>th</sup>
Adequate internet connectivity	215	3.60	1.022	10 <sup>th</sup>
Availability of e-procurement operations instruction	215	3.60	.942	10 <sup>th</sup>
Awareness and capacity building programmes	215	3.59	1.023	11 <sup>th</sup>
Availability of resources for maintenance and sustainability	215	3.58	.973	12 <sup>th</sup>
Availability of personnel skilled in e-procurement	215	3.56	1.002	13 <sup>th</sup>
Employees' commitment to e-procurement activities	215	3.54	1.044	14 <sup>th</sup>
Integration of business process	215	3.47	.951	15 <sup>th</sup>

Source: Field Data, Ofori and Fuseini (2019)

**Table 3. Kaiser–Meyer–Olkin (KMO) measure and Bartlett’s test on the Critical Success Factors (CSFs)**

<b>Kaiser-Meyer-Olkin measure of sampling adequacy</b>		<b>.802</b>
Bartlett's Test of Sphericity	Approx. Chi-Square	4047.089
	Df	136
	Sig.	.000

Source: Field Data, Ofori and Fuseini (2019)

technology; senior management Support; early supplier involvement in the e-procurement process; strong security of transaction; and adequate internet connectivity. Among these factors, perceived trust and integrity in the e-procurement system was the esteemed critical success factor, this suggest the need for a procurement system that will enhance accountability, transparency, responsiveness, dependability in public procurement system.

**4.3 Principal Component Analysis for the Critical Success Factors (CSFs) of E-procurement in Ghana**

The various components of the CSFs were examined by the use of principal component

analysis (PCA) to provide a better light on how the various interest parties in the public procurement system understands the CSFs for e-Procurement adoption. Before conducting the PCA, it was essential to find out the appropriateness of the dataset for this analysis. This was achieved by using Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett’s test for sphericity. The outcome of the KMO test in Table 3. fulfils the requirement to use principal component analysis due to the adequacy at 0.802 which is higher the minimum benchmark of 0.7 as stated [69]. Furthermore, the Bartlett’s test of sphericity ( $\chi^2 = 4047.089$ ;  $df = 136$ ) showed that the p value was significant at 0.000, meaning that the respondents of the study

**Table 4. Component transformation matrix on the CSFs for E-procurement adoption in Ghana**

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.241	48.479	48.479	8.241	48.479	48.479
2	1.761	10.356	58.835	1.761	10.356	58.835
3	1.276	7.505	66.340	1.276	7.505	66.340
4	1.076	6.328	72.667	1.076	6.328	72.667
5	.785	4.616	77.283			
6	.730	4.293	81.576			
7	.569	3.345	84.922			
8	.505	2.972	87.893			
9	.380	2.237	90.130			
10	.356	2.091	92.221			
11	.322	1.893	94.115			
12	.291	1.711	95.826			
13	.243	1.428	97.254			
14	.163	.961	98.215			
15	.163	.957	99.173			
16	.093	.550	99.723			
17	.047	.277	100.000			

Extraction Method: Principal Component Analysis.

Source: Field Data, Ofori and Fuseini (2019)

exhibit an unidentical correlation matrix. These two tests made it possible to use the principal component analysis in examining the components of CSFs for e-Procurement adoption in government sector [69].

The total variance explained in Table 4 revealed that 17 components of the extracted CSFs were reduced to 4 components with 72.67% as its cumulative variance explained of the total variance. These 4 components came as a result of the benchmark eigenvalue of 1, meaning all the components with an eigenvalue less than this benchmark was neglected.

Table 4 represents the rotated component matrix of the factor loadings of the extracted CSFs retained. The component rotation method is a technique for retaining factors (factors with eigenvalues greater than 1) which are rotated to attain a simple structure. Four new components were created, each of the components had a category of CSFs of e-procurement. The rule of thumb was that only factor loadings with values not less than 0.4 were retained in this table. Varimax rotation was used because the variables were uncorrelated, and this orthogonal rotation method help in maximizing the relationship among the variables, and the dispersion among the factor loadings [71]. Factors with high absolute values are deemed to have greater contribution to the extracted variable retained.

Table 5 presented on the rotated component matrix of the critical success.

Factors (CSFs) for adoption of e-Procurement systems in the Ghanaian public sector. By this, the aim of the principal component analysis was fulfilled by classifying and reducing the 17 CSFs identified into 4 components. The four-factor components were titled management support for physical infrastructure, system features, monitoring and control and supportive human factors. The first component which explained a variance of 48.48% is titled management support in the provision of the physical infrastructure needed for the success of e-Procurement systems in the Ghanaian public sector. The number and nature of variables loaded on this factor as shown in Table 5 did not come as a surprise. This is simply because the availability and accessibility as well as type and quality of physical infrastructure, such as Internet facilities, e-Procurement tools, and application, ICT infrastructure in terms of hardware, skilled personnel, and power supply in any organization is a function of top management attitude towards the use of such facilities and its readiness to invest in their acquisition. In the same vein, the level of awareness of e-Procurement technologies amongst staff members is also a function of the type of human resource recruited as well the in-service training they are exposed to within the organizations. These issues are mainly under the influence of top management of

**Table 5. Rotated component matrix a on CSFs for the adoption of e-procurement in Ghana**

	Components			
	Organisational support for physical infrastructure	System features	Monitoring and control	Supportive human factors
Availability of personnel skill for e-procurement	.833			
Early supplier involvement in the e-procurement process	.736			
Awareness and capacity building programmes	.720			
Availability of the needed information technology	.718			
Adequate internet connectivity	.710			
Availability of resources for maintenance and sustainability	.690			
Senior management support	.609			
Compliance with rules, regulations and guidelines in the procurement act	.592			
Common procedure standards		.816		
Integration of business process		.714		
Strong security of transactions		.700		
Perceived trust and integrity of the system by users		.665		
Proper audit control and proper authority of purchase			.701	
Project management team to monitor and evaluate progress of e-procurement activities			.696	
Documented e-procurement policy manual			.425	
Employees' commitment to e-procurement activities				.833
Availability of e-procurement operation instruction				.614

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 15 iterations.

Source: Field Data, Ofori and Fuseini (2019)

the public organisations in terms of policies and strategic decisions; and are essential components that should be put in place for effective deployment and sustained use of e-Procurement system. According to [45], these CSFs can be regarded as organizational related factors and constitute a barrier to the adoption of e-Procurement by the public procurement system stakeholders. This infrastructure needs management support due to the high financial commitment in the short-term needed to put them in place. This finding is supported by Afolabi et al. [72] in that lack of upper management support and lack of access to IT

infrastructure were major barriers organisations that want to adopt e-procurement in Northern Ireland.

The second component, system features, explained 10.36% variance in the critical success factors for the adoption of e-Procurement systems explored in this paper. This component explain that the adopters of e-Procurement systems are concerned with features like security of transactions, common procedure standards, trust and integrity, and compatibility of e-Procurement systems. This finding is also supported by the Rogers' Diffusion of Innovation

(DOI) theory of 1995. Specifically, Rogers [73], DOI theory noted that there are perceived attributes of an innovative tool or technology that would encourage or discourage its adoption by firms/individuals. Moreover, Laryea and Ibea [47] stated that three attributes of relative advantage, compatibility and simplicity as major contributors to the adoption of e-Procurement systems. Developers of e-Procurement technologies should ensure that these characteristics are of the highest standard while ensuring user friendliness of the system.

The third component, monitoring and control, explained 7.51% variance. In this component, issues pertaining to the users of e-procurement system were presented. This component can be linked to the Technology Acceptance Model (TAM) theory which explains the perceptions of workers on the usefulness of an innovative technology. The theory further posits that the acceptance of an innovative tool is influenced by the ease with which workers can learn, operate and use it [74]. This therefore necessitated the consideration of workers behaviour and attitudes in adopting an innovative system. The human factor component consideration is understandable because standards are made by human beings based on the present social-cultural, economic, legal, and technology factors from both local and global stance. This finding therefore implies that for the adoption of e-procurement in the public sector to be a success, there is the need to incorporate common standards for describing, displaying, and specifying materials, works, and services in the public sector organisations. Also, users of the e-procurement system should possess the relevant skills in operating it. However, there may be some resistance by the workers to the innovative technology, and this will therefore an effective change management plan and training of all the stakeholders involved in the procurement process.

#### 4.4 Perceived Challenges

To confirm so of the challenges identified in literature interview results with some key informants is presented. The personnel was interviewed and he revealed that:

*“...Procurement is one very key areas in the development of a country and it is also where corruption is very common and people can easily be corrupt because they deal directly with people. Thus, the presence of human interaction*

*leads to money exchanging hands prompting the need to allow systems to work to minimise this challenge.”*

He further stated that:

*“...because the system is not in use now we anticipate some challenges but we’ve not faced them as it stands now and some of these challenges as usual in this part of the world that we find ourselves include poor internet penetration, difficulty with the use of computers “born before computers” especially from the suppliers’ side and unwillingness of most suppliers to integrate their systems with this platform.”*

Moreover, two (2) representatives from two (2) pilot organisations were interviewed to find out challenges associated with the pilot phase of the e-procurement system. Rep A represented pilot organisation 1, whereas Rep B represented pilot organisation 2 in bid to ensure anonymity.

Rep A revealed that:

*“...our organisation is still integrating its systems to suit to meet government expectations. We are still in the initiation phase so we are yet to document major challenges because we are always in contact with officials from the Ministry and PPA. I think the system is exposed to challenges such as financial constraints, inadequate skilled personnel to handle those systems and inadequacy of infrastructure and facilities. Frequent system breakdown is also another challenge we are facing but technicians are currently working on it.”*

Rep B provided similar challenges but added that:

*“The e-procurement system is very new to this organisation and others as well but with time, I am hopeful that these challenges will be addressed. Government, for instance, is allocating more funds even at this pilot stage yet still we are still facing financial issues due to the huge costs associated with procuring the machines, equipment and other stuff.”*

#### 5. CONCLUSION

The widespread of internet usage coupled with the need to address the numerous challenges associated with the traditional manual procurement system prompted the need to adopt electronic procurement. No system is without

downside risk, however, the implementation of e-procurement comes with numerous benefits including: improved communication, better monitoring of procurement expenditure, greater management control, improved customer satisfaction, enhance decision making and market intelligence, which are drivers for improved transparency and accountability, efficiency and value addition in the public procurement system.

Despite these, the platform comes with various challenges such as inadequacy of human resource capacity, high cost (cost of purchasing, installing and maintaining sophisticated machines, switching cost, etc.), lack of stakeholder support, inadequate supporting infrastructure and facilities, lack of technology adoption, among others. These challenges have brought the need for careful consideration of the various critical success factors for e-procurement platform in public sector of Ghana.

The study assessed the CSFs for the adoption of e-Procurement platform in the Ghanaian public sector. The study discovered that users and stakeholders of the e-procurement perceive the availability of reliable, affordable and fast Internet services as the most critical success factor for the adoption of e-Procurement technologies. The critical success factors (CSFs) for e-procurement adoption were further classified into organisational/institutional support for physical system set-up, system features, Monitoring and control and supportive human factors. From these findings, the study recommends: (1). For e-Procurement technologies to adequately permeate the fabrics of the Ghanaian public procurement system, there is the need for increased awareness of the e-Procurement tools and technologies and the benefits that are associated with its use. This is important among government departments, agencies, and ministries.

Having highlighted the critical success factors (CSFs), the government and stakeholders should put in place mechanisms that can help measure the metrics of physical ICT infrastructure provision. This will in turn result in generating company policies that will guide the adoption of innovative tools in the procurement process. In addition, since e-Procurement systems are heavily dependent on Internet services, reliable and continuous improvement in the internet infrastructure is important for the successful integration of e-Procurement technologies.

Finally, government needs to play a crucial role in providing the necessary ICT infrastructure and providing the leadership role in using e-Procurement technologies in their public procurement process.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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