BARRIERS TO THE ADOPTION OF ELECTRONIC TENDERING IN CONSTRUCTION PROCUREMENT IN GHANA

By

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science Degree in Project Management and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgement is made in the thesis.

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DEDICATION

To the Most High God.

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A number of people have contributed immensely toward my master's programme and the conduct of this study and I am glade to use this medium to express my appreciation to them.

First and foremost, to may Maker, Lord and Personal Savior, Jesus Christ; I am grateful.

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ABSTRACT

E-tendering is accepted globally as a fast and efficient means of conducting procurement. This technique has helped to overcome some of the challenges with the traditional paper base method. The current study sought to explore the barriers to the adoption of electronic tendering in construction procurement in Ghana. Structured questionnaires were designed and administered to key professionals involved in construction tendering such as quantity surveyors, project managers, Architects among others. The data collected was analyzed into descriptive statistics with the aid of the Statistical Package for Social Sciences (SPSS) Software. Relative Importance Index was also used to analyze some of the data collected. The results revealed that the drivers to electronic tendering practices are reduction in time to source materials, enhancement of decision making and market intelligence, improvements in communication, and price reduction in tendering. The barriers to the adoption of electronic Tendering in Ghana included conservative nature of the industry, poor ICT infrastructure to support electronic tendering, the rules and regulations that cover the tendering process are still predominantly paper-based, skepticism about the method, fear for the possibility of hacking which defeats the principle of sealed bids, concerns of security of submitted tenders, and lack of agreed standards. The critical success factors also included availability of reliable ICT Infrastructure, Availability of reliable, affordable and fast Internet services, availability of skilled personnel to handle e-Procurement tools and processes, knowledge of the benefits of e-tendering use, High level of computer literacy among construction stakeholders, Confidentially in e-tendering transaction, security and authentication of e-tendering process, and top management commitment and support to e-tendering adoption. Based on the above it was recommended that the industry stakeholders should be flexible and embrace etendering as it has numerous benefits. Public educations should also be embarked on.

KEYWORDS: Electronic Tendering, ICT infrastructure, Drivers and Barriers to the Adoption of E-Tendering, Critical success factors

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Aqua group (2006) define tendering as: "A procedure to select a suitable contractor, at a time appropriate to the circumstances, and to obtain from him at the proper time an acceptable offer upon which a contract can be let."

The Royal Institute of Chartered Surveyors (RICS, 2005) defines e-Tendering as "the electronic issuing and receipt of any tender documentation as part of the procurement process". A fully operational e-Tendering process will allow for all stages of the traditional tendering process to take place electronically. This can take place through a web-enabled tender system. The RICS (2005) further explained that a web-enabled tender system is a unique website/extranet that enables access to all the participants of the tender process, via a login name and password, in order to upload and/or download documents. Betts et al. (2006) refers to this website/extranet as the "tender box". Technology is already available to allow communication of this type to take place, and is frequently called collaboration software**.**

However, the information entered into these ICT tools is almost invariably passed from one ICT system to another by producing paper-based electronic documents, which in turn are re-entered into various ICT systems used among Architecture, Engineering, in construction (Froese, 2003). It has been extensively reported by many authorities that traditional paper-based collaborative exchange of data between construction project participants is not efficient and that sensible use of ICT enhances productivity (Gunnigan et al., 2004). It has subsequently been concluded by Hore and West (2005a) that electronic transmission of business documents offers savings in time, paper

and postage. Tendering costs have been found to account for up to 6% of the total value of a project cost to a client on a typical construction project (Hughes, 2003 and CCDC, 2005). Furthermore, Hore (2007) found that firms can make significant monetary savings, in addition to direct process gains, through direct links between company's technological infrastructure.

1.2 STATEMENT OF THE PROBLEM

The construction industry plays a dynamic role in the economic growth and development of any nation. It satisfies lots of social, physical, and economic needs of the citizens through providing shelter, enhancing the infrastructure and creating employment opportunities, hence contributes to the fulfillment of essential national goals (Moavenzadeh & Rossow, 1976, pp. 2). Unfortunately, a number of research have shown that bribery and corruption are rampant in the construction sector worldwide according to Transparency International's 2002 to 2011 Bribery Payers Index (BPI) (Hardoon & Finn, 2011, pp. 2). It is also worth noting that according to the Canadian Construction Association (CCA), in a typical construction project, the cost of tendering to a client accounts for up to 5.85% of the total cost of the project (Hore et al., 2007, pp. 1). There is no argument about the fact that electronic tendering offers several advantages over the traditional paper-based method. Inefficient communication processes in tendering, lack of transparency, bureaucracy, ineffective monitoring and review mechanisms together with unethical public procurement officials among other concerns associated with tender process can be reduced through the introduction of a simple, accessible and cost effective ICT solution (O'Connell, et al., 2007). Thus many countries have adopted the use of electronic systems to enhance their tendering process.

While the above statement is through for many developed countries, the case of Ghana is different.

The use of the traditional system of procurement continue to dominate. Tender preparation and submission are done the old way (Sidik, 2010). Thus, this study seeks to explore the barriers to the adoption of electronic tendering in Ghana.

1.3 RESEARCH QUESTIONS

The current study is designed to find answers to the following questions:

(i) What is the construction industry's uptake of ICT, with particular focus on electronic Tendering in Ghana?

(ii) What is the constructions industry's opinion on the drivers to electronic Tendering practices in Ghana?

(iii) What are the barriers to the adoption of electronic Tendering in Ghana?

1.4 AIM AND OBJECTIVES

1.4.1 Aim

The research aim is to explore the barriers to the adoption of electronic tendering in Ghana**.**

1.4.2 Objectives

In order to achieve the aim above, the following specific objectives was pursued:

(i) To evaluate the constructions industry's opinion on the drivers to electronic Tendering practices

(ii) To identify the barriers to the adoption of electronic Tendering in Ghana

(iii) To identify the critical success factors for the adoption of electronic tendering in construction procurement in Ghana.

1.5 SCOPE OF THE STUDY

The research looks at the use of ICT in construction tendering in Ghana. The drivers, barriers and critical success factors to the use of electronic tendering were the focus of this study. Geographically, the study was conducted in the Accra Metropolis.

1.6 METHODOLOGY

This current study commenced with extensive literature review in electronic tendering; The drivers, benefits and barriers to its adoption were reviewed. In view of these secondary data were obtained from books, journal publications, previous thesis, and conference proceedings among others.

Based on the findings from the literature, structured questionnaires were designed to collect primary data from respondents. The collected data was analyzed using descriptive statistics and Relative Importance Index. the relative importance index (RII) was adopted to identify the rank (relative importance) of each barrier/challenge hindering the uptake of E-Tendering in Ghana in order to address and tackle them. The RII is widely used in construction research as in (Olukayode & Adeyemi, 2011), (Eadie et at., 2010); (Lavelle & Bardon, 2009). Analysis of the data was aided by the use of the statistical package for social science (SPSS)software. Presentations of the data was done using graphs and tables.

1.7 STRUCTURE OF THE THESIS

The study is organized into five chapters as summarized below; Chapter one will deal with introduction to the study by explaining the background to the study, problem statement, aim and objectives, scope, methodology and the structure of the study; and Chapter two will consider reviewing literature on electronic procurement.

Chapter three will explain the research methodology; Chapter four will present the results of the study and discussions on the findings of the study. Finally, the last chapter will present the conclusions drawn from the findings of the study. Recommendations for further studies will be highlighted.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents literature view on the various concepts and theories regarding electronic tendering. The drivers and barriers to electronic tendering have been reviewed. The benefits, system requirement among other key issues have been presented in this chapter.

2.2 CONCEPTUAL REVIEW

2.2.1 Tendering Procedures in Ghana

Over the years, tendering in Ghana has been done predominantly using the Paper-Based Tendering Method. The traditional tender process involves the Professional Quantity Surveyor (PQS) gathering the documentation together. This includes: photocopying/printing; assembling it into packages; binding, and dispatching to each of the prospective bidders for the tender. The dispatching thereof may be paid for by the bidder or by the PQS and normally involves the documentation being delivered by courier (CITAX, 2008). The process which involves the PQS in preparing tender documentation includes; The Bill of Quantities (BOQs) that lists all of the items that should be priced in each bid; drawings that are relevant to the tender, and any other relevant information (CITAX, 2008)

2.2.2 Understanding Electronic Tendering

According to Boer et al. (2001), Electronic Procurement (EP) can be defined as the use of Internet technology in the purchasing process. This definition excludes old purchasing applications, such as ordering by telephone or by fax. At the same time, the definition is relatively wide, encompassing the use of Internet applications in the purchase process, as well as the use of the

intranet and extranet applications. An example of an EP form is ordering office supplies by using a supplier's website catalogue.

E-Tendering is defined by Betts et al. (2006) as, "the procurement process simply conducted online, i.e., supplier registration/expression of interest, contract download, submission of bid document, evaluation of tenders". Importantly, e-Tendering is a growing and developing system that is available to both the public and private sectors of the construction industry for the efficient procurement of goods and services. Traditionally, the tendering process has been a paper-based system; however, three main factors have led to the growing application of electronic tendering, including (Betts et al. 2006):

1. The increasing use of technology within the construction industry;
2. The exchange of information between parties; and
3. Concern for the environment (minimizing the use of paper and materials).

Another definition for e-Tendering relates to the issue and receipt of tender documentation through electronic means, which facilitates the procurement of construction work and the awarding of contracts (Tindsley and Stephenson, 2008). Dawson et al. (2006) also recognizes the demand for a legally compliant and secure e-Tendering system within the construction industry. Additionally, Betts et al. (2006) define e-Tendering as the "electronic publishing, communicating, accessing, receiving and submitting of all tender related information and documentation via the internet, thereby replacing the traditional paper-based tender processes, and achieving a more efficient and effective business process for all parties involved".

Tendering, generally, is the process which is undertaken to obtain offers to create a contract between a client and a contractor (Tindsley and Stephenson, 2008). Electronic tendering which

also referred as e-Tendering is defined as the electronic publishing, communicating, accessing, receiving and submitting of all tender related information and documentation via internet, in that way replacing conventional paper based on tender process and achieving a more efficient and effective business process for all parties involved (Christensen and Duncan, 2006).

E-tendering is also defined by Al-Lawati and Aibinu, (2008) as the process by which tender documentation, such as drawings, bills of quantities (BoQ) and specification are issued to construction firms in an electronic format and via the internet. Thus, the invitation to tender, tender award, contract administration and monitoring project performance will be all undertaken electronically online. Furthermore, tender queries, tender addendums, updates, evaluation of work for payment and notification of payments are all to be exchanged electronically on the internet via the system's website and e-mail (Al-Lawati and Aibinu, 2008; CIOB, 2009).

Thus, e-Tendering electronically manages a construction tender; this includes sending the tender documents via email, contacting and notifying bidders, downloading documents, drafting, and responding to tenders through the website. Numerous e-Tendering systems and programs are available to the construction industry. These systems offer similar communications capacity, document management abilities, and auditing tools. Their functionality and processes are comparable to and reflect the paper tendering system. Betts et al. (2006) compares the general steps adopted in the tendering and e-Tendering process.

As noted above, the e-Tendering process is a "suitable mechanism for governments to fairly assign contracts for construction projects and procurement" (Betts et al. 2006). The increasing demand for efficiency in the construction industry has created a shift toward implementing e-Tendering in government sectors. As a consequence, the electronic environment presents solid prospects for improved communication and interaction between tender parties.

2.2.3 Benefits of Electronic Tendering

E-tendering can enhance tendering practice in many ways. For example, both the construction industry and government organisations agree that the traditional tendering process takes too much money and time, and the process would be much cheaper and faster if e-tendering was used instead (Kajewski and Weippert, 2004). Cost and time would be saved and productivity would increase, along with an enhanced competitiveness and improvement in an organisation's market share opportunities (Lenin, 2011). Ibem and Laryea (2016) find the main benefits when using etendering are reduction in transaction costs and turnaround time of the tendering process. Trkman and McCormack (2010) posit that one of the main benefits of e-procurement is an increase in the competitiveness, both financial and technical, of the tenderer's proposal. Additionally, contractors have benefited from the reduction in tender papers; hence, they are willing to profit from the significant time and cost savings in their e-tendering work (McAllister and McClave, 2010). Lavelle and Bardon (2009) identify five main benefits that can be gained from e-tendering: less administration costs for paperwork; improved two-way communications between the parties (contractors and sub-contractors); faster response to enquiries; a lesser timeframe for the tendering life cycle; and help in analysing the tenders. Farzin and Nezhad (2010) also identify the benefits of e-Procurement in three main areas of construction: strategies, opportunities and operations. Research by Zhang and Yang (2011) also highlights a number of other benefits from using etendering that can minimise collusion or make it more difficult for it to take place. Also, establishing or improving the use of e-tendering promises to allow construction organisations to update to best practice by exploiting the potentials of technology. As the move to e-tendering use becomes a global norm, even though there is a slow uptake in construction, e-tendering users are benefiting from the savings in time and money, improvements in quality and performance, and

increases in their competitive advantage. Tenderers who use traditional tendering miss opportunities through not keeping pace with new technology.

2.2.4 Functional Requirements for E-Tendering

Through literature, the spectrum of functional requirements (FR) definition is broad but yet holds close similarity. For instance, according to Pohl and Rupp (2011) FR is a requirement concerning a result of behavior that shall be provided by a function of the system. Meanwhile Bajpai and Gorthi (2012) describe FR as "what the system does". In addition, Sommerville (2005) defines FR as a description of system services, behavior or functions. In a nutshell, FR describes "what the system function should do".

Formal specification is ideal for the software developer, but it is not reasonable to necessitate the author of the requirements document, who is less familiar with formal methods or even with the concept of specification, to provide a formal description. Textual specification as natural language descriptions are a common means in software development for capturing requirements (Bryant, 2000; Denger, Berry and Kamsties, 2003; Casamayor, Godoy and Campo, 2012; Sommerville, 2007). It also found that using the language of the customer to describe these software requirements is most effective in gaining the customers understanding and agreement. These detailed software requirements are then used as input for the system design specifications as well as for test plans and procedures needed for implementation and validation. However, these requirements are usually are not properly communicate and documented, which contributes to incorrectness, inconsistency, incompleteness (Tjong, Hallam and Hartley, 2006; Denger, Berry and Kamsties, 2003) and misinterpretation (Tjong, Hallam and Hartley, 2006). Hence, without a proper template of natural language the specification could be confusing (Sommerville, 2007) and ambiguous

(Osborne and MacNish, 1996). In order to overcome this problem a requirements template should be used.

2.2.5 E-Tendering Security Requirements

Some e-tendering security requirements are similar to other electronic commerce systems. There is a need to address the integrity, confidentiality, authentication and nonrepudiation in e-tendering communications. System availability is also crucial, particularly during the tender submission stage before the close of tender time. Lopez (2007) believes that the most important security requirements that are relevant to e-tendering are those that are dependent on legal requirements. These requirements provide mechanisms that may be called on to provide evidence in the case of litigation. Specifically, these e-tendering requirements are nonrepudiation and authentication, secure time, and record keeping.

2.2.5.1. Non-repudiation and Authentication

Non-repudiation property is proof or evidence that a particular action has taken place. The algorithm for nonrepudiation can also be an extension of the authentication process. It provides a defense against denial of their actions by a participating party. In an e-tendering system, the digital signature mechanism (Rivest et al., 1978; Diffie and Hellman 1976) can provide authentication and non-repudiation.

2.2.5.2. Secure time

The security of an e-tendering system relies crucially on the recording of the date and time at which events occur within the system. The main areas of concern relating to secure time are: Time integrity, the closing and opening of the e-tender box.

a*) Time Integrity*

The evidentiary value of recorded temporal information depends on the technical assurance that derives from both the particular choice of time stamping mechanism and from their correct deployment and maintenance. The first option for time stamping an event is to generate a log record that includes a description of the event and the time of occurrence as measured by the clock of the local host computer. A second option involves using a digital time stamping service that associates date and time information to electronic documents in a cryptographic manner. Digital time stamping services are usually provided by third parties.

b) Closing/Opening Time of E-Tender Box

No tender submissions should be allowed after the stipulated closing time. In order to mitigate the threat of insider collusions, submitted tenders should not be opened before the established opening time, which must be set to be after submission closing time. Sometimes there are multiple tender boxes, both electronic or physical (The Internet Engineering Task Force, 1992). For the control of e-tender box opening time, there are a variety of technical mechanisms that can be considered in order to protect the confidentiality of submitted tenders until the pre-accorded opening time.

2.2.5.3. Secure Record-Keeping

E-tendering systems generate and process electronic documents that are part of business activities. A key legal requirement for record keeping is the preservation of the evidentiary integrity of records, both documents and contextual data; this poses a major technical challenge in an electronic environment. To maximize the evidentiary weight of electronic records, the e-tendering system needs to ensure that evidentially significant electronic records are identified, are available and are usable; identify the author of electronic records; establish the time and date of creation or alteration; establish the authenticity of electronic records; and establish the reliability of computer

programs. The following e-tendering documents are important evidential material: tender document submissions; Tender specification and addenda produced by the principal; tender revocation notices submitted by tenderers; negotiation communications post tender close time; request for explanation communications pre-tender close time; award oftener announcement; and any receipt of message acknowledgments.

2.2.6 E-Tendering Legal Requirements

Betts et al. (2006) listed some major legal areas that have an impact on the e-tendering process. These are Contract Law, Freedom of Information Act, Copyright Act, Trade Practices Act, and Electronic Transaction Act. Shift to an electronic environment presents several legal hurdles, in part because the law that governs electronic transactions is under-developed and lags behind the technology. However, as the tendering process is governed largely by contract law many of the various gaps in the law may be remedied by explicit and detailed conditions of tender. In developing conditions of tender that may fill the various gaps in the law, reference needs to be made to any legislation governing electronic transactions in the relevant jurisdiction (Vangala and Sasi 2004). As the UNCITRAL Model Law on Electronic Commerce has been

2.2.7 E-Tendering System Architecture

There are three possible system architectures for e-tendering: Principal based, trusted third party (TTP) based; and Distributed TTP architecture (DTTP) (Shahriyar and Hediy, 2014).

2.2.7.1 Principal based architecture

The principal based architecture is mostly used by government e-tendering organizations. The principal is the main administrator of the tendering process. The principal is responsible for ensuring the authentication of the tenderers. Tenderers usually verify the identity of the principal

and all correspondence coming from the principal, including tender specification documents and addendum, using a certificate distributed by the principal. Tenderers submit tender documents directly to the principal. The principal maintains the tender box application and must store all submitted tender documents securely, and ensure that no tender documents are submitted after, or viewed before the tender close time. The principal is also responsible for the secure storage and archiving of documents after the tender has been awarded. This architecture places a great deal of trust in the principal. Tenderers place their trust in the access control system employed by the principal to ensure that collusion or internal malfeasance by the principal's users is difficult. The principal must also develop a scheme for verifying the identity and authenticating documents from the tenderers. The principal would run a certificate authority, issue certificates and conduct a cryptographic key generation process with tenderers when they complete the pre-qualification process.

2.2.7.2 Trusted Third Party Architecture-(TTP)

The TTP based architecture is commonly used by private industry or independent government bodies. Like the principal in the principal based architecture, the TTP is responsible for authentication of all parties in the architecture. To enable this, the TTP should act as a certificate authority issuing certificates and cryptographic keys to the principal and tenderers. The TTP also act as a time-stamping server. The principal and tenderers should synchronies their clocks with the time published by the TTP. Thus, in the TTP based architecture the TTP entity is responsible for enforcing and maintaining the e-tendering requirements of non-repudiation, authentication, secure time and record keeping.

2.2.7.3 Distributed TTP architecture based architecture

The DTTP uses multiple TTPs to provide security services such as the Secure Time Server (STS) and the Certificate Authority (CA). The STS performs two functions, time synchronizations and time controlled key release for accessing submitted tenders. The CA has the function of key registration and key verification. Because of the separation of these roles, this architecture lends itself to a large scale e-tendering implementation. In this architecture, principals host the e-tender box, and DTTP only provides security services to preserve e-tendering process

2.2.8 Steps in E-Tendering (E-Tendering Process)

Basically, the tendering process consists of four stages which are registration, public invitation, tender /opening of tenders and publication of award (UN/CEFACT, 2005). Meanwhile, Construction Industry Board, Working Group 3 and Construction Industry Board Staff (1997) have determined the tender process will consist of qualification and compilation of the tender list, tender invitation and submission, and tender assessment and acceptance. In the meantime, Dawson et al (2006) highlighted seven (7) basic components for tendering process which are classified from the Australian Standard Code of Tendering (AS 4120, 1994). The components are pre-qualification and registration, public invitation, tender submission, close of tender, tender evaluation, award of tender, and archiving. To organize these e-tendering processes, the 7 basic components proposed by Dawson et al. (2006) will be used. The main reason is because these components consist sufficient elements which represent overall structure of e-tendering system. Besides, these components are based on both tendering and e-tendering process. Therefore, its suitability to represent the basic component of e-tendering process is solidified.

Next, the collected e-tendering process are classified and organized according to the 7main components of tendering process. By analyzing the input from Table 2.1, it is discovered that each

of the listed e-tendering process shares the same attribute. For instance, according to UN/CEFACT (2005), Ministry of Finance Malaysia (2013) and Duncan et al. (2006) e-tendering process should start with tenderer registration. However, based on literatures, there are slight variants on the immediate matter. To cite an instance, Dawson et al. (2006) stated that e-tendering process should issue username and password after principal examines registration application. This process is important since the tenderer needs username and password to access the e-tendering system. Still, there are several modifications have been made in this general e-tendering process and the summary of that result is shown in Table 2.1.

1) Pre-qualification & registration

At first, potential tenderers require to submit a registration form in the e-tendering system. These registration form is for qualification assessment. principals relevant to each potential tenderers` industry, assess each registration form and issue pre-qualification status for each qualified potential tenderers to access the e-tendering system. This status is usually based on the ability of the potential tenderers. In this stage potential tenderers have to create an account with a credit or debit card issuing bank who is responsible for potential tenderers authentication by biometric information. Bank will authenticate the tenderers to principal, also let them know that the tenderers have enough credit in their account for paying deposit of tenders.

2) *Public invitation*

In this stage, principal creates a public invitation to tender for a particular project. Each prequalified tenders can see the relevant tenders in their pages. Principal who creates the public invitation are authenticated by the card issuing bank base on their biometric information. Tender deposits are paid to principal account in this banks.

3) Tender submission

During Tender Submission stage the tenderers prepare and submit encrypted tender offer documents to the electronic tender box. The principal should not be able to v the tender offer documents before the close of tender. Tender submissions should be digitally signed by the tenderers and verified by their biometric information. The principal must ensure that its clock is synchronized with the STS and that the correct submission time is recorded.

4) Close of Tender

This stage covers the close of the tender box at a time specified by the principal. Documents submitted by tenderers are then released to the principal for evaluation. The principal will request a key to decrypt the offers from the STS. The STS will only release the key when the tender box is to be opened at or after the tender close time. Bell -LaPadula security model is imposed to let principals only read the e-tender box content. Shamir threshold crypto system is used to give each principal their shares of opening key. After the submission deadline, the principal can reject any late or non-conforming tenders according to the time stamping information and tender specification.

5) Tender Evaluation

The principal may need to request more information from the tenderers. authentication of the origin of this message is done by the bank using biometric information.

6) Award of Tender

In this stage, the principal will accept a tender and send notification to the winning tenderer. It also involves the public announcement of the result. A formal contract can then be signed between the principal and the winning tenderer if it is required. Both the principal and the tenderers will use the bank to verify each other's identity.

Table 2.1-E Tendering Process

Tendering main activity	e-tendering process	Reference
Registration	Registration	Ministry of Finance Malaysia, 2013; Dawson et al., 2006
	Apply for registration	UN/CEFACT, 2005
	Submit registration application	UN/CEFACT, 2005
	Examine registration application	UN/CEFACT, 2005
	Issue examination result notice	UN/CEFACT, 2005
	Issue username and password	Betts et al., 2006
Public Invitation	Establishment of project strategy	UN/CEFACT, 2005; Ministry of Finance Malaysia, 2013
	Create tendering subject UN	UN/CEFACT, 2005
	Invitation to tender (tendering subject publication)	UN/CEFACT, 2005
	Publish invitation to tender	UN/CEFACT; Ministry of Finance Malaysia, 2013; Duncan et al., 2006
	Pre-qualification	UN/CEFACT, 2005
	Submit prequalification application	UN/CEFACT, 2005
	Selection of tenderers	UN/CEFACT, 2005
	Issue letter of invitation to tender UN	UN/CEFACT, 2005
	Sale of tender documents	Ministry of Finance Malaysia, 2013
	Paying tender deposit (non-local tenderer	Ministry of Finance Malaysia, 2013
Tender submission	Tenderer registration to tender for a project	Dawson et al., 2006
	Download tender document	Dawson et al., 2006
	Addendum distributed by principal	Dawson et al., 2006
	Issue tender guarantee	UN/CEFACT, 2005
Close of Tender	Submit Tender	UN/CEFACT, 2005; Dawson et al., 2006
	Opening of Tenders	UN/CEFACT; Ministry of Finance Malaysia, 2013
Tender Evaluation	Evaluate Tenders	UN/CEFACT; Ministry of Finance Malaysia, 2013
	Decide successful tenderer	UN/CEFACT; Ministry of Finance Malaysia, 2013
	Qualification	UN/CEFACT, 2005
	Submit qualification application	UN/CEFACT, 2005
	Issue qualification result notice	UN/CEFACT, 2005
	Tender result notice	UN/CEFACT, 2005

	Issue tender result notice	UN/CEFACT, 2005
Award of Contract	Contract award publication	UN/CEFACT, 2005
	Create contract award	UN/CEFACT, 2005
	Notify contract award	UN/CEFACT, 2005

Source: Mohd et al., 2014

2.2.9 Reasons for the slow adoption of e-tendering in the Construction Industry

In the last decade, the use of e-procurement has increased in construction procurement technologies; however, the construction sector has been slower to adopt it than the manufacturing and retailing sectors (Laryea and Ibem, 2014). This may be because the organisation is not ready to shift to electronic practice, or is not focused on post-adoption. In the other hand, e-procurement in the construction industry is more complicated than in other industries such as goods and services. The reasons for this become clearer when comparing the adoption of e-procurement barriers and challenges in construction to the barriers in other industries (Eadie et al., 2011). The late implementation of IT/IS in the construction process is due to the construction industry itself having unique characteristics in terms of its product, complexity, size and location of projects (Aziz and Salleh, 2011). Finally, Lee et al. (2014) find that the government level plays a key role in encouraging the industry stakeholders to switch to e-tendering. There are two possible reasons why the adoption of e-tendering has been limited in the construction industry. Firstly, research into construction e-tendering is not consistent, but varies according to whether it focuses on factors such as people, processes, work environments or technology. Moreover, as Eadie et al. (2012) reveal in their review, IT/IS research in general focuses on post-adoption. In support, Wendler (2012) states that "most publications deal with the development of maturity models and empirical studies." Wendler (2012) has conducted a systematic review of maturity models in information systems (IS), reflecting their development in each area of research. As an indicator, there were 89 software development/engineering models by 2012, due to the dissemination and success of

maturity models emerging from the software industry. On the other hand, there were 17 project management models, ten construction process/engineering models, and ten process management models, demonstrating the impact of continuous research in the software development/engineering field. However, the construction industry is still failing to achieve comparable rates of IT use (Aziz and Salleh, 2011). The second issue is the lack of an effective and specialised model or framework to assess the readiness for use of construction organisations' e-tendering processes. As Aziz and Salleh (2011) observe, "a commonly cited problem that exists with e-readiness is the fact that there are many different types of measures available today and that there is no standardisation of these measures". None of these models and frameworks are suitable for assessing the readiness of a construction organisation to adopt e-tendering since they do not cover the full range of construction tendering activities, are outdated, and are not designed for general e-procurement purposes. Moreover, the other available e-readiness models are also not suitable for construction use as they vary in their economic and social use, which makes them difficult to apply to construction procurement Aziz and Salleh (2011).

2.3 EMPIRICAL REVIEW

2.3.1 Measuring e-tendering readiness

Nowadays, organizations that consider partially or fully shifting to the digital world need to measure themselves prior this change (Rafferty et al., 2013). As Goulding and Lou (2013) comment, "the term e-readiness is coined to measure the degree to which an organization may be ready, prepared, or willing to obtain benefits, which arises from the digital economy". Therefore, Lou and Alshawi (2009), in their study of critical success factors (CSFs) in implementing etendering suggest further research into whether "organizations could adopt a 'measured approach'

to help them be 'e-ready'". Finally, a measured approach helps organizations to increase their capability and results in a practical framework to ensure their e-Readiness prior to implementation.

2.3.2 Drivers to Electronic Tendering in construction Procurement

Numerous barriers and drivers affect the implementation of e-Tendering in the construction industry. The analysis and design of e-Tendering to overcome these barriers contributes to the critical success factors in the use of e-Tendering. The following sections outline the drivers that A driver is a benefit derived from the implementation of e-Tendering in the construction industry. One of the benefits is to centralize the tendering process and documents, which allows for easier access to tender documentation by all parties. Eadie et al. (2007) assessed the existing literature to establish the following list of e-Tendering drivers:

1. Price reduction in tendering;
2. Reduction in time to source materials;
3. Reduction of administration costs;
4. Reduction of staffing levels in procurement;
5. Gains in competitive advantage;
6. Improvements in communication;
7. Enhancement of decision making and market intelligence; and
8. Reduction in operating and inventory costs influence e-Tendering within the construction industry.

The main benefit of the collaborative electronic environment is improved work processes, efficient sharing and reuse of information, formation of strategic partnerships within the industry, and

reduced costs and time for preparation (Armit and Sott 2001). A competitive advantage can occur from the benefits of the collaborative electronic environment through increased efficiency, speed, data accuracy, and effectiveness in the tendering process (Lou and Alshawi, 2009). The benefits of implementing e-Tendering are different for the different parties involved in the procurement process. The benefits for the parties submitting bids for tender are as follows (Kajewski and Weippert 2004):

1. Quick and easy access to tendering information;
2. Increased tender opportunities;
3. Improved access for geographically isolated organisations
4. Increased market shares and competitiveness; and
5. Reduced cost of resources.

The benefits for the public sectors and government organizations are as follows (Kajewski and Weippert 2004):

1. Increased efficiency and effectiveness; and
2. Consistent tendering processes across the government.

Kajewski and Weippert (2004) also found that industry benefited from the following:

1. Reduced costs (up to 90% in preparing, copying and distributing tender documents);
2. Reduced time costs through efficient use of technology;
3. Equal advantage/disadvantage regarding geographical location;
4. Increased distribution speed of tenders;
5. Improved communication between parties;
6. Improved tender management; and

7. Reduced time spent on routine administration

2.3.3 Barriers to Electronic Tendering in construction Procurement

A barrier is a restriction or deterrent that affects the implementation of e-Tendering within the construction industry. Eadie et al. (2007) identified the following e-Tendering barriers:

1. Unclear legal position of e-Tendering;
2. Unaccepting company culture;
3. Lack of upper management support;
4. Lack of IT infrastructure;
5. Costly IT systems;
6. Lack of technical expertise;
7. Insecurity of transactions;
8. Interoperability concerns; and
9. Unrecognized business benefits

The biggest barrier to implementing e-Tendering and adopting the use of a collaborative electronic environment is the employees themselves, mostly because of their lack of awareness of the technology available within the construction industry. However, the lack of skilled workers, and cross-communication and information exchange contributed to the e-Tendering barriers (Lou and Alshawi, 2009). Alshawi and Weng Lou (2009) found that construction industry companies were often set in their old ways of doing business. Further, they see the change to an electronic environment as unproductive. Additionally, the legal aspects concerning an electronic environment were identified by Kajewski and Weippert (2004) as barriers, especially the lack of signed documents and face-to-face agreements between the parties on both sides of the tender documents.

This traditional and formal way of undertaking business was problematic for the employees, as were the contractual restraints that were no longer apparent with e-Tendering.

A central concern when industry organizations have to use the internet for electronic information transfer is that of security (Root and Thorpe, 200; Eadie et al., 2010. Oyediran and Akintola, 2011) identify security of e-tendering and ignorance of benefits as highly influential factors to the dismal state of e-tendering usage among Nigerian construction industry professionals in the performance of their activities. As expected, irregular electric power supply ranks highest on the influence scale followed closely by financial implications of setting up the facilities. These precede poor communications infrastructure, lack of training of professionals, skepticism about the system, reluctance to change, low quality education of graduates and lack of interoperability of software in use by construction industry professionals in that order (CITAX, 2008; Tone, 2005), Oyediran and Akintola (2011) bemoans the lack of ICT infrastructure for ensuring a secure e-tendering process are not widely available, and it is not clear whether those that have them have been using them to secure exchanged data. In addition, Brook (2008) warns of the dangers that arise when introducing this system. Firms need to consider if the market sector they are trying to source from is ready for e-tendering because a loss of bidders due to perceived complexity may be a big problem and a discouragement to securing a competitive bid.

High rate of obsolescence (Root and Thorpe, 2001; Ozumba, Ata, Oburo, David, 2010) a lack of strategic direction within the industry, in terms of overall direction, the standards and protocols that would inform any IT investment decision (Root and Thorpe, 2001). Ozumba et al. (2010) lament the high rate of development; inadequate infrastructure; power supply, and other essential public services, socio-economic and political upheavals, it seems that negative perceptions are justified (Ozumba et al. 2010; Westcott & Mayer, 2002). The conservative nature of the industry

means that it embraces change slowly (Tone, 2005: CITAX, 2008. The lack of awareness is one of the major barriers specifically acknowledged as the principal impediment to the adoption of collaborative technology environments (Lou and Ashalwi, 2009).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter present the research methodology used in conducting the study. It explained the research strategy, approach and design. The study population, sample size and sampling technique, data collection and analysis methods.

3.2 RESEARCH STRATEGY

A research strategy can be qualitative, quantitative, or mixed method as noted by Leedy and Ormrod, (2001). Quantitative research is used to enumerate the problem by way of generating numerical date or data that can be transformed into usable statistics. it is used to measure attitudes, opinions, behaviors and other variables- and generalize results from a larger population sample. In view of this, the research strategy used for the phenomenon under investigation was quantitative research strategy which helps in collecting numerical data that was subjected to statistical analysis. Moreover, the choice of this strategy was also influence by the nature of the research questions and the population sampled.

3.3 RESEARCH APPROACH

According to Naoum, (2006) two research approaches exist: inductive and deductive research approach. The later (deductive approach) involves testing existing theories while the other one builds new theories (Naoum, 2006). The choice of any of the above approaches also depends on the nature of the research question, the research philosophy adopted. Since the current study does not intend to develop a new theory, the deductive research approach was adopted to test existing

theories and findings on e-tendering for construction procurement in the Ghanaian Construction industry.

3.4 RESEARCH DESIGN

A survey, case study, experiment just to mention a few. A survey research design according to Leedy and Ormrod, (2001) also noted that a number of research design can be adopted depending on the research questions. Theses designs include a case study, survey, experiment, archival review among others. In the current study a survey research design was adopted. This research design identity's the research problem clearly and effectively describes the data which will be necessary for adequate testing and how explained how data was collected.

3.5 DATA TYPE AND CATEGORIZATION

3.5.1 Sources of Data

The study gathered both secondary and primary data. The secondary data was obtained through the review of literature from books, previous thesis, journal publications among others. The primary was also collected through a field survey suing questionnaires which was administered online.

3.6 POPULATION AND SAMPLING PROCEDURES

3.6.1 Population and Sample Frame

The population of a study comprises of the entire units of the variable the researcher sets to study (Bryman, 2004). In the current study, the sample members who were selected had special relationship with the phenomenon under investigation, sufficient and relevant work experience in the field of construction procurement, active involvement in several tendering activities, as well as proven research, within this context, the participants of this study were key professional such as

Quantity Surveyors, Engineers Architects, Project Managers among others. From these respondents the study sought to find out the drivers, barriers and success factors for the implementation of e-tendering in the construction industry in Ghana.

3.6.2 Sampling Technique and Sample Size

The method of Simple random sampling was used to develop the sample of the research under discussion. Fellow and Liu (1997), Desta (2006) argue that if there is no evidence of variation in the population structure or if there is no reason to ignore the structure, then random sampling procedure is appropriate. In this survey, a simple random sampling was used because there is no evidence of variation in the reason as to the barriers to the adoption of e-tendering in construction procurement in Ghana, through this approach a total of 150 structured questionnaires were administered online using Google Forms. However, 120 respondents received from the various professional bodies out of the total questionnaire administered were used, recently due to the increasing number of invitations to web-based surveys from different sources, the quite a number of the participants became less likely to respond and by so doing, the quality of their answers were not too good. This usually happens as in many cases the respondents/participants do not take sufficient time to examine critically before replying to each question in addition to misinterpreting the questions if they are not clear enough, in view of this, 30 respondents did not complete the forms properly, for that matter excluded from the data analyzed.

3.7 DATA COLLECTION METHODS

3.7.1 Data Collection Instrumentation (Primary Data)

Structured questionnaire was used to collect data from the study population. The first part of the questionnaire drew information about the background of the respondents namely; their position and years of working experience. The other part of the questionnaire asked questions on the drivers,

barriers and success factors for the adoption of e-tendering. The questions mainly close ended which ensured uniformity in the answers.

3.7.1 The Fieldwork

In the current study str/uctured questionnaire was administered online using Google forms. The questionnaire used a Five-Point-Likert-type scale to measure a range of opinions from "Strongly disagree to Strongly Agree" as the case may be. The study which utilized a questionnaire survey of Architectural, Engineering, Project Mangers, Quantity Surveyors consultants among others was carried out between July and August 2019 within the Accra Metropolis as a primary data, collected within the Greater Accra Region where most of the Population are located.

3.8. DATA PROCESSING AND ANALYSIS TECHNIQUES

3.8.1 Descriptive Statistics

The responses of the respondents were analyzed to enable discussions to be made on the subjects. SPSS (Statistical Package for Social Sciences) version 16 was first used to collate the responses. Afterwards, the questions on the demographic characteristics and general particulars of the respondents were analyzed into percentages. The results were further presented in graphs, charts and tables. Relative Importance Index (RII) was used to identify the rank (relative importance) of each barrier hindering the uptake of E-Tendering in Ghana in order to address and tackle them.

The RII is widely used in construction research as in (Olukayode & Adeyemi, 2011), (Eadie et at., 2010); (Lavelle & Bardon, 2009), etc. The formula is given by:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{AN}$$

Where, W = the weights given to each variable by the respondents, ranging from 1 to 5;

A = the highest weight (i.e. 5 in the study)

N = the total number of samples

3.8.2 Ethical Considerations

The following ethical standards were complied with:

1. **Informed consent of respondents**; In other to comply with the ethics of research the study sought the consent of the respondents.
2. **No force**- The respondents were not forced or coerced into filling the questionnaire.
3. **Anonymity and confidentiality**- Moreover, the anonymity and confidentiality of the information provided was also ensured.
4. **References-** Finally, all pieces of document or secondary data used for the study were duly referenced.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the results of the study and discussion of findings in relation to literature. There are basically five sections in this chapter. The first section presents the background details of the respondents while the remaining sections presents the findings of the study based on the study objectives.

4.2 BACKGROUND OF RESPONDENTS

Based on the results from the survey, Table 4.1 shows the background of the respondents selected from the study. These respondents are engaged in various professions. From the results, 70% of

the respondents are Quantity Surveyors, 20% of them are Project Managers, 6% of the respondents are Architect and lastly 4% of them are Engineers. Based on the above outcome of the profession, majority of the respondents were Quantity Surveyors. In addition, 10% of the respondents have a working experience between 1 -5 years, 58% of them recorded the highest working experience being between 6 – 10 years, 23% of the respondents have worked between 11 – 15 years. Moreover, 13% of the respondents have worked between 16 – 20 years lastly over 20 years working experience recorded the least of the respondents being 2%.

Furthermore, based on the educational level of the respondents as represented by the histogram below, it is realized that majority of the respondents (53%) have

Table 4.1 Background of Respondents

Sn	Respondent Profile	Frequency	Percentage
1	**Profession**		
	Quantity Surveyor	76	70.00
	Project Manager	24	20.00
	Architect	12	10.00
	Engineer	8	6.00
	Total	120	100.00
2	**Years of Experience**		
	(a)1 – 5 years	12	10.00
	(b) 6 – 10 years	70	58.00
	(c) 11 – 15 years	28	23.00
	(d) 16 – 20 years	8	13.00
	(e) Over 20 years	2	2.00
	Total	120	100.00

Source: Field study, (2019)

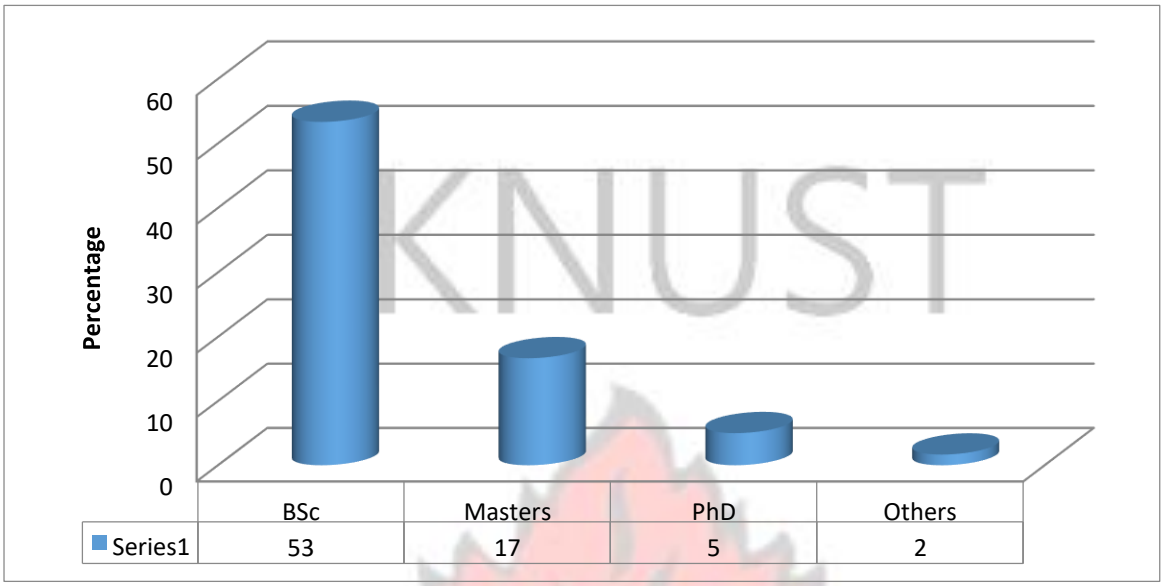

Fig 4.1: Highest level of education of respondents

Source: Field study, (2019)

4.3 DRIVERS TO THE ADOPTION OF ELECTRONIC TENDERING PRACTICES

It has been noted that numerous drivers affect the implementation of e-tendering in the construction industry. Drivers are the benefit derived from the implementation of e-tendering in the construction industry. Eadie et al., (2007) in literature established these drivers to the adoption of electronic tendering practices. Therefore, Table 4.2 shows the ranking of these drivers to the adoption of E-tendering practices in the construction.

Reduction in time to source materials

As argued by Armit and Sott (2001), reduced in time to source materials is one of the main benefits of the collaborative electronic environment. This helps in a form of competitive advantage which can occur through increased efficiency, speed, data accuracy, and effectiveness in the tendering process (Lou and Alshawi, 2009). These literatures are similar with of the findings of the respondents as indicated in Table 4.2.

Enhancement of decision making and market intelligence

In addition, majority of the respondents have the perception enhancement of decision making and market intelligence is another major driver to the adoption e-tendering in the construction industry. According to them, market intelligence helps to ensure efficiency and effectiveness in the tendering process. It also increases tender opportunities and market share as well as competitiveness. This finding from the respondents is not different from that Lou and Alshawi (2009) and Kajewski and Weippert (2004).

Improvements in communication

Furthermore, improvement in communication was noted by majority of the respondents as another driver to the adoption of E-tendering. Most of the respondents indicated that improved communication between parties helps the industry involved to benefit and eventually increases tender opportunities. This finding too from the respondents is similar from that of Kajewski and Weippert (2004).

Reduction in operating and inventory costs

Moreover, many of the respondents were of the view that reduction in operating and inventory cost is a major driver to the adoption of E-tendering. According to them, when the operational and inventory costs are reduced within a construction industry, it really influences e-Tendering within the industry. The finding is similar with of Eadie et al., (2007).

Table 4.2: Ranking of the Drivers to the Adoption of E-tendering

	Drivers	RII	Rank
1	Reduction in time to source materials	0.91	1st
2	Enhancement of decision making and market intelligence	0.85	2nd
3	Improvements in communication	0.82	3rd
4	Reduction in operating and inventory costs	0.76	4th
5	Price reduction in tendering	0.75	5th

6	Reduction of administration costs	0.72	6th
7	Gains in competitive advantage	0.68	7th
8	Reduction of staffing levels in procurement	0.55	8th

Source **(ITcon Vol. 12 (2007) Eadie et al, pp. 112)**

4.4 BARRIERS TO THE ADOPTION OF ELECTRONIC TENDERING IN GHANA

According to Eadie at al., (2007), a barrier is a restriction or deterrent that affects the implementation of e-Tendering within the construction industry. The literature identifies several barriers to electronic tendering in construction procurement in Ghana. Table 4.3 therefore indicates the ranking of these barriers to the adoption of e-tendering.

Conservative nature of the industry

As argued by Alshawi and Lou (2009) that construction industry companies often work using their old ways of doing business as a result of the conservative nature of the industry. They indicated that, the lack of skilled workers, and cross-communication and information exchange contributed to the e-Tendering barriers. The conservative nature of the industry means that it embraces change slowly. Most of the employees often relax because of the conservative nature of the industry and this has been identified as the biggest barrier to implementation of e-tendering. The finding is not different from that of the respondents.

Poor ICT infrastructure to support electronic tendering

Also, majority of the respondents were of the perception that Poor ICT infrastructure to support tendering is another key barrier to the adoption of electronic tendering in Ghana. They argue that the ICT infrastructure to ensure secure e-tendering process is most not available and further doubt

that those that have them have been using them to secure exchanged data. This finding is similar with of Oyediran and Akintola (2011).

The rules and regulations that cover the tendering process are still predominantly paper-based. As Brook (2008) warns of the danger that will arise when introducing the e-tendering system because of many rules and regulations that cover the tendering process are still predominantly paper-based. Additionally, the legal aspects concerning an electronic environment were identified by Kajewski and Weippert (2004) as barriers, especially the lack of signed documents and faceto-face agreements between the parties on both sides of the tender documents. This traditional and formal way of undertaking business was problematic for the employees, as were the contractual restraints that were no longer apparent with e-Tendering.

Skepticism about the method

According to Oyediran and Akintola (2011), security of e-tendering and ignorance as highly influential factors to the dismal state of e-tendering usage among were identified among many professionals in their performance of activities. This is because of the are skeptic whether this system will work or not. This finding too is similar with that of the respondents.

Table 4.3: Ranking of the barriers to the adoption of e-tendering in Ghana

	Barriers	RII	Rank
1	Conservative nature of the industry	0.95	1st
2	Poor ICT infrastructure to support electronic tendering	0.92	2nd
3	The rules and regulations that cover the tendering process are still predominantly paper-based	0.88	3rd
4	Skepticism about the method	0.87	4th
5	It exposes sealed bids to possible hacking which defeats the principle of sealed bids	0.86	5th
6	Costly IT systems	0.86	5th
7	Concerns of security of submitted tenders	0.85	7th
8	Adequacy of existing system	0.83	8th
9	Doubtful clarity and simplicity of e-tendering method	0.81	9th

10	Lack of agreed standards	0.80	10th
11	Unreliable internet	0.80	10th
12	The lack of internet connectivity	0.79	12th
13	Prevalence of legal and technical traps	0.78	13th
14	Ignorance of benefits of e-tendering	0.76	14th
15	Lack of technical expertise	0.74	15th
16	Frequent Viruses attacks	0.70	16th
17	Lack of robustness of electronic tendering	0.68	17th
18	Lack of efficiently designed websites	0.65	18th
19	Large initial capital investment is required	0.64	19th
20	Difficult in quantifying electronic tendering benefits	0.55	20th
21	Interoperability concerns	0.50	21st

ITcon Vol. 12 (2007), Edie et al. pg.115

4.5 CRITICAL SUCCESS FACTORS TO THE ADOPTION OF ELECTRONIC TENDERING IN GHANA

Based on the above barriers to the adoption of electronic tendering identified in Ghana, there are some factors that have been identified as to help facilitate the adoption of electronic tendering in Ghana. In light of this, Table 4.4 shows the ranking of some key critical factors to the adoption of e-tendering in Ghana.

Availability of reliable ICT Infrastructure

According to the respondent's provision of ICT infrastructure is a critical success towards the adoption of e-tendering. According to them, there should be a strategic direction within the industry, in terms of their standards and protocols that would inform any IT investment decision. Making these ICT infrastructures available will now make the e-tendering very effective and fast.

Availability of reliable, affordable and fast Internet services

Aside the availability of ICT infrastructure, the respondents added that not only do we need ICT infrastructure but also more reliable, affordable and fast internet services. Since electronic

tendering involves internet services, the respondents indicated that the internet services should be fast, reliable and affordable in order to ensure the effectiveness of the system.

Compatibility of e-Procurement with the existing procurement processes

As indicated by Alshawi and Weng Lou (2009) who found out that construction industries were often set in their old ways of doing business. Further, they see the change to an electronic environment as unproductive. Therefore, the respondents indicated that compatibility of eProcurement with the existing procurement processes is a critical factor towards the adoption of e-tendering in Ghana.

Confidentially in e-tendering transaction

The respondents were of the view that confidentiality in e-tendering is a critical success factor in e-tendering in Ghana. As noted by Lou and Alshawi (2009) that cross communication and information exchange contribute to the e-Tendering barriers, therefore confidentiality of the workers in e-tendering transaction is a critical factor towards the success of e-tendering in Ghana.

Table 4.4: Critical Success factors to the adoption of e-tendering in Ghana.

Sn	Success factors	RII	Rank
1	Availability of reliable ICT Infrastructure	0.98	1st
2	Availability of reliable, affordable and fast Internet services	0.96	2nd
3	Compatibility of e-Procurement with the existing procurement processes	0.92	3rd
4	Confidentially in e-tendering transaction	0.90	4th
5	Top management commitment and support to e-tendering adoption	0.88	5th
6	High level of trust on e-tendering technology by industry stakeholders	0.87	6th
7	Availability of skilled personnel to handle e-Procurement tools and processes	0.86	7th
8	Security and authentication of e-tendering process	0.85	8th
9	Existence of supportive e-Procurement policies and legislation	0.84	9th

10	Acceptance of the legality of electronic contracts	0.84	9thth
11	Government support for e-Procurement adoption	0.82	11th
12	Interoperability of e-Procurement software packages, applications and systems	0.81	12th
13	Employees' commitment to success of adoption	0.80	13th
14	High level of computer literacy among construction stakeholders	0.79	14th
15	Ease of use of e-tendering tools, applications and processes	0.76	15th
16	Knowledge of the benefits of e-tendering use	0.75	16th
17	Effective change management plan and training of all the stakeholders	0.75	16th
18	Constant power supply	0.63	18th
19	Existence of a uniform standard for describing, displaying and specifying construction materials, works and services	0.60	19th

ITcon Vol. 14 (2009) Lou and Alshawi, pp. 102.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter summarizes the results of the study, conclusions drawn as well as recommendations made for consideration by all stakeholders in future construction procurement.

5.2 SUMMARY OF FINDINGS

The current study sought to look into e-tendering in construction procurement in Ghana. Three objectives were pursued and based on the data collected and the analysis carried out, the following are the key findings for each of the objectives.

Objective 1: To assess the constructions industry's opinion on the drivers to electronic

Tendering practices

(i) From the data collection, the following are the major drivers:

(ii) Reduction in time to source materials

(iii) Enhancement of decision making and market intelligence

(iv) Improvements in communication

(v) Reduction in operating and inventory costs

(vi) Price reduction in tendering

(vii) Reduction of administration costs

Objective 2: To identify the barriers to the adoption of electronic Tendering in Ghana

The major barriers were also found to be as follows:

Conservative nature of the industry

Poor ICT infrastructure to support electronic tendering

(i) The rules and regulations that cover the tendering process are still predominantly paper-based

(ii) Skepticism about the method

(iii) It exposes sealed bids to possible hacking which defeats the principle of sealed bids

(iv) Costly IT systems

(v) Concerns of security of submitted tenders

(vi) Adequacy of existing system

(vii) Doubtful clarity and simplicity of e-tendering method

(viii) Lack of agreed standards

(ix) Unreliable internet

These findings were found to be perfectly in agreement with existing literature.

Objective 3: To identify the critical success factors for the adoption of electronic tendering in construction procurement in Ghana

The critical success factors were found to be:

(i) Availability of reliable ICT Infrastructure

(ii) Availability of reliable, affordable and fast Internet services

(iii) Availability of skilled personnel to handle e-Procurement tools and processes

(iv) Constant power supply

(v) Knowledge of the benefits of e-tendering use

(vi) High level of computer literacy among construction stakeholders

(vii) Effective change management plan and training of all the stakeholders

(viii) Confidentially in e-tendering transaction

(ix) Security and authentication of e-tendering process

(x) Top management commitment and support to e-tendering adoption

5.3 CONCLUSION

E-tendering has the benefit of addressing some of the weaknesses in the traditional procurement methods. From the current study it is was found that a number of barriers exist in the Ghanaian construction industry which makes it difficult for successful adoption of e-tendering for

construction procurement. Notably among them is the Conservative nature of the industry. These issues among others needs to be addressed to promote the adoption of the concept in the Ghanaian Construction Industry.

5.4 RECOMMENDATION

The following recommendations are made:

1. **Public Education**- One of the key challenges that was identified in the current study was that the Ghanaian industry is conservative in their adoption/acceptance of new technology. It is therefore recommended that public education should be embarked by all stakeholders to sensitize the public about the benefits of e-tendering.
2. **Capacity building personnel to handle e-Tendering-**It is also recommended that construction firm and institutions should build the capacity of the personnel to manage etendering.

5.5 FUTURE RESEARCH DIRECTIONS

Future studies should look at the following area:

- Assessment of confidentially in e-tendering transaction

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APPENDICES

APPENDIX A: QUESTIONNAIRES KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY(KNUST) DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Dear Sir/Madam

An invitation to partake in a Research Survey

I am undertaking a research study in KNUST as part of my partial fulfillment of the award MSc. Project Management. The Topic of my research is: Barriers to the Adoption of Electronic Tendering in Construction Procurement in Ghana

The main objectives of the research are:

(i) To assess the constructions industry's opinion on the drivers to electronic Tendering practices

(ii) To identify the barriers to the adoption of electronic Tendering in Ghana

(iii) To identify the critical success factors for the adoption of electronic tendering in construction procurement in Ghana

Attached is a copy of my questionnaire. I will be very grateful if you could answer this questionnaire to aid the study. **All information collected will be confidential and would be used only for academic purposes.** Thank you for your time and contribution in advance.

Yours faithfully

Esther Boateng
Department of Construction Technology and Management, KNUST Email: estboat@yahoo.com Mobile: 0244520560

Dr. Barbara Simons
Project Supervisor
Department of Construction Technology and Management, KNUST

PART ONE SECTION A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Please, kindly respond to the questions by ticking (√) in the appropriate box for each item.

1. Please state the capacity in which you work in your firm [ ] Quantity Surveyor [ ] Project Manager [ ] Architect [ ] Engineer [ ] Others (please specify) …….

2. How many years have you been practicing your profession your organization?
   [ ] 1 – 5 years [ ] 6-10 years [ ] 11- 15 years [ ] 16-20 years [ ] Over 20 years
3. Highest educational level [ ] Diploma [ ] BSc [ ] MSc [ ] Others (please specify) ……

PART TWO

SECTION A: DRIVERS TO THE ADOPTION ELECTRONIC TENDERING PRACTICES

4. Please rate your level of awareness on the following issues regarding value management techniques integration into project management practices using the scale below: 1= Not a Driver to 5 = Extreme Driver

	Drivers	1	2	3	4	5
1	Price reduction in tendering					
2	Reduction in time to source materials					
3	Reduction of administration costs					
4	Reduction of staffing levels in procurement					
5	Gains in competitive advantage					
6	Improvements in communication					

7	Enhancement of decision making and market intelligence					
8	Reduction in operating and inventory costs					
	Others (please specify)					

SECTION B: BARRIERS TO THE ADOPTION OF ELECTRONIC TENDERING IN GHANA

5. The table below shows some factors identified in literature as being Barriers to the implementation of Value Management in Project Management Practices. Based on experience rate the following factors on a five-point Likert scale (1= Not a Barrier to 5 = Extreme Barrier

   Please use the spaces below the table to add other barriers and rank

	Barriers	**Rankings**				
		1	**2**	**3**	**4**	**5**
1	Doubtful clarity and simplicity of e-tendering method					
2	Difficult in quantifying electronic tendering benefits					
3	Lack of efficiently designed websites					
4	Large initial capital investment is required					
5	Costly IT systems					
6	Lack of technical expertise					
7	Frequent Viruses attacks					
8	It exposes sealed bids to possible hacking which defeats the principle of sealed bids					
9	Lack of robustness of electronic tendering					
10	Ignorance of benefits of e-tendering					
11	Adequacy of existing system					
12	Conservative nature of the industry					
13	Prevalence of legal and technical traps					
14	Lack of agreed standards					
15	Poor ICT infrastructure to support electronic tendering					
16	Skepticism about the method					
17	Interoperability concerns					
18	The rules and regulations that cover the tendering process are still predominantly paper-based					

19	Unreliable internet					
20	The lack of internet connectivity					
21	Concerns of security of submitted tenders					
22	Unclear legal position of e-Tendering					
	Others (please specify)					

SECTION C: CRITICAL SUCCESS FACTORS TO THE ADOPTION OF ELECTRONIC TENDERING IN GHANA

6. The table below shows some factors identified in literature as being success factors to the adoption of electronic tendering in Ghana. Based on experience indicate your level of agreement with each of the variables listed below. Key: 1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5– Strongly Agree.

Please use the spaces below the table to add other success factors

Sn	**Success factors**	**Rankings**				
		1	**2**	**3**	**4**	**5**
1	Availability of reliable ICT Infrastructure					
2	Availability of reliable, affordable and fast Internet services					
3	Availability of skilled personnel to handle e-Procurement tools and processes					
4	Constant power supply					
5	Knowledge of the benefits of e-tendering use					
6	High level of computer literacy among construction stakeholders					
7	Effective change management plan and training of all the stakeholders					
8	Confidentially in e-tendering transaction					
9	Security and authentication of e-tendering process					
10	Top management commitment and support to e-tendering adoption					
11	High level of trust on e-tendering technology by industry stakeholders					
12	Ease of use of e-tendering tools, applications and processes					

13	Compatibility of e-Procurement with the existing procurement processes					
14	Acceptance of the legality of electronic contracts					
15	Government support for e-Procurement adoption					
16	Interoperability of e-Procurement software packages, applications and systems					
17	Existence of supportive e-Procurement policies and legislation					
18	Employees' commitment to success of adoption					
19	Existence of a uniform standard for describing, displaying and specifying construction materials, works and services					
	Others (please specify)					

7.Any additional comment can be indicated below

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End of Questionnaire Thank you.