

Factors Influencing E-Tendering Adoption in the Nigerian Construction Industry: A Theoretical Review

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Abstract

E-tendering has been defined as the outflow and receiving of tender related material and subsequent documentation through electronic means which brings about the procurement of construction work and the award of contract. Information and communication technology has been a driving force behind organizational performance through stimulation and standardization of smooth and effective communication among the members of organizations as well as inter-organizational collaborations. As these technological advancements have been progressing significantly faster in other countries, the Nigerian Construction Industry has lagged behind many of its developing country counterparts in terms of acceptance, usage and adoption of these technologies. Consequently, there is low level of e-tendering utilization in the Nigerian construction industry. Through an extensive review of literatures emanating from Nigeria, this study examined the causes of low e-tendering adoption among Nigerian construction industry and developed a conceptual model of e-tendering adoption using T-O-E Framework (Technology, Organization and Environment) as a theoretical basis to guide e-tendering adoption process. Findings from the study reveal that construction organizations are reluctant to adopt new technologies due to unfavorable economic environment. The study further found that the successful adoption of e-tendering is hinged on the alignment of technology, organization and environmental variables of an organization. It recommended that the construction managers should consider top management support among themselves and their employees and organisational readiness in their respective organizations for successful e-tendering adoption and use.

Keywords: Construction Industry, E-tendering Adoption, Technology Origination Environment, TOE.

Introduction

Despite the apparent benefits of information technology (IT), many organizations have been slow to adopt e-construction and in particular e-tendering, Nigerian construction industry is faced with low level of e-tendering utilization thus the gap which the study sought bridge. Many companies are approaching the use of e-tendering with caution in order to test its practical advantages and encourage confidence amongst staff before implementation; e-tendering has been identified as being one of the potential tools to assist changing the construction industry's culture and improving its processes.

The Royal Institute of Chartered Surveyors e-tendering guidance note (2005) explains that at its simplest e-tendering is the electronic exchange of any tender documents which forms part of procurement process. There are a significant number of benefits that may be obtained by adopting and participating in e-bidding. Peansupap and Walker (2005) argued that a clear benefit of use is one of the factors that could positively influence the diffusion of information and communication technology (ICT). Thus, it is clear that perceived benefits obtained from e-bidding system would have a positive impact on willingness to participate. According to (Sun *et al.*, 2007, Kajewski *et al.*, 2001) Perceived benefits derive from e-bidding may include cost savings; Time savings; Improved productivity; Improved competitiveness; Improved business opportunity.

It is essential therefore to carry out a comprehensive study aimed at investigating the factors influencing e-tendering adoption in Nigerian construction industry with a view to ensure effective project collaboration and successful project delivery. To this end, this study examined the various problem faced by Nigerian construction industry during e-tendering adoption and thereafter developed a conceptual model using TOE framework to address the issue.

The paper is structured into five sections; the first section introduces the topic and clearly stated the aim of the research. Section two discusses the existing model of e-tendering adoption in organization, section three examines the problems and causes of low e-tendering adoption faced by Nigerian construction industry and present a summarized literature. Section four of the research discusses and provides a conceptual framework for e-tendering adoption with the objective of determining the technological, organizational and environmental factors influencing e-tendering adoption, as well as relevant constructs used in developing the conceptual model. The last section present results of the study and dwells on implication, recommendations and areas for further research.

Materials and Method

The study is based on (Review) of existing literature and the study was carried out in Bauchi metropolis in North Eastern Nigeria; the study employed stratified random sampling, which involved collection of data through the use of administered questionnaire. The population of the study includes registered Quantity surveyors, architects, Builders and civil engineers within Bauchi metropolis.

Existing Models of E-Tendering Adoption in Organization

Many models have been developed to address e-tendering adoption in organization with individual models using specific variables. For instance, Aibinu, *et al.*, (2010) developed a theoretical structural model representing the impact of six latent variables on the willingness of construction organizations to participate in e-bidding. Data from questionnaire survey of 64 respondents collected from clients, contractors, consultants, and suppliers in organizations was used to analyze the model. The result of the data analysis suggests that perceived barriers, cost, the perceived benefits of e-bidding and security concerns are the factors influencing willingness to participate in e-bidding with perceived barriers being the most significant influencing factor. The major setback of the study, however, was the content in which rather than looking at the actual adoption, the model seeks to explain willingness of organization to participate in e-tendering. Another prominent model of e-tendering adoption in organizations was that of (Ciribini *et al.*, 2015). The authors proposed an innovative approach of e-public tendering utilizing diffusion of innovation theory, theory of reasoned action, technology acceptance model and theory of planned behaviour capturing innovation, organization, environment and CEO characteristics as the major variables. While the study was exhaustive, it was not specific as to the type of organization targeted and the environmental context in which the study was meant to address. This study targets e-tendering adoption in the Nigerian construction industry taking into account the relevant contextual issues (Technology, organization and environment) surrounding existing models and problems associated with its adoption. Similarly, Aboelmaged (2014) proposed a model by examining e-readiness e.g. e-tendering adoption. Using structural equation modelling, the authors found that readiness at manufacturing firms are mainly influenced by technological and organizational determinants. The study was however conducted in Cairo, Egypt though the study was empirical, it used little sample size (308 respondents) of construction professionals and the environmental characteristics of Egypt may be different from that of Nigeria.

Based on the reviewed models above emanating from extant literatures, this study sets out to develop a conceptual model of e-tendering adoption in construction organizations with specific reference to Nigeria. The study first examines the various problems hindering IT initiation and subsequent acceptance Thus, a conceptual model relating technology, organization and environment variables was proposed based on TOE framework as a theoretical basis.

The Causes of Low E-tendering Adoption Among Nigerian Construction Industry

According to Waziri *et al.* (2017), like most developing countries, the Nigerian construction organizations are faced with numerous challenges which hinder them from successful IT adoption. Quite a substantial number of researches have been carried out on e-tendering adoption among Nigerian construction organizations. For instance, one of the earliest studies carried out by Lou (2009) to investigate critical success factors e-tendering implementation in construction collaboration environment in Nigeria. The researcher found that traditional tendering method did not change much in terms of people and process issues, in implementing e-tendering the most important critical success factors is that all changes in the organization must be process led, and not technology led.

A more advanced study was conducted thereafter to investigate the use of e-tendering in construction industry. The author highlighted the following as constraint to e-tendering adoption thus security, ease of use, cost, availability of resources. The reasons for the relatively low adoption of e-tendering in developing nations are not farfetched.

However, numerous evidences from existing literature support Nigerian construction industry on e-tendering adoption. According to Omeire and Omeire (2014), the failure of Nigerian government to fully participate in electronic system of government is as a result of low ICT literacy rate, lack of regulatory framework, poor ICT infrastructures, corruption, and lack of committed leadership, epileptic power supply and bureaucratic bottlenecks. These constraints have spilled to not only construction organizations but the entire organizations from other sectors of the economy.

Theoretical Background

According to Baker, (2012), TOE framework classifies technology, organization and environment as the three sets of factors that affect an organization adopting innovations. The TOE framework has a strong theoretical basis, solid empirical support, and has been used to study technology adoption of innovations (Oliveira and Martins, 2011). Adoption by SMEs (Dwivedi *et al.*, 2017), according to Gregor *et al.* (2019), the TOE framework recognizes three principal contexts influencing the adoption and implementation of a technological innovation within a firm: (i) The technological context; (ii) the organizational context; and (iii) the environmental context (Tornatzky *et al.*, 1990). When applied, the TOE framework can be used to identify characteristics of innovative concepts affecting their implementation. While the technology acceptance model (Davis, 1989) and the unified theory of acceptance and use of technology (Venkatesh *et al.*, 2007) are suitable for predicting adoption on an individual level, they assume perfect information and create an illusion of accumulated adoption Oliveira and Martins (2011). To our best knowledge, only two models, namely the diffusion on innovation (DOI) theory postulated by Rogers (1995) and the TOE framework from Tornatzky and Fleischer (1990) study, are technologies adopted at firm level. Table 1 below shows a conceptualize variables derived from relevant literatures which were modified to suit e-tendering context.

The Technological Context

This section discusses the technology competence, top management support, and security concern and their impact on e-tendering adoption in construction organizations

Technology Competence

Technology competence (TC) corresponds to the technology resources available in the organizations, such as the IT infrastructure, which incorporates installed technologies, systems, and applications (Mata *et al.*, 1995). IT specialists, refers to people in the organization who have the expertise to implement and use information solutions (Martins *et al.*, 2016). Ritter and Gemunden (2004), affirmed technology competence as an enabler for organizations to understand, use and exploit technology.

In fact, technology competence is a method of support in preparing a technology infrastructure, including adoption of a basic level of knowledge as it relates to the available technology.

Table 1: Conceptualization of Research Variables

Construct	Concept	References
Technological context	Technology competence	Jesus <i>et al.</i> , 2019
	Top management support	Abed, 2020
	Security concern	Abed, 2020
Organisational context	Organizational readiness	Abed,2020
	Top management support	Abed,2020
Environmental context	Consumer pressure	Abed, 2020
	Competitive pressure	Jesus <i>et al.</i> , 2019
	Government support	Oladapo, 2017

Top Management Support

According Waziri *et al.* (2017), the support provided by top managers of an organization during IT adoption plays a vital role in its success. According to Garridor *et al.* (2005), once top management understands the significance of the IT system to be implemented, they encourage and motivate employees to buy-in to the adoption. In this instance, top managers allocate adequate financial resources necessary to set-up the system. Similarly, Bonstra, (2015) observed that top managers offer and supplies sufficient financial resources which enable the acquisitions of proper technical equipment and external expertise.

Security concern

Security is defined as the extent to which an internet platform is assumed to be insecure for conducting online transactions and exchanging data (Clear, 2007). Nowadays, security risks are increasing due to computer networks becoming more complex (Sahandi *et al.*, 2012). Several authors consider security issues, for instance, viruses, hacking and data interception, as the major concern is in conducting business over the Internet (Clear 2007; Sahandi *et al.*, 2012; Salum and Rozan, 2016).

The Organisational Context

Top management support

Top management support refers to the level of support received from the higher management to adopt innovative technology for business use (Grover and Goslar, 1993). Jeyaraj *et al.*, (2006) suggested that top management support is one of the three most critical predictors for IT adoption in Organization. Furthermore, research on technology adoption based on the TOE framework noted that top management support has a significant and positive relationship to the organizational decision to adopt innovative technology (Low, Chen, and Wu, 2011; Ramdani *et al.*, 2009; Wang, and Wang, 2010; Yang 2010). Consequently, it is highly expected that organizations with stronger top management support for new innovative technology would be more likely to adopt social commerce

Organizational Readiness

Organizational readiness refers to the level of available technical and financial resources in the organization to adopt new innovative technology (Chwelos, *et al.*, 2001). Rogers (1995) proposed that the availability of organizational resources significantly and positively affects the organizational adoption of innovative technology, as suggested by previous studies (Chwelos *et al.*, 2001; Fathian, *et al.*, 2008; Scupola, 2003). Fathian *et al.* (2008) reviewed the e- readiness assessment models and identified the critical factors for SMEs'

The Environmental Context

This section discusses the consumer pressure, competitive pressure, and Government support and their impact on e-tendering adoption in construction organizations

Consumer pressure

Several relationship characteristics between organisation and consumer have been identified as playing a significant role in organizations' adoption of technologies, such as encouragement, commitment and pressure from customers, in addition to trust between an organization and its customers. It has been verified that satisfying the different needs and expectations of customers by providing electronic customer services, which allow better interactive communication with customers, is a key driver of technology adoption in businesses (Maduku *et al.*, 2016). Companies are adopting new innovative technologies because they believe that their customers expect them to do this. A number of studies had examined the impact of consumer pressure on the adoption of new technology and found it to be significant (Chatzoglou and Chatzoudes, 2016; Kumar, *et al.*, 2019; Maduku *et al.*, 2016; Nugroho, *et al.*, 2017).

Competitive pressure

Context of innovative technology, competitive pressure corresponds to the degree of pressure felt by an organization from their competitors, being recognized as an important driver in the adoption of innovation (Zhu, 2003; Zhu 2006; Lacovou 1995). According to Missi *et al.* (2005), the more competitive pressure a firm has perceived, the more likely the firm is convinced to adopt CRM. Effectively, with the market competition, organizations are looking for approaches, solutions and resources more often, to improve customer service or even reduce costs, to achieve competitive advantage (Melville *et al.*, 2004).

Government Support

Waziri *et al.* (2017) asserts that IT adoption in developing countries suffers setback primarily due to inability of the state to provide adequate electricity supply and support organizations with incentives. In order to help and encourage IT adoption and usage in a country, the government provides adequate electricity and other infrastructures suitable for IT implementation. This motivates managers of organizations to act towards computerizing their organizations. According to Kraemer (1992), rapid and massive progress in IT adoption by some Asian economies (Korea, Japan, Singapore, Malaysia etc.) was attributable to the role played by government.

Conceptual Model of E-tendering Adoption in Construction Industry

Figure 1 below presents a conceptual model of E-tendering adoption in construction organizations based on the theoretical idea in technology, organization and environment. As earlier on highlighted, the technology context comprises of technology competence top management support, and security. The organization content addresses organizational readiness and top management support while environmental context contains variables such as competitive pressure, consumer pressure and government support.

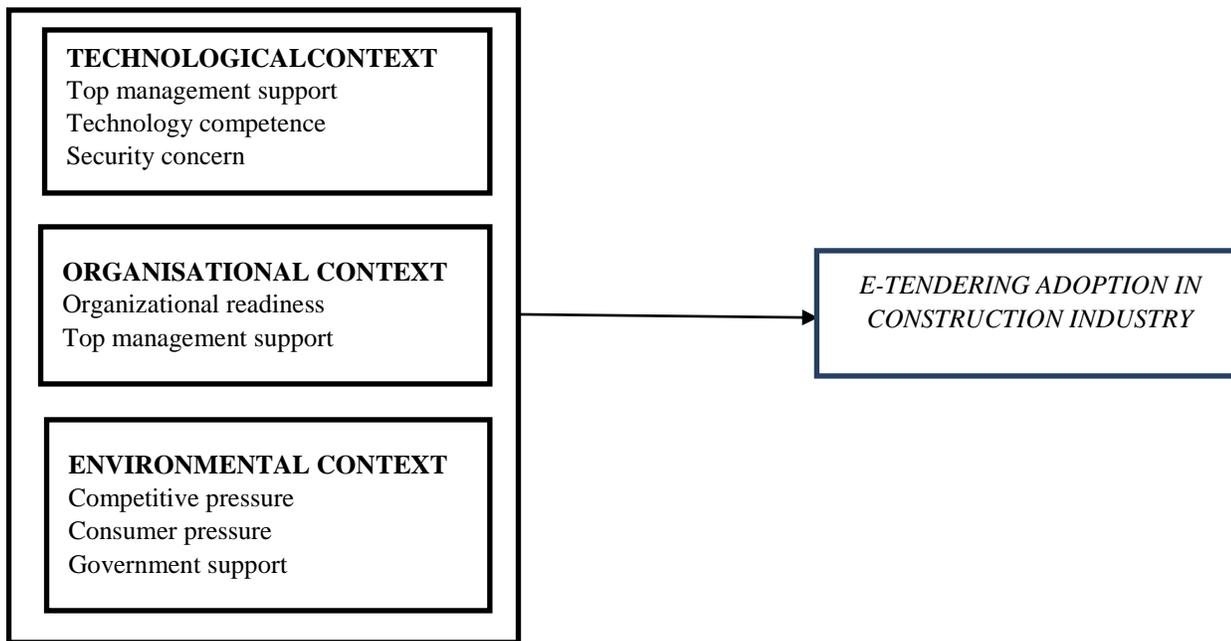


Figure 1: Conceptual Model for e-tendering adoption

Result and Discussion

This study attempts to address low level of E-tendering adoption in construction industry by proposing a Conceptual model using TOE framework. Firstly, studies focusing on IT adoption and e-tendering adoption were reviewed and the extracted variables were categorized for easy classification of variables under their respective contexts.

Technological context, findings show that for a successful adoption of e-tendering in construction industry, there is the need for adequate technical staffs with required technical expertise and IT equipment. Additionally, top managers must support and encourage the technical implementation and help in end-user acceptance and use. Furthermore, there should be adequate security or cyber security of e-tendering tools and their maintenance.

Organizational context, top managers do not appreciate IT system and the idea of their usage. This is as a result of their fear for technology. There is the general fear among both professionals and managers of construction firms that IT acceptance and implementation would make them redundant and irrelevant in the construction industry, top managers should sensitize and enlighten professionals about the use and advantage of IT innovation especially e-tendering.

Environmental context, results have shown that competition among construction organizations results in faster acceptance and diffusion of technology among organizations. Competition compels firms to introduce change to improve their business performance. Furthermore, it has been proven that in order to satisfy the diverse need of different customers' IT adoption is necessary. Provision of adequate electricity and e-tendering infrastructures by government has been found to significantly influence IT adoption. Lastly, the e-tendering regulatory framework when appropriately structured accommodates e-tendering adoption within an entire economy. The above results which emanate from the paper are in total conformity with previous studies carried out by Son *et al.*, 2012.

Conclusions

This study was set out to address the problem of low e-tendering adoption in Nigerian construction organizations. This study shows that TOE framework is a valid model to understand the adoption and use of e-tendering in construction organizations. The successful adoption of e-tendering is hinged on the alignment of technology, organization and environmental variables of an organization, specifically, the provision of skilled IT personnel, effective top managers and adequate cyber security for the operation and maintenance of e-tendering equipment. Furthermore, for successful e-tendering adoption in construction industry, it is critical for the industry to be ready and invest in IT system especially e-tendering. Lastly, Competitive pressure as an external environment variable exerts a significant effect on e-tendering adoption; customer pressure in terms of adhering to changes and adopting new ideas could affect e-tendering adoption in construction. Consequently, construction organizations with high level of ICT facilities are more competitive, enjoy greater benefits and are perceived favourable by customers. Government support is also an important factor affecting e-tendering adoption in construction industry. Results of the study suggest that provision of incentives to firms by government aids in effective implementation and utilization of IT in the construction industry. Additionally, improvement and adequate provision of IT infrastructures could potentially support e-tendering adoption among firms. Consequently, the construction professionals believed that government should serve as a role model for the construction organizations through implementation of e-tendering. This would speed up the e-tendering adoption within the industry and its subsequent diffusion into other industries. Therefore, this study provides a foundation for more definitive investigations into e-tendering adoption in construction industry.

Limitation in this study is the methodology adopted in the research. The study is purely conceptual and therefore needs empirical confirmation. Further study should therefore source for data and subject it to statistical analysis for a more concrete outcome.

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