



Semi-automated E-Tendering System with Web Services. A case study on tendering process in Pakistan

M. Y. KOONDHAR⁺⁺, M. M. RIND, M. Y. HUB^{*}, H. SHAIKH

Kulliyyah of Information and Communication Technology, International Islamic University Malaysia, Malaysia

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Abstract: Tendering is a process used by organizations to find a suitable Vendor / Contractor for procurement of goods and services. Organizations advertise the tender through local newspapers, websites or on notice boards. In response interested contractors submit their tender documents with estimate of prices and the time bar to complete the tender. Organizations have option to select or reject any suitable contractor among all on the basis of comparative statement evaluated after the receipt of all competitors. In Pakistan tendering system is manual and paper based. Organizations are advertising their tenders in newspapers; contractors are required to visit, show the company license and then collect the tender booklet in hard format after payment of tender fees. The purpose of this research is to propose and design an e-tendering system, along with process involved, identification of security parameters, recommendations and solutions for transparent and fast completion of whole process.

Keywords-component; E-tendering, contractors, web services, tendering process.

1. INTRODUCTION

An e-tendering system with web services facilitates both the organizations and contractors in more efficient and effective way through internet.

The technological innovation has totally changed the human lives (Du, *et al*, 2008). Like other fields ICT tools have changed the overall business. The internet has provided a good alternate platform for organizations and contractors to expedite information exchange by making tendering process more reliable and transparent.

In Pakistan, tendering process is still a traditional, manual and paper based (Mohammadi and Jahanshahi, 2009). Organizations advertise their tenders in local or national newspapers. In response contractors need to visit the organization office physically to get the required tender documents after showing their company registration license and paying the mentioned deposit fee at a specified branch of specified bank mentioned in the tender advertisement. After fulfillment of the entire requirements contractor submit its tender documents before or on the deadline. This manual process of tendering has too many drawbacks and flaws, mostly in underdeveloped countries like Pakistan. Country culture, political influences, and uncertain security and environmental circumstances are being experienced as a barrier in following the best practices and merit based selection of best contractor. To cope and overcome these issues, adoption of ICT tools and e-tendering system with web services is the only remedy for tendering process in Pakistan. E-tendering system provides flexibility to both organizations and competing contractors to edit, review,

view, update all the stages and process over the web portal on the internet (Kayed. and Colomb. 2002) (Kerridge, *et al*, 2000). Organizations can generate and share digital tender evaluation report to all competitors competing for a particular tender. This system also breeds trustworthiness, commitment, loyalty among and between competitors and organizations.

E-tendering system with web services replaces the entire manual and paper based work and offers easy, efficient and cost-effective system (Ahmad, *et al*, 2007). For e-tendering system, a more sophisticated standardized web platform is required as to be accessed not only by simple computers and laptops using legacy operating systems but also from latest android applications of best smart phones. A standardized XML based web services are the best option for deployment of e-tendering system to bring the continence to run the system by any programming language and on any operating system (Abdullah, *et al*, 2008) (Song, *et al*, 2008). XML and web based e-tendering system will allow the registered members to view the tender documents from any place by using any electronic gadget (Ahmad, *et al*, 2007). Organizations can use Web services to send message, alerts or email to the registered or targeted members for any update of process or policy change at any stage during a tender process (Du, *et al*, 2010).

2. MATERIAL AND METHOD

The current development in the field of ICT has provided opportunities to all sectors and all types of organization and business around the world. Business' processes are being optimized and time bound by utilizing project management best practices.

⁺⁺Correspondence Author: Email: yaqoobkoondhar@gmail.com Ph.no. +60178797236

^{*} Institute of Mathematics & Computer Science, University of Sindh, Jamshoro, Pakistan.

Organizations need more managed, robust, fast, transparent, and secure systems to prove their existence in the competitive market. Most of the organizations in the 1st world countries have fully adopted e-procurement and e-tendering system (Mohamad *et. al*, 2003). For the under developed countries like Pakistan where ICT is not evolved and adopted in true sense because of technical, financial and educational constraints, it is difficult to adopt fully automated e-tendering system.

Some government departments and private sector organizations are stepping ahead towards e-tendering (Li, *et. al*, 2003) (Lick, *et. al*, 2007). Organizations are making arrangement to automate the internal operations but still no progress is observed in this context. Our proposed semi-automated e-tendering system will best suit both organization and contractor to make best use of ICT. Proposed e-tendering system will contribute in relaxing and expediting the tendering process in addition to transparent evaluation between available competitors.

3. RESULTS AND DISCUSSION
(E-TENDERING SYSTEM OVERVIEW AND CONCEPTUAL MODEL):-

In this section, we will focus on the conceptual model of E-tendering system with web services on the above mentioned requirement basis. There are three main parts of the E-tendering system. Organization Tendering System (OTS) which is run and maintained by the tendering organization. The Contractor which is qualified, registered, authorized member, with limited access to OTS during an e-tendering process. Web

services provide the platform for the secure communication between OTS and contractors.

A. CONCEPTUAL MODEL FOR OTS:- In OTS following are the few main processes:

Tender ON:- In this process tender is first announced and simultaneously sent out to the targeted registered contractors along with payment options. OTS receives tender fee invoices and authorizes the vendors to access time bound OTS portal to fill the rates and submit the offer before due date and time.

Tender OFF:- This process relates to OTS only without further involvement of any contractors. During this process OTS evaluates, prepare comparative statement, and generate reports to the organization committee. Comparative statement is also shared with all competing contractors and suppliers for transparency purpose. At the end congratulation and tender award email is sent to the winning contractor.

B. CONTRACTOR :- During tender on process contractor plays an active role by thoroughly analyzing the organizational requirements announced on OTS web portal and received in an email. If contractor is interested to compete in the tender he pays the tender fee and request for OTS portal access username and password. After receipt of OTS access contractor fill the online tender requirements and submit. OTS through web services

C. WEB SERVICES: Web services are the central point of contact between the OTS and contractor. A secure, rich and robust platform is provided as communication channel during the whole tender process.

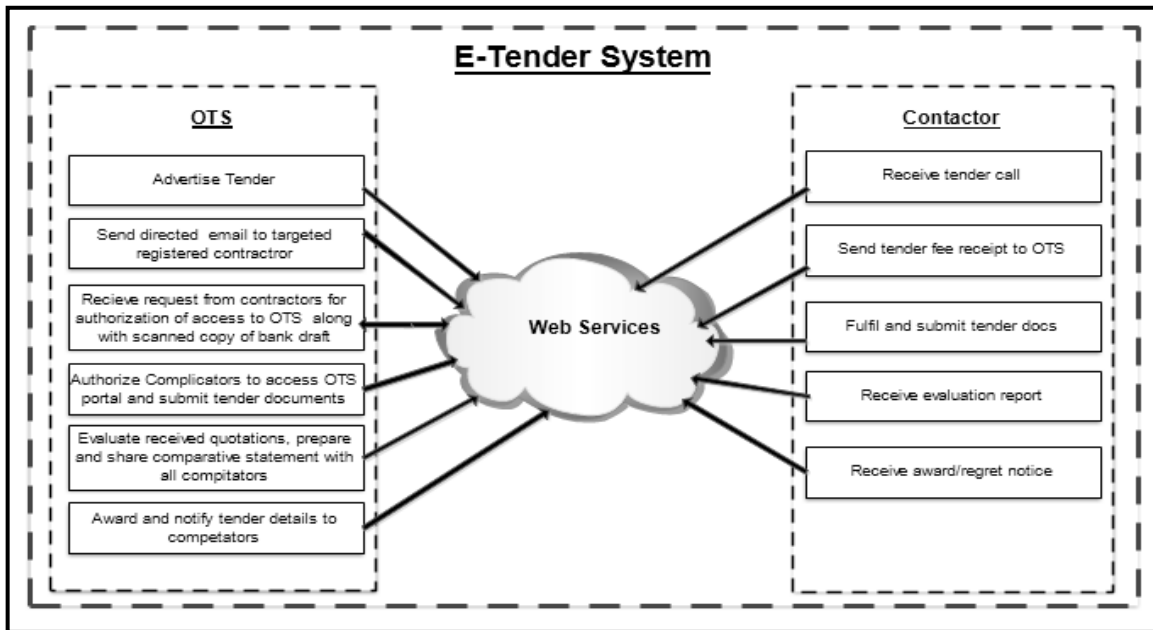


Fig. 1. E-Tendering System

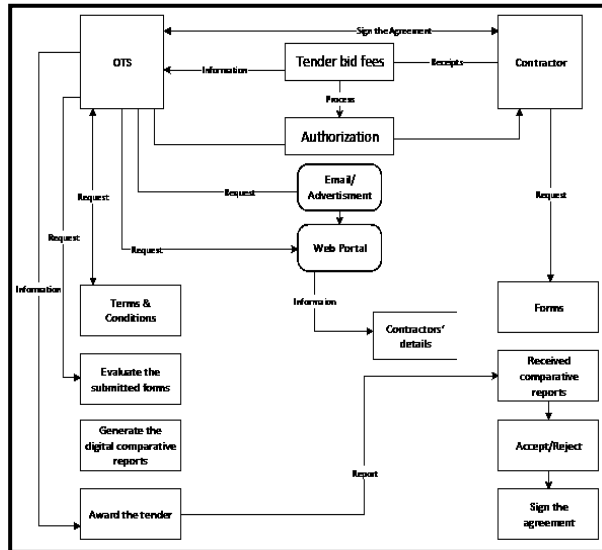


Fig 2: Workflow diagram of Online Tendering System (OTS) and Contractor

SYSTEM IMPLEMENTATION:-

a) Web services for Tender ON: - Following are two suggested types of e-tendering processes through web services to be used in Pakistan. Open competitive tendering and selective competitive tendering. Most of the tendering processes in both systems are same. It provides following services to the CTS:

Service Name = getcontractorID
 Service Name = getcontractdocs
 Service Name = uploaddocs
 Service Name = advertisedtender
 Service Name = protectdocs

b) Web services for Tender OFF:- It provides following services to the CTS:

ServiceName=edit
 Service Name = send alerts

c) Web services for exception handling:- In e-tendering system with web services some exceptions may occur. We will discuss how the exceptions are handled:

d) Bugs in the e-tendering system: - Sometimes when the contractors are filling the electronic form through the web services, he missed to enter the data in some fields or he insert integer values into the string fields. The system will not process until the contractor fills all the fields or puts the right information on right place.

Service Name = control bugs

e) To add or edit the submitted data in the system: - The system gives the permission to add or edit the data. The system provides this facility to the both means OTS and CTS. Generally three types of amendments are used, deletion, modification and addition. The system sends alerts to the concerned when amendment occurs.

Service Name = add
 Service Name = modify

Service Name = delete

f) Withdrawal from the tendering process:- The system provides the facility of withdrawal due to some reasons to the contractors during the tendering process.

Service Name = confirm withdrawal

Service Name = allow withdrawal

SECURITY REQUIREMENTS AND LEGAL ISSUES FOR E-TENDERING SYSTEM :-

Security is the major issue when we developing an e-tendering system with web services (Abdullah, *et. al.*, 2008). Most of the organizations are reluctant in using web based e-tendering system because of security threats (Vail, 2012). Major concerns are fear of losing the confidential organizational data. Security requirements in e-tendering systems are similar in nature to the E-commerce systems where authentication, integrity and validation process are embedded (Fayek, *et. al.*, 2011). Due to two way communication in the e-tendering system with web services, more security measures are required to be considered during authentication and remote access of OTS (Lai, *et. al.*, 2007). This proposed system ensures the organizational data security by transporting secret data through web services via internet using encryption techniques. Information exchange between OTS and contractors will be done by using Secure Sockets Layer (SSL).

Tendering process need to strictly adhere and fulfil organizational legal framework requirements (M. Belts, *et. al.*, 2006). We are including some legal issues including the solutions in the proposed e-tendering system, such as:

- Resolving the authentication issue both of user and documents. For this, the system must define the parameters at registration time. These parameters must be declared compulsory in registration process. These parameters will resolve the authentication issue.
- Currently organizations authorize a person / office where contractor submit tender documents by physically or by post before the closing date. This can be resolved by providing the acknowledgment facility by the system to the contractor when he submits the tender documents.
- The last issue is concerned with award of tender. System will send email containing the comparative evaluation report to all competing contractors who submitted the tender documents.

A) TECHNOLOGIES AND TOOLS:-

In the development of an e-tendering system using web services below mentioned technologies and tools are required for secure and user friendly communication.

- MS SQL server 2000, for the development of database

- Dream wear, PHP, ASP.net with C# for design and development
- Crystal Report, for report generating purpose.

DATABASE DESIGN ER-MODEL:-

Below Entity-Relation-model for e-tendering system shows conceptual representation of the data or information aspect of e-tendering system. Proposed E-R Model is necessarily be opted for clear abstraction of database to be used in this type of e-tendering system with close connectivity between database entities in form of tables structure.

4. CONCLUSION AND FUTURE WORK

Keeping in view the current status of Pakistan and available technology with technical and economic constraints, we have suggested a semi-automated e-tendering system based on web services. The OTS provides detailed information about the tendering processes at organization part where database and security measures are to be adopted to make the system more robust and reliable.

Contractors are required to be registered in OTS database, view and interact with OTS by using web services. Contractors in Pakistan still are not so technically sound to establish online database at their end. A conceptual model for e-tendering system with web services, issues such as legal and security are proposed.

A fully automated e-tendering system with OTS at organization end and CTS at contractor end in Pakistan can be a future work subject to the maturity of technology and human resources. Another future work for e-tendering system in Pakistan is to define the 3D diagrams for product samples (for supplies) and 3D diagrams for work location (for services).

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