Web-based e-Procurement System

Shubham Rewale[1], Dinesh Solanki[2], Vinith Suvarna[3], Prof. Pranit Gaikwad[4]

Department of Computer, UCOE, Mumbai University, India[1-4]

Abstract: With the advent of the Internet, systems for streamlining indirect goods and supply chains emerged which is now rapidly adopted by companies. In view of the paper-prone processes in many companies, the implementation of these electronic procurement systems led to substantial improvement potentials. In the existing system, there are a lot of downsides like the enforced policies, controls, restrictions, and the overall learning curve in an e- procurement platform. Due to insecure servers, all the tenders filed up were causing data leakage. In the existing e-procurement system, all the details of the companies, as well as the vendors, are not verified. There are no proper filter options to choose a suitable tender according to your needs and also, there was no option feature for Companies to negotiate the price with the vendors. Security has always been a concern in online transactions and the documentation has always been a tedious job, these issues are addressed in the project. Some suppliers may find online transactions uncomfortable since suppliers don't necessarily know whom they are dealing with. Knowing and verifying an organization over the Internet is difficult, and deception is easier to carry out online. The proposed project provides various functionalities such as convenient UI, provide one roof solution with advanced filters, categorization, smart profiling, advanced security features and e-documentation. The proposed project is committed to bringing efficiency and transparency in e- procurement domain. E-procurement technology is the future of supply chain management and will become a core component of organizations vendor management. As the early adapters imbibe this technology, transform their supply chain management, and share their experience, the benefits reaped will accelerate the adoption rate across industries.

Keywords: eProcurement, tender, company, vendor, Supply Chain Management.

I. INTRODUCTION

Internet has changed every field of work; the process of procurement is no special case. It has revolutionized the purchasing practices by significantly improving productivity in various businesses. The overall productivity of manufacturers often depends on their efficiency in purchasing their inputs. E-procurement sites, also known as business-to business(B2B) marketplaces, electronic supply chains, trading hubs, or trading communities, are essentially Web-based procurement networks in which one or more companies try to source their suppliers at the lowest costs possible [14]. From a conceptual standpoint, e- procurement does what tendering, its pre–Internet world analogy, has been doing—it helps companies source input products and services at the lowest cost, while ensuring that those inputs meet Technical and other (tender) specifications [14]. By making the process Web-based, e-procurement solution providers are changing the process in ways that go far beyond its mere computerization and automation.

B2B marketplaces in the Internet could prove to be the most radical innovation in modern business since the assembly line was invented. Like assembly lines in the beginning of the 20thcentury, e-procurement sites promise significant increases in productivity across many industries of the economy. Their most often quoted advantage is their potential to cut costs of purchased goods and services [9, 13, 14]. The phenomenon of cost saving allowed by e-procurement is based on the new processes that cut all costs associated with purchasing, that is, the cost of goods and services purchased, ordering costs, and holding costs [8, 10, 13]. The availability and generally low cost of information and technology provided by Internet-based purchasing create absolutely different economics characterized by the following: Low barriers for market entrance [12, 13].

Price transparency [8, 13]. Better opportunities to avoid "maverick buying" and to use preferred supplier networks [13]. Better balance of power between sellers and buyers [8].This new economics of purchasing lead to competition that is closer to perfect and, as a result, to goods and services of better quality purchased for lower cost. Another important and frequently mentioned result of e-procurement implementation is shorter product development cycles [11]. These are rooted in the following improvements allowed by e-procurement systems [8, 11, 10]: Shorter order cycles. Significant improvement in project management and team collaboration across supply chains. Integrated information sharing across supply chains.

One of the greatest impediments to e-procurement's fast adoption is a gap between the expectations of the two sides of the transaction—suppliers and buyers— about the way B2B marketplaces should affect them. On one hand, buyers adopting e-procurement are becoming increasingly dependent on suppliers because of the

wider adoption of JIT practices, shorter ordering cycles, increased involvement of suppliers in product development, and so on. On the other, suppliers may be reluctant to adopt the idea of e-procurement because of the necessity of dealing with more than one market place, high training costs associated with switching to e-procurement, turbulence in this new industry, the high risk of compromising sensitive data, and so on. [15, 16, 13]. Some suppliers will need to initiate a full organizational restructuring associated with technological changes related to e-procurement. Others might not like the idea of substituting mouse clicks for the human contact they are used to [15, 16]. Thus, the usual change management challenges should not be underestimated. Besides, it is probably worth remembering that for B2B commerce, "even in the Internet world it is not what you know, but who you know that matters" [16]. Another great difficulty in adopting B2B e-commerce is the rapidly growing multitude of standards in the industry. It is not clear which e-procurement solution providers (and whose standards) will survive, and which will not. Multiple standards in the industry are already causing confusion and increasing purchasing cost, which undermines the cost savings previously described [12].

The organization of the paper is as follows, Section II describes literature survey. Section III presents implementation details, Section IV projects on conclusion and future scope.

II. LITERATURE SURVEY

In 2015 Lewis-Faupel et al, found that e-procurement system is a low barrier market for entry of new suppliers. Better opportunities and use of preferred supply network. Shorter order cycle. Improvement in project management and team collaboration. The problem of the existing system as found in this research are, high training cost, some suppliers may have to initiate full organizational reconstruction. Rapidly growing multiple standards in industry and having no common uniform standard [1].

In 2001 Evgeniy A. Ageshin found that it is quite possible and, even likely, that the pool of potential B2B marketplace models is not exhausted, and that in future we shall see new forms of e- procurement services. These new forms will bring new advantages to participants of such marketplaces. However, even today the benefits offered by B2B e-commerce are enormous, and most business cannot afford to neglect them [2].

In 2006 Kishor Vaidya et al, found that because of sensitive data and nature of order and payments security of data is critical and in e-Procurement systems. It is critical that both parties have trust and confidence in the underline security infrastructure [3].

In 2010 Panda et al, found that the research problems faced by government in procurements are time and cost overrun due to procedural complexity viz. heavy paper work, multilevel scrutiny etc. The transparency and probity of procurement systems can be enhanced by keeping a traceable online electronic record of transactions [4].

In 2003 Joong-In Kim and Dan L.Shunk found that e-procurement system are not equally suitable for different business processes. Direct procurement can be scheduled in timely manner provided sufficient information about demand is available and source of material is secure and reliable [5].

In 2014 Subramanyam et al, found that electronic processing and communication of interorganizational data improve the timeliness and accuracy of the information, allowing trading organizations to better plan and manage their assets, such as inventory. The use of IT improves the process quality, which in turn improves the level of output. IOS also increases the bargaining power of the buying organization, which now has a better information visibility of its business processes. At the same time, however by having access to more information about the buyer, a supplier can better match the preferences of the buyer and extract a premium price. The close relationship built up between buyer and supplier may also enable the supplier to gradually increase its volume of business with the buyers [6].

In 2005 Simon Croom et al, One of the key themes in the existing literature on e-procurement has been concerned with the economies of information in particular the realization of cost improvements achieved as a result of transactional and process efficiencies. These efficiencies arise through greater opportunity for lower prices from suppliers; from the reduction in process activity needed to complete the total 'requisition to payment' process; through the increased speed of the procurement process and better decision making as a result of improved management information [7].

III. IMPLEMENTATION DETAILS

The proposed system aims to bring efficiency and transparency in e-procurement domain. The proposed system enhances the existing system by overcoming its drawbacks. It addresses the short comings of existing systems by providing various functionalities such as convenient UI, provide one roof solution. The vendor can use filters to refine the search and can easily find procurements of his/her own interest. Same can be used by companies to shortlist the tenders filed. A profile of vendor is created that provides complete and

verified information about the vendor's past projects and ratings and feedback given to the vendor. The data will be encrypted and stored at our secured server. On this website, the user is verified using government e-verification standards. The complete procurement transaction through the e- Procurement system happens in a transparent manner. The system captures the justification and comments of approvers at every stage and thereby enables users and approvers associated with a transaction to justify their decision. Reverse auctions can enable the departments to negotiate better rates from its suppliers. e-Procurement brings down the cost of doing business for the suppliers. This in turn will translate into reduction in prices by suppliers. e-Procurement facilitates real time tracking of purchase order/delivery schedule status thereby enabling better planning of inventory. It drives process 12 efficiencies and results in reduction in the turnaround time for a tender and/or a purchase order, again resulting in reduction in the inventory required to be maintained at the users end, thereby resulting in reduction in cost. e-Procurement enables a centralized database of procurement at all the project sites, thereby aggregating the requirement of similar items across locations. It results in increased purchasing power to negotiate better prices from suppliers. The web application has a convenient user-friendly user interface, secured and reduces the time elapsed creation of a tender to awarding. The tender aims at making an impact on the current procurement system by increasing transparency and overall efficiency. In the proposed system, the filed tender is saved on our secure server in encrypted form and it is made available to the company only on the date of opening the tender. Thus, reducing corruption. In our proposed system procurement goes online, saving a huge deal on papers and thus in turn benefiting the environment. The proposed system notifies the vendor whenever a new tender is published on our site. Then the vendor may file the tender which immediately received at our server unlike traditional mailing system that may take days or weeks. In our system both the parties are verified according to government norms, leaving no room for deception. The vendor can use filters to refine the search and can easily find procurements of his/her own interest. Same can be used by companies to shortlist the tenders filed. A profile of vendor is created that provides complete and verified information about the vendor's past projects and ratings and feedback given to the vendor. The data will be encrypted and stored at our secured server. The proposed project is committed to bring efficiency and transparency in e-procurement domain. On this website, the user is verified using government e-verification standards.

A. System Overview

We propose a web based e-procurement system, which bring efficiency and transparency in e-procurement domain. The entire procedure is as follows, Login into the procurement site as a company or a vendor. If company then create tender. The vendors view the tender and provides the services to the particular tender. The company views the services provided by various vendors and then selects the services of the particular tender. Hence the tender has been filed. The filed tender is encrypted and saved at the secured server. On the day of the tender opening, the filed tender is decrypted. The Company and the vendor sign the contract and payment is discussed. The system architecture of the proposed method is shown in the following Figure 1.
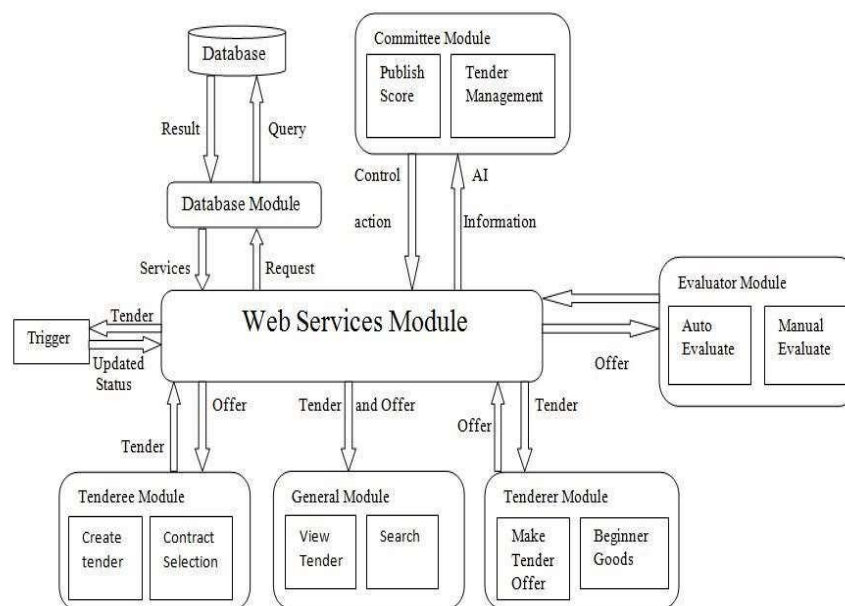

Figure 1. System architecture

B. System Module

The research work performed consists of following seven modules:

1) Application Software

The application is the software which makes it possible to carry out the procurement process online using computers and internet, replacing paper based documents. The application plays a pivotal role, as it is responsible for actual execution of the tendering process online. A robust and dynamic application seamlessly integrates with the existing systems allowing the user organization to customize it according to organizational policies.

2) Hosting and Bandwidth

The application has to be hosted at a secure site where bandwidth is not a hindrance when multiple users are logged on the system. The application has to be up 24X7 for e-Procurement to achieve its objectives. The reliability of the server and the bandwidth assurance for load bearing in terms of simultaneous usage, are inevitable for the smooth implementation of e-tendering for any organization.

3) Security and Legal Sanctity

E-Procurement   involves   a   high   amount   of   commercial transactions   and   also   publishing   of organization specific sensitive data on a public domain. High level of security has to be ensured so that there is a trustworthy access-control technology and authorization policy in place. Security has to be maintained not only of the data that is stored on the server but also of the information that is in transit, e.g. the bid documents or the bid figures being sent to the server by the vendor. The e- Procurement process and the policies that are implemented for the security of the data and communication have to comply to the IT Act of the country so that the transactions and disputes (if any) arising there from, are admissible in the Court of Law. Non- repudiation has to be taken care of within the purview of the Law, for the assurance to the 8 organization and the vendors. Indian IT Act has well defined provisions for documents submitted online, electronic records and digitally signed documents.

4) Strategic Sourcing

This module provides sophisticated tools to help create sourcing events, manage bids, and award contracts, while also offering a configurable workflow to ensure sourcing events, bids, and contracts are routed through proper stakeholders automatically. This module also offers a self-service access for suppliers so they can easily see events, or bid opportunities to provide a means to create events, manage   bids and award contracts automatically.

5) Contract Management

This   module   provides   end-to-end   Contract   Lifecycle Management, allowing stakeholders greater transparency into the contract process.   This module also provides a single repository for contracts, a large library of standard templates for various contracting needs, and real-time updates to contract.

6) Supplier Management

This   module   handles   supplier   enrollment   and   supplier management, allowing for automated vendor communication and onboarding, supplier qualification review, supplier risk management,   and   alerts   for documentation   expiration. Integration of this module with the other modules allows for supplier onboarding to be initiated early on in the procurement cycle instead of at the payment phase to automate supplier management.

7) Payment System

Provision for on-line payment acceptance by integrating online payment gateway. This module is geared at driving down invoice cycle times, adding transparency for vendors/suppliers into   the   payment   process,   and automating   tedious   paper processes where possible, to provide a touchless, e-Invoicing accounts   payable process,   real-time   visibility   and   direct interaction with suppliers, sales orders, and invoices, which can lead to payment discounts.

Contract Selection

After all the tender offers are evaluated, the overall scores are sorted in a descending order for the tenderee to determine the final tender winner(s). The pseudo code is given below. Here we also consider the need to have multiple tender winners, which is quite common in e-Government procurement process, so that no single supplier is monopolizing all the jobs.

To facilitate the tender allocation among multiple winners, two allocation modes are proposed: cooperative allocation, and competitive allocation. During the tender creation, the number of winners intended and which allocation mode to be used would have been decided.

```
Algorithm :
Switch (Winner Type ) {
case Single :
MaxScore = FindMaxScore(RFTID);
WinnerList = Find the Winner with the Max Tender Offer Score
/// There are more than one having the Max Score if (Winner List > 0 ) {
Winner = Random Get The Tender From the Winner List
///Assign all Price Item to this winner for each Price Item in CriteriaList { Assign the Winner supply this Price Item
case Cooperative:
for (each Price Item in Criteria list){ Criteria_MaxScore=FindMaxCiteriaScore(RFTID,Criteria);
/// Find the winner with the Max Score
WinnerList = Find The Supplier with the Max Score of this Price
Item
/// There are more than one having the Max Score if (Winner List > 0 ){
Winner = Random Tender From the List base on Tender Score
///Assign this Price Item to winner
Assign the Winner supply this Price Item
}
} break;
case Competitive: Calculate Composite bid
Cut off = Setting the Cut off Point
WinnerList = The winner that have lower price than Cut off
Price
///Setting the Actual Quality Request for (each Winner in WinnerList ){
if (Allocation type is Average ) {
Assign Quantity Averagely to this Winner if (Have Remainder )
Remainder Assign from the High Score to Low Score
}
else {
Assign Quantity According to Score Ratio to Winner
}
}
break;
```

IV. CONCLUSION AND FUTURE SCOPE

Web based e-Procurement system addresses the short comings of existing systems by providing various functionalities such as convenient UI, provide one roof solution. The proposed system enhances the existing system by overcoming its drawbacks. The proposed system increases transparency and efficiency. In the proposed system the companies can negotiate the price with the vendor. It also provides more authentication feature for company login. The proposed system also increases the application security and stability.

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