Developing E-procurement System for Purified Water Factory

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Abstract

E-procurement is the electronic integration and management of all procurement activities including purchase request, authorization, ordering, delivery and payment between a purchaser and a supplier. This paper intends to implement e-procurement system, instance purchasing materials for producing purified water. Before the use of e-procurement, the water factory can't do the purchasing process effectively. Because of doing manual process can cause delay. To show the effectiveness of Electronic commerce for B2B Company, speed up the purchase acquisition, approver and purchase order process. The aim of using e-procurement system was to replace existing systems, some paper-based and some computer-based, with a single system that would speed up purchasing.

1. Introduction

As the technology grows rapidly, computer based methods are used to improve the business processes [1]. The use of e-procurement system can achieve significant savings and other benefits in purchasing. Involve electronic trading between a buyer and suppliers. This involved in organizational purchasing and to indicate the potential time savings from e-procurement. E-procurement can help to improved the purchasing function in organization, reduce costly manual processes, source goods, materials and service at a sub initiatives lower cost.

In this paper, we focus on these activities which include searching and specification of product, purchase request, authorization, ordering, delivery and payment [1]. To enable the company to order online immediately, we put our pre-Internet trading records on the web server [1]. Purchasing agreements and controls were thus automatically set up on the Internet order form, including correct pricing and special payment terms [5].

To introduce e-procurement, the manager and procurement team must work together to find a solution that links together the different people and tasks of procurement [6]. Easier to introduce systems that only cover some parts of the procurement cycle. The organization will buy everything from water treatment for producing purified water.

The rest of paper is organized as follow. Section 2 addresses related work of this paper. Section 3 presents the background theory related to e-procurement activities. In section 4, implementation of proposed system for e-procurement is described. Finally we conclude our discussion in section 5.

2. Related Work

Today, many organizations are interesting to change their purchasing process electronically. Kim Viborg Andersen et.al [2] most frequent use of e-procurement is within the area of seeking information and receiving support. Alain-Michel et.al [3] use the e-procurement system for market site tends to give access to a wider range of suppliers than when it used one-to-one EDI transactions with suppliers. And the solution was implemented gradually through introducing new items in stages. Francis Pullen [4] illustrates the potential benefits of e-procurement by reviewing the original and revised process and costs. The e-procurement system in this case is a direct link between the purchasers, Cambridge Consultants, and the web-based catalogue of one its major suppliers, RS Components. The National e-Procurement Project (NePP) team [10] is working to support and enable schools to meet their e-Government targets and to gain the benefits available from e-procurement. Maureen Whitson et.al [11] use e-procurement to allow Glasgow City Council to better specify those goods/services, supplied in the form of an electronic catalogue and Invoices in a friendly and adaptable format (i.e. EDI, cXML, fax, email).

3. Background

E-procurement refers to the purchasing process conducted electronically via an electronic procurement application. There have been many

attempts to automate the process of procurement for the buyer using electronic procurement systems [EPS]. This involves online entry, authorization and placing of orders and e-mail-based workflow [1]. EPS is an electronic system used to automate all or part of the procurement function by management of approvals; routing of authorization requests; interfaces to other finance systems; and matching of documents to validate transactions.

There are two types of e-procurement:

Buy-side e-procurement is the most common, and is a buyer centric model in which a buyer connects to his or her suppliers. It helps the buyer streamline operations and enhance productivity through reduction of paper flow, electronic transmission of data and automatic purchasing processes.

Sell-side e-procurement is a seller-centric model that helps sellers implement and maintain Web-based commerce and storefronts. In this model, a single supplier may reach many buyers, and the seller can market directly to end consumers, capture and manage online orders, and improve customer relationships by offering cost-effective customer support.

In this paper, we implement buy-side e-procurement involves a single buyer establishing an Internet based purchasing program with many of its suppliers, normally through a centralized e-procurement structure. E-procurement should be directed at improving performance for each of the 'five rights' of purchasing which are sourcing items:
1. at the right price.
2. delivered at the right time.
3. are of the right quality.
4. of the right quantity.
5. from the right source.

3.1. Sub-system of e-procurement
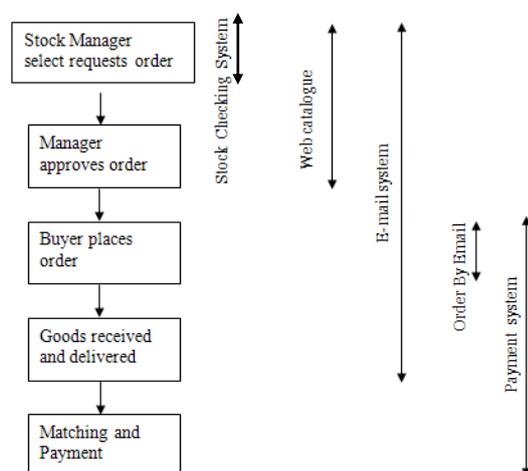
Figure 1. Sub-System of E-Procurement

Stock checking system - these relates mainly to production-related procurement; the system automatically highlights when re-ordering is required when the number in stock falls below reorder thresholds. It works as a database in which is stored the amount of raw material and notified the stock manager when the balance drops lower than the prescribed.

Web-based catalogue – uses web service application to find and get supplier from web server. Paper catalogues have been replaced by electronic forms that made it quicker to find suppliers. [3] Determine the best price and terms for an order.

E-mail and database workflow systems - integrate the entry of the order by the stock manager, approval by manager and placement by buyer. The order is routed from one person to the next and will wait in their inbox for actioning. Such systems may be extended to accounting systems.

Order by email – the buyer has the opportunity to order directly send to the supplier mail, there is no integration with systems for requisitioning or accounting.

Payment systems –accounting systems enable staff in buying department to enter and order which can then be used by accounting staff to make payment when the invoice arrives.

4. Implementation of Proposed System
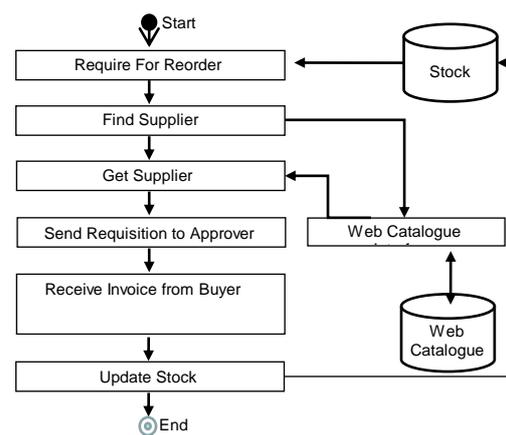
**Figure 2. Process Flow Diagram for Stock Manager**
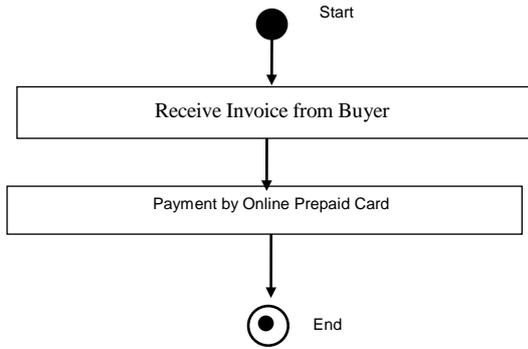
**Figure 3. Process Flow Diagram for Accountant**
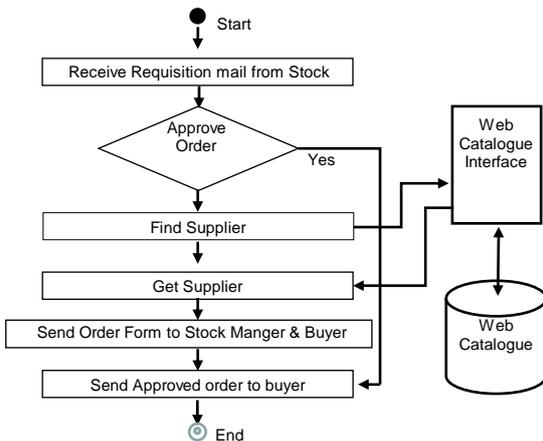
Figure 4. Process Flow Diagram for Approver
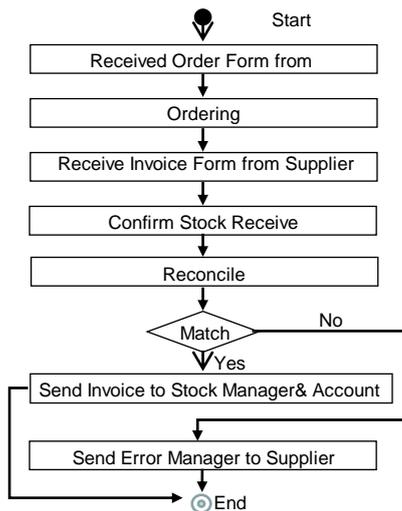
Figure 5. Process Flow Diagram for Buyer

In the proposed system, there are four actors: Stock Manager, Approver, Buyer and Accountant. Firstly, the Stock Checking System will alert the stock manager when the stock reaches to minimum thresholds as shown in Figure 6. The stock manager will select the supplier who matches the five rights by using the Web-based Catalogue as shown in Figure 7. After selecting the supplier, the stock

manager sends the requisition form to the approver by using the Mailing System as shown in Figure 8. When receiving the requisition form, the approver will approve the requisition form. If the approver wants to change the new supplier, the approver can select the supplier by using the Web-based Catalogue. Then the approver sends the approved order form to the buyer and the stock manager using the Mailing System. When receiving the approved order form, the buyer will order to supplier by sending email. After delivering the stock, the supplier will send invoice to the buyer. Then the buyer can reconcile the order list and invoice automatically by the Reconciling System as shown in Figure 9. In reconciling process, the system allows the supplier to send order stock separately to complete the order amount. If the Reconciling Process is successful, the buyer will send invoice to the accountant and the stock manager. If the Reconciling Process is not successful, the buyer will send error message to the supplier. The accountant will take the payment process after receiving the invoice as shown in Figure 10. When reaching the order list, the stock manager updates the stock database.

Figure 6. User Interface for Stock Checking System

Figure 7. User Interface for Web-Based Catalogue
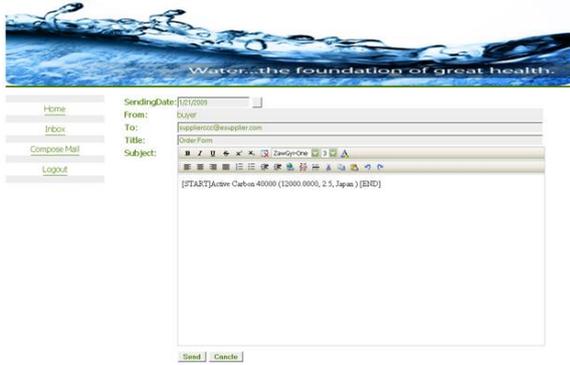
Figure 8. User Interface for Mailing System
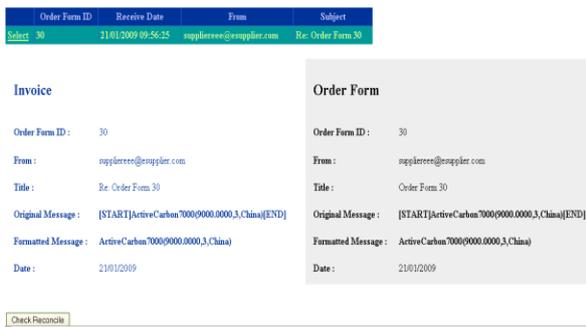
Figure 9. User Interface for Reconciling Process
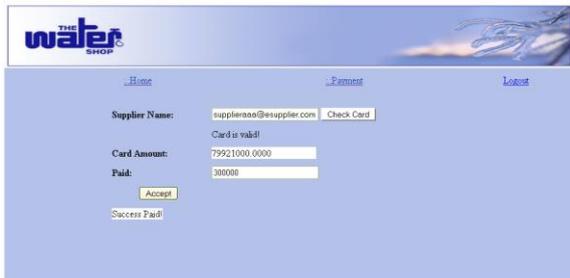
Figure 10. User Interface for Payment Process

4.1 E-Procurement Activities

Purchase Request – is an electronic order form which is filled by stock manager that sent to approver for requisition by the mailing system. Eliminate paperwork and reduce the time and money spent on dealing with requisitions within your organization. Select items from web-based catalogue or enter new items from new suppliers. Streamline requisition approvals with multi level email approval routing. Use their current email to route requisitions, approvals, quotations to the appropriate personnel. Convert requisitions into Purchase Orders with minimal data entry.

Authorization – the sock manager has authorized to find supplier using web service interface only when the system is alerted to re-order and after finding supplier, the stock manager's requisition form is sent to approver by mailing system. When receiving report stock list from buyer, the stock manager will update the stock database. The approver has authorized to approve the stock manager's requisition form. If the approver not satisfied the requisition form, the approver has authorization to find supplier. The buyer has authorized to order on supplier's web site that is approved by the approver. After delivering invoice, the buyer will reconcile the invoice and order by using EPS. If reconciling complete, send invoice to accountant to stock manager by mailing system. When delivering the stock, the accountant has authorized to payment after the system reconciling the purchased order copy and invoice.

Ordering – The buyer will order the stock directly send to the supplier mail.

Delivery – After ordering is done, the supplier will deliver the stock, invoice and delivery note.

Payment – After delivering and reconciling, the accountant will do the payment by using payment prepaid card.

4.2. Process Flow Analysis

Table 1. Process Flow Analysis for Traditional Procurement (typical cycle time, 6 ½ days)

	Task description	Process	Time
1.	Search for goods	Process	1 hour
2.	Fill in paper requisition	Process	10 min
3.	Send to approver	Transport	1 day
4.	In approver's in-tray	Delay	½ day
5.	Approver approve order	Process	1 hour
6.	Send to buyer	Transport	1 day
7.	In buyer's in-tray	Delay	½ day
8.	Buyer enters order number	Process	10 min
9.	Buyer authorizes order	Process	10 min
10.	Buyer prints order	Process	10 min
11.	Order copies to supplier and goods-in	Transport	1 day
12.	Order copy to account	Transport	1 day
13.	Invoice match	Process	1 day
14.	Cheque payment	Process	10 min

**Table 2. Process Flow Analysis for E-Procurement
(typical cycle time, 15 minutes)**

	Task description	Process	Sub System	Estimate Time
1.	Search for goods	Process	Web catalogue	5.5 sec
2.	Requisition Form	Process	Purchase Request	1 min
3.	Send to approver	Transport	Mailing System	2 sec
4.	Approver approve order	Process	Authorization	10 min
5.	Send to buyer	Transport	Mailing System	2 sec
6.	Order by Email	Process	Ordering	1 min
7.	Invoice match	Process	Reconciling	2 sec
8.	Order copy to accounts	Transport	Mailing System	2 sec
9.	Online payment	Process	Payment System	2 min

4.2.1 Comparison Description for two tables

Table 1 illustrates a typical traditional procurement for purified water factory. At first, the stock manager must find the supplier for goods manually. It may long for 1 hour. After that the stock manager will fill the paper requisition form (takes approximately 10 minutes) and then send requisition form to the approver (takes approximately 1 day). In approver's in-tray, there may have delay about ½ day. The approver then approves the requisition form (may takes 1 hour). After approved, the approver sends the approved order to buyer (about 1 day). In buyer's in-tray, there may have also delay about ½ day. After receiving approved order form, the buyer will enter order number, buys the order and then prints the order (takes 10 minutes respectively). Buyer also sends order copies to supplier, goods-in (takes 1 day) and to accountant (takes 1 day). After receiving invoice, the buyer reconciles the invoice and order (takes 1day). After reconciling, the account will take payment process (10 minutes). Its typical total cycle time is 6½ days.

Table 2 is estimated the process time for the new e-procurement process. At first, the stock manager can choose the supplier for goods using web-catalogue (takes 5.5 seconds). Then he fills the electronic requisition form (takes 1 minute). After filling requisition form, sends to the approver by mailing system (takes 2 seconds). Then the approver approves the order (takes 10 minutes). Then he sends approved order to buyer by mailing system (2

seconds). After receiving approved order, the buyer will order by email (takes 1 minute). Then the supplier will send invoice, the buyer will reconcile the invoice and order by using reconciling process (takes 2 seconds). After reconciling, sends order copy to accountant by mailing system (takes 2 seconds). Finally the account will take online payment (takes 2 minutes). Its total cycle time is 15 minutes.

5. Conclusion

E-procurement systems will be the important part of business purchasing. Enable greater flexibility in ordering goods from different suppliers according to best value. Reduce time and cost of purchasing processes. Significant savings can be made. Cost reductions should result in greater profitability. Process efficiencies result in less staff time spent in searching and ordering products and reconciling deliveries with invoices.

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