

Automated Medical Tendering Management System (Amtms) For Medical Suppliers In Jordan

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ABSTRACT

In Jordan, the growth of hospitals and medical centers (public and private) has increased dramatically. As a result, the demand for quality medical equipments and supplies increased and require suppliers to act swiftly at all times. Therefore, there is a need to strategically develop a system to manage supplies for these institutions. The Automated Medical Tendering Management System (AMTMS) is implemented as a Web-based system to as this allows the systems to be accessed anytime and anywhere. Furthermore, it plays a major role for the administration of trade and E-commerce activities. This study aims to identify the user requirements and to develop a prototype and validate the functional requirements. The prototyping approach based on General Research Design Methodology was used to develop the tendering system prototype. This web-based system was constructed using C#, ADO, Java Script for logical code, ASP for creating webs pages, and Microsoft SQL Server for database. In additional, the prototype has been evaluated by employees working in this field using two sets of questionnaires (functionality and usability). The result of the evaluation shows positive feedback on the system.

Keywords: Automated Tendering, Medical Supplies, Web-Based System, Tender, Electronic commerce.

I INTRODUCTION

The health sector in Jordan has a good reputation compared to other countries in the Middle East. Jordan is also able to contend the developed countries in the field of medicine due to the well trained medical staffs and state of art medical equipments in the Jordanian hospitals. According to the statistics of the Arab World medical report in 2008, Jordan was ranked among the leading countries in the Arab World in the health sector (SABEQ, 2010). In addition, Jordan is the main medical tourism destination for many Arab and foreign tourists because of the advanced medical facilities and excellent services at a lower cost, which is comparatively cheaper compared to other Arab countries (Connell, 2006). The statistics of the Jordanian Ministry of Health in 2012 revealed that

there are thirty-one public hospitals, sixty-one private hospitals, and around twenty-one medical centers (www.moh.gov.jo). These hospitals and medical centers definitely need excellent medical equipment and supplies which can be obtained through tenders. The hospitals in Jordan still use the traditional way in tender announcement for medical equipments such as through advertisement or offers in newspapers, fax, or e-mails. This way is considered as a real challenge for medical suppliers to keep pace with all the medical tenders and to check the tenders' details when necessary. Elias, Mahidin, and Shiratuddin (2003) point out that the traditional way of tendering require a big storage space, high number of pages, poor information security and safety, as well time consuming.

The tendering process involves written offer of goods, equipments or services at specific time and price. In the health sector, tendering process involves two main parts: hospitals and medical suppliers. The tender is created based on certain conditions (Azia and Rahman, 2010). The tendering conditions are different from one hospital to another and the way of announcing the tender is different as well. The most of hospitals still use the traditional ways for tender announcement such as e-mails, newspapers, or faxes.

These traditional ways are characterized by low security and need a lot of time to save and organize the announcements as they are paper-based tenders (Shapiro and Varian, 1999). Therefore, there is a need for an automated system which can save the time and cost compared to the traditional tendering procedures. The security and safety of tenders are considered as a real challenge for companies' manager as any employee in these organizations can view the tender's details and the cost of each equipment which are supposedly to be highly confidential. Hence, there is a need for a more secure system which can keep the confidentiality of tenders' details and can only be viewed by the managers of those organizations.

In addition, the tendering process is basically carried out by the manager of the organization (medical supplier) and has a specialized department for this purpose. The manager has to accept or reject the

tender's offer which is also made manually through papers. For that purpose, the manager has to review the previous tenders by searching through a huge pile of papers and files to find the cost and date of each tender. These procedures could be difficult for the manager and it may waste the manager's time in reviewing every single tender's details or advertisements. Thus, there is a need for automated tendering system which is able to view the new tendering offers and reviewing the existing offers. Furthermore, other problems emerged from utilizing the traditional tendering systems are location specific (distance problem), lack of dynamic and mobility of the processes. The managers must be in their office to perform their jobs. So, in order to address these problems the automated system must support the dynamic and mobility issues of the tendering processes which enables the managers to review the offers anytime and anywhere (Mahadevan & Kettinger, 2011). In Jordan, the medical supplier faces certain problems in tendering process by using the traditional tendering system as follows: (1) the high consumption of paper and the big spaces for storage purpose; (2) Poor security and safety and unavailability of information all the weakness information security and integrity; (3) wasting time and slow processing with high cost; and (4) distance problems (locations).

Generally, this paper propose an automated medical tendering management system for medical supplier in Jordan to address the highlighted problems inherited from the use of traditional tendering system and tenders' processes/procedures inside the company by converting the traditional tendering processes to its automated system format. This involve new business processes, which could save time and cost, and provide safer and secure business processes. (Resnick, 2009; Mahadevan & Kettinger, 2011).

II TENDER MANAGEMENT

Tendering is bidding process, or process of making proposal, an offer, bid or expressing interest in response to an invitation or request for tender. Organizations should look for other businesses to meet a specific need, such as the provision of goods and services, and choose the offer or bid that meets their needs and provide the best value for money (Brook, 2004). A tender document usually called an Invitation to Tender (ITT) which contains many procedures or steps such as introduction, specification, qualitative tender response, and instructions...etc (Chiu, Ng, Lai, Farwick, & Hung, 2007).

Traditional tenders' process starts when the notifications for these tenders are published on newspaper or any other media. Then, the companies will react to the announcement of the tender through the purchase of tender documents, and filling them out and submitting the required documents before the tender closing date (See Figure 1).

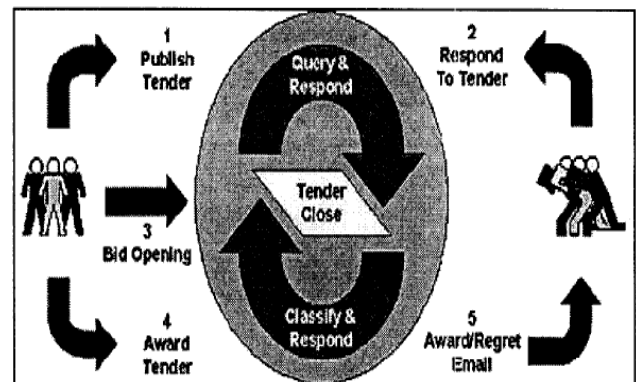


Figure 1. Traditional Tender Process (taken from Elias, Mahidin, and Shiratuddin 2003)

Electronic tendering management system is aimed to change the traditional tender process that is "paper based" and to get the advantage of using the information technology and internet. Electronic tendering is an online process that manages tender cycle from the announcement of the notice until/to issuance of the tender award. It provides a centralized process to help organizations improve efficiency and accountability while reducing the cost of traditional tender. Internet provides efficient platform for tender procedure for both contractors and (sellers/owner of tender). There is no need to reply or send out to paper-based tender (Howard, Kiviniemi, & Samuelson, 1998). The e-tendering process will give some advantage such as improves efficiency through cost savings and reduce transaction costs in buying direct. Other benefits are accountability, transparency, speedy exchange of data and information, and ease-use. This also includes other intangible benefits such as reduction of administrative overhead (Davila, Gupta, & Palmer, 2003; Henriksen & Mahnke, 2005).

According to Kajewski, et. al (2001), electronic tendering or E-Tender is one of the many interesting development today's. It refers to the use of the Internet and other electronic media to manage and facilitate the tendering process. Fundamentally, it does not change the way the tendering process is done, however it enhances the process by utilizing today's digital technology. Companies are finding that online trading allows the process smoother and faster, save money, provides market and competitive

intelligence, and creates a more even marketplace. E-Procurement not only offers huge benefits, but it also has done so since the very beginning in a significant, quantifiable, low-risk way verified by thousands of real companies around the world. (Singh, 2009).

There are several approaches of addressing tendering processes. There is tendering processes been grouped according to steps. The tender in procurement process can be categorized in many stages; but according to the Chief Technical Examiner (CTE) organization of central vigilance commission has released a book on "preventive vigilance in public procurement" during 2007; stages of tender can be sub-divided (bifurcated) under 4 stages (Vizagsteel, 2008): *Preparation of tender documents, Inviting and opening tenders, Pre-qualification, Evaluation of tender and Award of work*

III GENERAL RESEARCH DESIGN METHODOLOGY (GRDM)

This research primarily focuses on the development of website application to facilitate the working and prepare the medical tendering for medical suppliers in Jordan. In order to answer the research questions posed earlier, some actions in developing the system prototype are going to be considered. The design of the methodology will involve five main phases which are: awareness of problem, suggestion, development, evaluation, and conclusion (Kuechler & Vaishnavi, 2011). In this paper, we focus on the development aspect of this methodology. The system developments are the focus of this stage. Initially, in the implementation phase, previous stages are taken into consideration. For the validity and reliability purposes, this study adopted (Laudon & Laudon, 2009) reliability test of prototype development.

Step 1: Develop Initial Prototype - This step involves creating the initial prototype (tentative design) through collecting and documenting the prototype requirements and diagrams according to the previous step. By doing so, users will be provided by their requirements and needs in order to check the users' satisfaction of the proposed prototype. The initial design was created into the programming language to build the system (prototype) Automated Medical Tendering Management System for Medical Supplier in Jordan, using two software: Microsoft Visual Studio 2010 and Microsoft SQL Server

Management Studio 2008. The computer programming language that used to create the logical code is C# and Java Script for logical code, ASP.net for creates web pages, SQL for Database to create, store, and retrieve the data, and finally The ADO language was used to connect two software's and write the SQL statements (Quires) inside the C# code.

Step 2: Use the Prototype - In this step, users will be enabled to use the prototype of web based to identify their satisfaction as well as the system runtime, effectiveness, errors, and if there is a need for more processes, delete or update processes.

Step 3: Enhance the Operational Prototype - This step allows users to utilize the prototype of web based information sharing. It also enables the researcher to determine the users' satisfaction. Otherwise, the prototype should be enhanced through changing, updating, or adding to meet the users' needs. The prototype was created depend on the functional requirements that gathering and also on the diagrams that have mentioned in the tables 2 above. Moreover, this system is a flexible system as it's a dynamic system not a statistic one, as it will serve the objectives of each user in a very easy way without troubling them to turn from one page to another with a flexible way and will provide the necessary information for each user (Employees).

Sample of User Interface

This prototype admin page in Figure 2 is controlled by the higher admin of this website which are the managers for the medical supplier, and they havethe authority to do all activities in the system such as insert the tender advertisement, hospitals, and equipments and search operation for update and delete. In addition, they can also control and manage the tender itself such as insert/write tender and create a tender form. They can also generate both report (system and tender report). The managers have authority to adding a new employee, which are the employees in tender department or in supporting tender and give them the authorization to access the system and perform whatever actions that they are permitted to perform by the organization. .

Medical Tenders MainPage LogOut

* Please insert all required notice field to save it into database.

Notice Title	Notice From	Notice For	Notice Date	Notice Description
Tender error	Rani Ahmad	Emad Amran	5/19/2013	Error in tender number 44444
New Tender	Qusai Emad	Abed Kalk	4/5/2013	Tender number 55555 from Al Dhail Hospital.
Meeting Time	Ahmad Al Jarrah	Yazan Waleh	4/9/2013	we will discuss about the last task you take.
New Tender	Qusai Emad	Abed Kalk	3/31/2013	Tender # 33333 from Abu Obaida Hospital
New Tender	Abed Kalk	Ahmad Al Jarrah	3/31/2013	Tender number 33333 from Al Dhail Hospital.
New Tender	Qusai Emad	Ahmad Al Jarrah	3/28/2013	Tender # 22222 from Abu Obaida Hospital

Title of Notice: From: For:

Date: Description:

Figure 2. Manager/Admin Homepage

Medical Tenders MainPage LogOut

* Please insert all the required field to save it into database or to create Form.

Tender Number: 11111
 Hospital Name: Abdulhadi Eye Hospital
 Tender_StartDate: 3/31/2013 | All tenders that the company not entered the form as not enter it into the database.
 Tender_FinishDate: 4/30/2013
 Tender_Description: AhmedSound (1 unit, Germany), ActCel (2 unit, China), Azumaris ADC(2 unit, Malaysia)
 Tender_Condition: 1 year warranty and maintenance all year

1 2 3 4 5 6 7 8

Equipment Name	Equipment Model	Equipment Country	Equipment Year	Equipment Cost
ActCel	DOE	China	2000	100
ActCel	EEE050	Malaysia	2007	500
ActCel	P99406	Germany	2000	100

Tender Number: Hospital Name: Start Date:

#	Item Name	# of Units	Price Per Unit	Total Price	Tender Number
1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Figure 3. Insert/Write Tender

This Insert/Write tender page in Figure 3 is for the manager or tender department employees for adding a new tender in the database or to write/create a tender is by making a tender form. In this page the managers can see all tender advertisement in the system and the all equipment's that entered to the system. They can also select the tender advertisement to read the details, and check the cost of each equipment. To start writing a tender, the manager needs to click on the button "add new row". It is a dynamic button so when the manager clicks on it will create new set of textbox to allow them to fill the tender form. Furthermore, the manager has two options after finish from fill/write a tender. The first option is to add the tender into the database and printing tender at another time by clicking on "add" button. The second option is create form; this button will allow the manager to create a form application for this tender and print it out. Furthermore, when they click on the print button; the print screen will appear depending on which browser they use.

IV EVALUATION AND FINDINGS

The Microsoft Excel software has been used to carry out descriptive statistic analysis to interpret the collected data about demographic data and also functionality and usability of the system based on 25 users. Here, we discuss the evaluation results and the findings for the system by two parts of questions and these are; the functionality of the website through the (*Performance and Delivery*, and *Quality of the system*) questions to evaluate and measure the website functions'; and then the second questionnaires about the usability of the website to evaluate and assess the (*Ease of Use, Usefulness, and Website Capabilities*). The results of functionality attributes represented in Table 1 shows that in term of functionality of the system among the respondents, 59.6% were agreed with this part while 17.6% were not agreed, and 22.8% of respondents were neutral. On the other hand, the usability (ease of use, usefulness, and website capabilities) of the system has been measured and evaluated. The results displays that 58.7% of respondents agreed that the system were ease of use and 25.1% neutral, while 16.2% disagreed.

Table 1. The Summary of the Results

	% of Functionality	% of Usability
Agree	59.6%	58.7%
Neutral	22.8%	25.1%
Disagree	17.6%	16.2 %

V CONCLUSION

In this uncertain world and ever-changing, healthcare sector and participants must be creative and innovative in responding to an external stimulus, have a good knowledge of the medical environment, alert to opportunities, and increase confidence in its ability to adapt. Automated Medical Tendering Management System could be the start point of new businesses in the Jordanian medical supply sector specifically as well as healthcare sector and trading sector in general. A prototype tendering system for medical supplier in Jordan have been developed to help medical suppliers to organize, manage, and control the procedures related to medical equipment tenders. In addition, to perform the tendering processes online (online reference) in an easier and faster manner at anytime and anywhere. This system improves the efficiency of work in terms of repetition, speed, safety, accuracy, and security. Furthermore, an assessment was applied for the functionality testing based on (performance and delivery, Quality) and usability testing based on (usefulness, ease of use, and website capabilities) that were provided in the questionnaire got high employees agreement. So this study has done successfully the desired website with a high agreement from the employees who have used it. However, some improvements can be made in this AMTMS which are (1) to expand the scope of the research/study to other kinds of tender. (2) Should be the comparison between the different systems of tenders to determine which design would be best recommended for both types of hospitals (private and government). (3) Integrated the system with the supply chain management or with E-tendering evaluation system in ministry of health in Jordan.

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