DESIGN OF TENDER MANAGEMENT SYSTEM

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UNIVERSITI UTARA MALAYSIA
2012

DESIGN OF TENDER MANAGEMENT SYSTEM

A report submitted to Dean of Awang Had Salleh Graduate School in

Partial Fulfilment of the requirement for the degree

Master of Science of Information Technology

Universiti Utara Malaysia

By

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ABSTRACT

One of the E-government initiatives is the development of the government-to-business (G2B) system, which is an agenda sets to promote a higher service quality between government entities and the business sector. In Jordan, the vision of E-government would be an essential and active participant in the social development and economic with ICT to enable easy access to government services and information. The tender process in Jordan will be assessing based on the capital of the enterprises in order to be tender. However, the main user is the problem of corruption in the selection of tender. This proposal is to develop tender management system for public sector in Jordan, as well as to reduce corruption. The prototype will develop by using C# language, and the research design adopted the general methodology. The evaluation was based on usability testing with the System Usability Scale (SUS) proposed by Brooke. The prototype was assessed by a sample consists of thirty eight respondents. The results have been positive; when the respondents should that they are able to use the system.

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CHAPTER ONE

INTRODUCTION

1.1   Background

E-government has become a natural extension and a reality of the technological revolution that has accompanied the knowledge society. The E-government added new concepts in the science of public administration such as: citizen participation in the evaluation of government performance, accountability, transparency, and changed the political practices that transitioned to E-governance and e-democracy. E-government, which means "Government initiatives helping local authorities provide planning services online and accessible via the internet and email, for example, the Planning Portal website" (Mohammad, Almarabeh & Ali, 2009), depends on diverse expectations exist within its strategies, like restructuring administrations, achieving financial benefits/cost, remedy for previous policy failures, or a delivering services to citizens.

Furthermore, the purpose of E-government program is improving the government performance, to become a new kind of performance of governmental transactions, through raising the performance level of services for investors and beneficiaries from all segments of society accurately, efficiently, and easily

(Middleton, 2007). While most governments are eagerly looking toward a digital future, their view is obstructed by the challenges they face in the modernising such vast enterprises (Kassim & Hussin, 2009). The decision to automate public sector business processes via the e-Procurement and e-Tender system is seen among others as a mean to improve transparency (Magrini, 2005) and service quality (Leipold, Klemow, Holloway & Vaidya, 2004).

G2B have different types of systems. Independent system is one of them in which government agencies act. interdependent system is the another type that requires interactions between business users and government agencies, and is being support by other government organizations such as the federal registration department and management and transparency of government tenders results and account general (Kassim & Hussin, 2010). Electronic tendering fits under such a policy of E-government initiative that add values to trading parties by using Internet, that will be facilitating their procurement process for both arranger and supplier. The goal is to improve the effectiveness and productivity for deferent business processes is in facilitating the trading amongst business partners and the government agencies. Jordanian has been investing heavily in developing its ICT sector, aiming at enhancing the performance of its public and private sector organizations in terms of service provision, efficiency, accuracy, time and satisfaction (Obeidat & Abu-Shanab, 2010).

E-government in Jordan is a national program launched by the government with the aims of improving the performance of government institutions in terms of providing efficiency, services, expenses, accuracy, and the satisfaction of citizens, integration between specific elements for the formation of government services, and other government departments. The

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statistics indicated that in March 2001, 11 companies out of 27 provided internet services to the people in the country (Al-Zuabi, & Mahmud,2011).

The aims of Jordanian E-government are to provide information for the citizens, work transparency and establish communication channels, market Jordan internationally, facilitate the businesses, reduce the commercial businesses and costs of government, increase awareness of the citizens, promote computer kits, encourage information technology sector and train the employees. Additionally, Alomari, Woods and Sandhu, (2012) explained the challenges and risks of E-government in Jordan showed that the application of E-government in the country depended on the participation of a number of the private sector institutions and NGOs.

Figure.1 1: E-government Portal of Jordan

According to Almarabeh (2011), in Jordan the vision of E-government would be an active participant and essential in the economic and social development with ICT to enable easy access to government services and information for all citizens regardless of professional capacity or economic status or their geographic location. The Jordan Digital Strategy for government aims to make government information, processes, and services, accessible by using ICT to transform the way government engage with businesses and people. Through this study will develop prototype for public sector in Jordan for the tendering processes. The study is hope to improve the manual tendering processes; and yet makes it convenient to the contractors and clients to manage the tenders and protect the SMEs through classification the government tendering into levels that allow the SMEs competition between as, and compete with large companies with each other within another level. It is also will increase the integrity and transparency of the prequalification tendering processes.

1.2   Problem Statement

This section explores the importance of government to small and medium enterprises (SMEs) under the umbrella of G2B e-services. G2B transactions include various services exchanged between the government and the business community, including dissemination of policies, memos, rules and regulations. Business services offered include obtaining current business information, downloading application forms, renewing licenses, registering businesses, obtaining permits, payment of taxes, e-Procurement and e-Tendering (Obeidat & Abu-Shanab, 2010). On the web, there is many of the public sectors offer a tender, but still the documents of the tender offer request the contractor to go to the public work department to get the tender. There is a few, department offer

contractor to download the form through their website, it has make the processes take a lot of time. In the manual tendering processes, the client hires a consultancy team made up of experts, such as architects, designers, project managers, quantity surveyors and other construction expertise, while contracting the construction to the selected contractor (Abdullah, Mohamad Noor & Man, 2008).

There are lot of problems that will occur at the duration of processing time such as data lost and bureaucratic problems. Then there are many forms that contractor needs to be fulfils. The large volume of papers needs a lot of labour to arrange tender documents (Ng, Chiu & Hung, 2007). This tendering process used a lot of space to store the tender documents and it usually costly to both client and contractor. The public tendering processes imposed by the government, are aiming at reducing the possibility of waste and abuse of public money (Fong & Yan, 2009). Preparing tendering documentation and conducting tender obtaining processes requires much labour, which is costly for suppliers. The management of paper-based documents as product samples and confidential information presents an obstacle (Abdullah, Mohamad Noor & Man, 2008). The tender process in Jordan will be based on capital of the enterprises so the enterprises will have to be classified of ranked however, the main user is the problem of corruption in the selection of tender. This proposal is to develop tender management system for public sector in Jordan, as well as to reduce corruption.

1.3   Research Questions

The main question of this project is how to design a prototype of tender management system, that classification the enterprises in Jordan, the sub questions are:

1. What are the requirements of tender management system for public sector in Jordan?

2. What is the design for tender management system for public sector in Jordan?

3. How develop the prototype for test the functionality of tender management system for public sector in Jordan?

1.4   Research Objectives

The objective of this project is to develop a prototype of tender management system, which cans classification the enterprises in Jordan, the sub questions are:

1. To identify the requirement of tender management system for public sector in Jordan

2. To design prototype for develop the tender management system for public sector in Jordan

3. To develop prototype to test the functionality of the prototype of tender management system for public sector in Jordan

1.5   Research Scope

The scope of study focus on the build of tender management system for public sector in Jordan for help the owners of SMEs to compete through the

classification of government tenders with more transparency in showing of the results of tendering. The case study was applied on the Ministry of Municipalities in Jordan.

1.6 Research Signification

The signification of this study is to integrate the structure of various services, including tender invitation document preparation, uploading, tender obtaining, tender submitting, tender opening and tender analysis. With this system, tendering efficiency is increase and the possibility for tender collusion is severely reduced. Contractor participation is thus encouraged and a nation's competitive ability is consequently increased.

1.7 Organization of the Project

First chapter captures the theoretical and practical gap; through presented the background of the study whereby the problem of the research is put into light; the objectives and research questions are set. Moreover, describe the research significance and scope.

Chapter Two, provides a review of literature related to the design and development of tender management system for the Ministry of Municipalities in Jordan.

Chapter Three, emphasizes on the research methodology developed by Vaishnavi and Kuechler (2008), with the elaboration of its five stages (Awareness of the Problem, Suggestion, Development, Evaluation and Conclusion) in correspondence with the development of tender management system for the Ministry of Municipalities in Jordan.

Chapter Four presents the analysis and design of the research that comprises the system users' requirements, system design and prototype development.

Chapter Five provides the result for evaluation the system, its usability as well as ease of use and full assessment of the system.

Lastly, chapter six provides the concluding remarks on the system, its limitations as well as suggestions and recommendations for future research.

1.8   Summary

In this chapter, brief introduction has been introduced about the design of tender management system for the Ministry of Municipalities in Jordan. Which is to help the owners of SMEs to compete through the classification of government tenders with more transparency in showing of the results of tendering; it also offered a clear view of the scope and the significance of the study.

CHAPTER TWO

LITERATURE REVIEW

Through this chapter, a review of literature related for develop tender management system in E-government. Section 2.1 starts with the overview about government to business system, that will be via discussed a model of government business. As well as, clarify the benefits of system. In the section 2.2 shows the tender management system, an overview of e-Tendering stages and prequalification process. The tender management system issues were discussion in section 2.3. Finally, a summary of this chapter was displayed in section 2.4.

2.1   Government-to-Business System

The general concept and services of e-business system in public sector is the transformation of traditional, manual procurement process to an electronic system. It involves participations from two major players; federal agencies as buyers and private businesses as suppliers. In addition, there are also involvements by other agencies such as banks, Accounting General and certification related agencies as supporting organizations. While the usage functions and platforms are similar to the B2B marketplace, argue the underlying processes of G2B system are complex and an extra set of influential factors must be considered, that include financial risks, design and implementation risks and legislative issues (Henriksen & Mahnke, 2005).

The core functions and purposes of G2B systems differ between private and public sector usage. For the former, the main goal of usage is to reduce operational costs, maximise profits and improve performance, whereas for the latter, the main agenda is for value creations in which to reduce transparency (Moe, 2004), improve information flow and management, and more informed decision making (Kassim & Hussin, 2010). Vaidya, Sajeev and Callender (2006) also highlight on the detail objectives for the G2B system. These include to increase top-level funding availability, create open marketing which every supplier can compete, harness aggregated buying power of the government to achieve dynamic pricing of goods and services, improve efficiency of the procurement cycle while meeting all legislate mandates and ensure compliance with purchasing policies, both within departments and across the government agencies.

One of the key strategies to improve public sector service performance is by adopting information technology in the administration activities. Kassim and Hussin (2010) refer that the ability of a public sector to adopt new business models and IT innovation as an essential indicator of its transformation success. Similarly, the IT uptake to automate the G2B processes is seen as a strategy to improve the public sector service performance.

2.1.1   *Government Business Model*

Business modelling for E-Government needs to understand requirements first, and then depicts requirements with modelling methods. There are three basic models in Government Business Model (GBM), resource model, process model and organization model. Actually, resource model and organization model are also known as infrastructure model. Infrastructure model plays a constrained

and supportive role for resource model as illustrated in Figure 2.1 (Chen, Zhou, Xing & Yang, 2008).
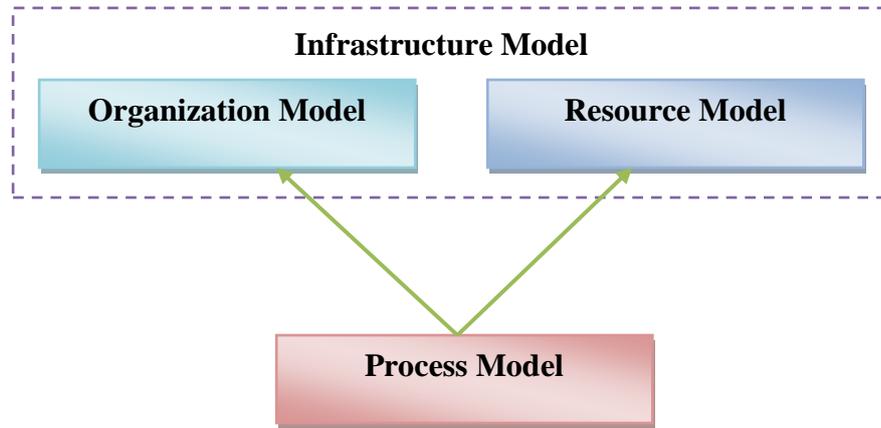
Figure 2. 1: Basic Models for GBM

Organization model is used to depict the structure of government departments. It can be defined as a quadruplet, which is a set of organizations; also include a set of roles. The relations in organization model have two kinds relation, Part-Job and Inclusion. Inclusion is the organization model position relations between organizations and membership relations between roles and organizations. By using Inclusion, the government departments can be expressed as a tree structure. Part-Job indicates that roles can take part time jobs in other organizations. As well as, the organization model has a set of integrity rules to check whether organization model is consistent and integral.

Resource model is used to describe the resources that government departments have and the classification relations between them. It can be expressed as resource model which include three types Res, RelR and IRR. Res is a set of resources. RelR defines the classification relations between resources. IRR is a set of integration rules. Resource model is the core of GBM. It describes all the business activities, necessary infrastructure elements, needed input

products, generated output products, and the partial orders to control activities' execution sequence.

Process model have many types which are {Act, Prod, Org, Role, Res, RelP, IRP}. Act is an activity set which constitutes the main tasks in a business process. Prod is a product set. Org, Role and Res are the same as in resource model and organization model. RelP is defined as a represents the relations between infrastructure elements and activities. As well as, the Dataflow and Reflow represent the flows between products and activities. The difference between them is that input product connected by Dataflow is consumed after the execution of activity, but that connected by Reflow is not consumed.

There are association relations among basic models. The association between organization model and process model is m to n. This means a process model can be performed by multiple organization model, which is a cross organizational business; and an organization model can own multiple process model. Resource model and organization model are built prior to process model. All the organizations, roles and resources used in process model are referenced from resource model and organization model.

2.1.2 System Benefits

Benefits or outcomes have many dimensions as success measurement of public e-tendering systems has been used. These include costs reduction, improved decision-making, operational efficiency, better communication coordination, improved relationship development and transparency. Some studies group the success measurement differently. Rahim and Kurnia (2004) categorized the impacts or success according to the three levels of the benefits;

strategic, tactical and operation. In contrast, Mukhopadhyay and Kekre (2002) classified the e-Procurement process outcomes as operational advantages and strategic.

The success of studies and impacts of public e-Procurement systems do not categorize and them according to the levels, for example attempt is believed to add values to the success against the strategic benefits through the parameters of the body of knowledge. With this issue, the study will assess transparency, relationship development and cost reduction, tactical benefits via quality access to operational benefits measured and information sharing as process efficiency.

In the meta-systems of governments and electronic markets, transparency is realized via information transfer and sharing of sensitive information that seeks to distribute or share the benefits of greater openness as widely as possible (Lamming, Caldwell, Harrison & Phillips, 2001). On the other hand, cost efficiency is defined as the reduction of procurement operation costs because of simplified process and electronic support (Panayiotou, Gayialis & Tatsiopoulos, 2004). Based on the work of Wagner and Essig (2006), relationship development is the control and development of supplier portfolio and the relationship that public organizations develop and maintain with their suppliers. As there are various definitions of information quality, we define it as the success of the information in conveying the intended meaning from the perspective of the desired characteristics and the quality of the system such as accuracy, data format, meaningfulness, reliability and timelines (Kassim & Hussin, 2009). Saeed, Malhotra and Grover (2005) defined process efficiency as process synchronization that allows a firm to gain efficiency in terms of improved process management and reliable lead times.

2.2   Tender Management System

e-Tendering is a process that replaces the traditional paper tendering system in the purchasing of products and services and is a means of electronically notifying, involving, vetting and selecting suppliers. For the seller it is a means of electronically competitively bidding for contracts. Among the major benefits of e-tendering is the reduction of costs from tender documentation production, a shortened tender period, a secured method of sending and receiving tenders and a more systematic and progressive method of working. E-tenders are also portable, inexpensive and simple to compile (Forbes-Pitt, 2006; Utvich, 2005).

Tenders can be divided into several types such as open, restricted and negotiation tender. Open tender is a tender that offered to any interested contractors. Negotiated tender is carried out under special circumstances whereby is done when the clients need some expertise that capable in doing such projects. Restricted tender is applying when purchase authority has procedure in place, which will definitely lead to the award of a contract. The procedure is restricted because contractors are first invited to express an interest and those contractors that have qualified against certain criteria are invited to submit tender (Du et al., 2004). Tendering processes is a complex process. A typical one involves many business procedures such as tender specification preparation, tender advertisement, tender aggregation, tender evaluation, tender awarding, and contract monitoring (Ng et al., 2007).

Illustrated in Figure 2.1, a scenario where the so-called web-based tendering system or electronic tender was mainly used for information display on a website. While most of the front-end services that interact with the users

(suppliers) are digitized, a large part of the backend processes remained unchanged. It is known that reforming processes and workflows especially in bureaucratic environment like government bodies involves many policy issues and would have to gradually take time. The backend processes are core-functions of electronic tender that not limited to the following tender creation but includes policymaking, bids evaluation, decision-making and other supports. (Ng, Chiu & Hung, 2007).
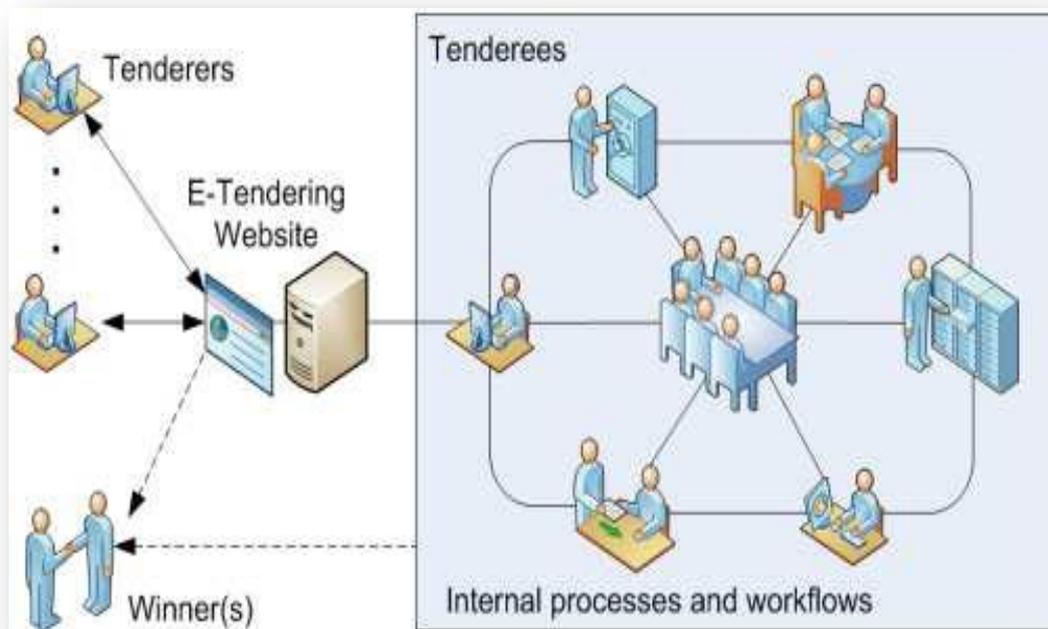
Figure 2. 2: Offline processes for electronic tendering system

E-government efforts progressed finally into digitizing both the services and information of both backend and frontend. The backend processes were partially integrated with automated workflows. They are more or less digitized and operating in a secure Intranet environment mainly for exchanging and archiving documents. This describes web-based tendering system in most E-government situations nowadays, the frontend is largely used for interacting with

users and the backend is partially automated and integrated. The scenario of today's web-based tendering system is described in Figure 2.2. It is shows an ultimate scenario, which final target of E-government reform that the processes are fully automated and integrated. The completely web-based tendering system is unified by closely coupling the backend workflow and the website as a whole application (Fong & Yan, 2009).
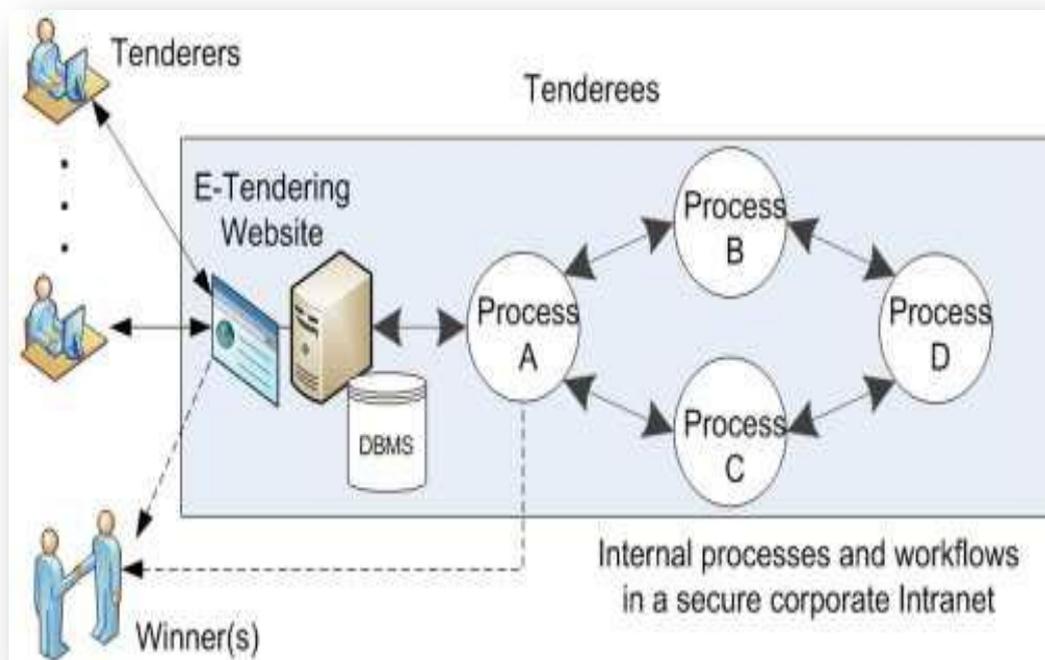
Figure 2. 3: Online processes for electronic tendering system

2.2.1 Stages of e-Tendering

Governments and business are more likely to develop an e-Tendering system in phases. Base on Katsikas and Lopez, a significant number of government e-Tendering systems have developed e-Tendering systems up to the second stage of development (Du, Foo, Nieto & Boyd, 2005).

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The first stage is one way communication, this stage of development allows the principal to post the tender advertisement and documents on a website and the tenders download the tender documents, the documents are still submitted in paper. There is no two-way communication occurring in an electronic environment. For web-based applications, the Secure Sockets Layer (SSL) is an effective mechanism to provide integrity and confidentiality to communications. Although SSL can provide message authentication, it does not provide non-repudiation of communicated data. When non-repudiation is needed, this has to be provided by digitally signing the data before it is passed on to SSL for transmission. For closed or restricted tenders, only correctly identified per-qualified tenders should be able to view the tender specification or advertisement.

The second phase is tender submission and two-way communication. This stage of development is where the Tender documents are downloaded from a website and also submitted electronically. However, the tender is not awarded electronically. The main improvement of the Tender Submission and Two-Way Communication stage is that tenderers can upload electronic tender submission documents (Du, Foo, Nieto & Boyd, 2005). HTTP file upload or similar point to point, connection oriented protocol should be used rather than email or other store and forward protocols.

On other hand, the second stage is electronic tendering contract formation, this stage of development is the same as the second stage except the tender is awarded and the contract formed electronically with on-going contract administration carried out electronically via collaboration software. In the

previous electronic tendering system, digital signatures were proposed as a technical means to ensure the non-repudiation of pre-contract communications. In this new electronic tendering system, electronic signatures will be needed to ensure the authenticity of an electronic contract. The probability that this authenticity will be brought into dispute is likely to be much higher than that of pre-contract communications. Failing to prove the authenticity of an electronically signed contract may lead to severe consequences. The risk assessment for this electronic tendering system needs to take into account these consequences (Mohammadi & Jahanshahi, 2009).

2.2.2 *Prequalification process*

Prequalification tendering process is to identify qualified constructors based on some criteria as requested by clients. As well as, the prequalification stage is certifies all the documents that are required to be submitted by constructors. Prequalification stage is generally preferred by clients to minimize the risks and failures. It also will enhance the performance levels of selected contractors. The prequalification tendering practices are different between procedures to be followed, regulations and countries according to the rules (Lou, & Alshawi, 2009).

In Australia, USA and Hong Kong there are previous study examined several prequalification practices, (Palaneeswaran & Kumaraswamy, 2001). Construction Industry Development Agency in Australia has recommended three categories of prequalification criteria namely mandatory, reserved and additional. Technical, financial, quality assurance, time performance, human resource management, skill, occupational health and safety are considered as mandatory

whilst claims performance and research development are regarded as additional and reserved. However, construction industry in Hong Kong has identified several different prequalification criteria such as experience, corporate, workload, support functions, resources and facilities. Whilst in USA, different public clients use various prequalification ratings. Other research study about Turkey has determined four main prequalification criteria in construction industry in including ability to complete projects, expertise, experienced technical staff and resources (Topcu, 2004).

2.3   Tender Management System Issues

Most of the academic research works as observed by the authors, concentrated on a particular aspect of e-Tendering, especially on assessment of tenders by decision support makers. However, advocate that e-Tendering is not merely a website of interactive services dealing with tenders or analyzing their bids; but it is a workflows of evaluation rather and full set of processes, management and approval issues that span across multiple intra-organization departments and even link up with supply chains.

2.3.1   Integration and interoperability issues

Integration and interoperability issues: They are important especially in our case of e-Government because potentially there would be a large variety of business partners and agencies to relate to in the e-Tendering process. According to Ng, Chiu and Hung (2007) a web service SOAP messaging architecture is proposed for this purpose. It uses SOAP messages exchange in XML format to improve inefficient manual or semi-automated tendering process. Web service SOAP messaging architecture as described in Figure 2.3 has been used to

improve the integration and interoperability of the tendering process. The contract award provides the tendering Web services for suppliers. The Web Services Description Language (WSDL) document has described the Web service technical details and Web service interface such as what operations it supports, what protocols is adopted, and how the data exchanged should be organized (Erl, 2005). It is considered as a contract between the Web services requestor and the provider. The inter-processes communications in e-Tendering is modelled in (Mohemad, Hamdan, Othman & Noor, 2010).
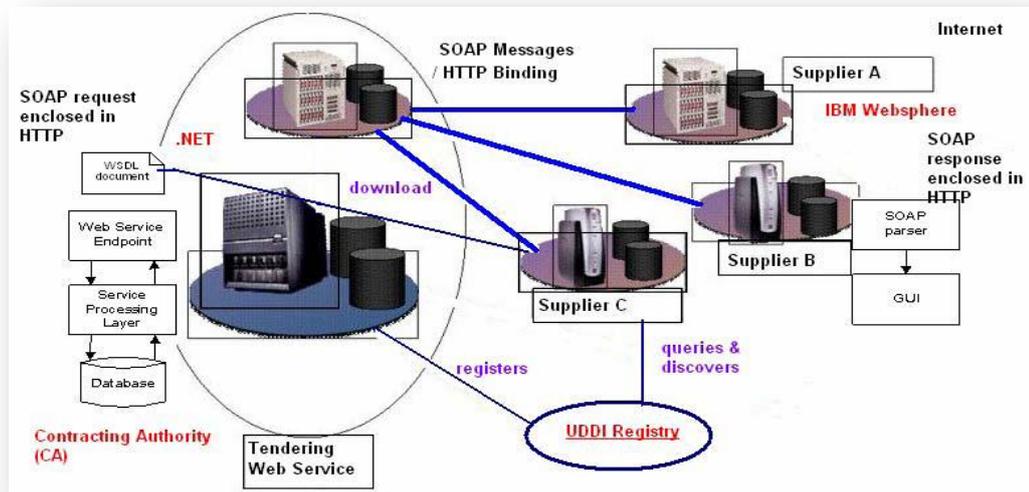
Figure 2.4 : Messaging Architecture for Web Service SOAP

2.3.2   System Architecture

Focusing on the bidding/tendering process, Mohemad, Hamdan, Othman and Noor, (2010) reviewed a list of existing information systems over the Internet that supports this process. They developed a SupplyPoint system, which can electronically support and automate the completely tendering/bidding process of virtual consortia for construction industry. Another similar system is e-Tendering with Web Services by Lou and Alshawi (2009). The system

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provides the tender document details for the tenderers , and the tenderers submit their tender price via Web services. The paper has a case study on building construction. PreQTender, by Abdullah, Mohamad Noor and Man, (2008) is another Web-based tender management system for selecting pre-qualified tenders in construction projects. The system aims to increase the integrity and transparency of the prequalification tendering processes.
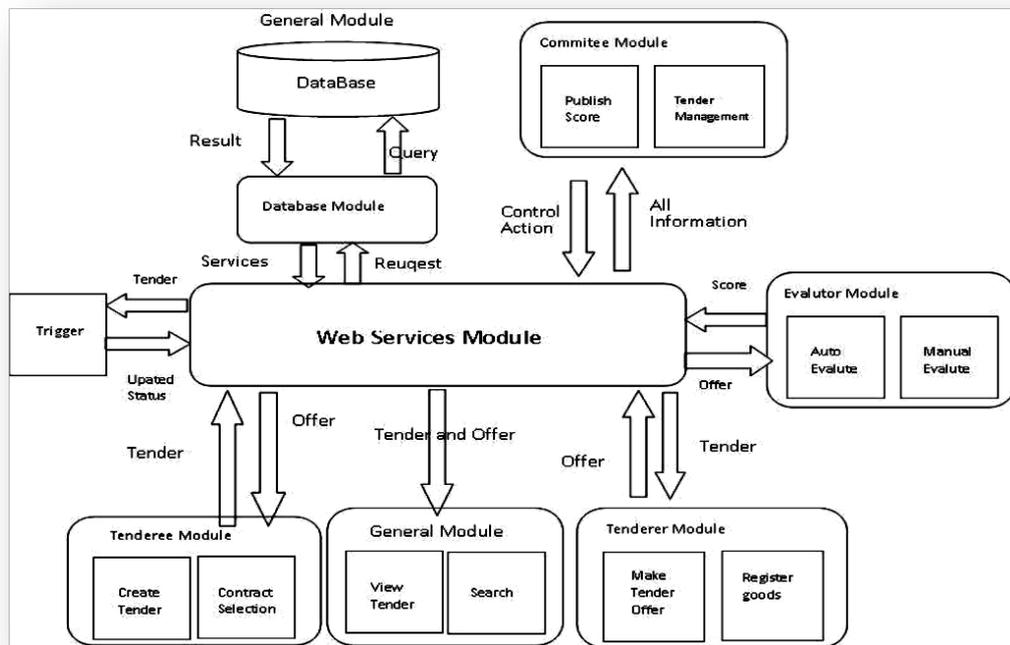
Figure 2. 5: Proposed of WTS system architecture

Most of the papers focus on the tendering mechanisms and the pricing factors, where details on decision-support systems, approval workflow, and bid evaluation as an integral solution are inadequate. They were designed for specific industry sectors.

De la Hidalga, Zhao and Sampaio (2008) respond by proposed an application of the Domain Engineering approach for the development of

tendering applications. This approach combines the analysis of the e-marketplace domain with a set of Domain Engineering models to support the development of tendering e-marketplace assets. It commented that however, most work on e-marketplaces has concentrated on solving specific problems, rather than providing reusable software development models. This inspired us to opt for a generic, reusable and modular e-Tendering design.

2.3.3 Decision-support systems

It is an important element usually located in the backend process of a WTS that helps the tender to decide which tenders should be chosen as winner(s) of the contracts. Some popular models studied in the literature are Genetic Algorithm that used to find tenders that optimize costs (Wendt, Cortés & Margalef, 2010) Multi Criteria Decision Making (MCDM) (Noor *et al.*, 2007; Ahmad *et al.*, 2007), Fuzzy set for setting price bid (Faez, Ghodsypour & O'brien, 2009) and Combine Scoreboard Evaluation in tender evaluation (Yang, Li, Wang & Fei, 2008). In particular, MCDM is used by integrating the existing statistical models with weight, and Guided Analytic Hierarchy Process (GAHP) (Ahmad *et al.*, 2007). Although many research works are on selecting winners by various methods, few studied about in case of multiple candidates are equally competitive how the jobs could be distributed to them at the best of the tender's interest. This motivated us to design a decision-support system to cater for this.

2.3.4 e-Tendering Security

As important support services that ensure an e-Tendering system functions in a secure environment, a number of security techniques including protecting the communications are proposed from Mohammadi and Jahanshahi (2009). The research in security is a major step required to integrate critical legal

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requirements into e-tendering system design. The security of an e-tendering system relies crucially on the recording of the date and time at which events occur within the system. The main areas of concern relating to secure time are time integrity and the closing and opening of the e-Tendering box.

The evidentiary value of recorded temporal information depends on the technical assurance that derives from both the particular choice of time stamping mechanism and from their correct deployment and maintenance. The first option for time stamping an event is to generate a log record that includes a description of the event and the time of occurrence as measured by the clock of the local host computer. A second option involves using a digital time stamping service that associates date and time information to electronic documents in a cryptographic manner. Third parties usually provide digital time stamping services (Betts et al., 2006).

Moreover, should not be allowed a tender submission after the stipulated closing time. In order to mitigate the threat of insider collusions, submitted tenders should not be opened before the established opening time, which must be set to be after submission closing time. Sometimes there are multiple tender boxes, both electronic and physical (Betts et al., 2006). For the control of e-Tendering box opening time, there are varieties of technical mechanisms that can be considered in order to protect the confidentiality of submitted tenders until the pre-accorded opening time.

2.4   Summary

e-Tendering in a general sense fits under such a plan of E-government initiative that add values to trading parties by using Internet

technology by facilitating their procurement process for both procurer and supplier. The goal is to improve the productivity and effectiveness for various business processes is in facilitating the trading amongst business partners and the government agencies. The requirement of e-Tendering system will be to determine clarify after presenting this chapter and analysis all the dimension of the tender management system. However, e-Tendering system is needs to determine the best model that can be used to development and accelerate a tendering management process

CHAPTER THREE

METHODOLOGY

These chapters discuss the methodology used to accomplish the objectives of this study. Section 3.1 of this chapter describes the research methodology and is followed by it is the stages in section 3.2. In section 3.3 was for describing the system design.

3.1 Research Methodology

A research methodology is a method to solve problems, based on organized systematic planning; it is the application of logic and objectivity to the understanding of phenomena (Kaplan & Maxwell, 2005). Method is a set of techniques used by the scientific community to investigate the phenomena by providing a framework to make the goal of scientific research and data analysis to reach a conclusion on this investigation. (Krippendorff, 2004).

Methodology used in many studies to achieve many process such as gathering information and data, development, evaluation (Refsdal, 2008; Schmuller, 2002). Similar to these phases are important to make us fully

awareness about the requirements of this study and the research problem. An agreeable method is used in this study, described, excellently chosen and accepted among many researchers in information system research design (Vaishnavi & Kuechler, 2008). The research is conducted in several steps. The following Figure 3.1 illustrates the major steps of the design research methodology.

| Knowledge flows	Process steps	Outputs
	Awareness of problem	**Proposal**
Circumscription	**Suggestion**	**Prototype Requirements**
Operation and goal knowledge	**Development**	**Prototype**
	Evaluation	**Test prototype**
	Conclusion	
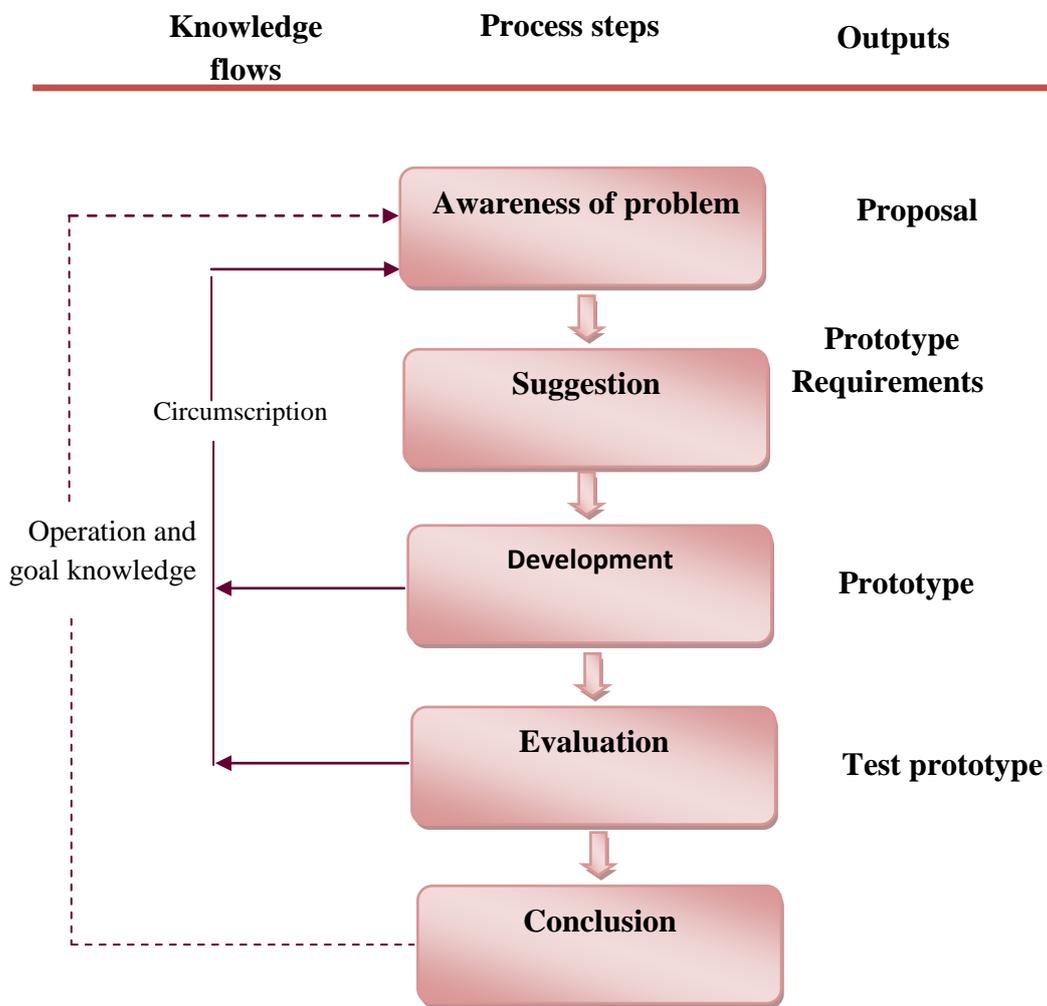
Figure 3. 1: General Methodology (Vaishnavi & Kuechler, 2008)

According to Vaishnavi and Kuechler (2004), the design research methodology or sometimes-called "Improvement Research" contained the major

steps: Awareness of the Problem, Suggestion, Development, Evaluation and conclusion as shown in the previous figure.

3.2   Methodology Stages

3.2.1   *Awareness of Problem*

First stage of methodology is to understanding of the objectives and the scope of study, as well as the problems, which are required to solve. In this case, the awareness of the problem arises because the understanding of the electronic environment of the tendering management system for Ministry of Municipalities in Jordan, to help the SMEs for competition in government tendering by classification the level of work and company depend on capital. to solve this problem will aim to develop tender management system for the Jordanian government (TMSJ). On other hand, that will be analysis the result and display directly to the participation to be the government more transparent.

The prototype requirements were gathered based on the current system review techniques. The review of the current system that is documented and obtained from a deeper review of documentation of the e-Tendering; According to Ng, Chiu and Hung (2007) the data lost and bureaucratic problems will occur at the duration of processing time. On other hand, the contractor needs to fulfill many forms, which mean a large volume of papers needs a lot of labor to arrange tender documents.

Moreover, Fong and Yan, (2009) pointed out the aim of public tendering processes is to reduce the possibility of waste and abuse of public money. Abdullah et al. (2008) refer that the obstacle in tender management system is

management of paper-based documents as product samples and confidential information.

3.2.2 Suggestion

This study suggests using tender management system for Ministry of Municipality in Jordan to develop the relation of G2B to provide services to the citizens, so the businessman can easily access to the system for participate and bid in government tenders based on the level which belong in. The output of this phase is the temporary design of the system includes UML diagrams. The UML diagrams are general use case diagrams, detailed sequence diagrams for each use case, and class diagrams.

During the design phase, Unified Modeling Language (UML) will be used to involve general use cases such as use case diagrams to show the user retaliations and the system components. Sequence diagram to show how the system work based on the use case diagram, follow collaboration diagram to illustrate the main components of the sequence diagram and the relation between them. The other diagram will be designing is activity diagram; this diagram used to describe operational workflows of a system. Finally, class diagram will be drawing to show inter-relationships, the operations and attributes of the classes of the system. The Rational Rose 2000 Enterprise Edition's software was chosen as a tool to develop the diagrams, which are use case diagrams, sequence diagrams, and all of the system structure was implemented in Chapter Four.

3.2.3 Development

In this stage, as the previous studies, the system designer will assess the current system in the same way, as well as, the requirement gathered in the first and second phase has come out with appropriate application. Furthermore, Figure

3.2 shows the components of the prototype, which are iterate the proceeding steps to arrive to the final solution to execute the construction of the prototype. The prototype was developed by use C# programming language under environment of ASP.net. ASP.net is use to build enterprise-class software applications, which defined as a unified software development platform that provides the services necessary for developers.
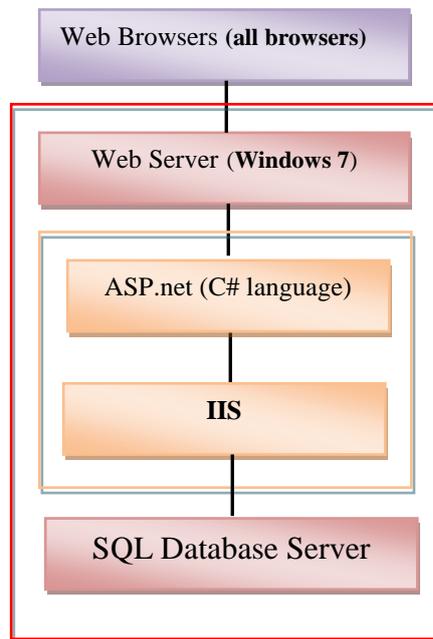
Figure 3. 2: TMSJ technology components

Microsoft Internet Information Web Server (IIS) for Windows 7 enables easy publication of personal web pages and turns any Windows 7 computer into a web server. IIS is easy to administer and install. It also simplifies sharing information for all users on internet or intranets. Moreover, it is perfect for developing, evaluating and platform web application, in additional peer-to-peer publishing with its support for sharing files over HTTP.

IIS supports ASP.net scripts and all extensions. IIS does not have the system requirements of a full web server but it has been optimized for interactive workstation use. IIS was selected because this system can be view in a standalone personal computer; it cannot be implementing in the real web environment. Additionally, there are fewer options available to manage IIS as those users who require web services to run on windows 7. SQL Server (2005) has many features: (1) it is possible to post information such as reports and forms on the Web, so that people in remote locations may view the required information. (2) Support of a variety of data formats. (3) Tables are grids that store related information.

3.2.4 Evaluation

The evaluation was performed to determine the level of usefulness and operability of the system after the system has been developed; it is tested through a questionnaire. The evaluation is based on usability testing by using System Usability Scale (SUS) proposed by Brooke (Bangor, Kortum & Miller, 2008). The prototype was evaluated after the development of the system through the 38 respondents who would use it on line. The aim was to see the level of satisfaction and ease of use and operability of the prototype system.

3.2.5 Conclusion

In this phase, the results are consistent with the objectives of the research. Where feedbacks are collected and notes for giving an overview of the possibility of activating the proposed to build a tender management system for the government of Jordan.

3.3 Summary

This chapter has discussed the methodology that been used in this project, where the methodology was grouped according to five phases that are based on the project objectives as follows: awareness of the problem phase, suggestion phase, development phase, evaluation phase and conclusion phase.

The requirements of the tender management system prototype were goatherd use a review of the current system. The prototype was developed by use ASP.net environment; System Usability Scale (SUS) evaluated the prototype with a sample of about 20 executive of SMEs in Jordanian.

CHAPTER FOUR

ANALYSIS & DESIGN

The prototype of tender management system for Ministry of Municipality in Jordan (TMSJ) will present in this chapter to discuss succinctly. The requirements of the TMSJ prototype will be the outcomes of this chapter and the system will be analysis by using UML language to knowing how the prototype works during design a use case diagram, sequence diagram, collaboration diagram and class diagram. Finally, constrict the tender management system interface for public sector in Jordan.

4.1 System Requirements

4.1.1 Functional Requirements

According to Zhang, Han, Wan and Wang (2011) the behavior of the system will be capturing by determination the functional requirements of system. There are several functional requirements to the proposed system. The system will deal with many staff and business people. Each one (employee) will interact with the system through interfaces as well as the requirements appear when it is based on the users interface.

Table (4.1) summarizes the functional requirements for the system and gives a brief description of the different requirements. M it mean mandatory requirements (something the system must do), D mean desirable requirements (something the system preferably should do) and O mean optional requirements (something the system may do)

Table 4. 1: List of Functional Requirement

NO	Requirement ID	Requirement description	Priority
	TMSJ_01	**Show the Homepage**	
1.	TMSJ _01_01	The user (Admin/User): can put the link in address and see the home page of the website of the ministry of municipality; then enter to the tenders' page.	M
	TMSJ _02	**Login**	
2.	TMSJ _02_01	To authenticate user Admin (government employee) User (business people) must enter a validate username and password.	M
	TMSJ _02_02	If the users enter invalid user name and password, the system will display error massage.	
	TMSJ _02_03	Cancel login process.	
	TMSJ _03	**View Tender Page**	
3.	TMSJ _03_01	The actors (admin, user) has ability to view the tenders' page after enter the username and password.	M

	TMSJ _04	**Manage Enterprises**	
4.	TMSJ _04_01	The admin has ability to add any new enterprise to the system and determination at which level is belonging depends on capital of the company.	M
	TMSJ _04_02	Modify the enterprise information or remove enterprise.	
	TMSJ _05	**Manage Tender**	
5.	TMSJ _05_01	The admin has ability to add a new tender to the website.	D
	TMSJ _05_02	Determine the level of tender, which mean only the enterprise has same level can watch the announcement of the tender.	
	TMSJ _06	**Join Tender**	
6.	TMSJ _06_01	See the announcement of the tender.	M
	TMSJ _06_02	The user has ability to join the tender by select the tender that want to share.	
	TMSJ _06_03	Confirm the join process.	
	TMSJ _07	**Bid Tender**	
7.	TMSJ _07_01	The user has ability to bid the tender that joins it before by enter amount. This page will be active only in the data/time to start the tender and will be close at the end of the time.	M
	TMSJ _07_02	Confirm bid process	

	TMSJ _08	**Result Tender**	
	TMSJ _08_01	The system will take decision-making.	
8.	TMSJ _08_02	Display the results of the tender after the time finish directly.	M
	TMSJ _09	**Log out**	
9.	TMSJ _09_01	The admin and user have ability to make log out of the system.	M

4.1.2   Non-Functional Requirements

The non-functional requirements will capture properties of the system that has to do with performance, quality or features that are not fundamental for the system to work. They are however very important because they are often properties that highly desired by the user and can help the system gain competitive advantage over other systems (Ghezzi & Tamburrelli, 2009). Table (4.2) summarizes the non-functional requirements for the system.

Table 4. 2: List of Non Functional Requirement

NO	Requirement ID	Requirement description	Priority
	TMSJ _10	**Performance**	
10.	TMSJ_10_1	The system must have a reasonable speed according to the technology used to access many of officers at the same time.	O

11.	TMSJ _10_2	The system should be easy to understand for whole staff and users	D
12.	TMSJ _10_3	The system should be available to all kind of users.	M
13.	TMSJ _10_4	The system should be available 24/7.	M
	TMSJ _11	**Security**	
14.	TMSJ _11_1	Only the person who has user name and password can access the system.	M
15.	TMSJ _11_2	Only Administrator will be able to login to a system to make update for tender files or enterprise information.	M
	TMSJ _12	**Cultural**	
16.	TMSJ _12_1	The system shall comply with Jordanian traditions and environment standards.	M
17.	TMSJ _12_2	The system will operate in Windows environment	D
18.	TMSJ _12_3	The system should be able to work on any Web browser	M
	TMSJ _13	**Flexibility**	
19.	TMSJ_13_1	System modifications do not cost much, so as we have modular system.	M
	TMSJ_14	**Usability**	
20.	TMSJ _14_1	The system has friendly interfaces, and it meets most of users and admin needs and requirements.	M

	TMSJ _15	**Efficiency**	
21.	TMSJ_15_1	The system should not exceed 3-5 seconds to start anew function.	M
22.	TMSJ_15_2	The system should not require many resources to operate.	D

4.2 System Design

4.2.1 Use Case Diagram

Use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. They are not meant to indicate how the communication between participants of the system is, but rather a tool to identify the functionality the different actors have to offer (Egeberg, 2006).

A use case and measurable value of actor to provide something that describes a series of actions can be made as a horizontal ellipse (Ambler, 2004). A prototype component are (use case/actor). In this study actor represents administrator (Admin) and user (Business people) as shown in Figure 4.2.

Login

View HomePage

<<Incloude>>

View Tender Page

User

Join Tender

Manage Tender

Admin

Bid Tender Page

Manage Enterprise

View Result Tender

Logout
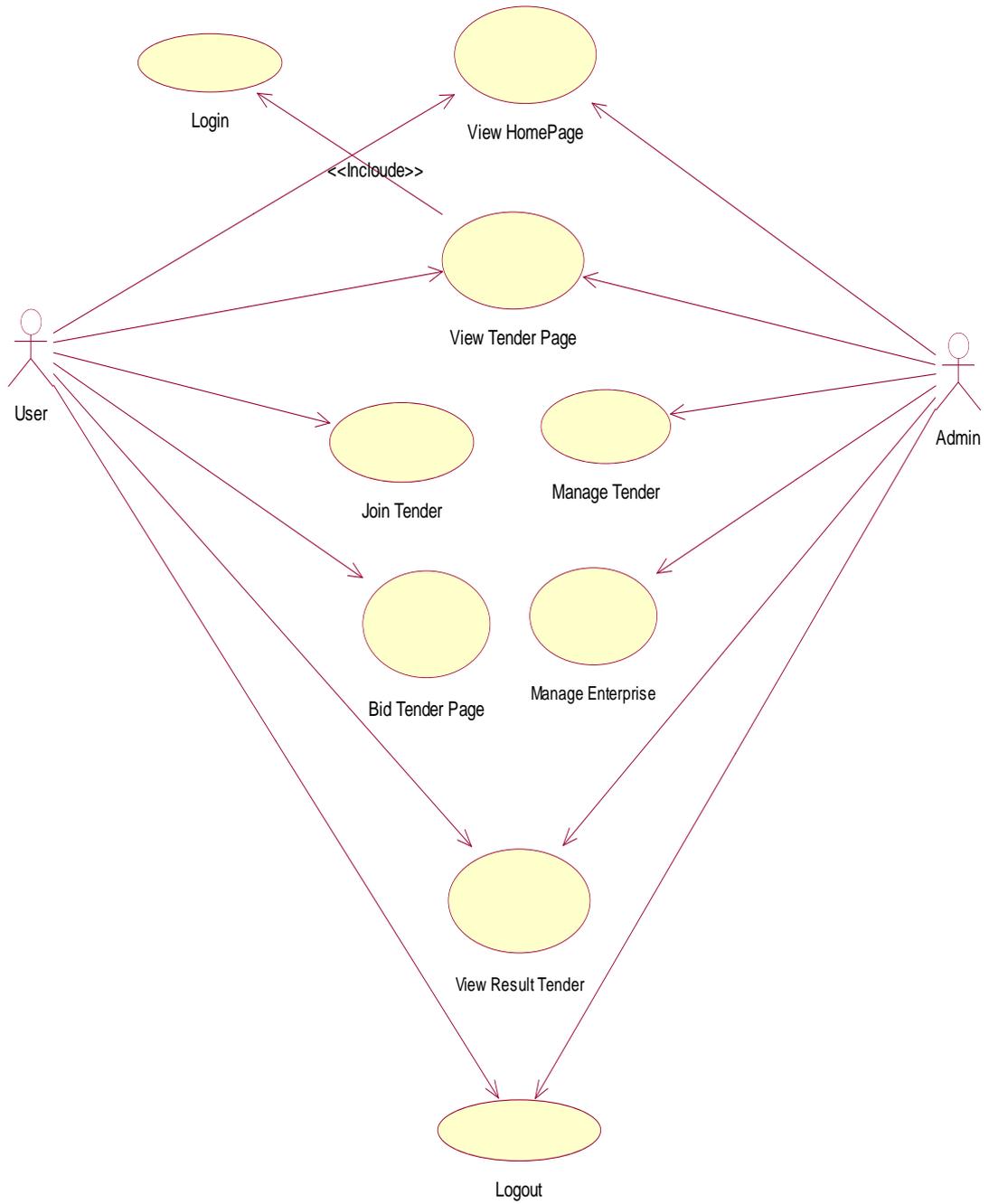
Figure 4. 1: Use case Diagram for TMSJ prototype

4.2.2 Activity Diagram

The dynamic diagram is activity diagram that shows the event and the activity, which causes the object to be in the particular state. An activity diagram represents the business and operational workflows of a system (Chen, et al., 2009). The activity diagrams for (admin & user) TMSJ system are illustrated in Figure 4.2 and 4.3.
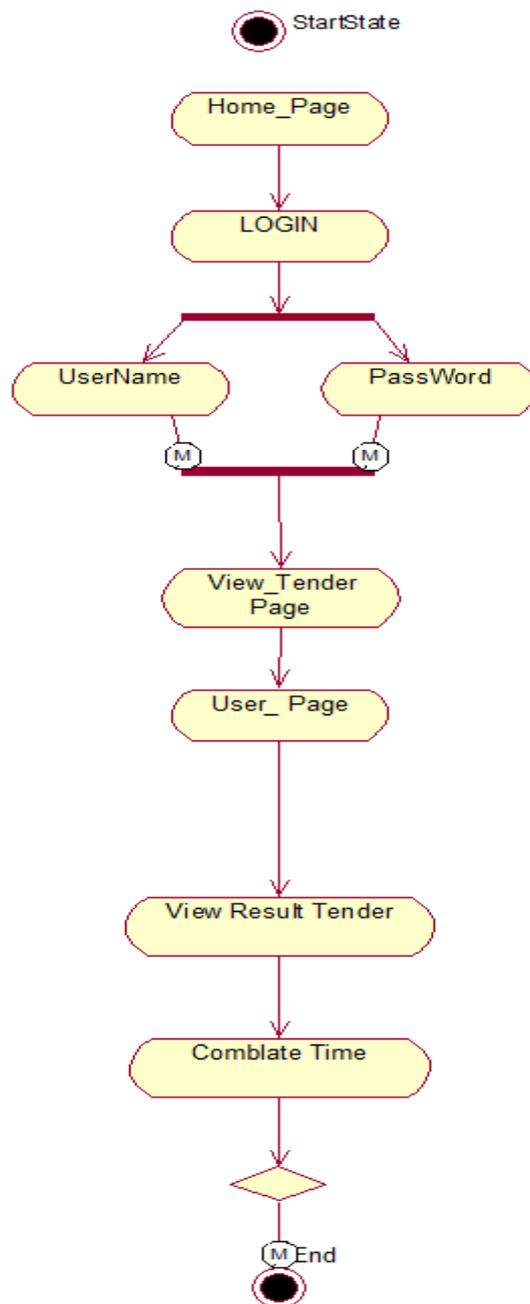

**Figure 4. 2: Description activity diagrams for Admin (TMSJ) prototype**
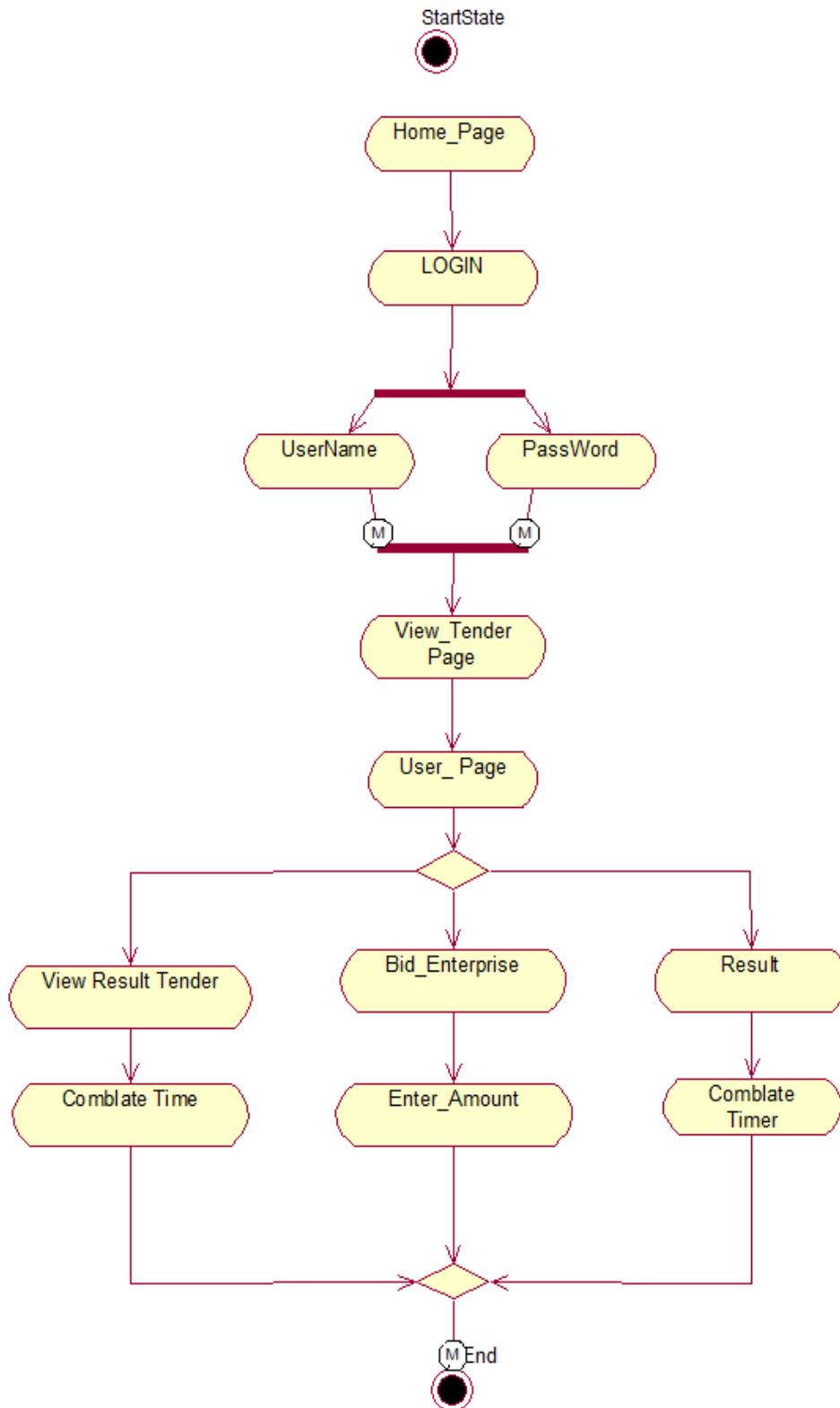
Figure 4. 3: Description activity diagrams for user (TMSJ) prototype

4.2.3   Sequence Diagram

Swain, Mohapatra and Mall (2010) referring that the most popular UML diagram for modeling dynamic artifact and used for the purposes of analysis and design is sequence diagram. It is consists of messages and objects. Objects are represented exactly how they are represented in all UML diagrams as rectangles to emphasize the class name in the rectangle, which focuses on identifying the behavior within the system. The sequence diagram for each Use Case of TMSJ is illustrated as follows:

Login page

The admin and user have the ability to login to the TMSJ system. Figure 4.4 describe how the users select login button and how this process will be done.
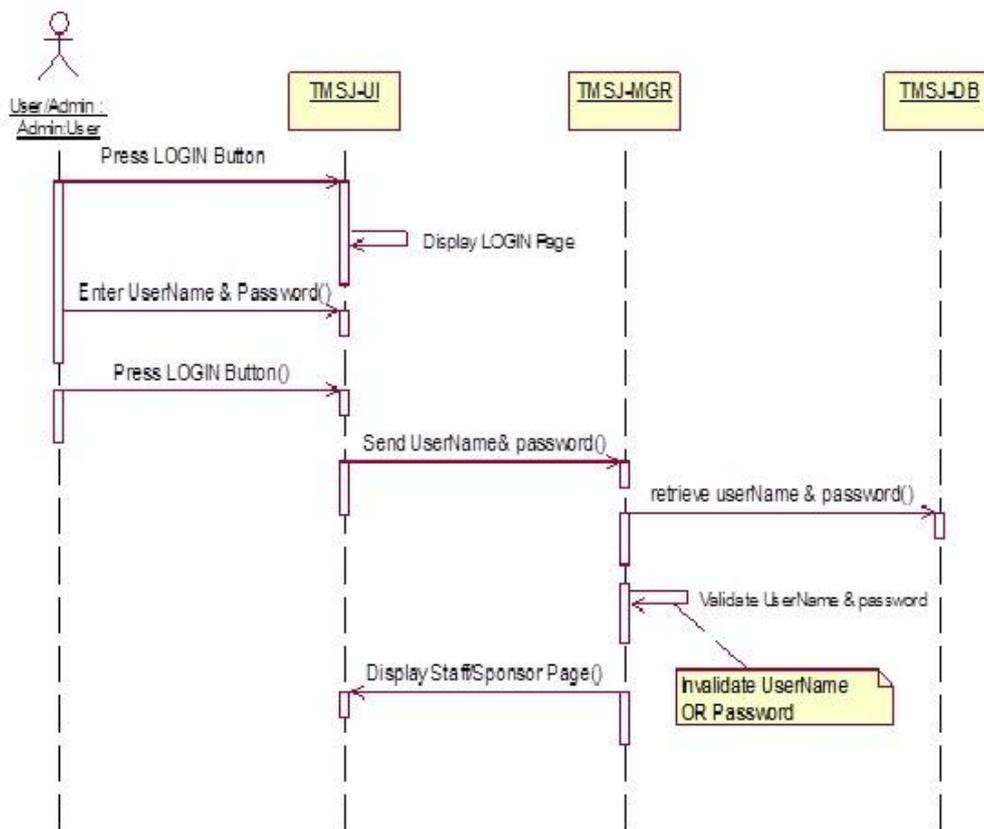

Figure 4. 4: Registration sequence diagram

View tender page

      The user and admin have the ability to view the tender page after login to the TMSJ system. Figure 4.5 shows the user when select view button to view tender page and how this process will be done.
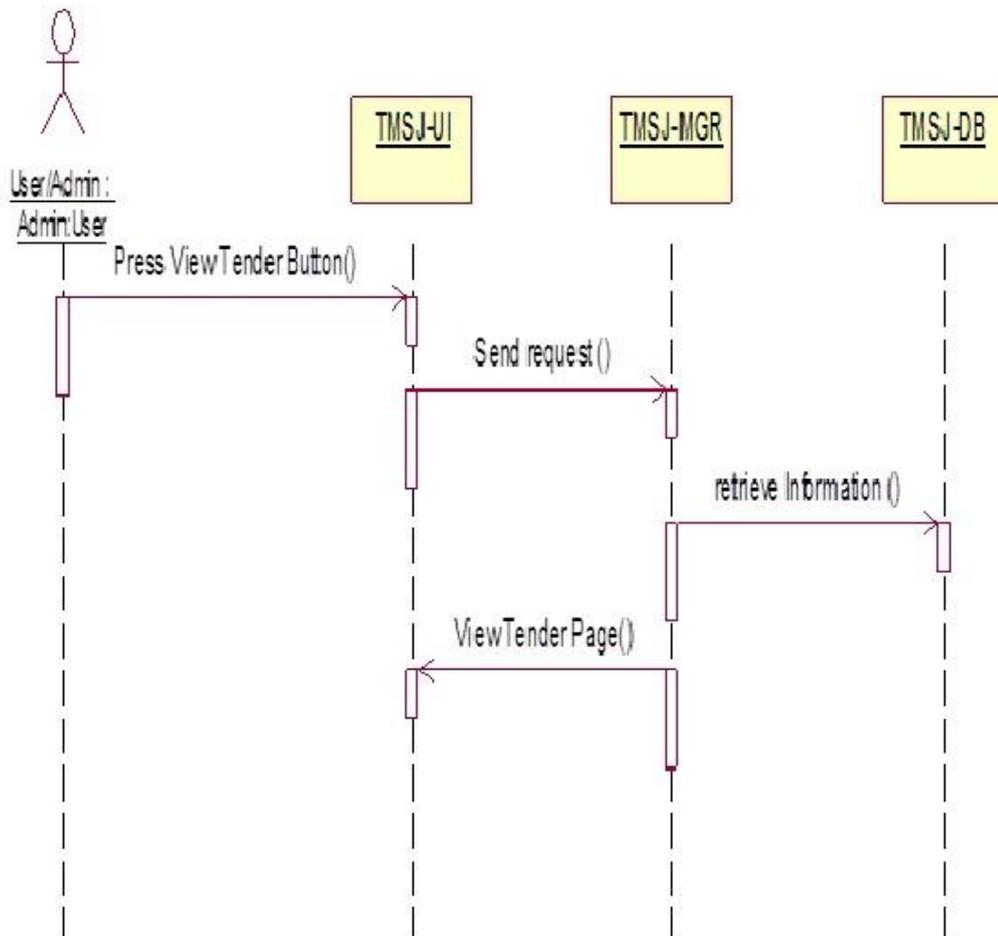

Figure 4. 5: View tender sequence diagram

Manage tender page

The admin has the ability to add new tender and modify or delete. Figure
4.6 illustrated when the admin add tender and select the level for the enterprise
then press confirm button and how this process will be done.
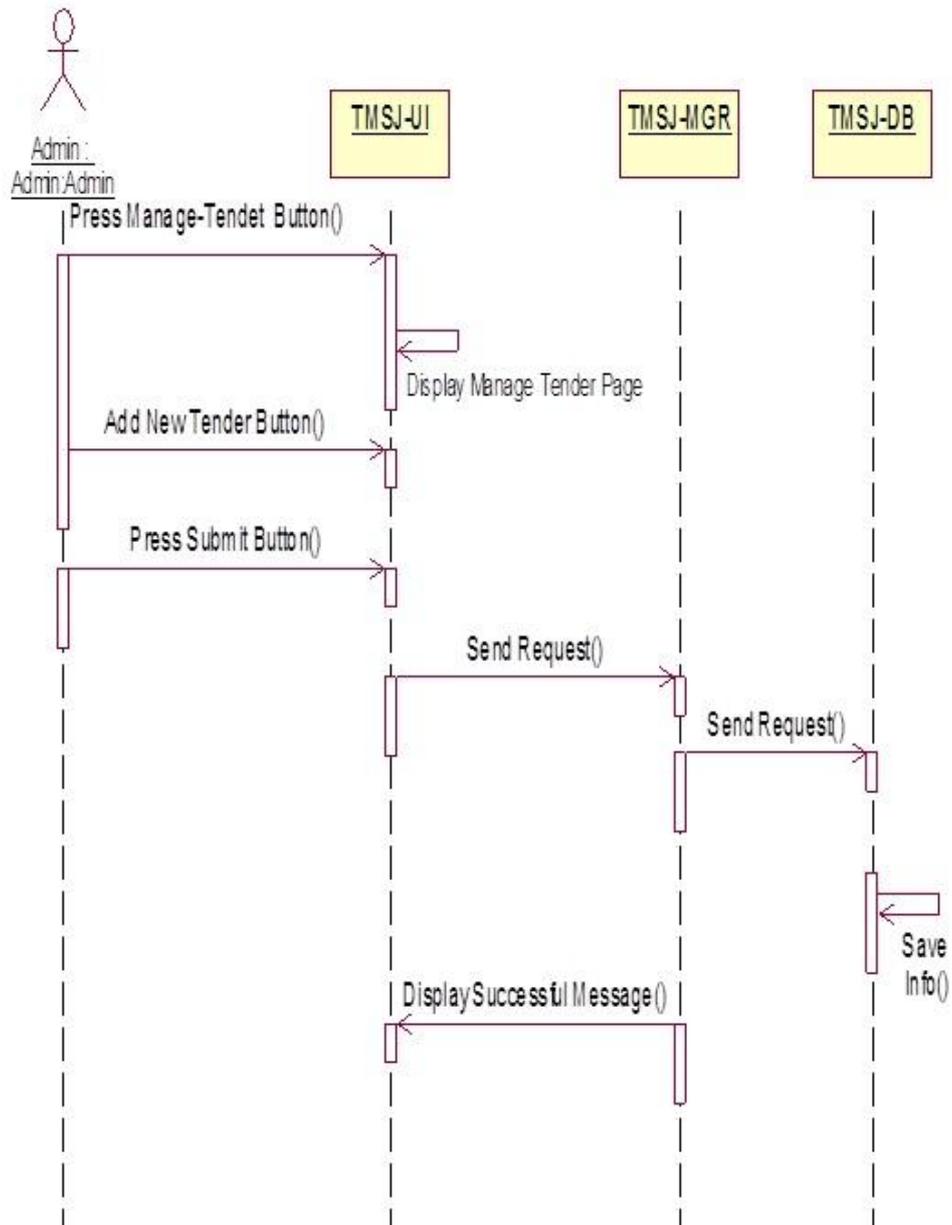
Figure 4. 6: Manage tender sequence diagram

Manage enterprise page

The admin has the ability to add new enterprise and modify the information of company or delete. Figure 4.7 illustrated when the admin add information about enterprise and select the level depend on capital, then press confirm button and how this process will be done.
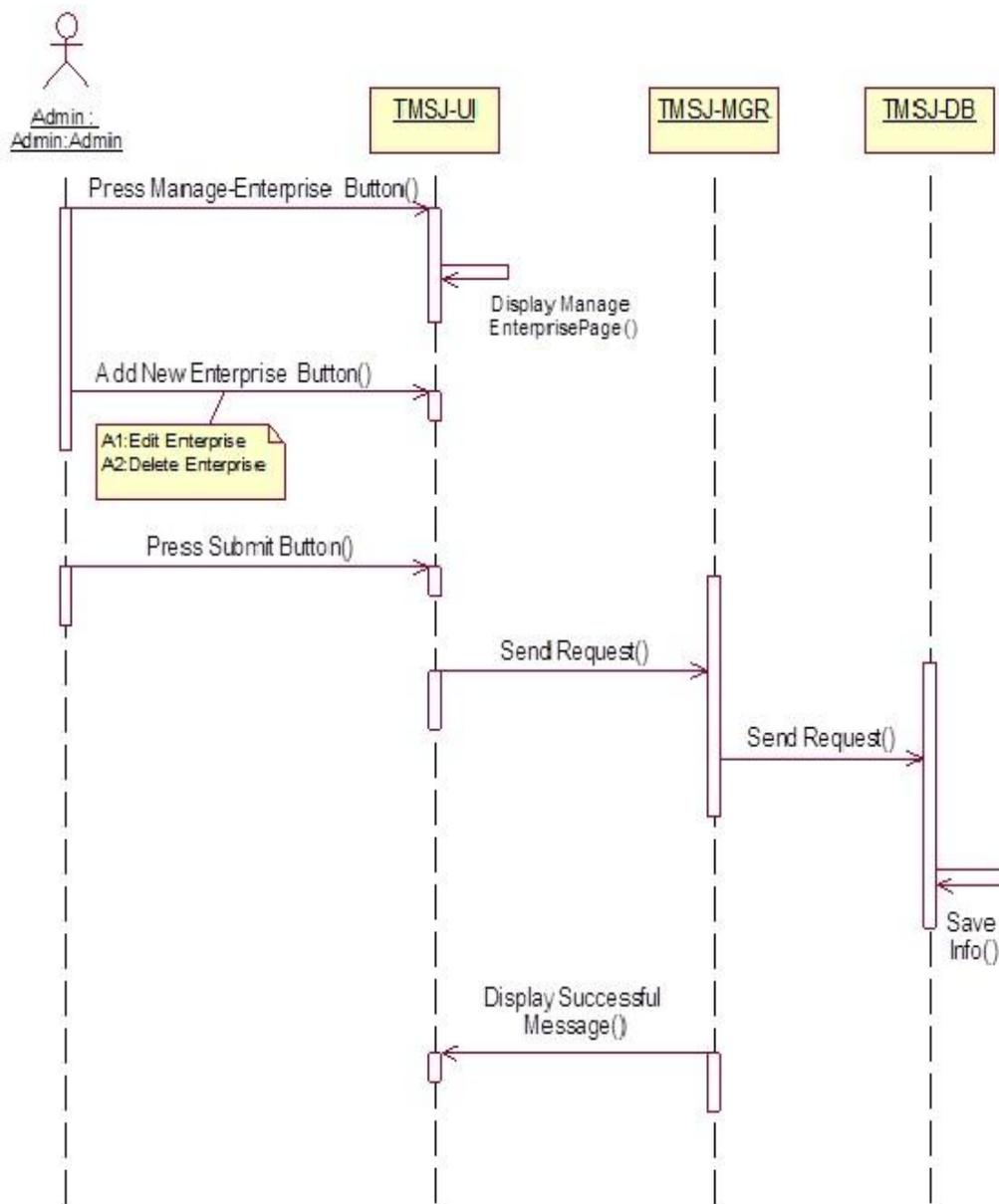

Figure 4. 7: Manage enterprise sequence diagram

Join tender page

The user in this sequence diagram has the ability to view the announcement of the tender then select the tender that want to join it. Figure 4.8 illustrated when the user select join to tender and how this process will be done.
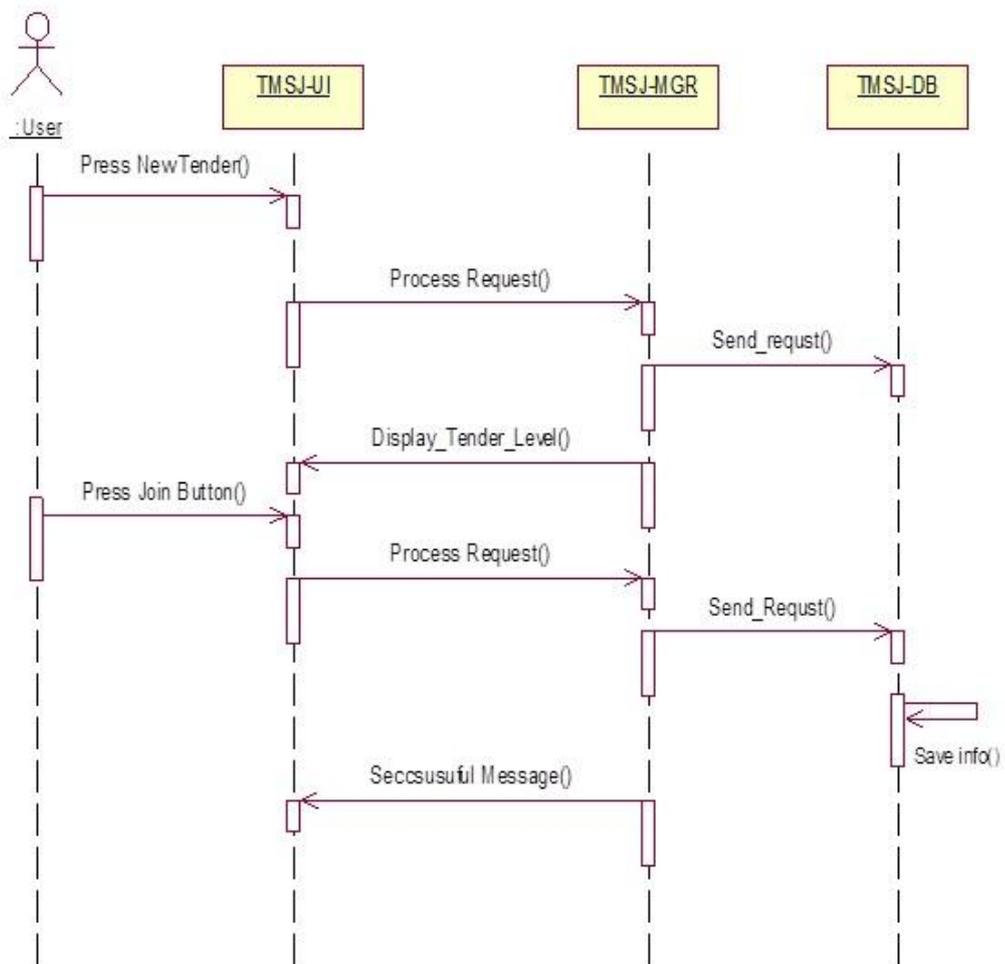

Figure 4. 8: Join tender sequence diagram

Bid tender page

The user in this sequence diagram has the ability to bid tender that joined before. Figure 4.9 described when the user press bid page button and how this process will be done.
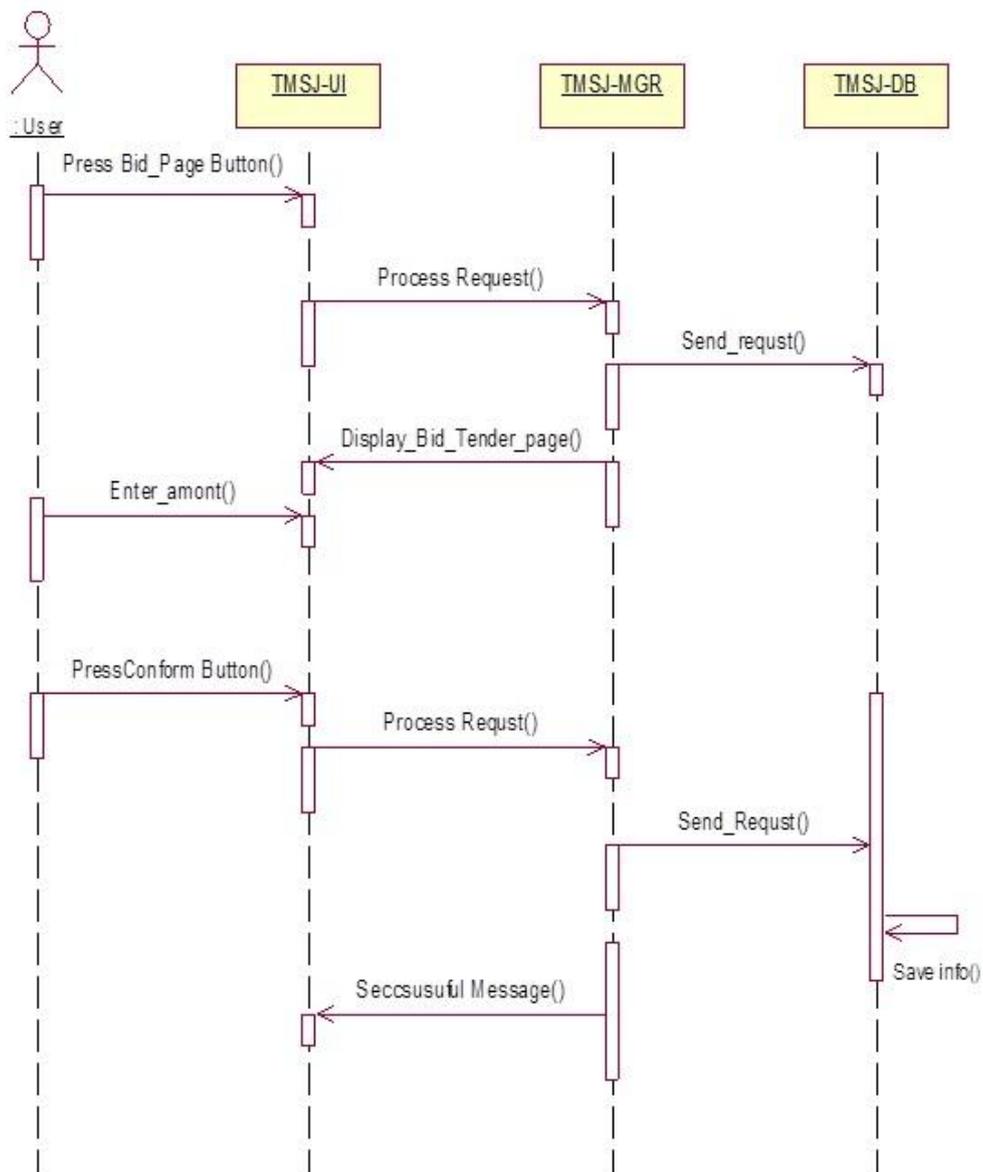

Figure 4. 9: Bid tender sequence diagram

Result tender page

The system will display the result to the user and admin after the time of the tender complete directly. Figure 4.10 show when the system display result page to the user and admin and how this process will done.
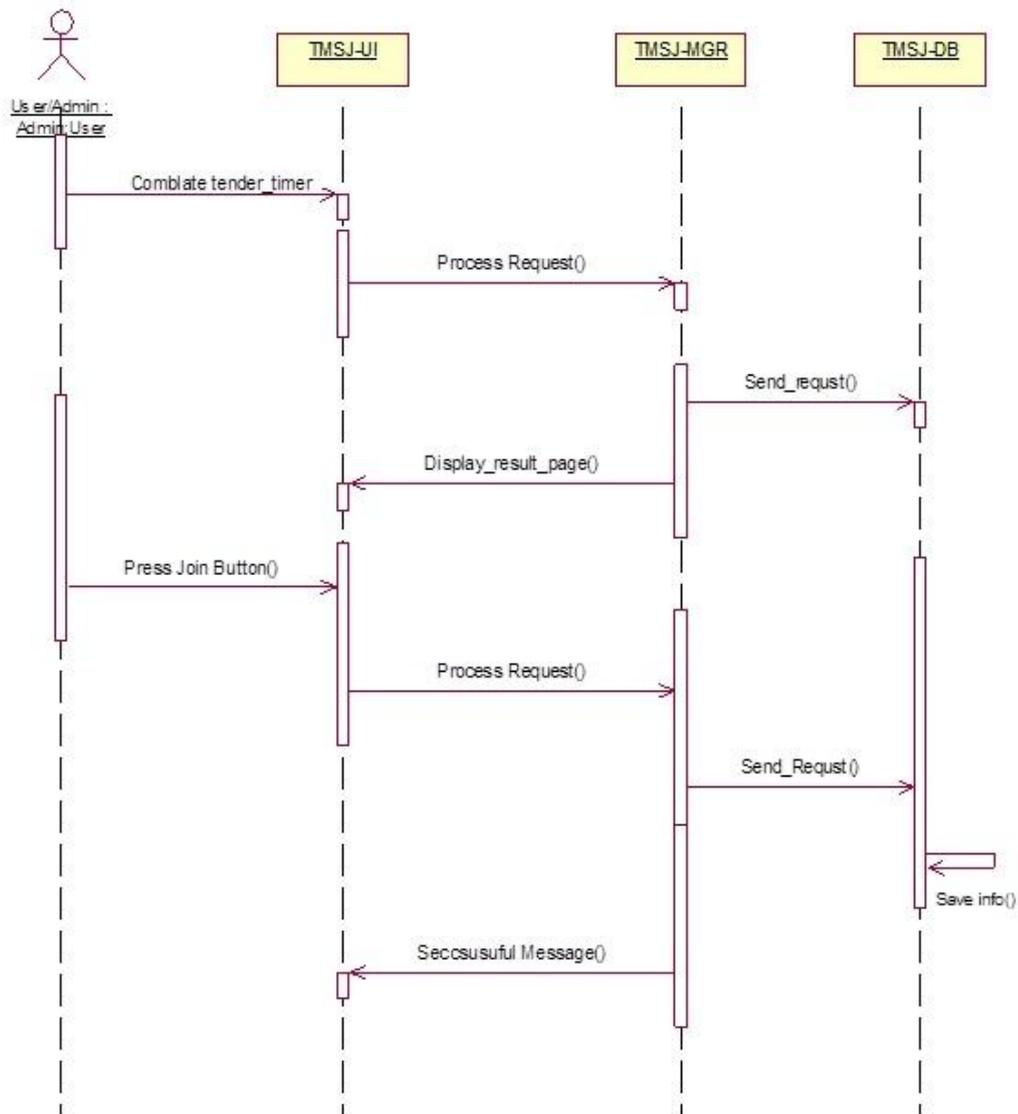
Figure 4. 10: Result tender page sequence diagram

Logout page

The admin and user in this sequence diagram have the ability to logout from the page and goes to home page through the system. Figure 4.113 shows when the users select logout button and how this process will be done.
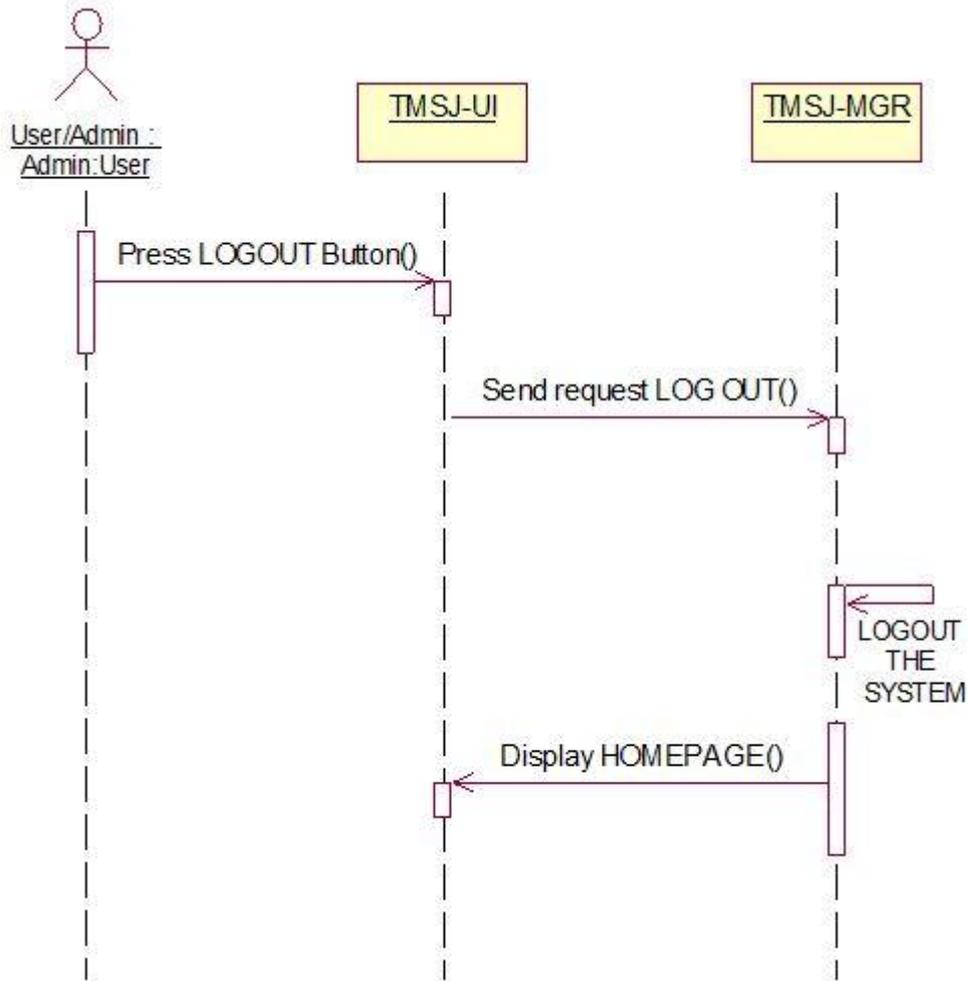
Figure 4. 11: Logout page sequence diagram

4.2.4   Collaboration diagrams

Login
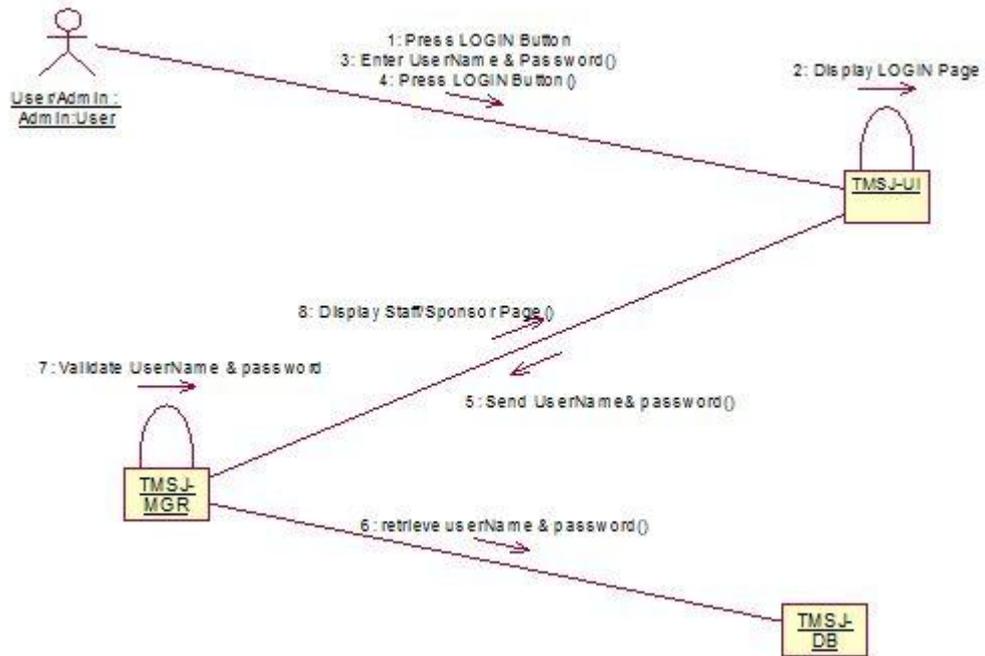
Figure 4. 12: Login collaboration diagram

View tender
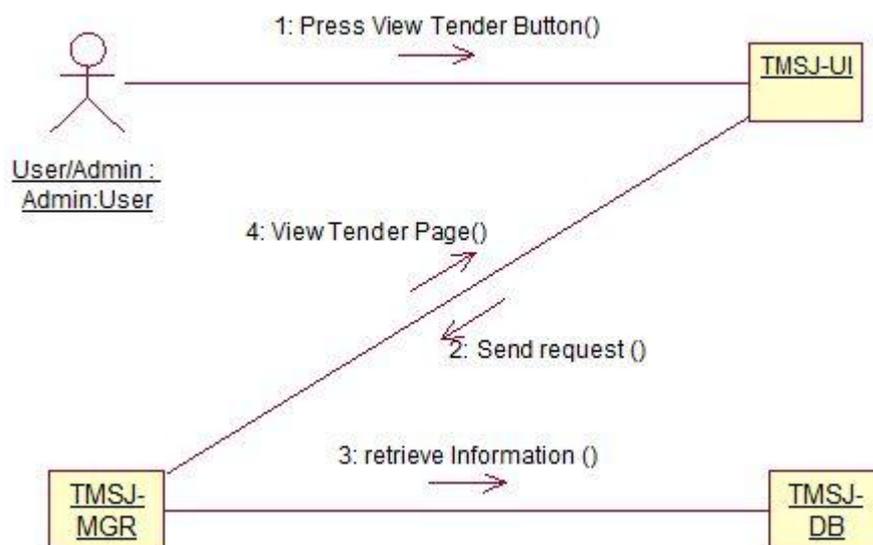
Figure 4. 13: View tender collaboration diagram

49

Manage tender

Figure 4. 14: Manage tender collaboration diagram

Manage enterprise
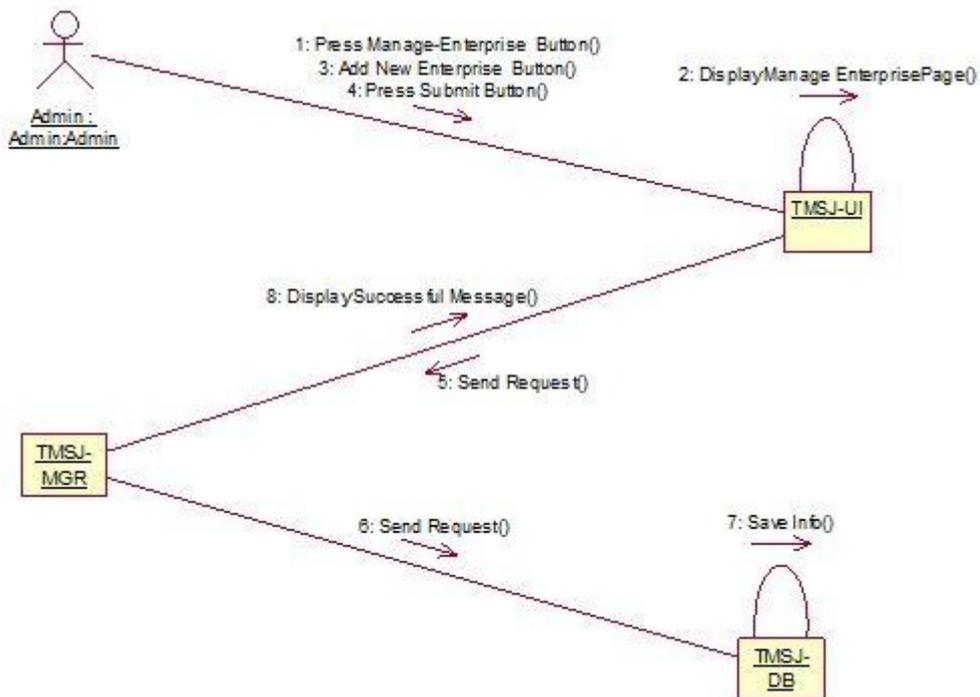
**Figure 4. 15: Manage enterprise collaboration diagram**

Join tender
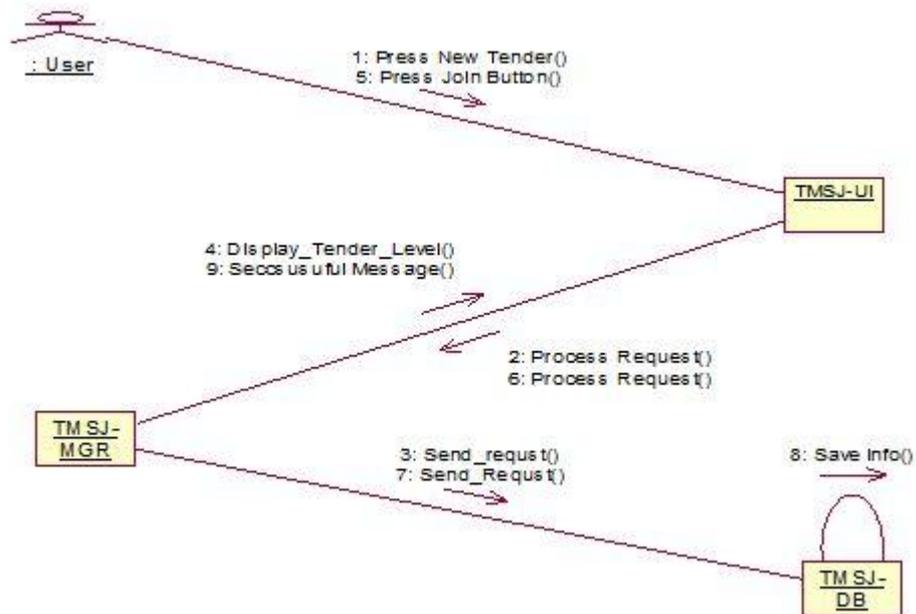
Figure 4. 16: Join tender collaboration diagram

Bid tender
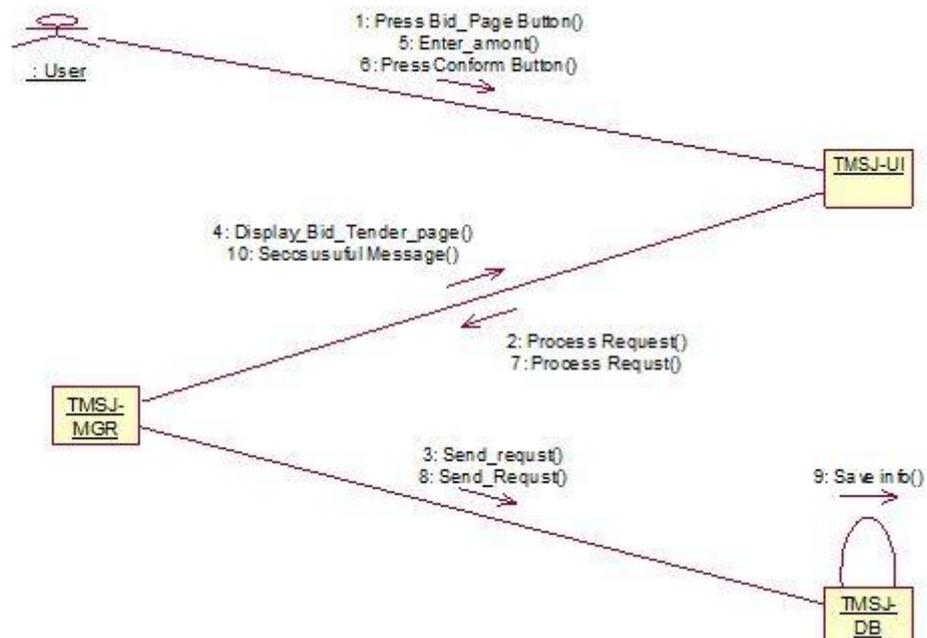
Figure 4. 17: Bid tender collaboration diagram

51
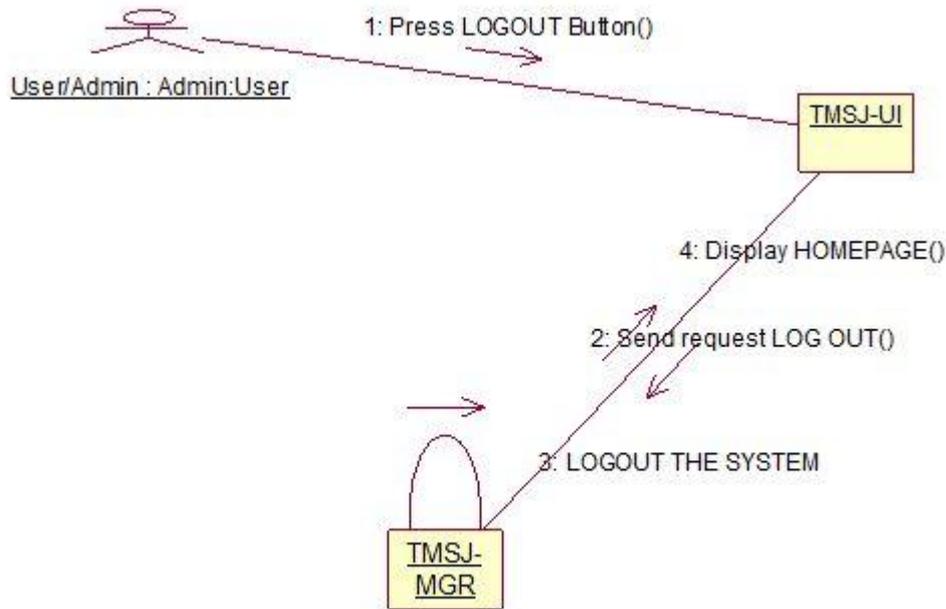
Logout

Figure 4. 18: : logout collaboration diagram

4.2.5   Class Diagram

Elaasar and Labiche (2011) referring that class diagrams are the base for object-oriented analysis and design. It is purpose to represent the classes within a model. The classes divided into attributes (member variables), operations (member functions) and relationships with other classes; all these parts can illustrate very easily within The UML class diagram. Moreover Class diagrams show the classes of the system, their relationships (including inheritance, aggregation and association), and the operations and attributes of the classes. So Class diagrams are used for a wide range of uses, including conceptual/domain modeling and detailed design modeling; Figure 4.19 shown the class diagram of TMSJ prototype.

52
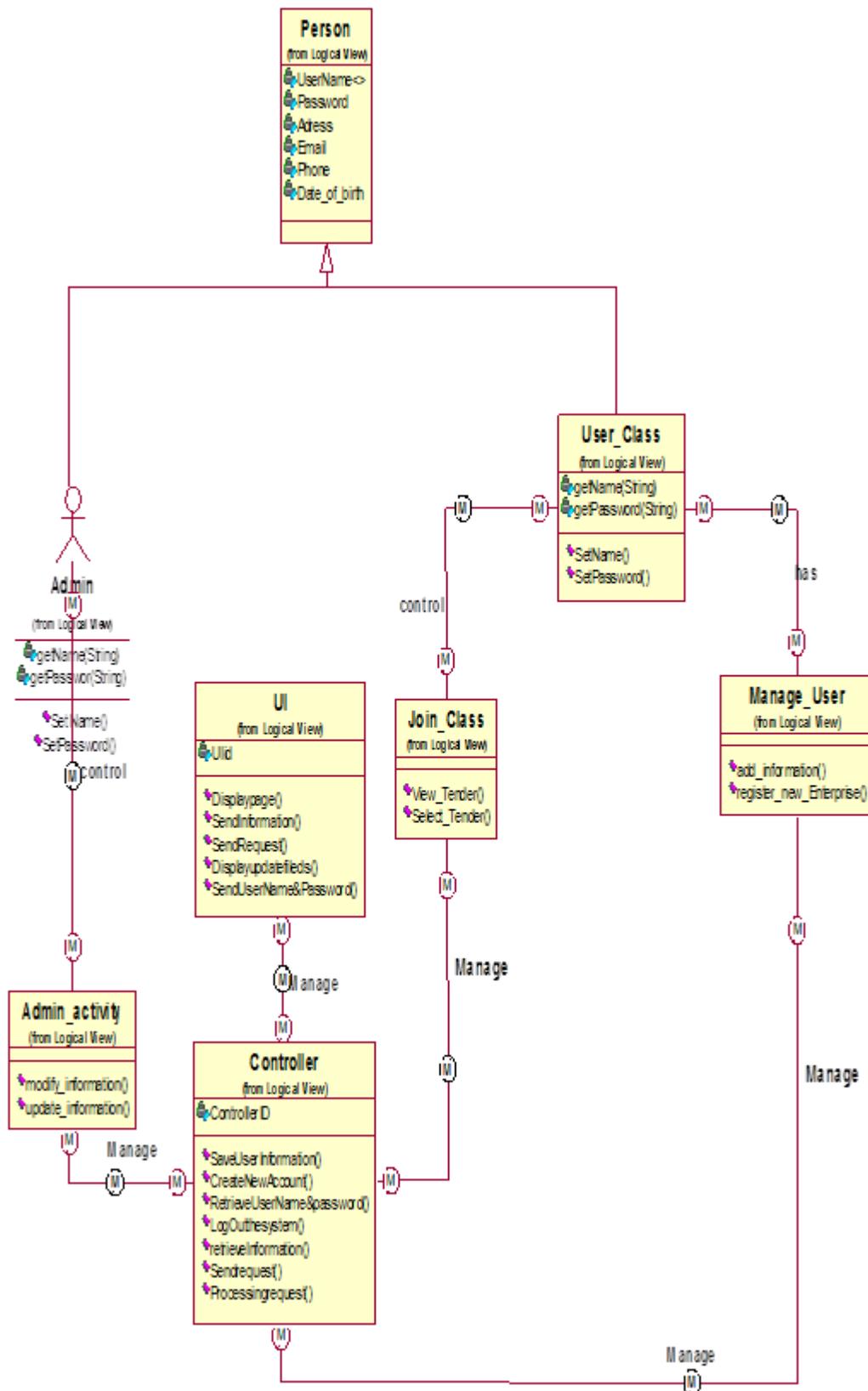
Figure 4. 19: TMSJ System class diagram

4.3 System Interface

4.3.1 System Interface

Homepage Interface

The homepage of the prototype was automatic transmission to the login page of the system illustrated in figure 4.20.

Figure 4. 20: Homepage Interface

Login Interface

The actor (Admin, User) has ability to enter the system by insert the username and password, and he/she must have validated username and password as shown in Figures 4.21.
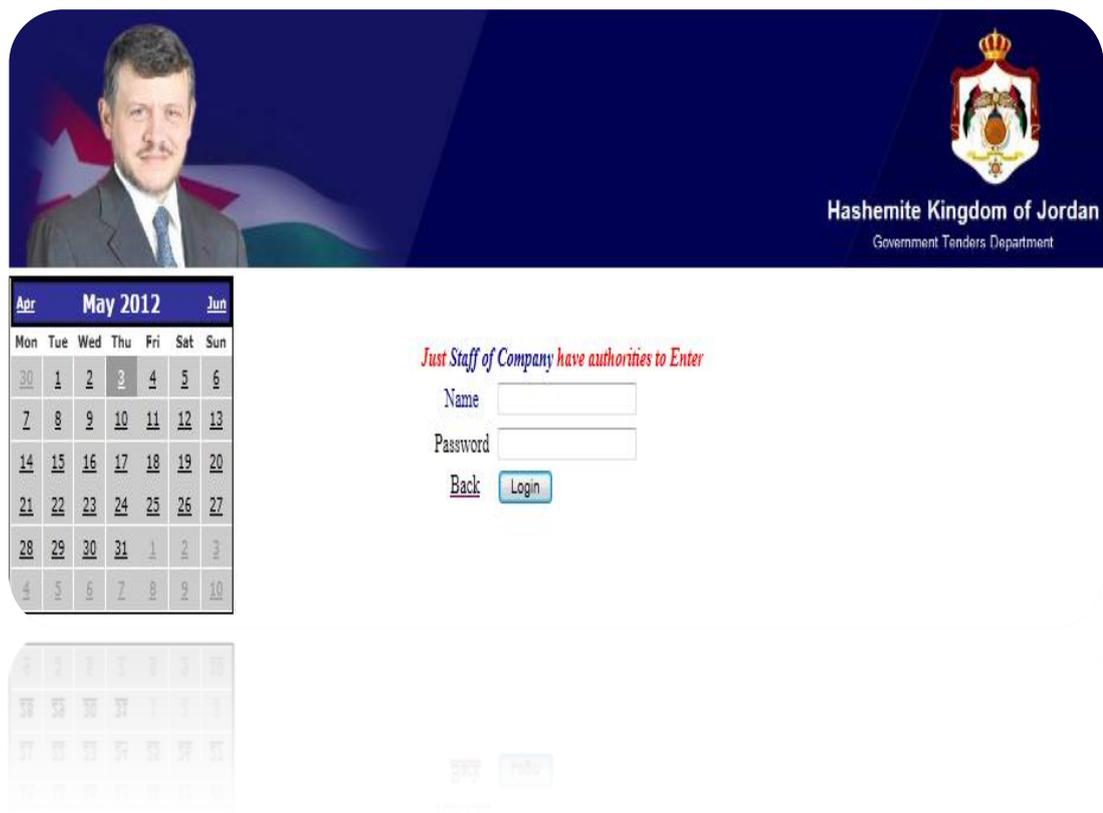
Figure 4. 21: Login Interface

4.3.2 *Admin Interface*

Manage Company Interface

The admin has ability to manage the company by add company and information about it, also set a password and select the level of the company as shown in Figure 2.22.
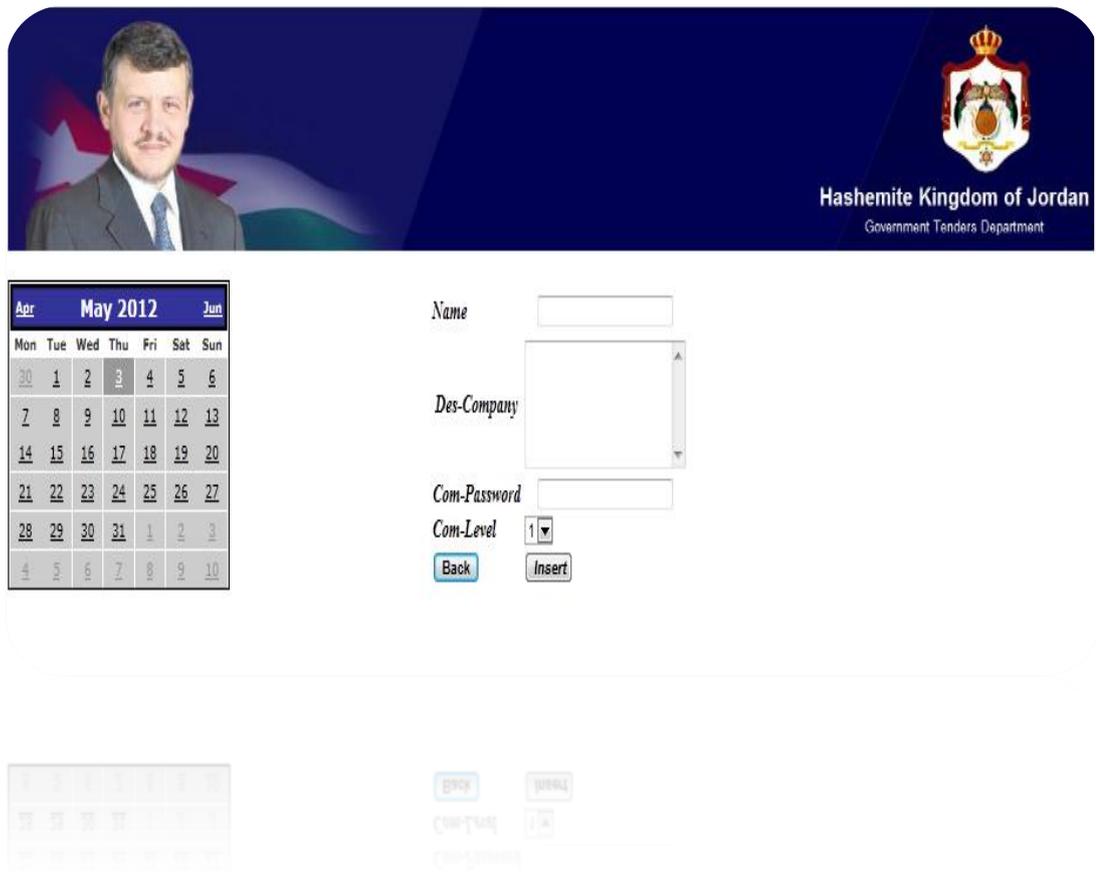
Figure 4. 22: Manage Company Interface

Manage Tender Interface

The admin has ability to manage the tender by add new tender and information about it, also set a date and select the level of the tender as shown in Figure 2.23.

Figure 4. 23: Manage Tender Interface

4.3.3 User Interface

View Tender Interface

The user has ability to view the announcement of tenders by click on see tender, the system will display only the tender that has the same level as illustrated in Figure 4.24.

Figure 4. 24: View Tender Interface

Join Tender Interface

The user has ability to join a tender that chooses, and participate by enter the

amount which set to enter the tender as illustrated in Figure 4.25.

Figure 4. 25: Join Tender Interface

Display Result Interface

The actor (Admin, User) has ability to view the tender result, Figure 4.26 discretion the interface of this process.
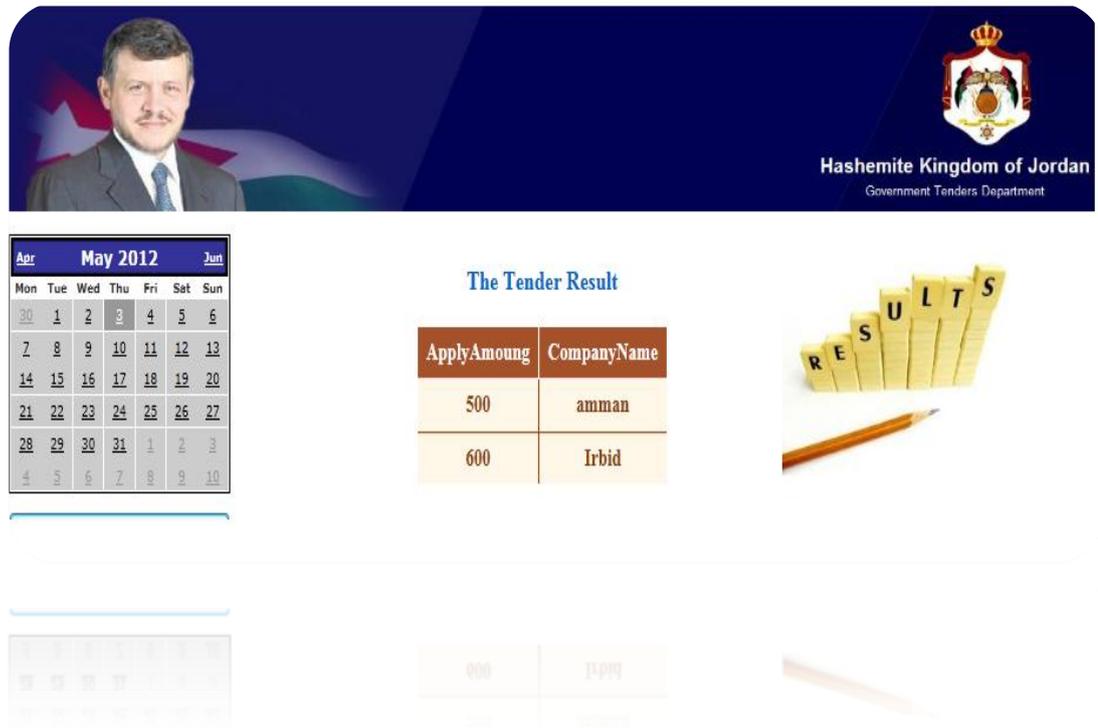
Figure 4. 26: Display Result Interface

4.4 Summary

The analysis about the prototype will applied through this chapter, as well as determined the requirement of the prototype, and drawing the use cases diagram and the entire diagrams that illustrate the functions of the tender management system for Ministry of Municipality in Jordan. The output of chapter four is the design and builds the prototype.

CHAPTER FIVE

EVALUATION & RESULTS

Assessment of prototype is important to demonstrate the viability of the system, which can be used by the clients. It is an environment for integrated system to assess the system's compliance with its specified requirements. Prototype of tender management system for municipality monastery of Jordan was design and implemented as illustrated in chapter four; the last stage in the application of the system is the test the validity of the prototype. Bangor, Kortum and Miller (2008), referring that the prototype evaluated depends on using System Usability Scale (SUS) proposed by Brooke, this questionnaire consists of 12 questions and liker scale with one to five degrees. In accusation, a sample of about 38 users was selected randomly to measure the user satisfaction towered the tender management system for Jordan (TMSJ) prototype effectiveness and efficiency. The questionnaire is content of two section, general information and evaluation of user.

5.1 General Information

Prototype for tender management system for Jordan (TMSJ) was assessed through a sample consists of 38 persons. The perform descriptive statistics

analysis for the collected data will be analyses by use tools named Statistical Package for Social Sciences (SPSS) version 19 has been used to perform descriptive statistics analysis for the collected data; in additional, the SPSS used to conclude the frequencies of each question. However, the histogram has been provided in this evaluation. The respondents were distributed in to 33 (86, 84%) male and 5 (13.16%) were female as illustrated in Table 5.1, Figure 5.1.

Table 5. 1 Gender of sample

Gender	Frequency	Percentage (%)
Male	33	86.84%
Female	5	13.16%
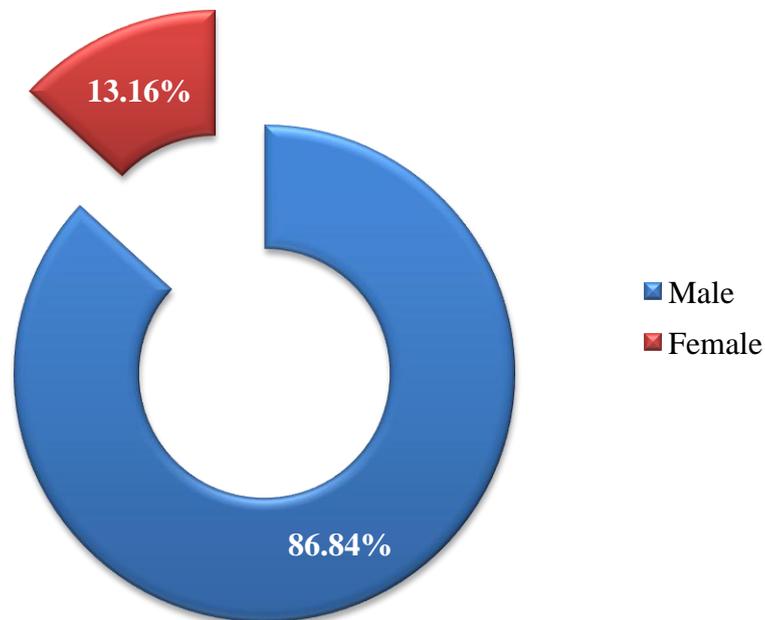
Figure 5. 1: Statistics for sample gender

Participants' ages ranged from the questionnaire, on top of (18) (47.36%) of the respondents were 40-49 years old and 14 (36.84%) were 30-39 years old, additionally (6) (15.8%) of respondents were 20-29, mean majority of participates questionnaire are youth, as shown in Table 5.2 and Figure 5.2.

Table 5. 2: Age of sample

Age	Frequency	Percentage (%)
20-29	6	15.8%
30-39	14	36.84%
40-49	18	47.36%

■**20-29** ■**30-39** ■**40-49**
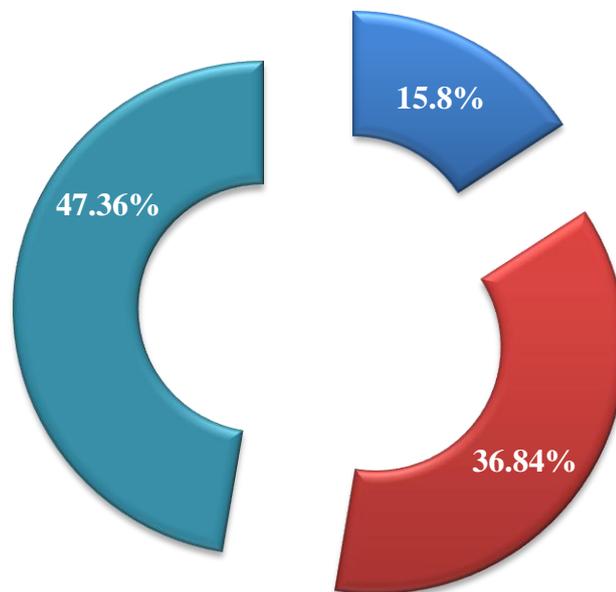
Figure 5. 2: Statistics for sample age

Most of those who participated in the evaluation are got degrees, as shows in Table 5.3 Figure 5.3, the (7) (18.43%) of respondents have master certificate and the majority of them are degree certificate (12) (31.57%). Ten (26.32%) of respondents has diploma certificate and the remaining (9) (23.68%) are high school certificate.

Table 5. 3 Education of sample

Education	Frequency	Percentage (%)
Master	7	18.43%
Degree	12	31.57%
Diploma	10	26.32%
High school	9	23.68%
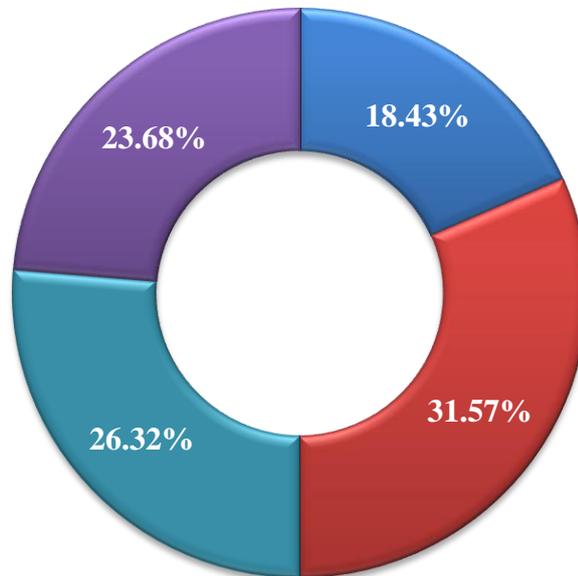
Figure 5. 3 Statistics for sample education

5.2 Evaluation of User

Performance measurement the prototype of tender management system and as explained earlier that the system relies mainly on assessment of users. Each questions in the measurement has a rate from 1 to 5 (Strongly Disagree mean 1, Disagree mean 2, Neutral mean 3, Agree mean 4, and Strongly Agree mean 5). The assessment focus on two dimension the ease of use and usefulness as illustrate in Table 5.4; the result illustrates that the mean for every dimension is above four as illustrate in Table 5.4 and Table 5.5 are shown the details about the statistics for elements of the questionnaire. The questionnaire form and other details were existed in appendix A.

Table 5. 4 attributive statistics for dimensions

Dimension	Number	Mean
Perceived Ease of Use	38	4.114
Perceived Usefulness	38	4.2646

Table 5. 5 Illustrate Statistics for All Elements

PERCEIVED USEFULNESS		6Mean
Q1	Using TMSJ helps me to be more effective	4.1579
Q2	Using TMSJ helps me to be more productive.	4.1316
Q3	Using TMSJ saves my time when I use it	4.0789
Q4	Using TMSJ would enhance my effectiveness	4.0526
Q5	Using TMSJ would make it easier to do my tasks	4.0789
Q6	TMSJ was everything I would expect it to do.	4.1842
PERCEIVED EASE OF USE		**Mean**
Q7	TMSJ is simple to use.	4.1579
Q8	TMSJ is very friendly to use	4.0263
Q9	It requires the fewest steps possible to accomplish what I want to do with it	4.3684
Q10	I can use it without written instructions	4.3421
Q11	I don't notice any inconsistencies as I use TMSJ	4.1842
Q12	I can use TMSJ successfully every time.	4.0526

The analysis for first question as illustrate in Table 5.6 and Figure 5.4 was illustrated four level of response the high degree focus on level strongly agrees with (19) (50 %), that means the system is an effective tool for user to handling with the tender.

Table 5. 6 Q1 Using TMSJ helps me to be more effective

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	10.5	10.5	10.5
	Natural	5	13.2	13.2	23.7
	Agree	10	26.3	26.3	50.0
	Strongly Agree	19	50.0	50.0	100.0
	Total	38	100.0	100.0	

■ **Disagree**   ■ **Natural**   ■ **Agree**   ■ **Strongly Agree**
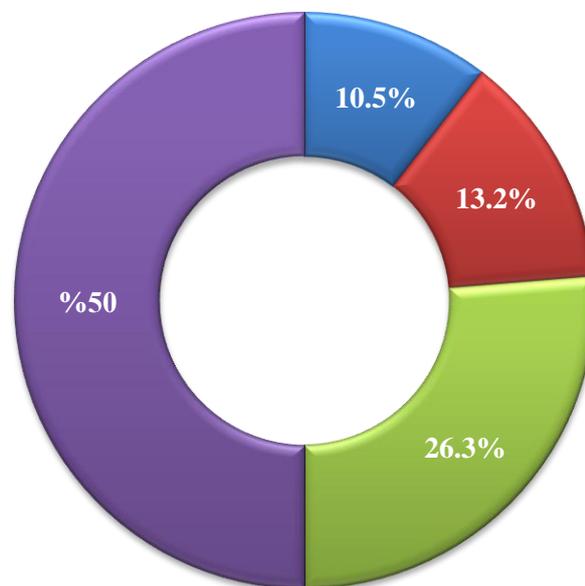
Figure 5. 4: Statistics for question one

The analysis for second question as shown in Table 5.7 and Figure 5.5 shows four level of response, the strongly agree level is the first with (52.6%) meant (20) users gave 5, then the second level are agree and natural with (18.4%) meant (7) users give 4 and 3. Four of user gives disagree with (10.5%), which means that the prototype was saves people's time to manage their work.

Table 5. 7 Q2 Using TMSJ helps me to be more productive.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	10.5	10.5	10.5
	Natural	7	18.4	18.4	28.9
	Agree	7	18.4	18.4	47.4
	Strongly Agree	20	52.6	52.6	100.0
	Total	38	100.0	100.0	

Figure 5. 5 Statistics for question two

The analysis for third question as shown in Table 5.8 and Figure 5.6 illustrate four level of response, the strongly agree level is the first with (52.6%) meant 20 users gave 5. Moreover, (5) users (13.2%) agree give to the prototype; four users disagree with (10.5%) but (9) of users are natural with that in (23.7%), which that mean TMSJ prototype is useful for people.

Table 5. 8 Q3 Using TMSJ saves my time when I use it

		Frequency	Percent	Valid Percent	Cumulative Percent
	Disagree	4	10.5	10.5	10.5
	Natural	9	23.7	23.7	34.2
Valid	Agree	5	13.2	13.2	47.4
	Strongly Agree	20	52.6	52.6	100.0
	Total	38	100.0	100.0	

Figure 5. 6 Statistics for question three

The analysis for fourth question as shown in Table 5.9 and Figure 5.7 explains three level of response, the agree level is the first with (47.4%) meant 18 users gave 4, then the second level is strongly agree with (28.9%) meant (11) users give 5. Nine of users natural with (23.7%); that mean TMSJ prototype are effectiveness in performing good deeds for people.

Table 5. 9 Q4 Using TMSJ would enhance my effectiveness.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Natural	9	23.7	23.7	23.7
	Agree	18	47.4	47.4	71.1
	Strongly Agree	11	28.9	28.9	100.0
	Total	38	100.0	100.0	
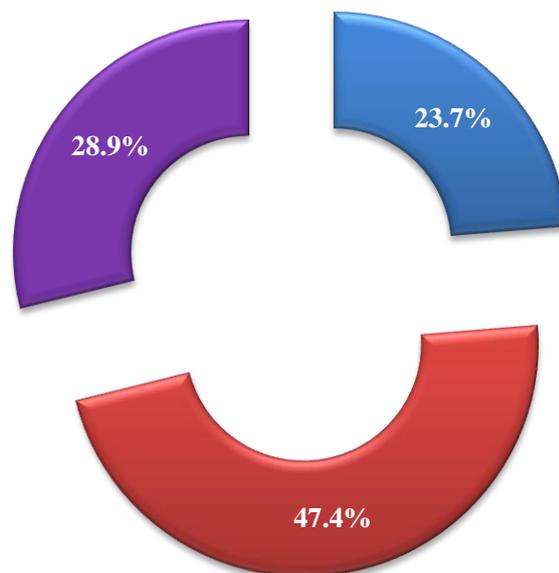
Figure 5. 7 Statistics for question four

The analysis of fifth question as illustrated in Table 5.10 and Figure 5.8 show three level of response, the strongly agree level is the first with (36.8%) meant 14 users gave 5, then the second level is agree with (34.2%) meant 13 users give 4. Eleven of users give natural with (28.9%) that mean the prototype help the people to finishing their tasks easier.

Table 5. 10 Q5 Using TMSJ would make it easier to do my tasks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Natural	11	28.9	28.9	28.9
	Agree	13	34.2	34.2	63.2
	Strongly Agree	14	36.8	36.8	100.0
	Total	38	100.0	100.0	
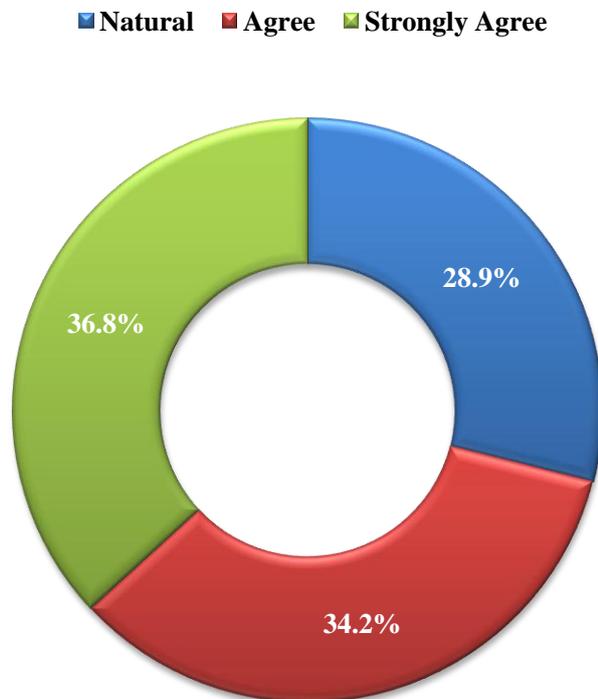
Figure 5. 8 Statistics for question five

The analysis for sixth question as illustrated in Table 5.11 and Figure 5.10 shows four level of response, the strongly agree level is the first with (47.4%) meant (18) users gave 5, then the second level is agree with (36.8%) meant (14) users give 4. Five users disagrees with (13.2%), and (1) (2.6%) users give natural; which that means system was everything the user expect from an online tendering.

Table 5. 11 Q6 TMSJ was everything I would expect it to do.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Disagree	5	13.2	13.2	13.2
	Natural	1	2.6	2.6	15.8
Valid	Agree	14	36.8	36.8	52.6
	Strongly Agree	18	47.4	47.4	100.0
	Total	38	100.0	100.0	
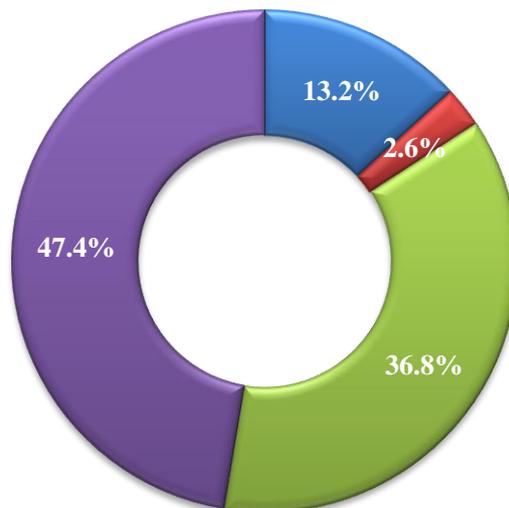
Figure 5. 9 Statistics for question six

The analysis for seventh question as described in Table 5.12 and Figure 5.10 shows four level of response, the strongly agree level is the first with (44.7%) meant 17 users gave 5. Furthermore, (11) users (28.9%) agree give to the prototype; one user disagree with (2.6%) but (9) of users are natural with that in (23.7%). That means the TMSJ prototype is very easy to use.

Table 5. 12 Q7 TMSJ is simple to use.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.6	2.6	2.6
	Natural	9	23.7	23.7	26.3
	Agree	11	28.9	28.9	55.3
	Strongly Agree	17	44.7	44.7	100.0
	Total	38	100.0	100.0	
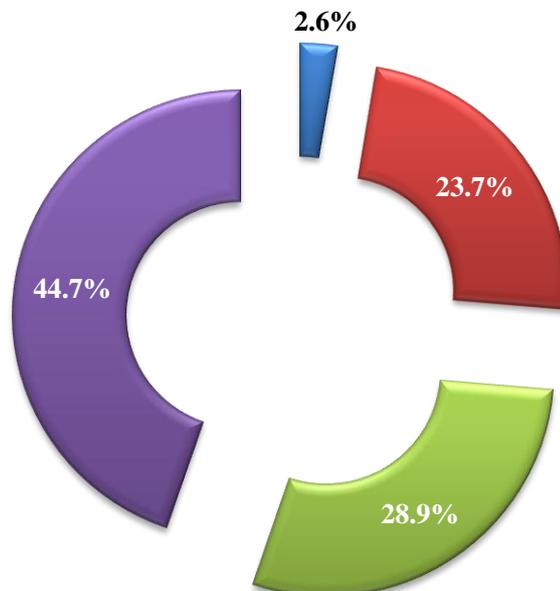
Figure 5. 10 Statistics for question seven

The analysis for eighth question as shown in Table 5.13 and Figure 5.11 illustrate four level of response. The strongly agree level is the first with (36.8%) meant (14) users gave 5, then the second level is agree with (34.2%) meant (13) users give 4. Nine users give natural (23.7%), and two users disagree with (5.3%), which mean the system is friendly with the user.

Table 5. 13 Q8 TMSJ is very friendly to use

|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	5.3	5.3	5.3
	Natural	9	23.7	23.7	28.9
	Agree	13	34.2	34.2	63.2
	Strongly Agree	14	36.8	36.8	100.0
	Total	38	100.0	100.0	
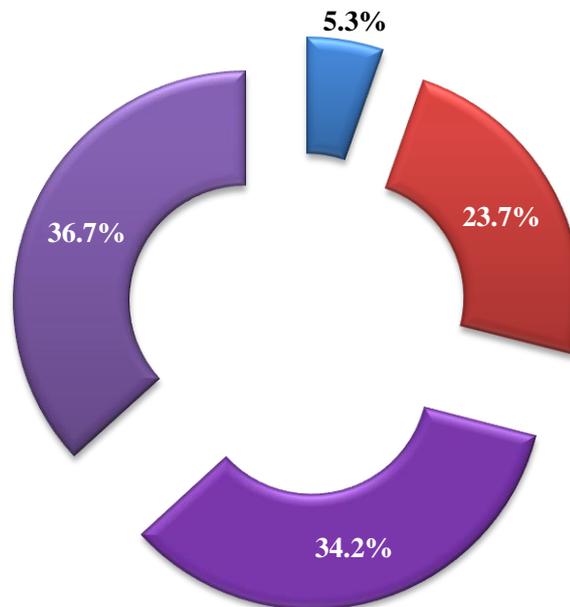
Figure 5. 11 Statistics for question eight

The analysis for ninth question as illustrated in Table 5.14 and Figure 5.12 shows three level of response, the strongly agree level is the first with (47.4%) meant (18) users gave 5, then the second level is agree with (42.1%) meant (16) users give 4. Four of users give natural with (10.5%), which mean the prototype is accomplishing the work in short way.

Table 5. 14 Q9 It requires the fewest steps possible to accomplish what I want to do with it

|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Natural	4	10.5	10.5	10.5
	Agree	16	42.1	42.1	52.6
	Strongly Agree	18	47.4	47.4	100.0
	Total	38	100.0	100.0	
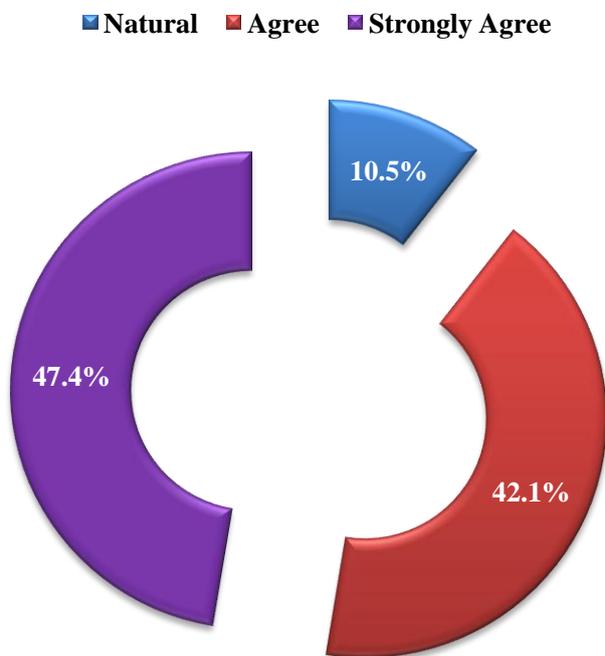
Figure 5. 12 Statistics for question nine

The analysis for tenth question as described in Table 5.15 and Figure 5.13 shows three level of response, the agree and strongly agree levels are the first with the same percent (44.7%) meant (17) users gave 4, 5 respectively. Then the second level is natural with (10.5%) meant (4) users give 3, that mean the functions of TMSJ prototype are make user work on it without help.

Table 5. 15 Q10 I can use it without written instructions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Natural	4	10.5	10.5	10.5
	Agree	17	44.7	44.7	55.3
	Strongly Agree	17	44.7	44.7	100.0
	Total	38	100.0	100.0	
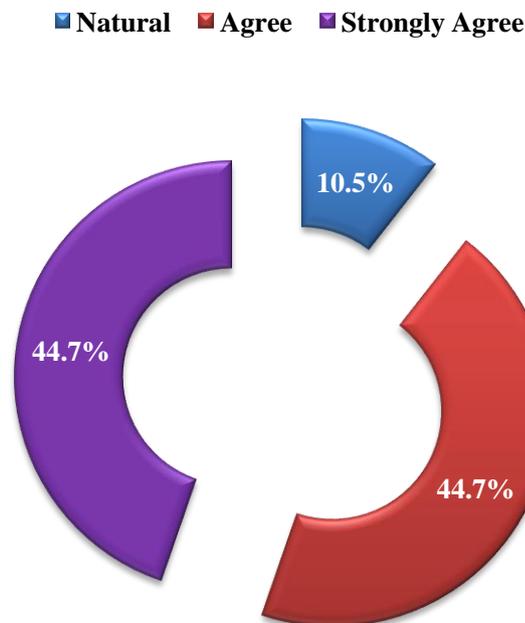
Figure 5. 13 Statistics for question ten

The analysis for question eleven as described in Table 5.16 and Figure 5.14 shows four level of response, the agree and strongly agree levels are the first with the same percent (42.1%) meant (16) users gave 4, 5 respectively. Three users disagree in (7.9%) also natural, mean the functions of TMSJ prototype are well integrated.

Table 5. 16 Q11 I don't notice any inconsistencies as I use TMSJ

|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	7.9	7.9	7.9
	Natural	3	7.9	7.9	15.8
	Agree	16	42.1	42.1	57.9
	Strongly Agree	16	42.1	42.1	100.0
	Total	38	100.0	100.0	
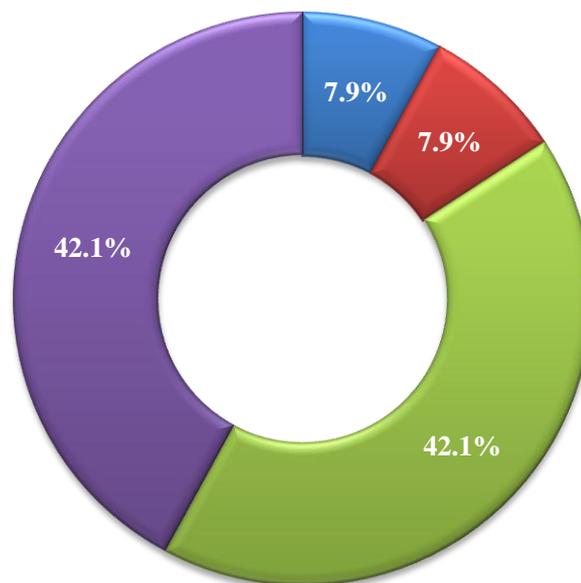
Figure 5. 14 Statistics for question eleven

The analysis for last questions as illustrated in Table 5.17 and Figure 5.15 shows four level of response, the strongly agree level is the first with (50%) meant (19) users gave 5, then the second level is natural with (35.3%) meant (12) users give 3. Six of users give agree with (15.8%), and in the last level is disagree with (10.5%), which means TMSJ prototype is successfully to use.

Table 5. 17 Q12 I can use TMSJ successfully every time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	10.5	10.5	10.5
	Natural	9	23.7	23.7	34.2
	Agree	6	15.8	15.8	50.0
	Strongly Agree	19	50.0	50.0	100.0
	Total	38	100.0	100.0	
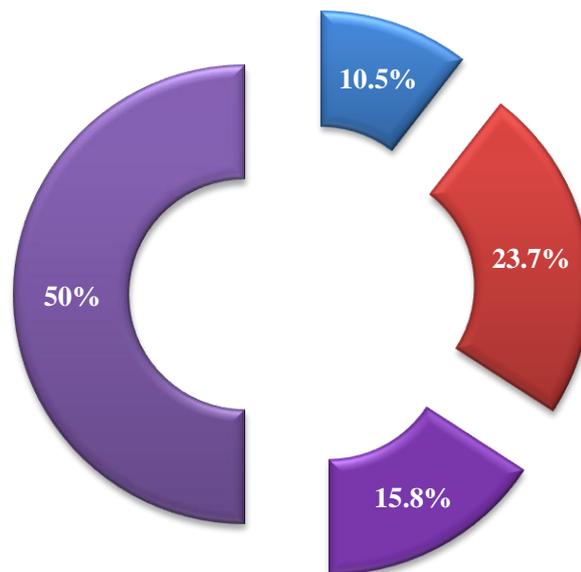
Figure 5. 15 Statistics for question twelve

5.3 Summary

Important part in the development process is assessment takes, which can uncover usability deficits early during the design. In further works, more usability tests for the re-design application with real customer should be conducted. Interviews with these test persons and evaluation to reach more people will help to shape application and better meet the user's opinion, requirements and expectations. The overall results were encouraging but always improvement is definitely needed.

CHAPTER SIX

CONCLUSIONS

This chapter summarizes the project contribution and future works towards the using of tender management system for Ministry of Municipality in Jordan. At any rate, this chapter will discuss the outcomes, clarify the contributions of the study, and then make recommendations for the future work.

6.1 Discussion

The main purpose to built TMSJ prototype to manage the tender of public sector in the Jordan government, one of the important aims is ranked the enterprises in Jordan to gives the SMEs the opportunity to growth and development in the Jordanian society.

Objective One

The first aim of the project is to identify the requirements of the TMSJ. Based on the previous studies was determined the requirements of the TMSJ as obtained the following:

> ➢ Admin can manage the announcement of tender as well as add a company and select the level for the company depends on the capital.

> ➢ User (business owner) has ability to view only the tender announcement in same level and select the tender to participate in specific time; in addition, he/she can participate in the tender online when the tender open with limited time.

> ➢ The system was close the tender after time complete, as well as classified bids ascending and displays the results.

Objective Two

The second objective of the study is to design a tender management system that allows the process of adding a tender or company, join tender and make bid from the user. This has been achieved by designing the process flow using UML utilities. The design is executive all the requirements that identify in objective one. The SQL was use to designed the database and the interfaces was implemented by using C# language under ASP.net environment. However, the system is compatible with all operating system.

Objective Three

The third objective is to assess the usability of the prototype; in any case, the functions of applications always need to prove the validity, which will be through testing the performance and functionality of the system and find out the weaknesses in the system before its adoption. The TMSJ prototype for Ministry of Municipality is evaluating by System Usability Scale (SUS) psychometric evaluation proposed by Brooke (Bangor, Kortum & Miller, 2008). The questionnaire was assessed thirty-eight respondents for employee and company owners from Jordan; and the results have been positive.

6.2 Contribution

The study obtained the following contributions in the public sector of E-government:

1. Use information and communication technologies facilities to develop a public sector in E-government by develop a tender management system for more transparency.

2. Give possible solutions to activate the public sector services for businesses owners online; through the use of a tender's management system, it will provide information about the tenders and doing bidding for the tender online.

3. This study contributes to facilitate and accelerate the work of businesses owners, and give him/her the potential to provide greater opportunities for the growth and development by organize the tender as level as well as the enterprises to protect the SMEs.

4. Using the TMSJ as a base to build a developing tender management system with taking into consideration the diction making about the tender directly for reduce corruption.

6.3 Future Work

The growth of the number of users quickly and the spread of the Internet is putting information technology in the areas of new research and development vehicle. Accompanied by the continuous development and facility earned this area the flexibility to cope with all the sciences. Through this research was to

shed light on a public sector and the services which provided to the enterprises, and the transparency is the important idea for the public management. The future research in this field covers the followings:

1. TMSJ system has content many important information, which that mean the system need more security and preferably use biometric technique.

2. Through the system is can extend the tenders management system to include all the public sector in Jordan, so that help the enterprises to search about the tender in any Ministry.

6.4 Conclusion

The introduction of Information and Communication Technologies can radically affect working methods and activities of public and private organization to provide online social services. G2B transactions include various services exchanged between the government and the business community, including dissemination of policies, memos, rules and regulations. Business services offered include obtaining current business information, downloading application forms, renewing licenses, registering businesses and e-Tendering.

Electronic tendering is a process that replaces the traditional paper tendering system in the purchasing of products and services and is a means of electronically notifying, involving, vetting and selecting suppliers. For the seller it is a means of electronically competitively bidding for contracts. Among the major benefits of e-tendering is the reduction of costs from tender documentation production, a shortened tender period, a secured method of sending and receiving tenders and a more systematic and progressive method of working.

Through this project was designed a tender management system for the benefit of SMEs in Jordan by divided the tenders into levels as well as the company to help the SMEs to growth and competition. System was developed by using C# language under ASP.net environment. Moreover, the evaluation was based on usability testing by use System Usability Scale (SUS) proposed by Brooke and prototype was assessed through a sample consists of thirty-eight respondents; and the results have been positive.

Finally, the rapid development of information and communication technology accelerates the growth of many areas especially G2B under service sector, which is the basis for the formation of modern societies.

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APPENDIX A

COLLEGE OF ATRS AND SCIENCES

UNIVERSITY UTARA MALAYSIA

Tender Management System

I am Master of Science (Information Technology) student at final semester in University Utara Malaysia. Currently, I am performing this questionnaire to help me gain an understanding of the user who used Tender Management System for public sector in Jordan (TMSJ). This questionnaire aims to understand general information about system user's and the usability of the system. The results from this questionnaire will help me to understand the system requirements for developing a TMSJ prototype.

All your information will be held in strictest confidence and it will be used for research purpose only. Your insights a feedback in making this study successful is highly appreciated. If you have any queries or if you like to know the result of this study, please do contact me at 014-3282151or through the e-mail: s808180 @student.uum.edu.my . This questionnaire consists of two sections:

- Section A - General Information
- Section B - System Usability

This questionnaire is adopted from Brooke (Bangor, Kortum & Miller, 2008) System Usability Scale (SUS).

Thank you for your valuable time and help in completing this questionnaire.

MSc. IT Candidate

Dima Alrwashdeh

QUESTIONNAIRE

System to Be Evaluated:

Tender Management System for public sector in Jordan (TMSJ)

Objective:

Obtain your view on the evaluation of TMSJ.

Please answer **all** questions from each segment.

1) General Information

This segment is about your background information. Please fill up the blanks and mark [√] where appropriate.

1. Gender: [ ] Male   [ ] Female

2. Age: _____ Years.

3. Education background

   [ ] High School   [ ] Diploma   [ ] Degree   [ ] Master.

2) Tender Management System for public sector in Jordan (TMSJ)

Please rate the usefulness and ease of use of Tender Management System for public sector in Jordan (TMSJ)

English Form

	PERCEIVED USEFULNESS	1	2	3	4	5
Q1	Using TMSJ helps me to be more effective	O	O	O	O	O
Q2	Using TMSJ helps me to be more productive.	O	O	O	O	O
Q3	Using TMSJ saves my time when I use it	O	O	O	O	O
Q4	Using TMSJ would enhance my effectiveness	O	O	O	O	O
Q5	Using TMSJ would make it easier to do my tasks	O	O	O	O	O
Q6	TMSJ was everything I would expect it to do.	O	O	O	O	O
	PERCEIVED EASE OF USE	1	2	3	4	5
Q7	TMSJ is simple to use.	O	O	O	O	O
Q8	TMSJ is very friendly to use	O	O	O	O	O
Q9	It requires the fewest steps possible to accomplish what I want to do with it	O	O	O	O	O
Q10	I can use it without written instructions	O	O	O	O	O
Q11	I don't notice any inconsistencies as I use TMSJ	O	O	O	O	O
Q12	I can use TMSJ successfully every time.	O	O	O	O	O

Arabic Form

	فائدة النموذج الاولي	1	2	3	4	5
Q1	استخدام النظام TMSJ يساعدني لايكون ادائي اكثر فعاليه	O	O	O	O	O
Q2	استخدام النظام TMSJ يساعدني لايكون ادائي اكثر انتاجية	O	O	O	O	O
Q3	استخدام النظام TMSJ يوفر الوقت	O	O	O	O	O
Q4	استخدام النظام TMSJ يحسن فعالية ادائي	O	O	O	O	O
Q5	استخدام النظام TMSJ سوف يجعلني اقوم بمهامي بكل يسر	O	O	O	O	O
Q6	النظام TMSJ هو يلبي كل ما احتاجه في عملي	O	O	O	O	O
	PERCEIVED EASE OF USE	1	2	3	4	5
Q7	النظام TMSJ هو سهل الاستخدام	O	O	O	O	O
Q8	النظام TMSJ هو سهل في التعامل معه	O	O	O	O	O
Q9	النظام TMSJ يقوم بتنفيذ المهام التي ارغب باقل خطوات ممكنه	O	O	O	O	O
Q10	يمكن استخدام النظام TMSJ بدون الحاجة الى تعليمات مكتوبه	O	O	O	O	O
Q11	لم الاحظ الي تناقضات في استخدام النظام TMSJ	O	O	O	O	O
Q12	يمكن استخدام النظام TMSJ بشكل ناجح في اي وقت	O	O	O	O	O

Picture for some of sample in Jordan