ACKNOWLEDGEMENT

First, we thank to Almighty GOD for giving us the courage and perseverance in completing the project. And we would like to give our regards and deep sincere of gratitude to our project Advisor Azeb Mehari, (Head, Computer and Network Security Chair) for providing valuable guidance at every stage of this project work.

And also, it is a great pleasure for us to also acknowledge the assistance and support of all the people who helped us start and finish this project successfully especially Instructor Selama G/Meskel(MSc.) who has been a great supervisor.

Finally we would like to express our deep sense and thanks giving to Guna Trading PLC, mekelle branch and Mekelle University procurement and Property management Office workers, their direct or indirect help has enabled us to complete this work successfully.

Abstract

In the past, there wasn't any process for issuing a new tender online. All process were offline. If any new tender was issued then the organization would give an advertisement on its website, newspaper or any other media. Newspapers contain only few detail of tender, if any more details are required then the contractors have to physically visit the organization. All process from issue of a new tender to allocate a tender to the contractor would have to be done on paper and personally. So the Bidder's, contractor's portfolio and bid details are managed manually. No online registration and subscription were provided.

This e-procurement system (electronic procurement system) facilitates the complete tendering process from the advertising of the requirement through to the placing of the contract on online. All the Bidder details, corrigendum details can be shown online. In e-procurement system Bidder can bid for the Product online and portfolio can be submitted at the time of bidding.

Contents

CHAPTER ONE 1
1. Introduction 1
1.1. Background of the Organization 2
1.2. Statement of the Problem 2
1.3. Objectives of the Project 3
1.3.1. General Objective 3
1.3.2. Specific Objectives 3
1.4. Scope and Limitation 4
1.5 Methodology 5
1.5.1 Observation: 5
1.5.2 Interview: 5
1.5.3 System development 5
1.5.4 Implementation Tools 6
1.6 Significance of the System 7
Chapter Two 8
2. Requirement Analysis 8
2.1 Overview of the project 8
2.2. Current System description 9
2.3 Problem of Existing system 11
2.4 Proposed System 13
2.4.1 Overview of the proposed system 13
2.4.2 Objectives of the project 13
2.4.3 Scope and limitation of the project 14
2.5 Functional Requirements 15
2.7 System Model 19
2.7.1 Use case model 20

2.7.2 Use case description....24
2.8 Sequence diagram....29
2.9 Class Diagram....35
CHAPTER THREE....37
3. SYSTEM DESIGN....37
3.1 Introduction....37
3.2 Purpose of the system....37
3.3 Design Goal....37
3.4 Current software architecture....39
3.5 Proposed Software Architecture....39
3.6 Subsystem decomposition....42
3.6.1 Component Diagram....42
3.7 Software/Hardware Mapping....43
3.7.1 Deployment Diagram....44
3.8 Persistent Data Management....46
3.9 Access control and security....49
3.10 Global Software Control....51
3.11 Boundary conditions....51
3.12 Subsystem architectures....52
CHAPTER - 4....53
4. System Implementation and Testing....53
4.1 Introduction....53
4.2 Objective of Implementation....53
4.3 Constraint of Implementation....57
4.4 Error Handling....57
4.5 Testing....58
4.5.1 Unit testing....61
4.5.2 Integration Testing....61
4.5.3 Functional Testing....62

4.6 Conclusion.....62
4.7 Recommendations for Future Work.....62
4.8 Acronym and abbreviation, definition 64
4.9 References 65

Table 1.Hard ware requirement 18
Table 2. Software Requirements.....18
Table 3. Use case description for log in.....24
Table 4. Use case description for logout.....25
Table 5. Use Case Description for Create Tender 25
Table 6. Use Case Description for Upload Tender.....26
Table 7. Use Case Description for Create Invitation.....26
Table 8. Use Case Description for Add criteria for tender.....26
Table 9. Use Case Description for publishing blacklist and winner 27
Table 10. Use Case Description for Create and send notification.....27
Table 11. Use Case Description for Prepare Contract.....27
Table 12. Use Case Description for download tender documents.....28
Table 13. Use Case Description for view announcement.....28
Table 14.User Information.....47
Table 15. Product/service category name and Description 47
Table 16. Errors and systems respond 58
Table 17. Test cases 60

Figure 1. Use Case diagram for bidder. 21
Figure 2.Use case diagram for manager. 22
Figure 3. Use case diagram for procurement expert. 23
Figure 4. Use case diagram for admin. 23
Figure 5. Sequence diagram for create users 30
Figure 6.Sequence Diagram for Admin 31
Figure 7.Sequence diagram for Procurement Manager 32
Figure 8.Sequence diagram for expert 33
Figure 9.Sequence Diagram for Bidders/Suppliers 34
Figure 10. Class diagram 36
Figure 12.Internal structure of MVC software Architecture 42
Figure 13. Component Diagram 43
Figure 14. Deployment Diagram 45

CHAPTER ONE

1. Introduction

Today, the use of technologies takes an increasing importance in our everyday life as it makes the world a small planetary village, and this constitutes a major concern for our country. Ethiopia Government plans to use the ICT for Development and National Information and Communication infrastructure framework. Achieving the implementation of the ICT framework in Ethiopia, requires the government to spread the use of high technologies in all government institutions, which means, from offices to public academic centers to private academic centers. To do so, the government of Ethiopia has started various programs to quicken (quick start) the use of the ICT in the country.

As technology advances, the world tends to be more technology dependent, as a way to improve their working environment. E-Business continues to grow and thrive as more organizations begin to utilize the Internet infrastructure and align their processes. The same case is true for e Procurement. Online solutions allow procurement officers to perform their tasks more effectively and efficiently. Procurement is the acquisition of goods and services and it is favorable goods and services be appropriate and procured at the best possible cost to meet the needs of the purchaser in terms of quality, quantity, time and location. The procurement departments have always been seeking effective ways to improve how the procurement process works. Bearing that in mind, it seems fitting for the Guna trading house, to further embrace the use of the ICT, and introduce the e-procurement system. The use of such a system could be of great importance, because it should be very supportive in terms of easy storage of bids and easy access of results.

Traditionally, the bidders' details had been kept manually on the shelves, and the evaluation process of tenders was erroneous and lengthy. Again, bidders were having difficulties to access results of their bids.

Online Procurement (E-Procurement) System is a website which is developed in PHP for helping Suppliers to sell products through online and fix rates based on procurement procedure. This website is also useful for posting classifies under different category. In present fast growing

information technology and software world web application are playing important role in increasing business mainly online purchase related websites are growing fast in every filed.

The title of the project is E-Procurement For Guna Trading PLC. This means that the project is aimed to build a website that can be accessed via the internet. This web site enables the Suppliers to participate the e-procurement that held by the Guna trading PLC for buying products inside and outside the Houses. Users can see the available e-procurement in the web site and can easily apply to the procurement and participate simply in the place where internet access is there.

1.1. Background of the Organization

Guna trading PLC is private company established in 1992 located in Mekelle Ethiopia. It is working in overseas business, import and export agents, food retailers, herbs and spices farming, agricultural services, agriculture business activities. One among the funding members of the holding company i.e. EFFORT. Guna trading house PLC. Is one of the founding member of the corporate entity of endowment fund for the rehabilitation of Tigray (EFFORT) the company is established according to the Ethiopian code of 510ff in 1992 G.C. it is legally registered as "GUNA TRADING HOUSE PLC." And its trade mark is legally protected in the Ethiopian patent authority, certificate number 4653 Guna is established with a paid up capital USD 10 million and with an annual sales turnover of USD 100 million and it is mainly engaged in import and export business activity. The company has about 410 well qualified and experienced employees. The head quarter is located in Addis Ababa, behind to Jackros Residential units, Bole sub-city, kebele 14/15.

1.2. Statement of the Problem

As we know in present system, procurement advertising is done through newspapers, which is causing problems like communication gap between companies and government authorities because of this problem competition is reducing, ultimately cost of project is increasing. There is no computerize sytem in the purchasing office so the user follow the old system to get the respose of the requests. Think about it how much is difficult to fill all data in paper during in digital technology and difficult to know how much time is needed to get ordered materials from different customers held in the company.

Here are the problems on the existing system

- The system has no security mechanism such as authentication and authorization; Lengthy process on getting service.
- No more tenders are participate due to luck of announcement delivery (can't get information easily since it is posted locally, even if TV and News).
- The tenderers are take procurement manually and participate physically.
- Deficult to manage the user request because the request is done manually to take thier order as first come first serve.
- It consume more personel power and material wastage like paper, pink related to printing documents for the sake of procurement guideline for employment.

So we have developed this website to fix these problems by submitting tender details to a dedicated tender site which will be visible for every company and apply for tender through this web site .This process will reduce time and provide option for different companies respond to the tender.

1.3. Objectives of the Project

1.3.1. General Objective

The main objectives of the project is to develop web based procurement system for Guna Trading PLC.

1.3.2. Specific Objectives

In order to achieve the general objective stated above we identified the following specific objects.

- Provide available procurement online in web site
- Provide online access including document upload and download for the procurement
- Access opening and ending date for procurement in a given specific time.
- The tenderer see who is the winner after the procurement time is complete.
- The tenderers see the guideline of procurement in the website without take many time and resource for the company.
- view current tender opportunities

- provide access apply to tender online
- Implementing online creation, editing of bids.
- Implementing viewing, applying for bids.
- Provide access to view accepted bidders
- Provide access to view cancelled tenders

1.4. Scope and Limitation

The scope of the project will cover the system functionalities, technologies used, the targeted users, system deployment and methodology. As a whole the system is focused to work with Electronic Procurement system.

Due to time and resource limitation this system is mainly focuses on the following areas:-

- Automate procurement system partially.
- Announce available procurements.
- Provide full information about the procurement.
- Automate online procurement response.
- Automate Bidder login and register.
- The system supports only English language
- The system only holds all necessary information's about procurement process, customers, venders and employees.

After identifying the system the proposed system is not include the following points as limitation.

- Distribute the material from the stock to the request department
- Generate Report when the material received.
- The system will not support money transfer
- The project focuses only on open procurement, may not include other types.
- The project only concern material request but not attending whether it is deliver to the requester or not.

- ❖ The project only selects with least bidder from the given entry, not from documents and does not work weather they take the materials after they win or not.

1.5 Methodology

1.5.1 Observation:

When we observed the real system how to take procurement in the company it is very complex.it is implemented in purchasing team tenderers participate physically and there are many documents in the office that take earlier procurement in the company.

1.5.2 Interview:

In a project we have interviewed Mekelle University Procurement department and Guna Trading purchasing team coordinator to understand organizational directions, policies and expectations, managers have on the units they supervise and other non-routine aspects.

1.5.3 System development

The methodology employed in this project is object oriented system development. The team preferred this approach as it combines data and process together in to objects. The object could be then redefined and re-examined to meet system requirements. The advantage of reusability is additional asset towards this approach. More over object oriented analysis and design approach becomes the current practice and trend since it is easy for the user to use system without knowing the details of functions. The advantages of using the object-oriented approach are:

- ❖ Improves programmer productivity by making the code reusable.
- ❖ Increased extensibility it contains the data and function together. When the need comes for extension, an individual functionality can be modified and do the trick.

1.5.4 Implementation Tools

JavaScript

JavaScript also provide the facility for validating user input. Data is validated before submitting it to the server and hence server is saved from extra processing. And it is also easy to do image animation based on its function.

HTML

Hypertext Markup Language (html) is a language in which web Pages are written, documents displayed over the internet. It is platform Independent language that is predominantly used the web and web base applications.

CSS

Cascading Style Sheets, or CSS, allow you to specify things like the font we want on your page, the size of your text, whether the page is to have lots of columns, whether the text is to be in bold or italics, and so on. In other words, it is the part that lets you control the appearance of your web page.

PHP

PHP makes it possible to create pages that changes depending on the data given to PHP, for example we can show a different page to people from different countries or we can show a different page depending on what was posted recently on the page.

Software tools

- Browser**:** - IE, Mozilla Firefox etc...
- Editor**:** - Dreamweaver, Notepad++
- Word processor**:** - Microsoft Word 2010,2013

1.6 Significance of the System

The new system have its own significance in avoiding the drawbacks of the current system. In addition to this it also minimizes time, cost and man power expenditure.

- The Suppliers of the commodities are not left out. With the use of the Internet, Supplier can make bids and place their bids from the comfort of their own homes.
- Carrying out procurement sales over the internet not only reduces costs on both parties (buyers and sellers) but raises security, provides better comfort for customers, affords the customers increased privacy, etc.
- Buyer (Guna) will not limit on local products since they can make bids for products from anywhere.
- Making the procurement process effective.
- Can provide updated information at any time about the procurement status.
- Saves time and resource expenditure for both bidders as well as procurement participants.
- There is no time constraint on which bids can be placed at any time (24/7). Items are listed for a number of days so it provides a chance of giving bidders time to search, decide, and bid.
- There is no geographical constraint so Sellers or bidders can participate from anywhere that has internet access.

Generally it helps the buyers and sellers to concentrate on online activities instead of following advertisements and magazines

Chapter Two

2. Requirement Analysis

2.1Overview of the project

E-Commerce has been defined as "any electronic communication that facilitates the exchange of goods, services or other assets between suppliers and buyers. Ecommerce includes all forms of electronic trading including EDI (electronic data interchange), electronic banking, electronic mail, e-procurement and other online services.

E-procurement tools have been used by several organizations to purchase direct and indirect materials for processes such as operations, sales, administration and maintenance, construction related items, cleaning solvents, and transportation services, among others. This procedure allows the organizations to have a decentralized purchasing decision, in which only the accredited suppliers can be seen in their purchasing systems, through for example e-catalogues.

One of the tools used within the e-procurement process is the e-RFQ (Electronic Request for Quotation), where the quotation is requested online in a platform set by the buyer (Guna) in which the form for the quotation is uploaded and the supplier can only update the information requested. Another tool used in e-procurement is e-auction, where the number of suppliers can be maximized while the workload is minimized and through which negotiations can be completed in a short time with great saving potentials, though procurement and related documents uploading and downloading.

The project is designing and implementing e-procurement on business-to-business, B2C, and C2B transactions, it first identifies current procurement process and explores how to implement procurement that involves mainstay drivers and problems of procurement system usage and investigate the effect on the performance of the trading house plc. The solution essentially involves in creating all the requirement details/ specific, of a tender to be used electronically.

E-Procurement is an online procurement system that enables company/branches, Guna trading around the country to procure products electronically from both local and international suppliers by using internet.

2.2. Current System description

When the Trading House want to buy goods or materials, first they organize a committee that identifies the type of goods that should be buy, after the identification they propose the goods to the highest body in the organization; then the highest body of the organization assess the goods that provided by the auction committee and then it decides whether they should be buy or not. The existing system has procedures that must be followed according to the law and regulations of tender in Ethiopia. We have spent time at analyzing, interviewing users and observing the way they prepare tenders. After the approval made by the highest body, the company brings it to the media, and the committee decides the place where procure should be held and the starting and closing date of auction.

During the procurement planning process and the preparation of bidding documents, the procurement shall ensure that there is sufficient budget allocation.

I. Preparation of bidding documents

The Procurement Unit prepares the bidding documents and incorporates the technical specifications based on the standard bidding documents. The bidding document is prepared based on the approved annual procurement plan which provides important details like quantities, cost estimates, method of procurement etc. Once the bidding document is ready it must be given to the Tender Committee which will review and provide comments. The bidding document is then finalized. In accordance with the procurement law, the bidding document should provide the following information:

a. The specific requirements relating to the goods, works or services being procured and the time limit for delivery or completion;

b. The general and specific conditions governing the contract, if the performance security is provided;

c. The tender number assigned to the procurement proceedings by the procuring entity;

d. Instructions for the preparation and submission of Bidders including:

- ❖ The bid form;
- ❖ The number of copies to be submitted with the original bid;
- ❖ Any bid security required, the form and amount of such security;
- ❖ Any proof evidencing the bidder's qualifications.
- ❖ A statement of where and when tenders shall be submitted,
- ❖ A statement of where and when the tenders shall be opened;
- ❖ A statement of the period during which tenders shall remain valid;
- ❖ The procedures and criteria for bid evaluation and comparison;
- ❖ A statement that the procuring entity may cancel the bids at any time before the signing of the contract;
- ❖ Anything else as may be provided by the bidding document in accordance with this Law or public procurement regulations.

After the house announces the venue and the items for auctions to the general public through electronic or print media; The sellers who wish to take part in the auction should first take the document (the form that contains the list of materials which are proposed to be buy or wanted documents and other documents with a blank space that bidders will fill the price they wish) and then arrive at the venue of the auction on the given date and time with the necessary document. This method restricts most of the interested bidders out of the city or region to decline their offer or interest as they can't be available on the day of auction. Another flaw of this method is the piles of paper work that has to be maintained then keep it save for the future. They have to keep track of the bidders and the sellers until their final settlement. Bidders submit bids that they want with in post which is sealed by wax and put it in an auction box. This process requires physical presence of the bidder himself/herself or by their agents. When the bidding time expires the auction process will be closed. After the closing date of the process then the Trading house collects these bids from the sellers and evaluate these bids. Finally the auction committee decide the winner bidder who bids lowest will be selected. Then Guna pays the required amount of

money for the seller and in turn the winner gives the material. The buyers and branches, their notices and documents, contractor's records and bid details are managed manually. No online registration and subscription provided.

II. Bidding Process:

The bidding process which involves both the technical bid and the financial bid is not automated. Bidders send the necessary documents like their tax and certificate, technical resources data and their quotations through post.

In the bidding process, technical bid is the first stage if the materials need specification wherein the bidders have to give the proof of his solvency and the data about his financial position. Then he is required to give the details of the technical resources available with him. Both the technical bid and the price bid are kept in two separate covers which are again kept in one main cover. Only those bidders' price bid is opened whose financial records and technical bid are satisfactory. Earned Money Deposit of those bidders who are not qualified at the technical bid stage may be refunded or returned, in form of CPO.

After proper evaluation, the final bid is selected and the bidder whose bid is selected will have to pay some amount as a security deposit. This amount will be adjusted later on.

2.3 Problem of Existing system

The problem with public auction is that the participation of the general public is very limited. This public auction is managed manually and involves lot of paper work. Another headache of the current system is to track each bidding process and to make it finish in financial settlement.

In present, there is no any process online for issue a new bidder. But all process work offline on paperwork. If any new buying is issue then organization gives an advertisement in TV, newspaper or any other resources. Newspaper contains only few detail of materials, if any more detail required then suppler physically visit the organization. Manual procurement transactions can take up to 20-30 days to process, including all the time spent exchanging paperwork and contacting suppliers etc. An integrated e-Procurement solution can be used to simplify the procurement process.

Generally existing System:

- No Automated Bidding Process: The bidding process is completely manual and so very time consuming. There is no provision for online bidding.
- Security: The manual process is not very secure. In the new system, the passwords are generated so only the members know their passwords.
- Not as Accurate and Fast: Retrieving information is slower as everything is managed manually. Since, everything is managed manually; there might be a lack of accuracy.
- No Searching Facility: There are no searching facilities for bidders such as quick search mechanism in the existing system.
- It consume more personel power and material wastage like paper, pink related to printing documents for the sake of procurement guideline for employment.
- The existing system has a problem of keeping the records separately because of using a file based system.
- Users are using Word or Excel to record companies' names and personal details, writing one record many times in different sheets which leads to inconsistency of data. Consequently, users are facing the problem of getting reports on time because of searching the information related to one tender in different files.
- The existing system has many problems associated with it, for instance: it wastes time for recording the process of tender information.
- In the existing system, the process of evaluating tenders takes a lot of time to do analysis and to compare documents as they (users) write down and also remember they have to search for the documents they want manually.
- It is hard to get reports on time because they have to write manually. In other words, each record they keep is not in the format of reports, and at the time of issuing the report, they have to type it manually.
- Bidders who need to sell the things, he attend the place of bidding.
- It covers only limited Area, Bidders far from the organization will not participate.
- Limited Bidders and Sellers.

2.4 Proposed System

While this model may seem anarchic, an increasing degree of control is being exercised by a centralized procurement management function (Procurement and Contracts Officer) that oversees the development of centrally negotiated contracts with suppliers of key goods and services required throughout the organization. Conditions of Contract, Service Level Agreements and Pricing are all negotiated through one point of contact thereby ensuring consistency and ease of a management.

2.4.1 Overview of the proposed system

The motto of the new system will be AAA, 'Anyone, Anytime, Anywhere'. That what it really is? The "E-procurement" is online auction house so the bidder doesn't need to go anywhere, instead they can take part in the auction just sitting in the comfort of their living room, be it during the day or night.

Need for new system

- To automate the bidding process and provide the tender details online:
  - ✓ The tenders should be able to make a bid online. All the important details of the tenders should be made available online. Tender and procure notices should be displayed as well.
- To check the status of Tenders
  - ✓ Such a facility will enable the contractors to know the status (Allocated/Non-Allocated) of the tenders easily and quickly.
- Faster retrieval of information:
  - ✓ Retrieval of information becomes easier compared to the manual system. Details regarding bidders, feedback, documents etc. are available easily.

2.4.2 Objectives of the project

The general objective is to automate the procurement system

The main objective of this project is as follows

1. This portal will gives procuring /purchasing of product online.
2. Implementing online creation, editing of bids.
3. Implementing viewing, applying for bids by Sellers.
4. Design a database which is able to keep every transaction related to tender process.
5. The user will be able to generate a report they need on time because every record will be saved in database.
6. Implement the level of security so that every user will be able to access the information according to their role in the system.
7. This new system will avoid the duplication of data that leads to consistency of data.

2.4.3 Scope and limitation of the project

- Table updates according to user input
  - ✓ Deleting and Modification of existing records update the table accordingly.
- Improvised reports.
  - ✓ Reports have been improvised with the facility for individual and group items separately.
- Multiple Operations available in a single form.
  - ✓ Facility to add, modify, delete, update etc. are provided in the same form so that the user does not have to switch over from one form to another form to the same.
- Accurate and timely reports are available as a result efficiency of the employee increases.
- Since the application is accessible from anywhere the time in accessing the information is highly reduced.
- Security would be available from unauthorized users and each user's access to the different parts of the application.

Limitation

- money transfer is not included for payments of materials
- documents evaluation will be manual, because of different procure materials or services
- not include whether the materials arrived or not
- It only supports English language
- The system doesn't support technical or financial proposal evaluation
- Browser limitation it may not work below IE-8

2.5 Functional Requirements

The new system will facilitate procurement system and receive the response for online method and the tenderer, system have its own account.

FR1. User registration

This functional requirement allows for the user registration of new Procurement Officers and Tenderers/Suppliers to the E-Procurement system. The registration process must ensure the confidential transfer and storage of necessary personal Information of users. Furthermore, mechanisms may be put in place for the validation of the information provided by new users of the system.

Hence, the registration process may be performed in two phases. One phase can allow new users to apply for registration to the system, and another phase can allow authorized personnel to validate the submitted information and approve or reject a registration application.

FR2. Document Uploading and downloading

This functional requirement relates to the ability of the E-Procurement system to store procurement information of its registered users. Users can upload and download documents if required. This procurement information; can be used for several other functionalities of the system, including reporting, automated notifications, etc. Moreover, upload and download can

allow users to setup their preferences when using the system, in terms of how data is searched, displayed, etc.

FR3: **Bidder Management**

- It must be accessible through the web without any installation necessary.
- In order to take part in the auction process the users must register themselves and during registration to become a member there must be some payment this is done through transferring money from bank accounts, in CPO. But if they are not new users they can take part in the auction process by logging into the system with his/her account.
- For bidders to participate in the bidding process the system cross checks the fulfillment of requirements that are expected from bidders.
- Participants in the bidding process always have access information, they can see their rank, after bidder result has been published
- After the closing date of the auction there must be a notification for the winner bidder and auctioneer.
- The product must be available on the site for only those days on which the auction process starts and to the last date. After this date it must be hidden from the site.

FR4: select bidder

Select the bidder who puts smaller payments or least price, but this may not be used for concluding the winner is the one who puts smaller amounts of birr for their supply may not be, because of technical documents.

FR5: Announce winner

Thus bidders whose technical documents match or exceeds the wanted documents by the procuring organization (Guna trading) will be selected and their financial documents will be opened; whose financial documents with least price is selected; winner will be announced online.

FR6: **Award letter**

For whom who wins with the least prices, and losers will be announced and rewards the letter.

FR7: Contract Agreement

Contract is send to the winner and the winner download the contract files.

2.6 Nonfunctional Requirements

Availability Requirements**:** The new system should be available at all times, the user can access it using a web browser. This is only restricted during down time of the server and they can handle this problem by reserving backup databases on the other server.

Security requirements:-This system should be secured on which the user's data must be transmitted confidentially. We will handle this by making the system's back-end server accessible for only authenticated users or it should not allow non-authorized users to access the system. We will provide a way by which a user can enter to the procurement system by signing in so that s/he can have access to all the services. Then this system will keep Member information securely.

Reliability requirements:-This system will provide backup databases, these databases will be maintained and updated in a consistent manner and this helps users to gain reliable services. And also it will be executed by using any type of web browsers, operating systems either Windows or Linux and can run on Computers, Laptops.

Usability requirements:-The new system should be usable. It will use visual (GUI) and interactive features. It will have easily browse able pages, which are consistent. An online documentation on how to use the system shall also be included to make it easy for users of the Auction system. In times of errors made by any user, the system will guide the user to solve problems and response time of the system should be fast enough to display each page when a user browses.

2.6.1 System Requirements

We have put the requirements for electronic procurements system as shown below

Table 1.Hard ware requirement

Hard Ware	**Hard Ware Component**
Processor	Cor i3 above 2.3 GHZ
Hard disk	200 GB
Ram	2 GB

Table 2. Software Requirements

Text Editor	Note pad, Sublime, Dream Weber, WYSIWYG
Server	Apache
Front end and Backend	HTML and PHP
Operating system and Browser	Windows OS, any browser

2.7 System Model

Scenarios

Business rules are statements about the enterprise's way of doing business. They reflect business polices. Organizations have policies in order to: Satisfy the business objectives, Satisfy customers, make good use of resource, and conform to laws or general business conventions. Business rules become requirements, that is, they may be implemented in Software as a means of requirement of this software system.

BR1.The tenderer should provide receipt which certifies the tenderer as he/she paid the current tax.

BR2.The tenderer must submit the bid before closing date of the auction.

BR3.The tenderer must pay a specified amount of money in casher payment order (CPO) for auction before taking part in the auction.

BR4.If the tenderer is not willing to supply the goods after he/she won, the initialization payment will not be returned, subsequent winners award

BR5.If the organization gets any chance which is better than the auction, he/she has the right to cancel the auction.

BR6.The auction will be closed if and only if the specified auction date is over or Organization gets other means.

BR7.For the supplier to participate in the auction process must fill the valid auction document form.

2.7.1 Use case model

Use case diagrams consist of named pieces of functionality (invoking the functionality (actors use cases (subjects).

Use cases, which describe how people interact with the system. Use cases give you a structured way of capturing the behavioral requirements of a system, so that you can reasonably create a design from them. They help you to answer some fundamental questions:

- What are the users of the system trying to do?
- What's the user experience?

Actor: An actor represents any outside entity that interacts with your system. It may request services from your system; and it may perform services for your system. An actor can be a person; but it may also be another system, or perhaps a device such as a printer.

System Boundary**:** It is shown as a rectangle. It helps to identify what is an external verse internal, and what the responsibilities of the system are. The external environment is represented only by actors. Since the object oriented analysis and design methodology is used, functional requirements are presented in terms of use cases.

The detailed descriptions of these use cases represent the requirements of the system. Here we have 4 actors; Procurement Admin, Procurement Manager, Procurement expert and Suppliers. But one more actors here, Procurement committee, whose roles feedback technical documents and contract agreements, so that not included in the system, because of they only need technical documents, and this technical documents should be available for them in softcopy.

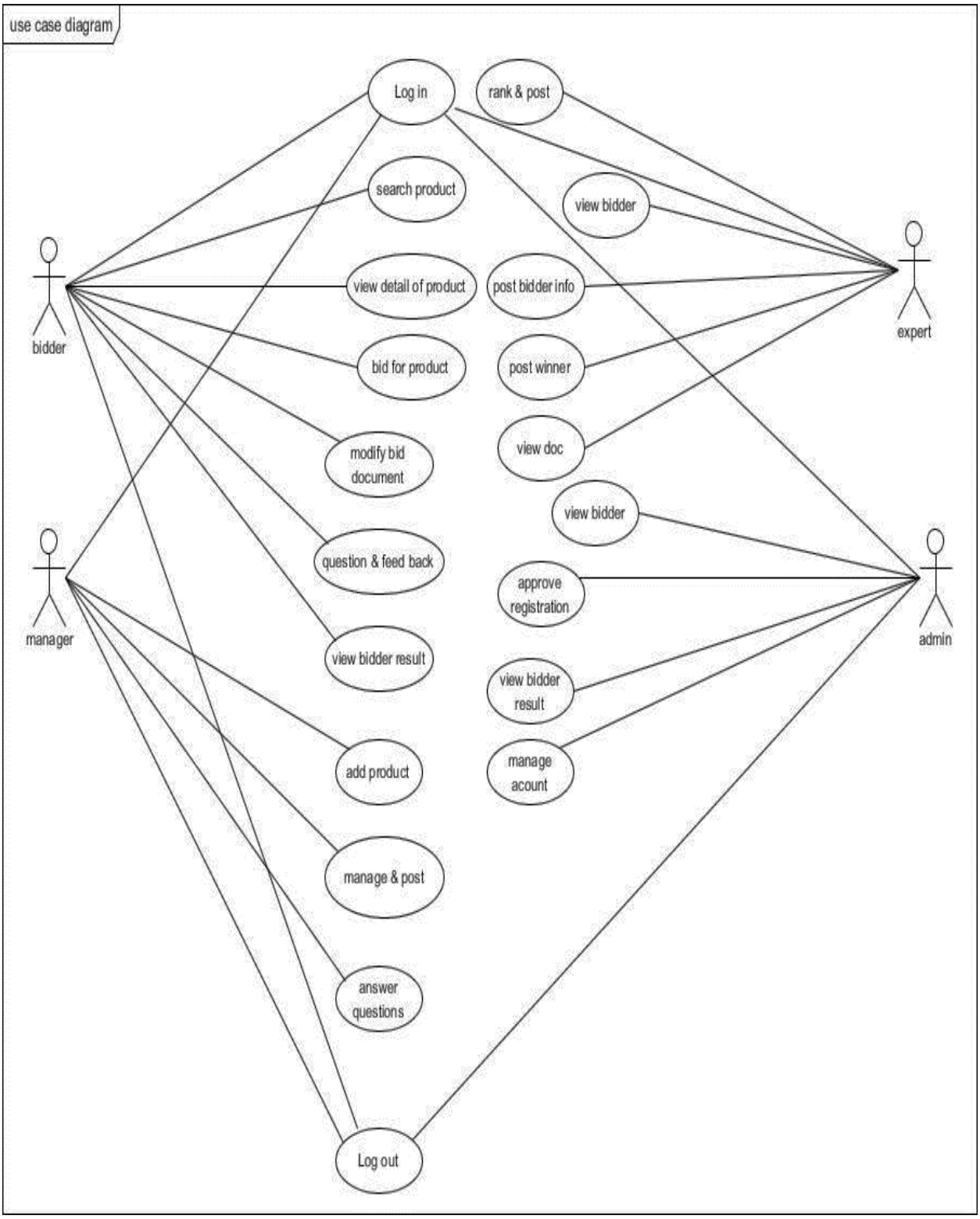


Figure 1. Use Case diagram.

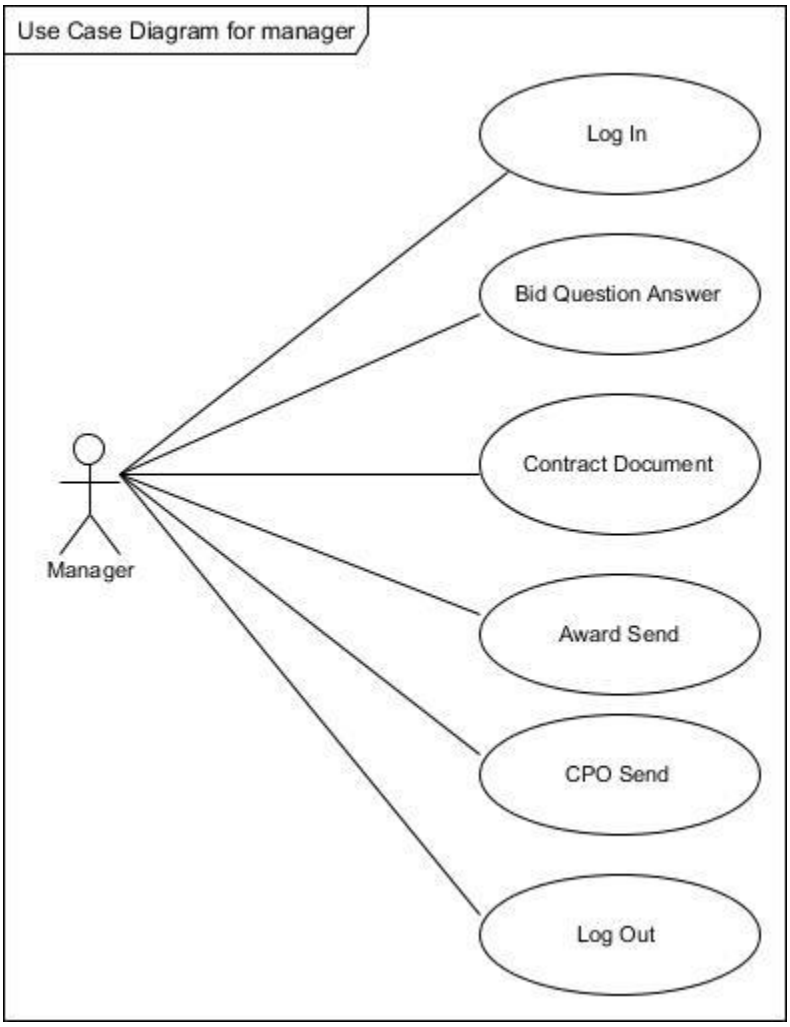


Figure 2.Use case diagram for manager.

Figure 3. Use case diagram for procurement expert.

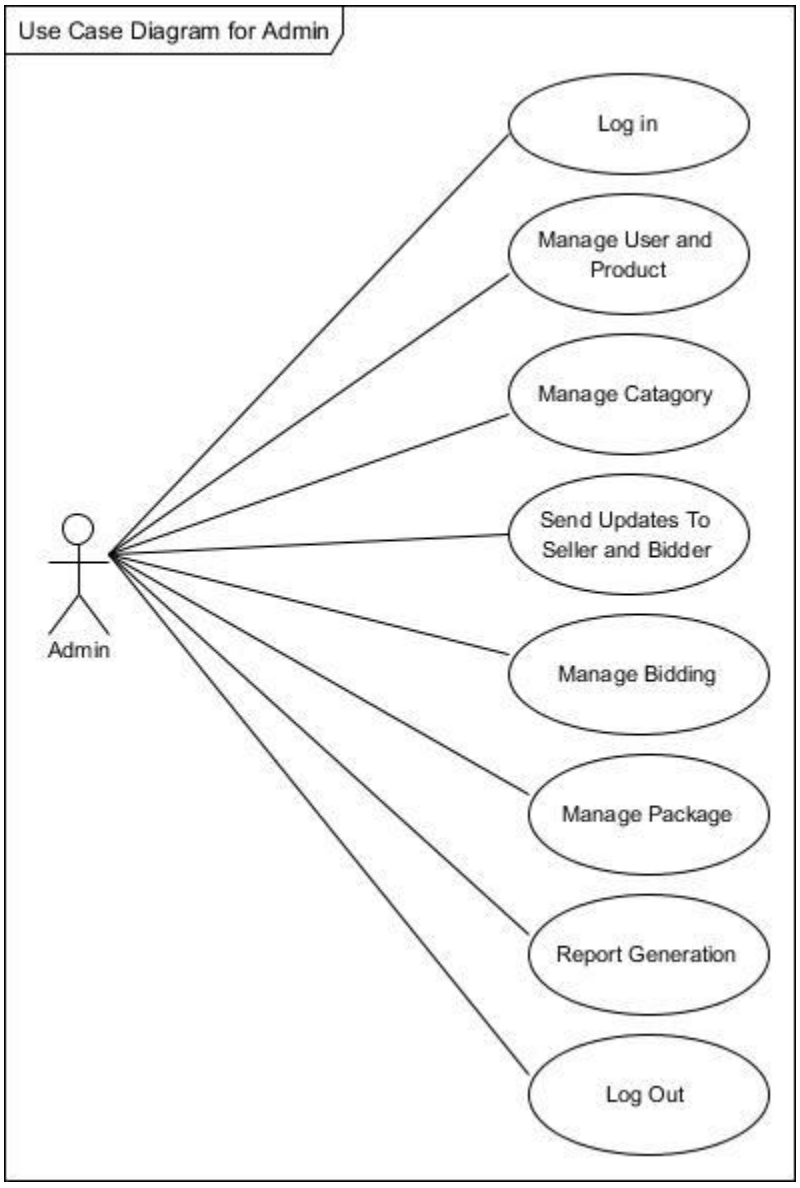


Figure 4. Use case diagram for admin.

2.7.2 Use case description

Table 3. Use case description for log in

Name:	Login
ID	UC
Extend	----
Include	-----
Actors	Tenderer ,Admin, Procurement Expert, Manager
Description	The tenderer open website home page and click login button to go his own page
Name	Login
Pre-condition	The actors go to the site home page and login
Post condition	The actors login in to his own page
Basic Course of Action	1. The actors request login 2. The actors get login form 3. The actors fill the requirement. 4. The System approves login 5. End of use case
Alternate Course of Action	A1: If the information is invalid or incomplete A2. The system asks to fill the appropriate information. A3. The actors fills the appropriate information on the form. A4. The use case continues from step 3

Table 4. Use case description for logout

Use case name	Logout System
ID	2
Primary Actor	Administrator
Secondary Actor	Procuring entity
Preconditions	A valid procuring entity logged on to the system
Flow of event	1. After finishing access the system, the users will logout the system. It is more for the security. 2. After Log out, the user back to main menu.
Post conditions:	

Table 5. Use Case Description for Create Tender

Use case name	Create tender
ID	**3**
Primary Actor	Procuring entity (Procurement expert, manager), Administrator.
Preconditions:	A valid procuring entity logged on to the system
Flow of event	1. After finishing access the system, the users will logout the System. It is more for the security. 2. After Log out, the user back to main menu.
Post conditions	

Table 6. Use Case Description for Upload Tender

Use case name	Upload Tender document
ID	**4**
Primary Actor	Procuring entity, Administrator.
Preconditions	A valid procuring entity logged on to the system
Flow of event	1. Choose Upload tender menu 2. Browse where tender document is saved and upload it.
Post conditions:	

Table 7. Use Case Description for Create Invitation

Use case name	create invitation
ID	**5**
Primary Actor	Procuring entity, Administrator.
Preconditions	A valid procuring entity logged on to the system
Flow of event	1. Choose create invitation menu 2. Fill all invitation information 3. Save and publish invitation information
Post conditions	

Table 8. Use Case Description for Add criteria for tender

Use case name	Add criteria to tender
ID	**6**
Primary Actor	Procuring entity, Administrator.
Preconditions	A valid procuring entity logged on to the system

Flow of event	1. Choose add criteria menu 2. Fill all criteria information according to tender document 3. Save all criteria information
Post conditions:	

Table 9. Use Case Description for publishing blacklist and winner

Use case name	publish blacklist and winner
ID	**7**
Primary Actor	Procuring entity, Administrator.
Preconditions	A valid procuring entity logged on to the system
Flow of event	Procuring entity create a report of all bidders and who are fail in evaluation and who is win and publish it.
Post conditions:	

Table 10. Use Case Description for Create and send notification

Use case name	Create and send notification
ID	**8**
Primary Actor	Procuring entity, Administrator.
Preconditions	A valid procuring entity logged on to the system
Flow of event	1.Choose create and send notification menu 2.Create all notification and send it to all bidders
Post conditions:	

Table 11. Use Case Description for Prepare Contract

Use case name	Prepare Contract
ID	9
Primary Actor	Procuring entity, Administrator.

Preconditions	A valid procuring entity logged on to the system
Flow of event	1. Choose create contract menu. 2. upload contract for awarded bidder in Document
Post conditions:	

Table 12. Use Case Description for download tender documents

Use case name	Download tender
ID	10
Primary Actor	Public, bidder.
Preconditions	
Flow of event	1. From main page. 2. Choose download tender menu. 3. Download tender document.
Post conditions:	

Table 13. Use Case Description for view announcement

Use case name	View announcement
ID	11
Primary Actor	Public, bidder.
Preconditions	
Flow of event	1. From main page 2. Choose view announcement menu 3. Click on announcement you need.
Post conditions:	

2.8 Sequence diagram

Sequence diagram shows simple interactions between objects arranged in a time sequence. It shows the objects with their lifeline and the exchange of messages between objects. If may also show the creation of new objects. The sequence diagram shows if the object is activated with a rectangular lifeline. When an object is not active, just existing, and cannot be activated again.

The lifeline can be split into two or more concurrent lifelines. Each lifeline corresponds to a conditional branch in the message flow. The separate lifeline can merge together at some later point in time. Along the time axis timing marks can be specified. These timing marks can be used to give constraints, like specify the maximum time a message exchange may take.

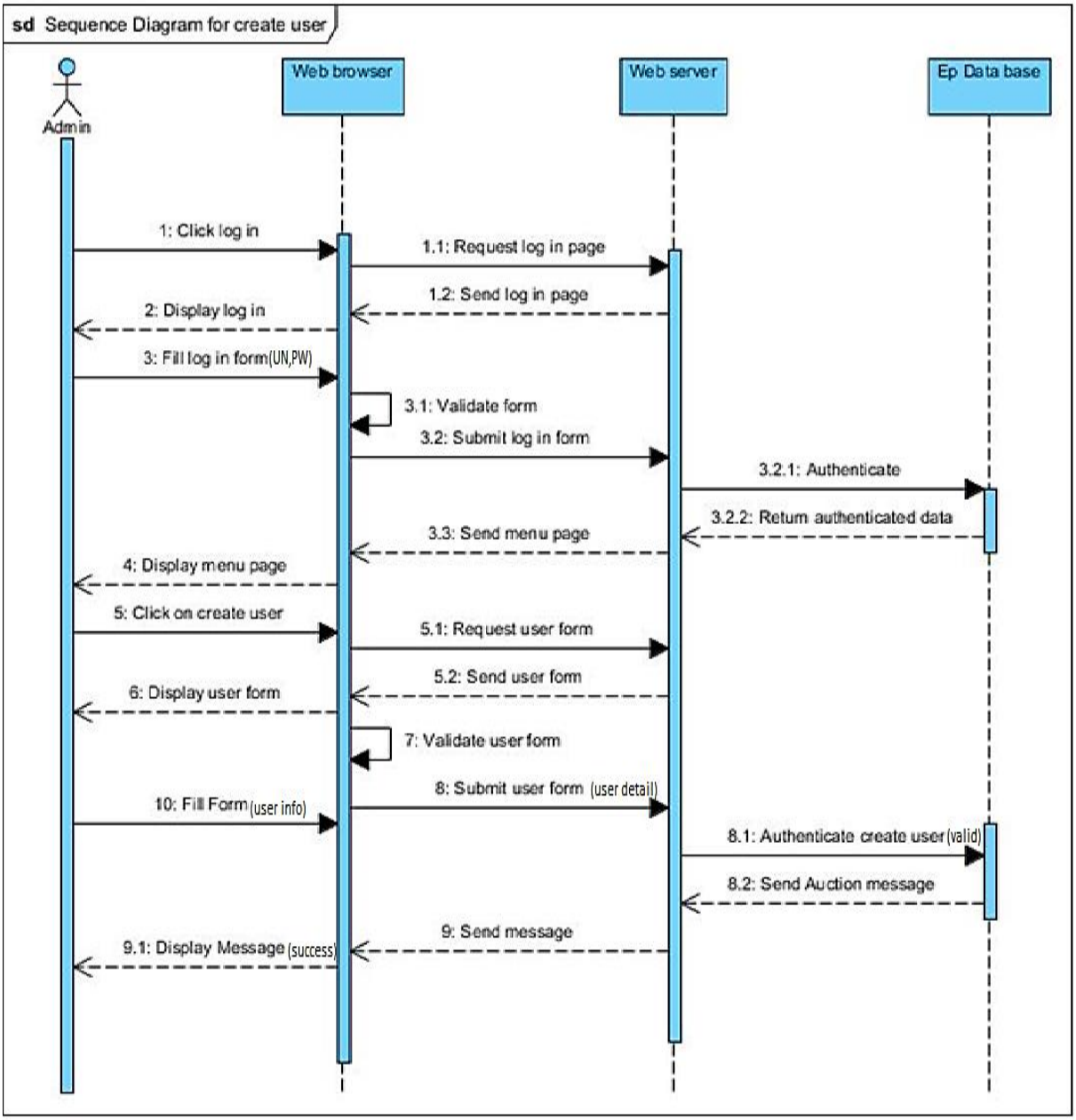


Figure 5. Sequence diagram for create users

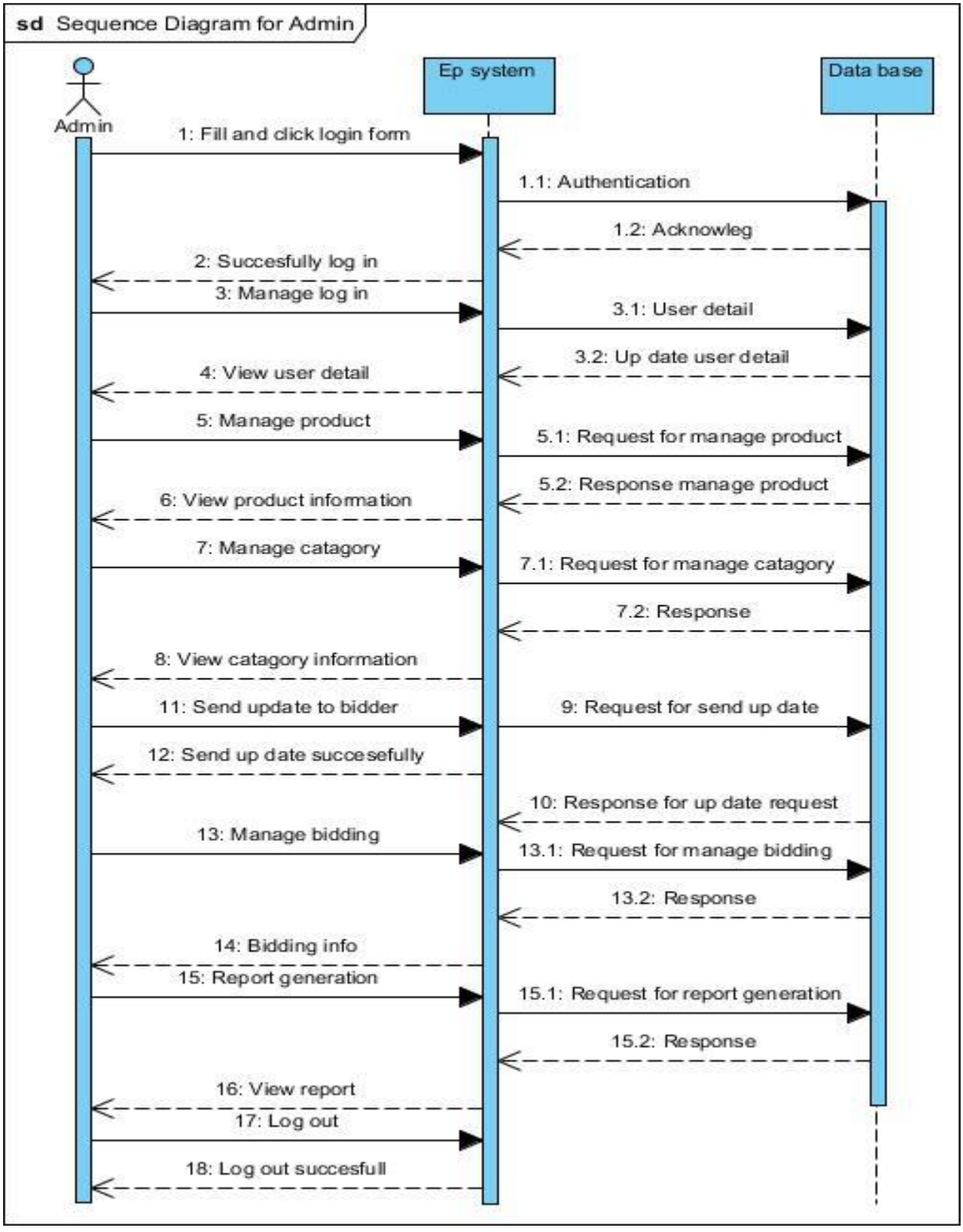


Figure 6.Sequence Diagram for Admin

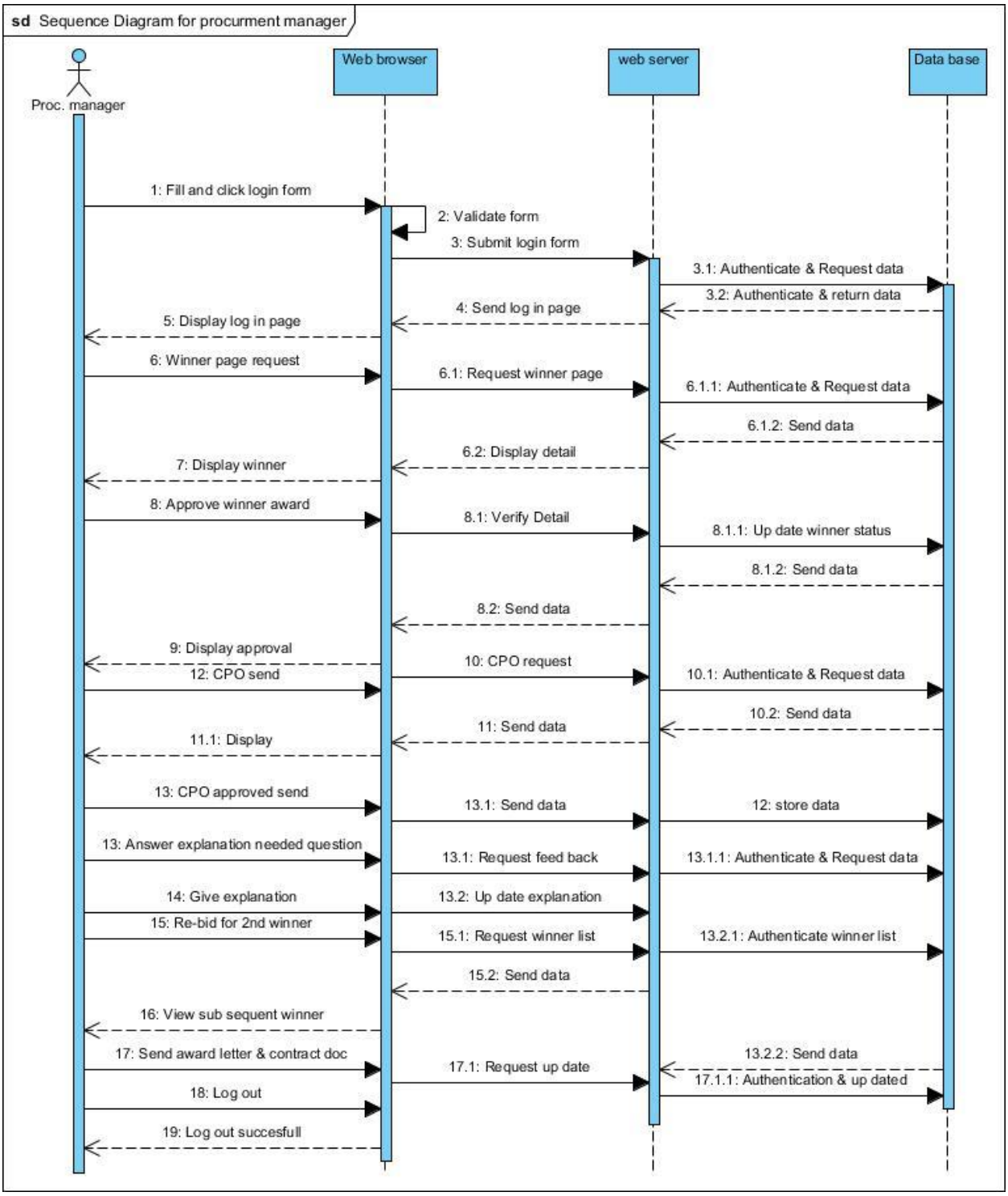


Figure 7.Sequence diagram for Procurement Manager

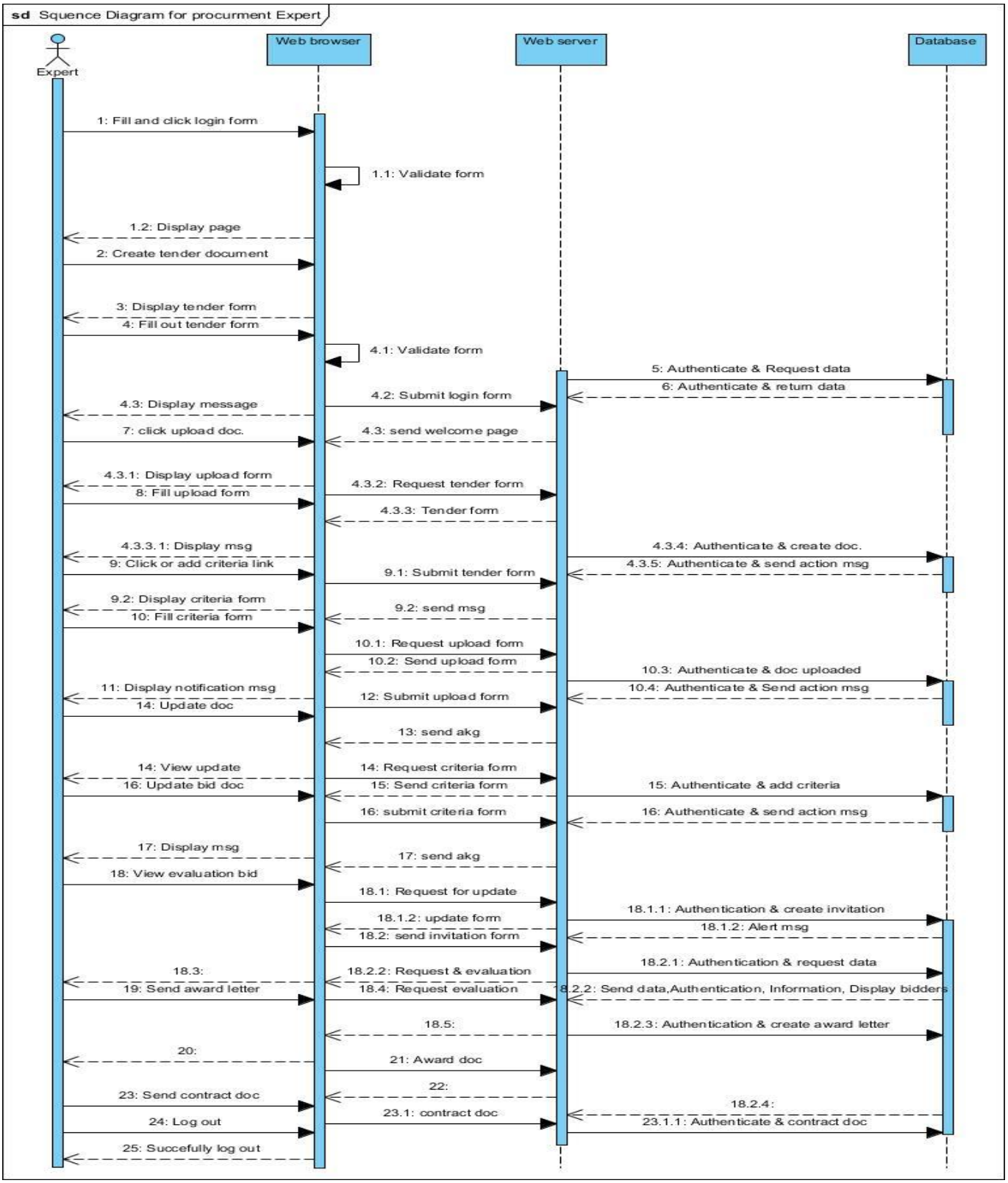


Figure 8.Sequence diagram for expert

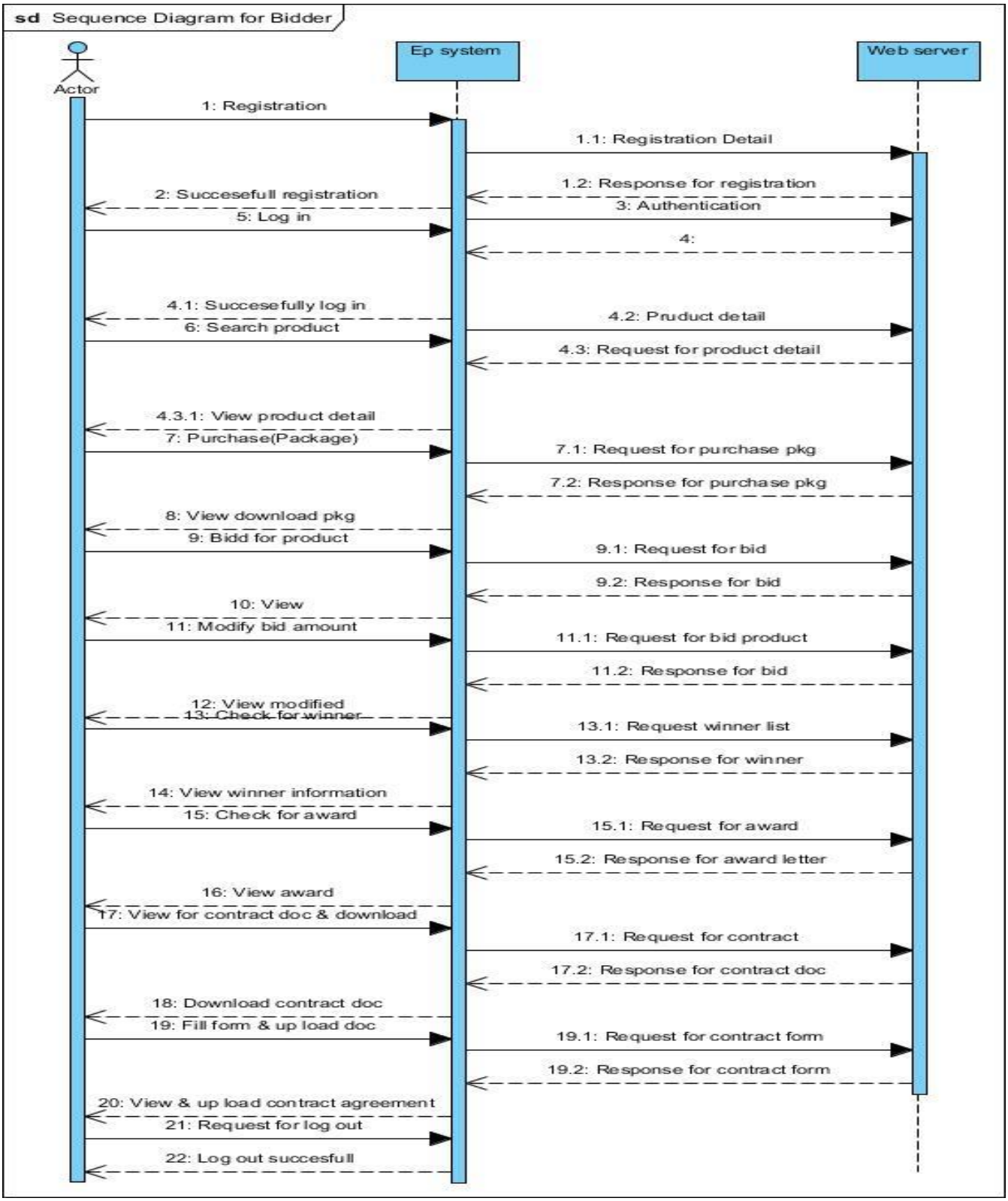


Figure 9.Sequence Diagram for Bidders/Suppliers

2.9 Class Diagram

A class diagram describes the types of objects in the system and the various kinds of static relationships that exist among them. Class diagrams also show the properties and operations of a class and the constraints that apply to the way objects are connected. The UML uses the term feature as a general term that covers properties and operations of a class. A class represents the operations and attributes of one or more objects within your system.

- An attribute**:** is a characteristic that describes objects of the class.
- An operation: describes something an object of the class can do.

Notation:

Class
-Attributes
+ Operations()

In UML, a class appears as a rectangle broken into three sections. The top section identifies the name of the class, the middle section lists the attributes of the class, and the bottom section lists the operations of the class.

A relationship is a connection among things. The three most important relationships are: Dependency is a relationship between two elements where a change to one element (the supplier) may affect or supply information needed by the other element (the client).We use dependencies to model relationships between classifiers where one classifier depends on the other in some way, but the relationship is not really an association

The next step of the design phase is to draw an UML Class Diagram of the system. Since the programming language of the system is an object oriented one, an UML Class Diagram is particularly adapted to show the classes of the system, their inter-relationships, and the operations and attributes of the classes.

Here is the class diagram of the project as shown below.

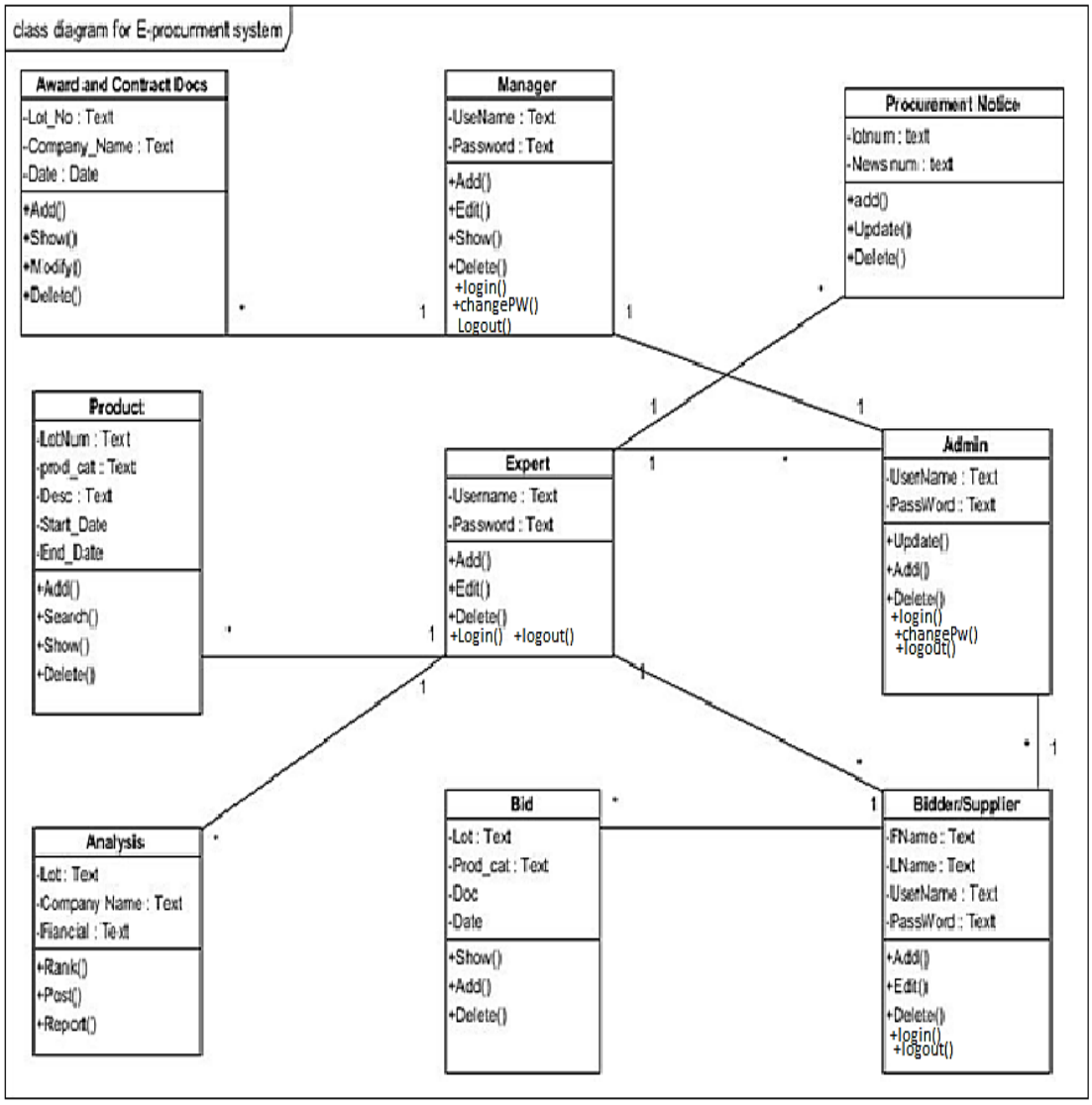


Figure 10. Class diagram

CHAPTER THREE

3. SYSTEM DESIGN

3.1 Introduction

This system is developed through object oriented methodology approach. Object oriented methodology allowing the system to have Object Oriented property that is data abstraction, inheritance, polymorphism and class and objects. Generally the system uses this methodology to make the system effective, efficient and easily understandable.

3.2 Purpose of the system

This system has different type of class type architecture such as user interface, process/control, business/domain, persistence and system layers and also different type of system modeling techniques that are used for the implementation of the system such as class, component and deployment modeling.

The system design processes the idea and converting into a solid design.

- To make the system simple to understand
- To easily code the system
- To see how a real system works
- To specify objects, operations of the system clearly

3.3 Design Goal

The basic goal of system design is to plan a solution for the problem. This phase is composed of several systems. This phase focuses on the detailed implementation of the feasible system. It emphasis on translating design specifications to performance specification. System design has two phases of development logical and physical design.

Our system designing phase is on the bases of object-oriented system approach, this designing phase uses sequence and other diagrams to model the system. The design phase is the interface

between the requirement specification and the implementation part. One of the importance's of this phase is to clarify specifications as it clearly represents the blue print of the actual system.

- **Security:** The system should be designed to prompt the user with password and user name. This provides security in such a way that unauthorized users can not have access to the system's resources. Moreover, the system should be designed to reject invalid user inputs to ensure the system's robustness for all interacting users.
- **Maintainability:** the system should be extensible enough to incorporate functionalities and easy modifiable.
- **User Interface:** Our system provides user friendly and self-explanatory graphical user interface that eases the interaction of the user with the system, it also has helping contents that for how to use the system
- **Robustness:** Since error handling and extreme condition is one of the nonfunctional requirements of the system to handle wrong user action. Invalid user input or any incomplete information that may encounter errors, the system should withstand invalid input so that it will function under those condition if the users types invalid text query, also it should generate a means to kindly handle the situation to formulate the query again.
- **Reliability**: The system should be reliable and consistent so that it provides the correct result in all circumstances unless an error is encountered. If an error occurs the system will traps the error in the input and notify the user to take appropriate corrections.
- **Availability**: The system is web based or online system so it will be accessible 24 hours per day and 7 days per week unless some problems happened like connection failure, power failure and other; basically server will not off, since alternative power. And also the system accessible from any system that can operate internet access (like computers, smartphones, tablets and soon) and will be accessible anytime a user would want to use the system.
- **Easy to use:** This system will have a well-defined and easily understood interface. The processes will be easy to understand and use by a user's.

- **Data integrity:** The system to maintaining and assuring the accuracy and consistency of data over its entire life-cycle, and is a critical aspect to the design, implementation and usage of system which stores, processes or retrieves data.

3.4 Current software architecture

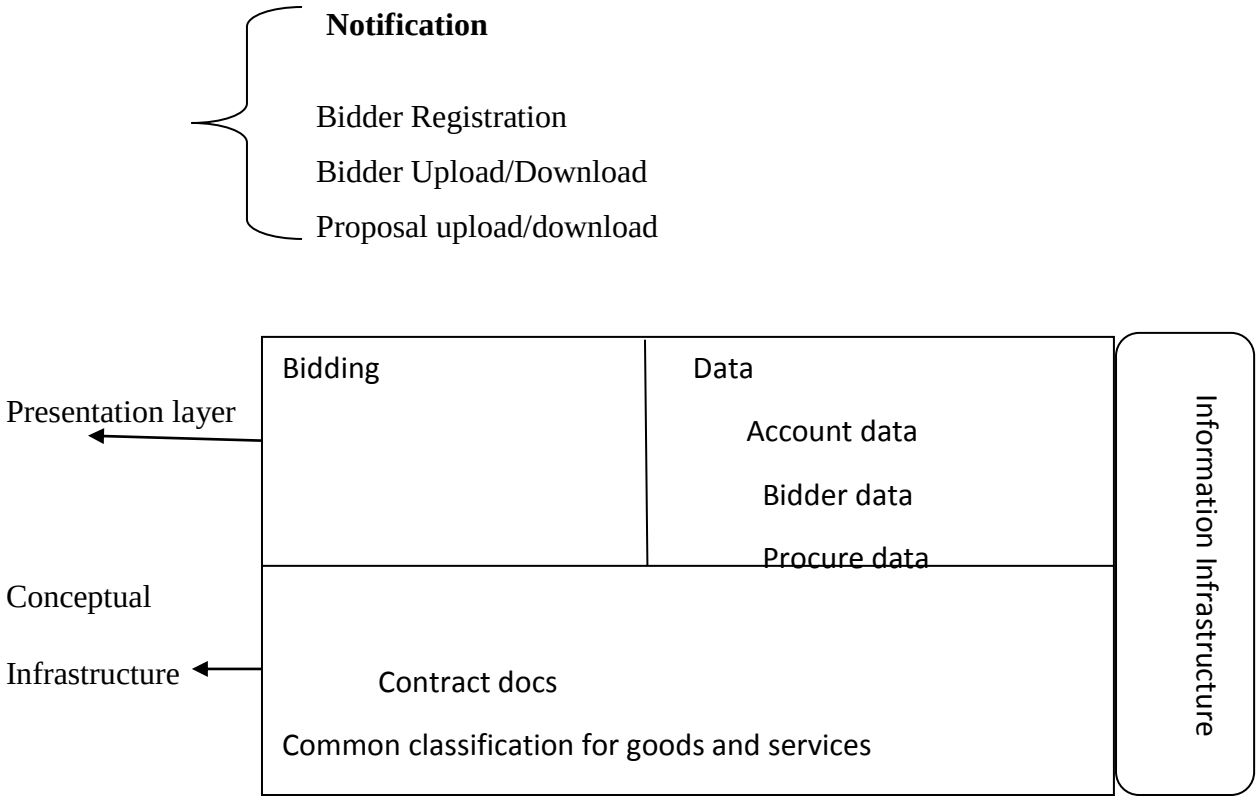
Software architecture is the structure of the system, which comprise software elements, the externally visible properties of these elements, and the relationships among them. The current software architecture found in Guna trading house for registering suppliers, Documents, bidders and biding detail using a manual document architecture. So we can say that the trading house has no specified architecture; there is no any software architecture used.

3.5 Proposed Software Architecture

Architecture is a set of significant decisions about the organization of a software system. Such decisions include:

- The selection of structural elements and their interfaces.
- The composition of this structural and behavioral element into progressively larger subsystem.
- The architectural style that guides this organization, the elements and their interfaces, their collaboration and composition.
- E-procurement is website designed to be used as a distributed application. As a development language PHP is selected. The users of the system access this website through the Internet via web browsers.

The main elements of e-procurement system are Guna trading house and Suppliers. Through this system, Guna Trading Post products with announcement to bidders, publish tender related information, get proposals, etc. On the other hand, vendors participate in tenders, get tender files, and etc. Shortly, E-procurement facilitates data sharing among them.



Proposed Model

This system will be built in a web based environment to allow users to access the system anywhere and anytime. The identified main users are Procurement expert, Procurement manager, bidders/suppliers and administrator. The users have different roles when using the system and they will be connected to the database by interface. This interface will make the process of system user's activities easier and practical.

Software architecture defines the components of a software system and their inter-dependencies. Model–View–Controller (MVC) is a software architecture which provides to implement the visual, data and processing code parts independent. For example the Model unit is a collection of classes in communication with the other parts. It is the process unit, processes the task ordered by the Control Unit. View unit is the place to deal with the presentation of the data to the end user. It can get the data from both Model and Controller unit. Also it can send interactive data to both units. Controller part is the main part of the structure. If we want to concretize the architecture, (MVC C is the brain, M is the nerves and V is the move). Internal structure of MVC Architecture is given in Fig below

If we choose MVC architecture as our proposed software architecture because it becomes widely used as architecture for object-oriented software. It has a capability of supporting user requirements that are presented through differing interface styles. It supports modifiability and portability. In particular, allows one to change the functionality related to one class (e.g. Suppliers), without changing others (e.g., Procurement notice.) Also, makes it easier to port a system to different I/O devices. This architecture is best suited for software system where user interfaces play an important role. But we have choose procedural paradigms.

In general the solution architecture offers the following advantages:

- Low deployment and maintenance costs: Even if accessed by many users from different locations the system can be fully managed and maintained by operating on the central server; no intervention is required to install or maintain workstations.
- Access from anywhere: Users can access the system from any workstation running a generic Web Browser that support both local and remote connections through the internet.
- High Data Security: End users can access the system data only through the application layer which implements appropriate business rules to allow only authorized operations based on the actual user permissions; no direct access to the physical database is needed.
- High System Reliability: The centralization of the data allows efficient monitoring and backup procedures; no data is stored on clients.

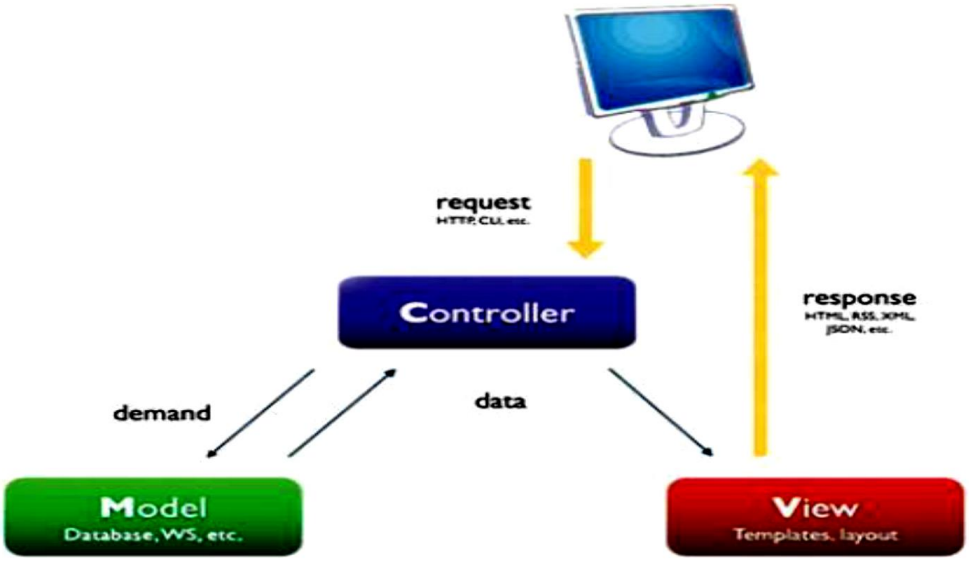


Figure 11.Internal structure of MVC software Architecture

3.6 Subsystem decomposition

3.6.1 Component Diagram

The Component Diagram helps to model the physical aspect of an Object-Oriented software system. It illustrates the architectures of the software components and the dependencies between them. Those software components including run-time components, executable components also the source code components.

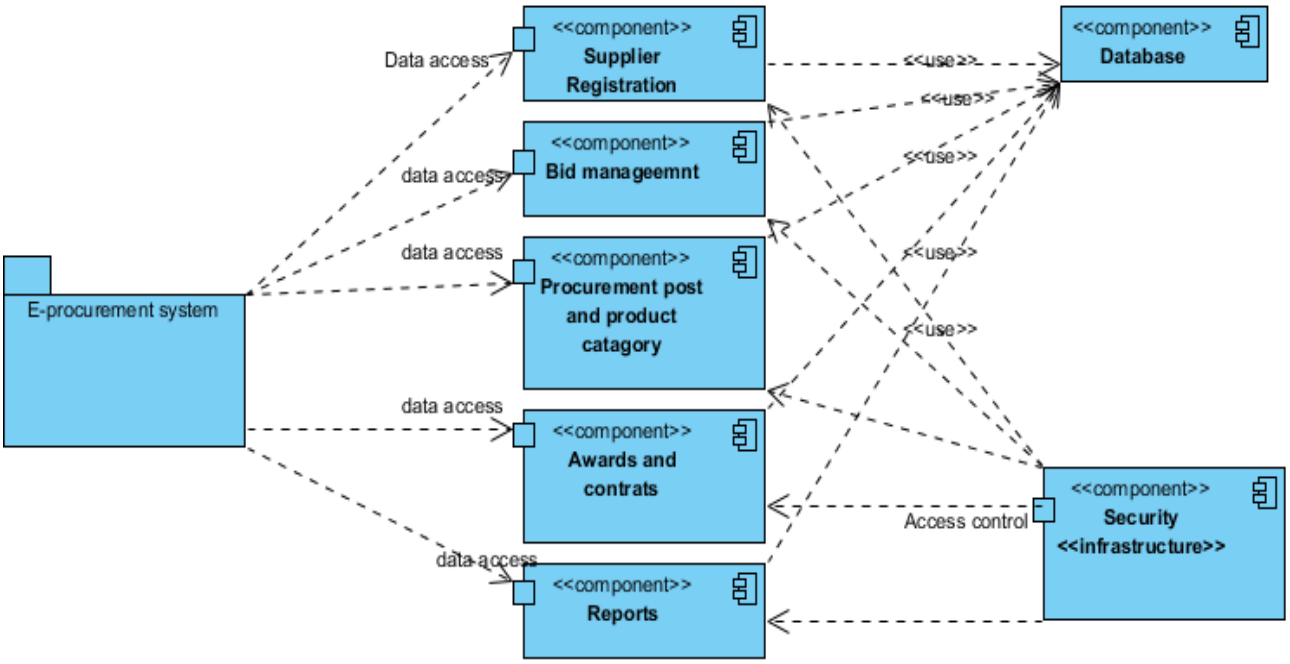


Figure 12. Component Diagram

3.7 Software/Hardware Mapping

The E-procurement system will have three main components: the client, the web server and the database server. The web server will contain all subsystems. The database server will use MySQL database and will handle all persistent data storage. Again, the client will access the Electronic procurement system website through their web browsers (i.e. Mozilla Firefox, Google Chrome, IE browsers). The web server and the database server will be hosted on the same physical machine. However it is possible to place on separate machines as desired.

3.7.1 Deployment Diagram

The Deployment Diagram also helps to model the physical aspect of an Object-Oriented software system. It models the run-time configuration in a static view and visualizes the distribution of components in an application. In most cases, it involves modeling the hardware configurations together with the software components that lived on.

The proposed system is expected to replace the existing manual system by an automated system in all sides. The architecture used for the system is a 3 tier Client/Server Architecture where a client can use Internet browsers to access the online web sites provided by the system within the Wide area network anywhere using the Internet. The data tier maintains the applications data such as Supplier data, Bid data etc. It stores these data in a relational database management system. The middle tier (web/application server) implements the business logic, controller logic and presentation logic to control the interaction between the application's clients and data.

The controller logic processes client requests such as requests to view current bids, to register supplier details or to retrieve data from the database. Business rules enforced by the business logic dictate how clients can and cannot access application data and how applications process data.

The most commonly used web servers are Internet Information Server (IIS) and Apache. The web server we used in this system is Apache. HTTPS is used to transfer data across an Intranet or the Internet. It is the standard protocol for moving data across the internet. The client tier is the applications user interface containing data entry forms and client side applications. It displays data to the user. Users interact directly with the application through user interface. The client tier interacts with the web/application server to make requests and to retrieve data from the database. It then displays to the user the data retrieved from the server.

In such architecture, there are 3 main elements:

- The client tier, that is responsible for the presentation of data, receiving user elements and controlling the user interface.

- The application server tier, that is responsible for the business logic of the system. In fact, business-objects that implement the business rules online here, and are available to the client-tier. This tier protects the data from direct access by the clients. For the project, we used Apache as application server.
- The data server tier, that is responsible for data storage. As data server, we used MySQL, an open-source relational database.

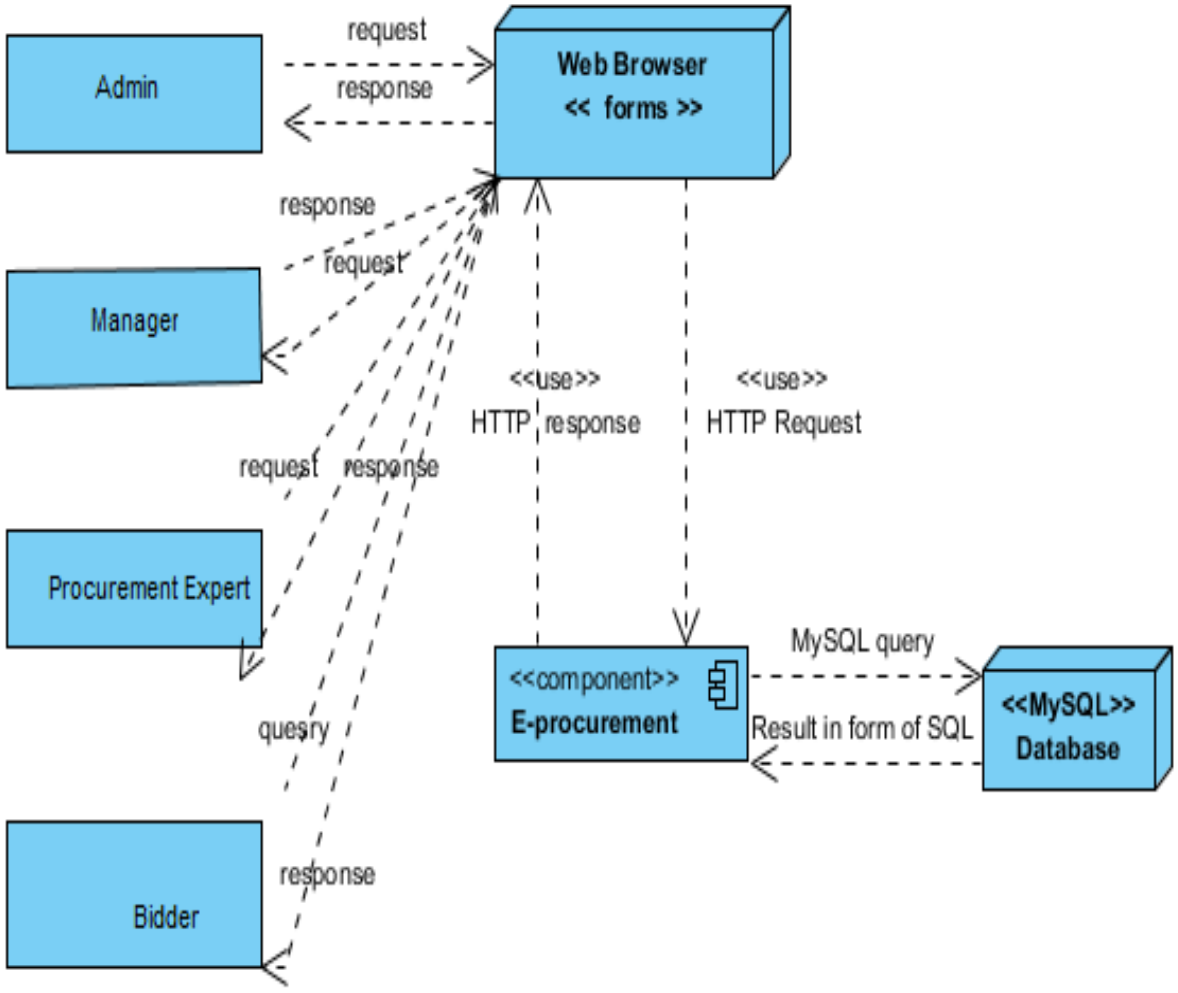


Figure 13. Deployment Diagram

3.8 Persistent Data Management

The system is depend on a relational database to perform day-to-day operations and storing data. Data will be stored in a MySQL, DBMS and manipulated through the Database Subsystem, which will ensure integrity and consistency of the data. It allows the database to be easily integrated with and accessed by the rest of the system. The database will retain customer information (Employee and Bidders, winners, email, phone, and address and soon), Awards and contracts, and procure organization information, Helps, and Procurement's detail. Whenever possible, the data itself will be used as a primary key – in the case of the Supplier's information table, the account would be unique to each user. An individual could not have more than one account.

Each of the data items will be in a separate table. Database Subsystem will contain all necessary SQL queries that will be accessible by the rest of the Subsystems. The Database will be hosted on Database Server and will be accessible 24/7 via local or public network.

The overall objective in the development of database technology has been to treat data as an organizational resource and as an integrated whole. DBMS allow data to be protected and organized separately from other resources. Database is an integrated collection of data. The most significant form of data as seen by the programmers is data as stored on the direct access storage devices. This is the difference between logical and physical data.

Database files are the key source of information into the system. It is the process of designing database files, which are the key source of information to the system. The files should be properly designed and planned for collection, accumulation, editing and retrieving the required information.

The tables for E-Procurement system.

User Information: table stores the user details of those who register at system (Procurement Expert, Manager, Suppliers, and Admin)

Table 14.User Information

Field	**Type**	**Constraints**
User Id	Number	Primary key
Login Name	Varchar	
Pass word	Varchar	
First Name	String	
Last Name	Varchar	
Role(Level of)	Text	
Birth Date	Date Time	
Address(Phone)	Alphanumeric	
Email	Varchar	

Category Table: types of procurement (Product/service category name and Description)

Table 15. Product/service category name and Description

Field	**Type**	**Constraints**
Lot Num	Text	Primary Key
Cat. Name	Text	
ProdCat.Desc.	Text	

Products Table: Stores details of Products

Field	Type	**Constraints**
Prod ID	Number	Primary Key
Product Name	Varchar	Not Null

Product Details	Text	
Image	Varchar	
User ID	Number	Foreign Key
Open Date	Date Time	
End Date	Date Time	
Last Bid Value	Money	
Cat ID	Number	Foreign Key
Date Created	Date Time	
Status	String	

Bidder Table: Stores bidder transaction

Field	**Type**	**Constraints**
Trans ID	Number	Primary Key
User ID	Number	Foreign Key
Prod ID	Number	Foreign Key
Total Bid amount	Money	
Date Created	Date Time	

Closed Bid: stores the Closed Bid details

Field	**Type**	**Constraints**
Closed Bid ID	Number	Primary Key
Prod ID	Number	Foreign Key
Final Amount	Money	
Closed Date	Date Time	
Seller Notify	String	

Feedback details: feedbacks about procurements

Attributes	Datatype	Size
Feed-id	int	
Name	Varchar	
Emailed	Varchar	
Subject	Varchar	
Feedback	String	
Create date	date time	

3.9 Access control and security

Access Control

The access control to each of the database is all controlled by the Application subsystem (business tier). This subsystem will be responsible for determining user's privilege and granting them the access to create, view, update or delete operation on the database.

Security

- Authentication mechanism**:** Identifying and authenticating the user using user name, password

Database Security: Varying level of access control will be provided to different users of the system to maintain the database security. Access control will be differentiated based on the access privilege provided to each user as stated below. Besides this security majors the system is users divided in to 4 Roles each having different permission level.

E-procurement project covers security issue including posting auctions, announce the winner by using email notification, checking customer, and tenderer bank account in the administrative permission.

Administrators

The administrator can access the entire module as needed including managing users. This the super user capable of maintain the system this user have the ability of performing any operation on the database server (except editing supplier financial proposal total amount of money).

- modifying
- posting
- approve request
- approve registration
- session managing as administrative permission

Bidders

- check awards
- Uploads documents
- Upload, reserve auction money (CPO)
- see auctions and apply to auctions
- register and get account from administrator

Manager

- register and get account
- return CPO to winners/losers
- explain questioned information

Procurement Expert

- experts have the privilege of managing procurement detail of suppliers and winners
- download bidders document
- modify procurement documents
- control over all activates regarding to transaction activity

3.10 Global Software Control

As a dynamic website, when a user is presented with a web page they will have the option of clicking on a number of links. When a link is clicked, a function in the system management subsystem will be invoked. Functions in a subsystem may call other functions within that same subsystem or they may communicate with other system using the interface provided in those subsystems

3.11 Boundary conditions

Startup**:** open browser

- Type URL on the address bar
- Click Login

Shut Down:

- Click Logout and
- Close browser

Error Conditions and notifications:

Logging in:

- Either username or password or both field are blank.
- Password and username don't match.
- Username is wrong or does not exist.
- Username not found on this user level.

User settings

- User is unable to change certain settings or changes don't reflect.

Supplier Registration

- You have empty fields

- ❖ You have entered invalid input
- ❖ You are already registered
- ❖ Username is taken by other user
- ❖ The email is already exist

3.12 Subsystem architectures

User Registration Module - Those who wish to take part in bidding or sell products at the site have to register at the site as seller or suppliers. Only authenticated users can take part in selling or in bidding. The system automatically rejects un-authenticated users who try to bid or sell at the site.

Products Module - This module is for presenting items for bidding. Only those who have registered and authenticated as sellers can place their articles for bidding. The Module collects information like Product Name, Product Details, Open Date, Closing Date etc. The system automatically inputs the closing date.

Bidding Module - The module is for bidding on any selected item. The bidder has to authenticate before participating in bidding. The system places the record in the bid history against the bidder account.

Notice Module - This page is an interface for seller. Suppliers can see the profile of the bidding history of items which are still open on which he/she has already bided, winners, bidder results and award and contract Documents.

Feedback and Help - The purpose of the page is to send messages/comments to the web administrator or Managers. And also this page is meant for first time users of the site. The page provided answers to questions which are common and frequently asked.

CHAPTER - 4

4. System Implementation and Testing

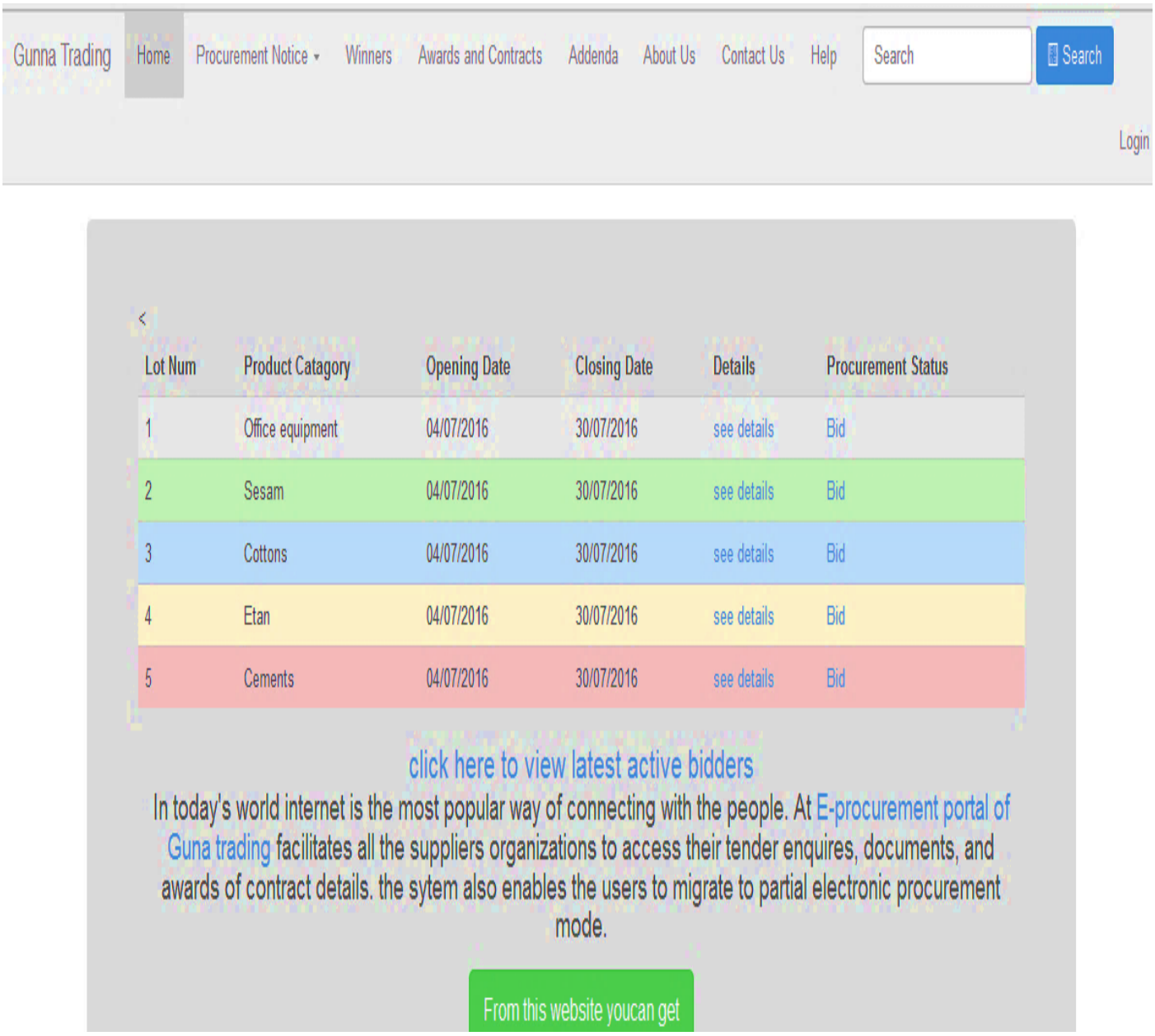
4.1 Introduction

Implementation includes all those activities that take place to convert from the old system to the new. The old system consists of manual operations, which is operated in a very different manner from the proposed new system. A proper implementation is essential to provide a reliable system to meet the requirements of the organizations. An improper installation may affect the success of the computerized system.

4.2 Objective of Implementation

The objective or goal of the implementation phase is to construct (describe) all what have been designed in the previous development phase (i.e. Design phase). Specifically, it is to implement the system by PHP and MySQL. The system contains many pages and user interfaces. These pages are combined in one server to be a system as a whole. Generally, the objective of this phase is to demonstrate how the system or website works.

We have include some User interface and sample codes



And some sample codes below

```
<!DOCTYPE html>
<html lang="en">
```

```
    <head>
    <meta charset="utf-8">
    <title>Gunna Trading e-Procurement</title>
    <link rel="stylesheet" type="text/css" href="bootstrap/css/bootstrap.min.css">
    <link rel="stylesheet" type="text/css" href="bootstrap/css/bootstrap-theme.min.css">
    <script type="text/javascript" src="https://code.jquery.com/jquery-1.11.2.min.js"></script>
    <script type="text/javascript" src="bootstrap/js/bootstrap.min.js"></script>
    </head>
    <body>
   <?php
include "header.php";
?>
    <div class="container">
                    <div class="jumbotron">
<div>
                    </div>
                    <div>
                      <?php
include "table.php";
?>
   </div>
<h3   align="center" > <a href="#">click here to view latest active bidders</a>
          <p>In today's world internet is the most popular way of connecting with the people. At
<a href="#" target="_blank">E-procurement portal of Guna trading</a> facilitates all the
```

suppliers organizations to access their tender enquires, documents, and awards of contract details. the sytem also enables the users to migrate to partial electronic procurement mode.

<a href="#" target="_blank" class="btn btn-success btn-lg">From this website youcan get</a>

View a list of tenders /contracts/quotaions.

View information on contracts that have been already awarded.

<h2>About Us</h2>

Guna trading house plc

<a href="#" target="_blank" class="btn btn-success">see More »</a>

<h2>Branch</h2>

Mekelle branch

Addis ababa

<a href="#" target="_blank" class="btn btn-success">see More »</a>

<h2>Services</h2>

export

Import <a href="#" target="_blank" class="btn btn-success">see More »</a>   <hr>

```
        <footer>
            <p>&copy; Copyright 2016 Guna trading house plc</p>
        </footer>
    </div>  </div>  </div>   </body>
</html>
```

4.3 Constraint of Implementation

The main constraint in implementation is language limitation. It is embedded with English language and does not entertain local language. The system supports doesn't support Amharic/Tigrigna Languages.

The main constraints listed as follows, it may be threat for future:

- Requirements aren't clearly defined
- Requirements need to change for business reasons.
- My fancy content management system/e-commerce site got hacked

4.4 Error Handling

Errors could happen in two ways. One is, if a user tries to proceed without providing required information. For instance leaving input fields empty and try to continue. Or errors also occur when a user tries to insert invalid data into the database. For example if a user tries to insert numerical values to a text box which accepts only letters like name field, it will also create an error. Any system to be a good system it should handle errors and exceptions carefully. As a result to handle the different errors in our system we used different mechanisms like popping up message boxes which tells a user made an error and an error provider(placeholder) which appears just inside the text box in which the error is committed so that the user will easily correct the error.

Table 16. Errors and systems respond

No.	Unexpected Input	System Response
1.	Try to insert empty record (Form Validation)	When click on submit it says this field is required if the field is empty
2.	Try to insert characters or text instead of numbers(Form Validation)	When click on save submit it notify to input numbers only
3.	Try to login to the system with wrong username and password	Invalid password and username please try again!

4.5 Testing

Software testing is a process of verifying and validating that a software application or program meets the business and technical requirements that guided its design and development, and works as expected. Software testing has three main purposes: verification, validation, and defect finding.

- The verification process confirms that the software meets its technical specifications. A specification is a description of a function in terms of a measurable output value given a specific input value under specific preconditions.
- Validation is the process of evaluating a system or component during or at the end of the development process to determine whether it satisfies specified requirements.
- A defect is a variance between the expected and actual result. The defect's ultimate source may be traced to a fault introduced in the specification, design, or development (coding) phases.

System testing is a critical aspect of Software Quality Assurance and represents the ultimate review of specification, design and coding. Testing is a process of executing a program with the intent of finding an error. A good test is one that has a probability of finding an as yet undiscovered error. The purpose of testing is to identify and correct bugs in the developed

system. Nothing is complete without testing. Testing is the vital to the success of the system. In the code testing the logic of the developed system is tested. For this every module of the program is executed to find an error. To perform specification test, the examination of the specifications stating what the program should do and how it should perform under various conditions.

There are two basic techniques of software testing: black box testing and white box testing.

Black box testing (also called functional testing) is testing that ignores the internal mechanism of a system or component and focuses solely on the outputs generated in response to selected inputs and execution conditions. White box testing (also called structural testing and glass box testing) is testing that takes into account the internal mechanism of a system or component. Testing involves the following checks

- Validation
  - ✓ Validate the HTML
  - ✓ Validate the CSS
  - ✓ Check for broken links
- Flexibility
  - ✓ Try varying window sizes
  - ✓ Try varying font sizes
- Speed
  - ✓ Access the site via a **CABLE**
  - ✓ Check image size specifications
- Test for accessibility
- Browser independence
  - ✓ Try different browsers
  - ✓ Check printed pages
  - ✓ Switch JavaScript off
  - ✓ Switch plug-ins off
  - ✓ Switch images off
- Other checks
  - ✓ Check no orphan pages

- ✓ Check sensible page titles

And also we have included major cases as test cases in table below

TEST CASES

Table 17. Test cases

No.	Test cases	Case Type	Expected Result	Actual Result	Pass/Fail
1.	Log in	Enter correct username and Password	The system can redirect the page	The system display page	Pass
		Wrong User name or Password	System throws an error and prevent from login	System display Message like "wrong username or password"	Fail
2.	Registration	Required field validation	Mandatory fields shouldn't be blank	You have enter values in mandatory fields	Pass
		Required Field Validation	Mandatory Fields blank	You have blank enter some Value into mandatory fields	Fail

4.5.1 Unit testing

Unit testing focuses verification effort on the smallest unit of software design; the software component or module. Using the component level design description as a guide, important control paths are tested to uncover errors within the boundary of the module. The unit test focuses on the internal processing logic and data structures within the boundaries of the component. During the programming stages each and every form, modules and class treated unit has been put into the test data. Every module is tested independently. The steps are follows.

Manually code is tested like spelling checks, logics and errors. Once the manual checking is over the complication has been done. Syntactical errors if any have to be corrected. After the clean completion the program, some dummy data, as specification, has been used for testing of the module to see if it works as specified.

We implemented the proposed system by putting all the necessary information from the design phase. We organized all the functionalities of the system in a way that can be changed into a fragment of code for each pages (e.g. login page, Post procurement, Registration pages)

4.5.2 Integration Testing

As the name suggests, in integration testing the idea is to test how parts of the system work together; the integration of the parts. Integration tests are similar to unit tests, but there's one big difference: while unit tests are isolated from other components, integration tests are not. For example, a unit test for database access code would not talk to a real database, but an integration test would.

E-procurement sub systems need to have tests to verify that each separate sub systems; like winner's page and tender results page. As a result when validating integration test results, could validate a database related test by querying the database to check the database state is correct.

4.5.3 Functional Testing

Functional testing is defined as the testing of complete functionality of some application. In practice with web apps, this means using some tool to automate a browser, which is then used to click around on the pages to test the application.

We use a unit test to test an individual function and an integration test to check that two parts of the play nice. Functional tests are on a whole another level. While we can have lots of unit tests, we usually want to have only a small amount of functional tests. This is mainly because functional tests can be difficult to write and maintain due to their very high complexity. They also run very slowly, because they simulate real user interaction on a web page, so even page load times become a factor.

4.6 Conclusion

E-Procurement System can improve the procurement process significantly. It can help in terms of having an easy access on data, easy storage of data and in the evaluation process in the procuring unit of the Guna trading. The project improves the quality of existing operations in Procurement system in Trading House. It is considered to be successful with the objectives met and with the new system working as it should be.

Electronic Procurement, as one of the ICT initiative, is perceived to be an alternative that leads to better and more effective public procurement management by overcoming many traditional paper-based problems. E-Procurement process brings essential benefits for both the Trading House and the Suppliers. It provides an open purchasing environment that facilitates interoperability between them in order to conduct public procurement activities.

4.7 Recommendations for Future Work

One of the recommendations for the future work is to improve E-procurement according to the recommendations given by the examiners, the presentation.

The future enhancements that can be done are to solve these limitations:

- Edit bid facility could be added in the bidding module.
- Bidding Payment, Tender Fees, integrate with bank
- Procurement request from different department
- Amharic language support
- E-signature for CPO approval
- Send contract documents to individual supplier when they wins
- System should analysis technical and financial documents based on criteria given
- Mobile SMS Alert to Client regarding Tenders could be provided

4.8 Acronym and abbreviation, definition

- e- Procurement is an important aspect of Programmatic buying, which is getting more and more popular in Display (related) advertising. Another major part of online advertising is Sponsored search
- Bid: refers to offer from a bidder
- Bidder: means any potential participant or participant in public procurement proceedings.
- Contract: means the agreement between the procuring entity and the successful bidder.
- Goods: means objects of every kind and description including raw materials, products, equipment's.
- Procuring Entity: means National Government authority, Local Government authority, Suppliers, public institution, commission, Government Projector any specialized institution engaged in procurement process and entering in contract with successful bidder.
- Public Procurement: refer to the supplies or goods, work, services they may be needed by a procuring entity.
- Tender Committee: means a committee established by the procuring entity to assist the Procurement Unit, in the bid opening, evaluation and recommended for award of procurement contracts.
- Tendering Document: means the document containing information required for the preparation of bids, the award process and tender execution
- Services: refers to any services other than consultant services.
- Successful bidder: means a bidder whose offer has been accepted after being considered the most competitive both technically and financially.
- Works: means all activities related to the realization of building or engineering works upon the request by the clients

4.9 References

1. **HTTP://EPROCURE.GOV.IN**
2. **HTTP://WWW.HABESHATENDER.COM/TENDERLISTS.PHP**
3. **a web-based public procurement system, Hamide Karahan Turan april 2004**
4. Agile Modelling Website www.agilemodeling.com
5. https://www.shopify.co.uk/tour/ecommerce-website
6. http://creately.com/Draw-UML-and-Class-Diagrams-Online, Online UML tool
7. http://contsem.unizar.es/def/sector-publico/pproc.html Public Procurement Ontology