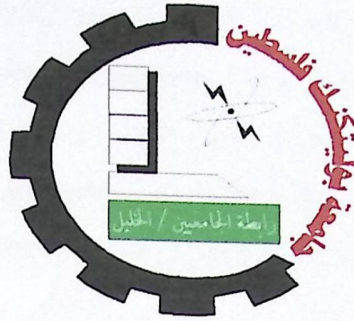بسم الله الرحمن الرحيم

Palestine Polytechnic University
Collage of Administrative Sciences and Informatics
Department of Information Technology

Computer Center Warehouse Management
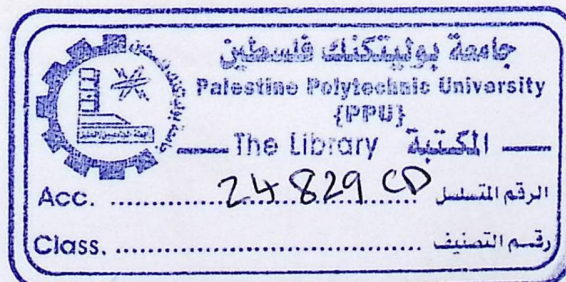**System**
(WMS)

Project team
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Supervisor
Eng.Hani Salah

Abstract

With the rapid overlapping of information technology in many life aspects (personal, educational, health, governmental, sports, etc), it was normal that a technological academic organization as Palestine Polytechnic University to automate and computerize its different systems. Although the university has already automated a lot of its previous systems such as E-learning, E-registration, E-library, but there still some systems that are working with traditional paper-based method, and one of those systems is the warehouse computer center system.

The computer center is responsible for purchasing, installing, maintaining, storing, and distributing all physical hardware and software equipments and networking devices and other related equipments and their distribution at various university buildings and colleges.

The staff of the center currently follow-up to the entry, exit, storage, maintenance, warranty period of all these equipments, and transfer from a staff member to another staff member, as well as the transition between the different buildings and inventory, and follow-up warranty matters with the companies through the traditional manual system which suffers from many problems which include: inaccuracies and many potential errors as well as the difficulty of obtaining information about one of the equipment.

This project aims to build a modern electronic system to automate all manual processes that currently performed at PPU computer center warehouse. The system will depend on web technology to enable the staff concerned with the system to access it from anywhere and at anytime. The system will help in the archival of all existing equipments in the store and those distributed in the laboratories, offices and various university facilities, as well as issuing various reports in an easily accessible manner through a simple interface .The system also allows browsing equipment specification via mobile phones.

The system will be integrated with the existing PPU systems and that requires the use of technology that compatible with other systems, where the technologies will be used are PHP, and MySQL.

الملخص

مع التداخل المتسارع لتكنولوجيا المعلومات في كافة مناحي الحياة   (الشخصية ، التعليمية ، الصحية ، الحكومية ، الرياضية ، ...) كان من الطبيعي أن تبادر مؤسسة أكاديمية تكنولوجية كجامعة بوليتكنك فلسطين إلى أتمتة وحوسبة أنظمتها المختلفة . ورغم قيام الجامعة بأ تمتة العديد من أنظمتها السابقة ، ما زالت بعض الأنظمة تعمل بالأسلوب التقليدي الورقي ، وأحد هذه الأنظمة هو نظام مستودع مركز الحاسوب .

ان مركز الحاسوب هو المسؤول عن شراء، وتركيب ، وصيانة ، وتخزين ، وتوزيع جميع المعدات الفيزيائية (hardware) والبرمجية (software) ومعدات وأجهزة الشبكات ، والمعدات ذات العلاقة والموزعة في جميع مباني وكليات الجامعة المختلفة .

يقوم موظفو المركز حاليا بمتابعة دخول وخروج وتخزين وصيانة وكفالة جميع هذه المعدات ونقلها من عهدة موظف إلى موظف آخر ، وكذلك انتقالها بين المباني المختلفة وحصرها ، ومتابعة أمور الكفالة مع الشركات من خلال نظام تقليدي يدوي يعاني العديد من المشاكل التي من أهمها : عدم الدقة والأخطاء الكثيرة المحتملة وكذلك صعوبة الحصول على معلومة حول أحد المعدات .

يهدف هذا المشروع إلى بناء نظام الكتروني حديث لأتمتة كل العمليات اليدوية التي تجري حاليا في مستودع المركز . سيعتمد النظام على تكنولوجيا الويب لتمكين الموظفين المعنيين للنظام من الوصول إليه من أي مكان وفي أي وقت حيث سيساعد في أرشفة جميع المعدات الموجودة في المخزن وتلك الموزعة في مختبرات ومكاتب ومرافق الجامعة المختلفة ، وكذلك إصدار تقارير متنوعة يتم الوصول إليها بكل سهولة من خلال واجهة بسيطة . وربط النظام بتقنية ال Mobile application.

سيتم دمج النظام مع الأنظمة الموجودة حاليا ويتطلب ذلك استخدام تكنولوجيا تتوافق مع الأنظمة الأخرى حيث سيتم استخدام تكنولوجيا PHP, MySQL .

Dedication

To the candle which lighted and guided us through darkness and frustrating moments;

To our parents …

To all our brothers and sisters …

To all of our friends …

To our teachers who supported us…

To all those who care about us…

To who granted us the tenderness and taught us the patience….

To all of these persons we would like to dedicate this project…

Acknowledgment

We would like to take this opportunity express our thanks to the College of

Administrative Sciences and Informatics

The team members advance deep thanks to their dear supervisor

Eng. Hani Salah

who has granted them support orientation, guidance, help and advice.

The team advances deep thanks to the web programmer

Mahdi Attawneh

The team advances deep thanks to the computer center in our university,

for their support and assistance…

Then our thanks and gratitude to everyone who contributed to the success of the project

from near or far and we don't forget our dear teachers, lecturers, friends…

We can only say for their gratitude..

Thank you…

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Chapter One
Introduction

❖ **Overview**

❖ **Problem statement**

❖ **Project goals**

❖ **Methodology**

❖ **Expected results**

❖ **Benefits**

1.1 Overview

Warehouse can be defined as a facility that provides a suitable environment for storing goods and materials, and it should be designed to accommodate the loads of the materials to be stored, and to receive, send, distribute the associated handling equipments.

In Palestine Polytechnic University, the computer center warehouse currently uses a traditional (manual / paper-based) to handle all the warehouse operations.

This project aims at building a modular web-based warehouse system, using technologies such as PHP, MySql, mobile, barcode reader, and using standard software such as Adobe Flex.

1.2 Problem statement

The traditional (paper-based) method in managing the computer center warehouse has several problems such as: loosing of equipments and information, duplication of information, errors in writing the specifications of the equipments, errors in determining the precise location of the equipments, as well as errors in determining the warranty period. Furthermore, the traditional system is slow, not accurate, and needs huge paper work.

To overcome the previous problems, we will implement a computerized system, which aims at transforming the traditional method to a web-based system that helps users to store, view the equipments and their specifications, and follow-up where they are, using barcode, web and mobile application technologies.

1.3 Project goals

The project aims at achieving the following goals

1. To create an electronic system that manages Computer Center Warehouse accurately and easily, and controls the entry and exit of devices and equipments.
2. To query on the specification of equipments and devices using the barcode reader, and localize the current place of tools, and their warranty period.
3. To create reports of stock and tools which are still guaranteed, the specification of stored materials, other information about the suppliers, and create reports to view the custody for each category.

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4. To track the events that happen to the stored tools and equipments which include entry, exit, and destruction operations.

5. The design of the system should be modular enough, so that new features can be added without making any basic change in the system.

6. Linking the system with a mobile application through which the user can read the barcode of the equipments, by installing this application on the mobile that is connected to the system database of server .This application interpret the barcode number using special mobile phones that read it and view the specifications of the equipment on mobile screen .

1.4 Methodology

The project team will follow the traditional method of software engineering, which called System Development Life Cycle (SDLC), in the analysis, and development of the system. We have started by collecting data about the system, by interviewing computer center staff, who has a direct link to this system, and taking all information about the system, analyzing this information, and using it to build the system. The technologies used in creating this system include: PHP, MySQL, Mobile application and Adobe Flex Builder3.

1.5 Benefits

The main benefits of the system are the following:

1. Increasing the productivity by reducing the overall searching time, and facilitates use of information. As a result, the new system will increase the efficiency and reduce redundant data handling.

2. The system design will be integrated with other existing systems at PPU.

3. Improve line level of accuracy.

4. The system allows the users to access meaningful information at anytime from anywhere depending on user request.

5. Making the Warehouse management system easier and more professional.

Chapter Two

System requirements

- ❖ **Introduction**
- ❖ **System requirements**
- ❖ **Constraints and limitations**
- ❖ **Risks and solutions**
- ❖ **Feasibility study**
- ❖ **Selecting the best choice**
- ❖ **Time schedule**

2.1 Introduction

This chapter presents the functional and non-functional requirements of the system, the risks that may face the system, and the proposed solution of these risks. It then shows the feasibility study of the system, and the time schedule.

2.2 System requirements

This section lists both functional and non-functional requirements of the system.

2.2.1 Functional requirements

The functional requirements of the system are classified based on the request of the computer center to the four main user types which namely are: administrator, power user, view user, and main user.

2.2.1.1 Administrator functions

1. Data entry

The Administrator enters all information about incoming and leaving equipments from warehouse computer center which includes specification, warranty period, suppliers, quantity, barcode number, and the custody of equipment.

2. Browsing equipments information

The administrator can search and view all information about incoming and leaving equipments from warehouse computer center by using the category type.

3. View reports

The administrator views various reports about equipments which include equipments with valid warranty, equipments that exceeded the warranty period, stored equipments, destructive and distributed equipments, quantity of categories, suppliers of categories. The administrator also can view three custody reports about the equipments , he can view the equipments that have been delivered, view the custody in a given period, and view custody for each employee who were handed over tools.

4. Querying on the specification of equipments

The administrator can query on the equipments, localize their location, and other information by using barcode number either on PC or mobile .

5. Updating user accounts

The administrator can update users accounts through creating new accounts, deleting existing accounts, and editing account information such as role, campus, and department.

2.2.1.2 Power user functions

The power user can do the whole functions of the administrator (which is listed in Section 2.2.1.1) expect updating the user accounts function.

2.2.1.3 View user functions

The view user can only browse equipments, query on equipments and view reports about the equipments.

2.2.1.4 Main user functions

The main user who is responsible for the main warehouse at PPU University can only view three custody reports about the equipments that have been delivered ,custody in a given period, and identify who were handed over tools.

Note:

Every user can update his profile by changing password and email.

Table (2.1) below summarizes user types, and the privileges of each type.

Table (2.1): Users and their privileges

privilege / users	Administrator	Power user	View user	Main user
Data entry	√	√	X	X
Browsing	√	√	√	X
View reports	√	√	√	X
Querying	√	√	√	X
Updating account	√	X	X	X
View custody reports	√	√	√	√

2.2.2 Non-functional requirements

1. Usability

The system should provide friendly interface to make it efficient, and easy to use.

2. Integrity

The system should be integrated with existing systems in Palestine Polytechnic University, and connect the database of the system with the database of the university systems.

3. Performance

The system should be fast, which means the users can retrieve information quickly, because the access of the system most of the time is from the university which provides a fast connection.

4. Security

The system should be protected from possible threats and attacks, This can be achieved using md5 encryption, using complex passwords, authentication, authorization, give every user a specific privilege. The system also will benefit from the existing security infrastructure of PPU network and web services.

5. Modularity:

The system should be modular which means it can be easily expanded and modified in the future without changing its core.

2.3 Constraints and limitations

The main constrains that must be taken into account by the project team during the development of the system include:

1. Working within the deterministic budget.
2. The system should be delivered within the specified period.
3. The system is customized to the computer center warehouse only.

2.4 Risks and solutions

During the different phases of this project, there are a number of possible risks that may face the system:

1. The emergence of new requirements during, or after completion the development of the system.

   - This problem can be solved by specifying the system requirements accurately.

2. The system may be exposed to the physical and programmatically problems.

   - To resolve this problem, different backup copies should be made periodically.

3. The system may be damaged by hacking or by any other threats.

   - To resolve this problem the system design should be secure.

2.5 Feasibility study

2.5.1 Alternatives

There are different alternatives to implement the tasks of warehouse management system. These alternatives could be summarized as follow.

1. **Desktop application**

Desktop application can be defined as: "a self contained program that performs a defined set of tasks under the user control". [1]

- **Advantages:**

  - Do not require a network or internet connection.
  - High security.
  - Low cost.
  - It is fast.

- **Disadvantages:**

  - Need to be individually installed on each computer.
  - Machine independent, every change has only reflects at the machine level.
  - In some cases need high storage capacity.

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2. Web application

Web application can be defined as: "an application that is provided to the user from a web server through internet". [2]

- Advantages:
  - Easily accessible from any computer or location that has internet access.
  - Requires single installation, all the data is shared in a centralized place.
  - Internet dependent program, any change reflects at everywhere.
  - Platform independent.
  - Do not require any special configuration or installation, a simple web browser is enough.

- Disadvantages:
  - Less secure than desktop application.
  - More expensive (over time) than desktop application.
  - Relies on internet speed to transfer data which makes it slower.

2.5.2 Cost analysis

This section presents the financial study of the system, for all alternatives stated in Section 5.2.1.

1. Development and operational resources (desktop application)

❖ Development costs

The human resources, hardware resources, and software resources that are required during the development stage of the desktop application alternative are detailed below in Table (2.2), Table (2.3), and Table (2.4) respectively.

Table (2.2): Monthly development human resource budget for desktop application

Human resource	Quantity	Monthly cost per developer	Overall cost per month
System developer	3	500 $	1500 $

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Table (2.3): Physical development budget for desktop application [1]

Item	Quantity	Specification	Cost
Compatible PC	1	HP, CORE 2 DUO 2GHz processor. RAM 2 GB, Hard disk drive 250GB, SuperMulti DVD Burner.	500 $
barcode reader	1	INTERFACES RS232, USB. Wedge & Wand READABLE BAR CODES 2/5 family. Code 39 (plus Code 32, Cip 39). EAN/UPC, EAN128, Code 128, Code 93. CODABAR,TELEPEN, PLESSEY. Code 49, Code MSI, Code Delta IBM, Code 11, Code 16K. ISBN/ISSN, ISBT128, RSS variants.	129$
Flash memory	1	4 GB	15 $
		Overall Cost	644 $

Table (2.4) Software development budget for desktop application [2]

Program	Cost
Windows XP professional	113 $
MySQL server	50 $
Adobe Flex Builder 3	245 $
Microsoft Office 2007	290 $
Overall cost	698 $

❖ **Operational costs**

The operational costs of the desktop application include yearly maintenance costs of about 200 $. No special hardware and software are required for the system operation; the users of the system are employees at the university and they can install the application on their computers.

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[1] Source: Al_Manara Company for Computer and Programming, Hebron, (visited: 17 / 02 / 2010)
[2] Source: http://www.amazon.com , (accessed: 17 / 02 / 2010)

2. Development and operational resources (Web application)

❖ Development costs

The development resources of the web application are the same as those of the desktop application as detailed above.

❖ Operational costs

The human resources and hardware resources that are required during the operational stage of the web application alternative are detailed below in Table (2.5), Table (2.6) respectively. The software requirement for this stage is the same as that detailed in Table (2.4).

Table (2.5) Operational human resource budget for web application

Human resource	Quantity	Cost	Overall cost for 1 month
System administrator	1	500$	500$
Overall cost	500$		

Table (2.6): Operational physical budget for web application [3]

Item	Quantity	Specification	Cost
Server	1	Processor: 2x Quad Core Intel Xeon E5504 (2.00GHz, 1333FSB) Memory: 8GB PC2-5300DDR2 Hard Drive: 4x 1466B SAS 15K with integrated RAID5 Optical Drive: 16x DVD+/- RW SATA Networking: Dual Gigabit Ethernet NIC Power: Dual power supply.	0 $

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[3] The cost is set to zero because the system will be installed on a server that already exists; this server belongs to the computer center of PPU.

Barcode reader	1	INTERFACES RS232, USB. Wedge & Wand READABLE BAR CODES 2/5 family. Code 39 (plus Code 32, Cip 39). EAN/UPC, EAN128, Code 128, Code 93. CODABAR,TELEPEN, PLESSEY. Code 49, Code MSI, Code Delta IBM, Code 11, Code 16K. ISBN/ISSN, ISBT128, RSS variants	0$
		Overall Cost	0 $

2.6 Selecting the best choice

The project team has analyzed and studied the possibility of applying web application and desktop application taking into consideration the advantages and disadvantages of both alternatives (which detailed in Section 2.5.1) as well as the costs of both system which also detailed previously in Section 2.5.2. Another studied alternative is to apply a mixed desktop / web application as an attempt to take benefits of both applications and overcome their drawbacks. The problem with this mixed model is the synchronization between web part and desktop part; it is very hard to update the databases of the two parts simultaneously. Nevertheless, there are some solutions for this problem; one possible solution could be achieved using a specific synchronization protocol; however, this solution will not be adopted in this project because of its complexity and the lack of knowledge of project team in this area. In other words, without such synchronization, the system will suffer data inconsistency for all the time intervals when users are disconnected from the web part of the system.

Because the university has several campuses, and in order to facilitate access to the system from any computer or location that has internet access, the web application seems to be the most appropriate for the system.

2.7 Time schedule

To discuss the time schedule of the project, it is best to refer to the Gantt chart shown below in Table (2.7).

Table (2.7): Time tasks schedule

Task number	Task name	Duration(week)
T1	Data collection	2
T2	Planning	1
T3	Analysis	1
T4	Requirements specification	2
T5	Designing	2
T6	Coding	7
T7	Implementation and testing	2
T8	Maintenance	2
T9	Documentation	16

Table (2.8): Gantt chart

Week \ Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T1	■	■														
T2			■													
T3				■												
T4					■	■										
T5						■	■									
T6							■	■	■	■	■	■	■			
T7													■	■		
T8															■	■
T9	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ Expected time .

□ Actual time.

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Chapter Three

System specification

- ❖ **Introduction**
- ❖ **Functional requirements**
- ❖ **Use case diagram**
- ❖ **Class diagram**
- ❖ **Sequence diagrams**
- ❖ **Test plan**

3.1 Introduction

This chapter first presents the specification of functional requirements of the system. It then presents three Unified Markup Language (UML) diagrams; namely: use case diagram, class diagram, and sequence diagrams.

3.2 Functional requirements specification

1. Data entry

Function	Input details about all incoming and leaving equipment from warehouse.
Description	Enable the user to enter and save all information about incoming and leaving equipments from warehouse computer center which include specification, warranty period, sponsors, type, location, barcode number, , price, and buy date.
Input	Equipment details.
Output	Data entry was done successfully.
Requirements	Correct username and password.
Procedures	The user login to the system using correct username and password, then chooses the webpage where he enters the information and save them.

2. Browse equipments information

Function	Browsing information about all incoming and leaving equipments from warehouse.
Description	Enable the user to view and display the information about all incoming and leaving equipments by using the type of them.
Input	Equipment type/ equipment name.
Output	Equipments information.
Requirements	Database tables.
Procedures	The user logins to the system through electronic website and chooses browsing webpage, then enter the type of specific equipment, after that choose browsing this equipment.

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3. View reports

Function	View various reports about equipments.
Description	Enable the user to view and display various reports which include equipments with valid warranty, equipment that exceeded the warranty period, stored equipments, destructive equipments, quantity of categories, suppliers of categories, custody in a given period, general custody report, and custody for each employee
Input	Type of report.
Output	Reports.
Requirements	Database table.
Procedures	The user enters the webpage of reports, and then chooses the topic which the report views, then he choose to display specific report.

4. Query equipments specification

Function	Query on the specification of equipments.
Description	Enable the user to query on equipments by using barcode number and display the specifications of these equipments and localize their current places.
Input	Barcode number.
Output	Specification of equipments.
Requirements	Barcode reader, Database table.
Procedures	The user enters the page of querying, and then enters the barcode number (through the barcode reader of the mobile phone) of specific equipment which needs to know its specification, after that he searches about specifications and display the specifications of the equipment. This function performs either on PC or Mobile.

5. Update user accounts

Function	Update the accounts of users.
Description	Enable the user to update the users accounts through creating new accounts, deleting existing accounts, and editing account information for existing users such as role, campus, and department.
Input	Username.
Output	Updatable user accounts.
Requirements	Username.
Procedures	The user enters the webpage of user accounts, then chooses specific account and updates it.

6. View custody reports

Function	View the custody reports about equipments.
Description	Enable user to view reports about the equipments that have been delivered whether in a given period or in general, and identify who were handed over tools.
Input	
Output	Custody report.
Requirements	Username and password, database table.
Procedures	The user enters the webpage of reports, and then chooses to display the custody report.

3.3 Use case diagram

The use case is the first UML diagram that describes the system as a whole. As can be seen in Figure (3.1), the system has a database and four users; namely: administrator, power user, view user, and main user.
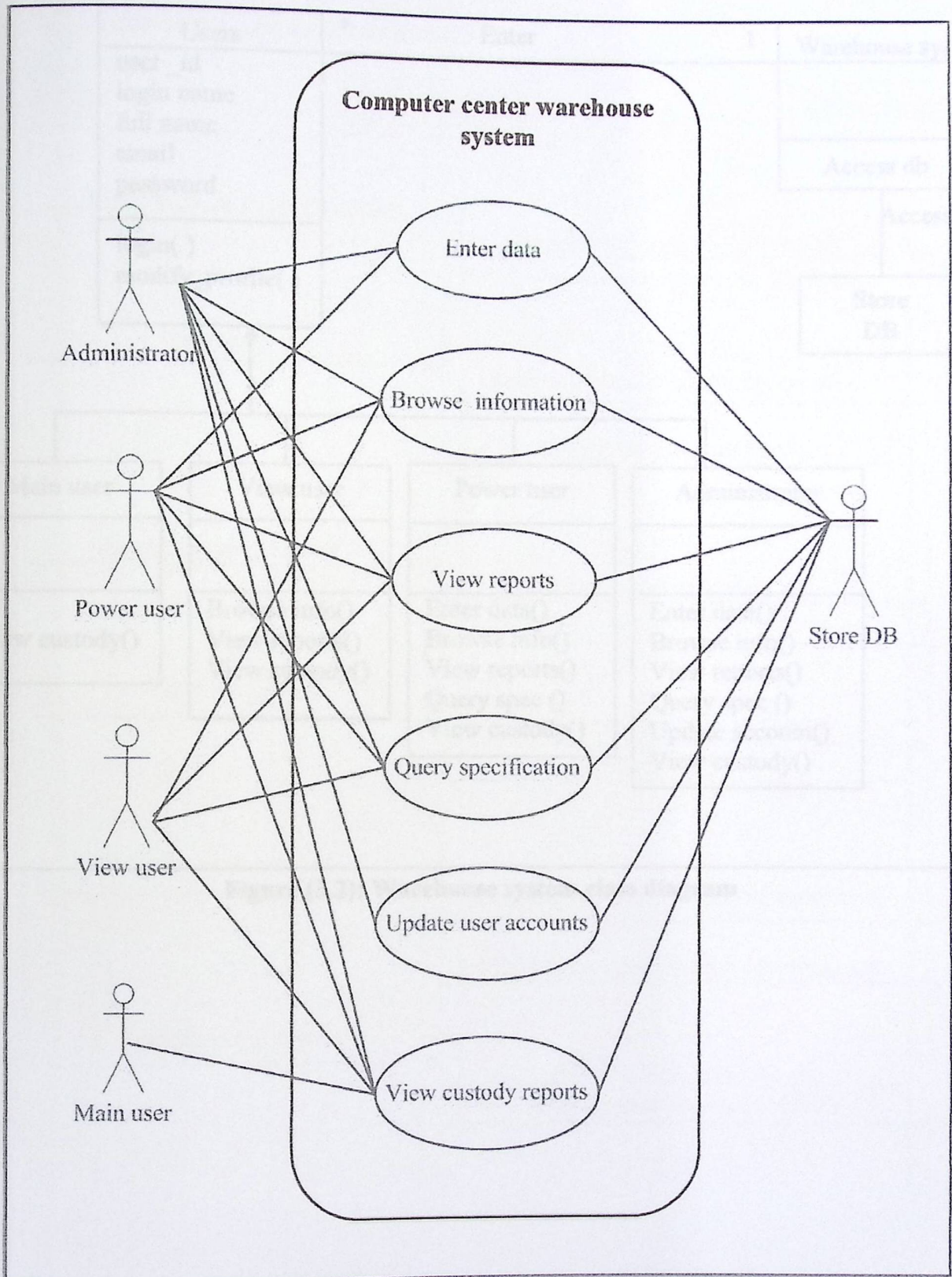
Figure (3.1): Warehouse system use case diagram

3.4 Class diagram

The second UML diagram describes the system classes. As can be seen in Figure (3.2), the system has three main classes which are: users, website, and database.
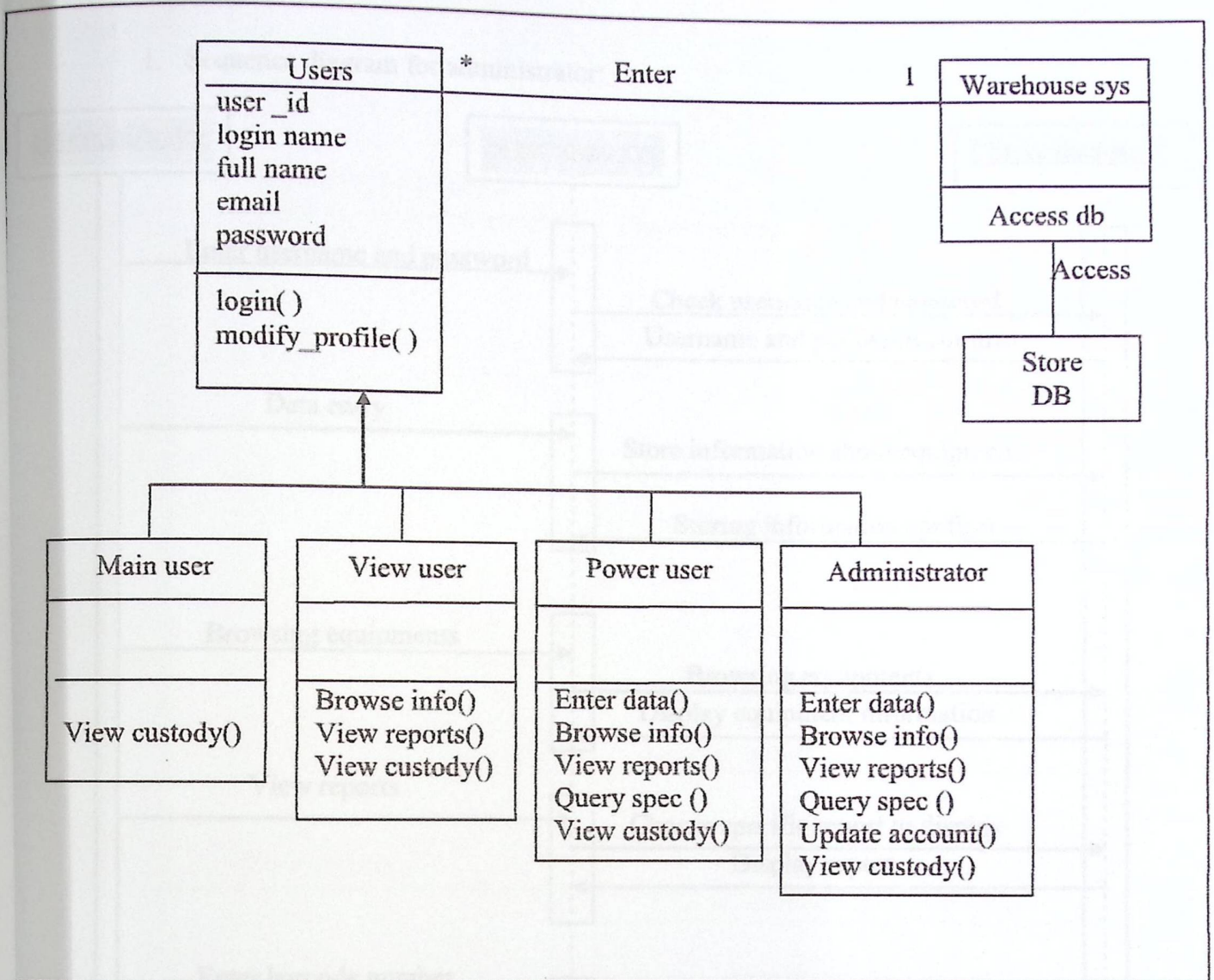
Figure (3.2): Warehouse system class diagram

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3.5 Sequence diagrams

The third UML diagrams that describes the system sequence, there is a sequence diagram for each user of system as can be seen in the figures below.

1. Sequence diagram for administrator:
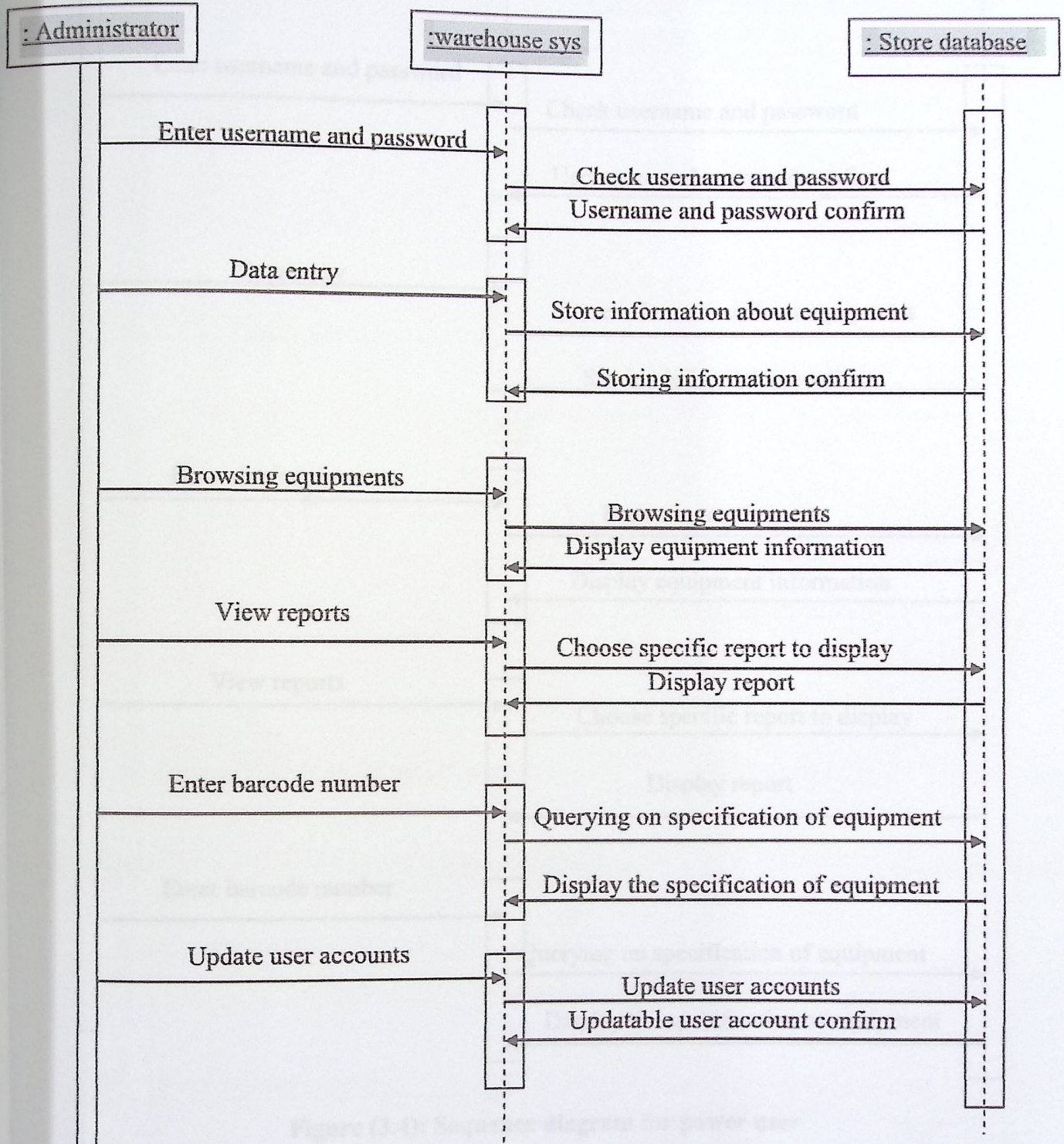
Figure (3.3): Sequence diagram for administrator

2. Sequence diagram for power user:

| : power user | | : warehouse sys | | : Store database |

Enter username and password

Check username and password

Username and password confirm

Data entry

Store information about equipment

Storing information confirm

Browsing equipments

Browsing equipments

Display equipment information

View reports

Choose specific report to display

Display report

Enter barcode number

Querying on specification of equipment

Display the specification of equipment

Figure (3.4): Sequence diagram for power user

3. Sequence diagram for view user:
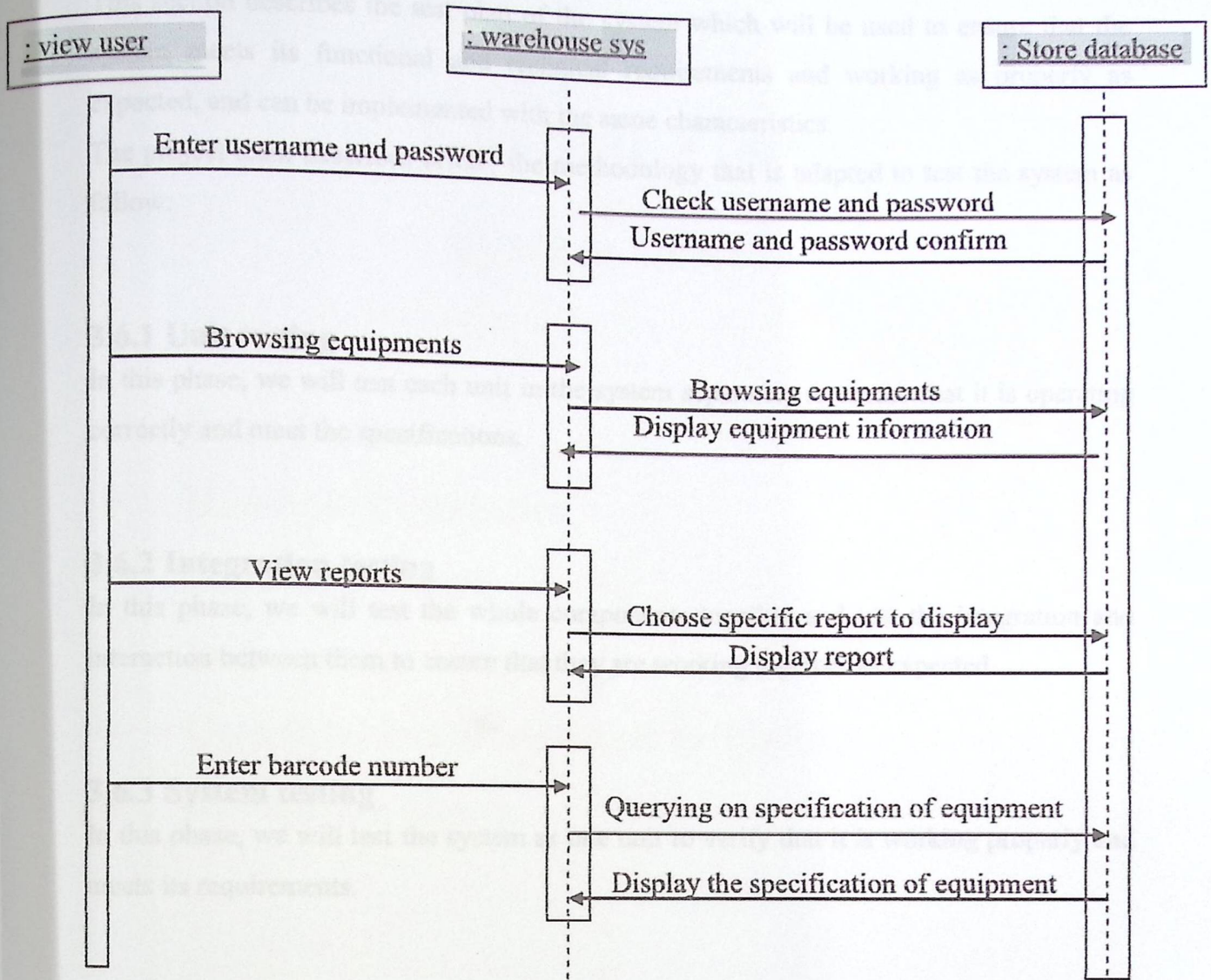
Figure (3.5): Sequence diagram for view user

4. Sequence diagram for main user:
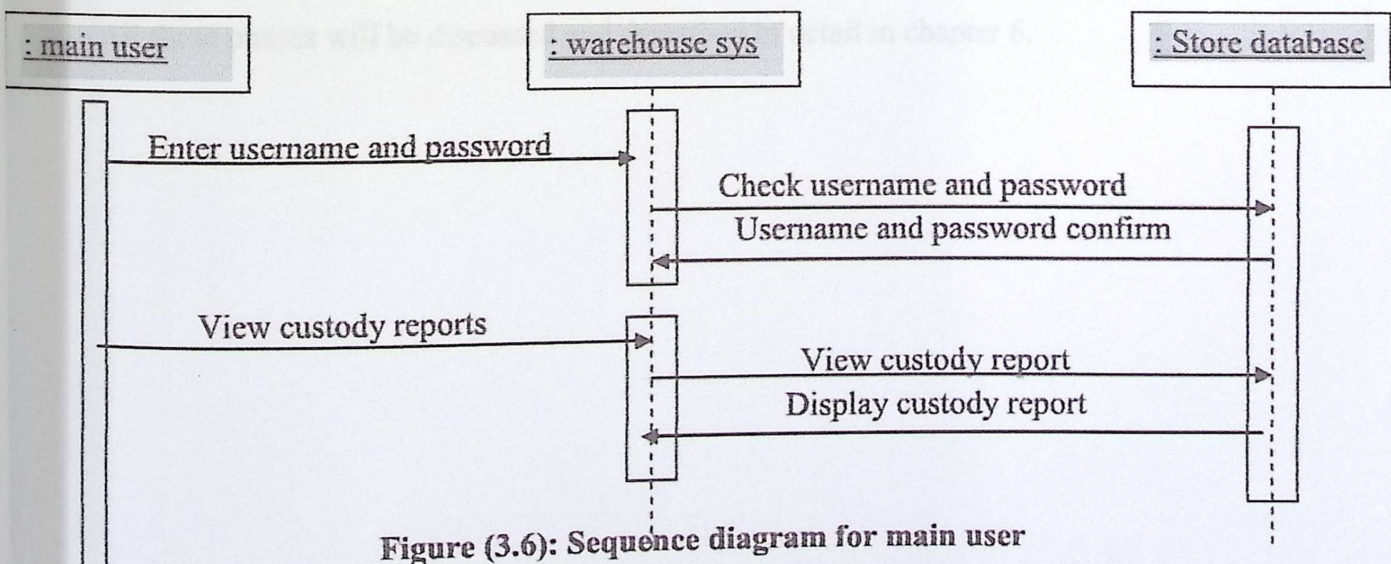
Figure (3.6): Sequence diagram for main user

3.6 Test plan

This section describes the test plan of the system which will be used to ensure that the system meets its functional and technical requirements and working as properly as expected, and can be implemented with the same characteristics.

The project team describes briefly the methodology that is adapted to test the system as follow:

3.6.1 Unit testing

In this phase, we will test each unit in the system separately to ensure that it is operating correctly and meet the specifications.

3.6.2 Integration testing

In this phase, we will test the whole components together and test the integration and interaction between them to ensure that they are working together as expected.

3.6.3 System testing

In this phase, we will test the system as one unit to verify that it is working properly and meets its requirements.

3.6.4 Acceptance testing

In this phase, we will test the user acceptance and satisfaction of the system to verify whether the system meets their requirements.

All these phases will be discussed and described in detail in chapter 6.

Chapter Four

System design

- ❖ **Introduction**
- ❖ **Database description**
- ❖ **Database design**
- ❖ **Database dictionary**
- ❖ **User interface design and validations**
- ❖ **Navigation charts**

4.1 Introduction

This chapter discusses the design of the system and its interfaces, the design of database and its dictionary, and finally describes navigation diagram.

4.2 Database description

The system database contains the whole information that the system needs to accomplish its functions and operations. The database consists of ten tables which are:

o Users

o Suppliers

o All_emp

o Types

o Campus

o Dept

o Guardianship

o Category

o Roles

o Status

4.1.1 Database Design

Figure 4.1 shows the tables of the system database and the relations between them.
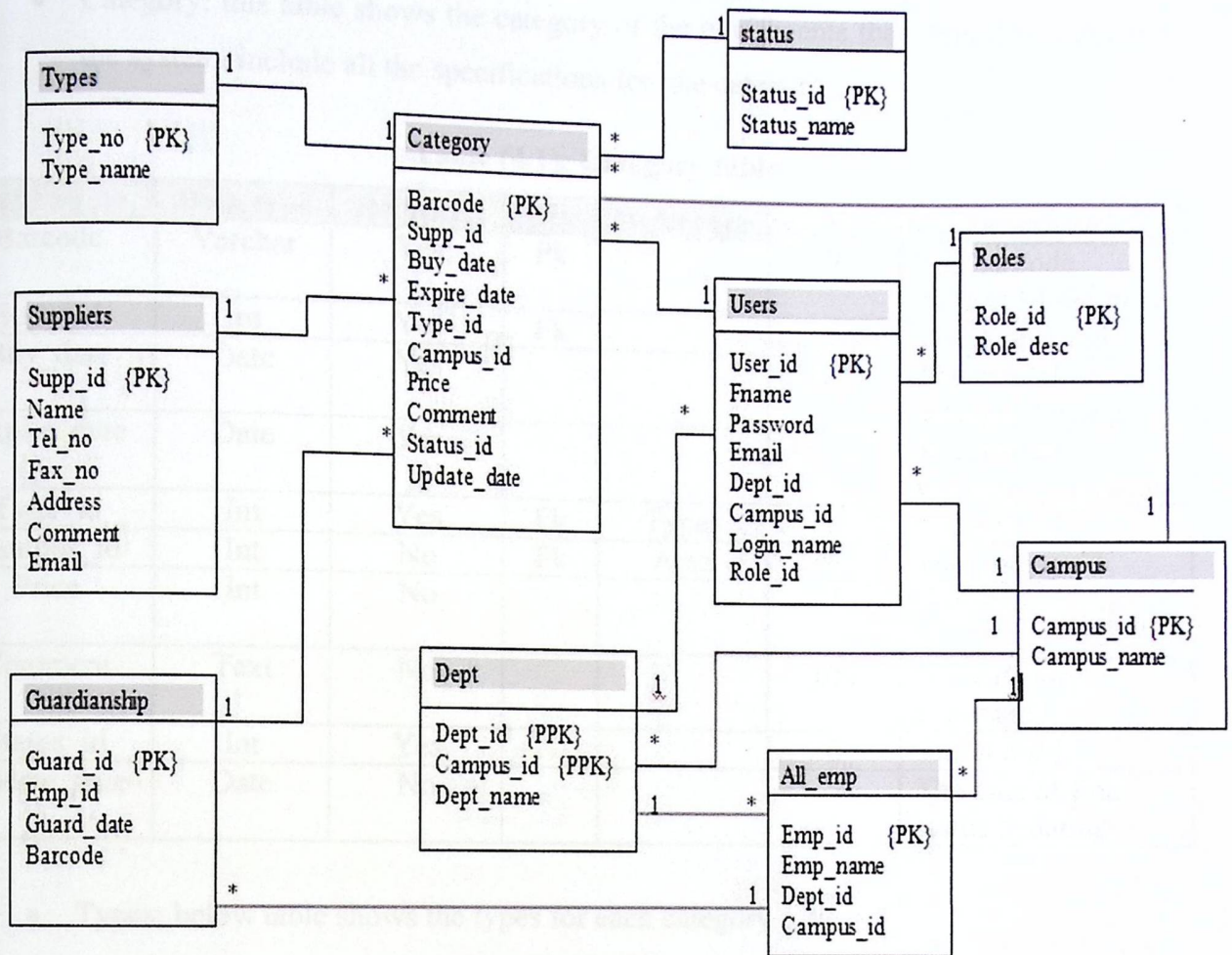
Figure (4.1) Database design

4.2.2 Database dictionary

This is a description of each table and it's fields:

- Category: this table shows the category of the equipments that should be enter to the system, include all the specifications for the category.

Table (4.1): Category table

Field name	Data type	Required	Key	Reference	Length	Description
Barcode	Varchar	Yes	Pk		50	The barcode number of the item
Supp_id	Int	Yes	Fk		6	The supplier id
Buy_date	Date	Yes				The date of category buying
Expire_date	Date	Yes				The date of warranty expiration
Type_id	Int	Yes	Fk	Types	6	The type id
Campus_id	Int	No	Fk	Area	6	The campus id
Price	Int	No			7	The price of the item
Comment	Text	No			100	The category comment
Status_id	Int	Yes			6	The status id
Update_date	Date	No				The date of final status updating

- Types: below table shows the types for each category.

Table (4.2): Types table

Field name	Data type	Required	Key	Reference	Length	Description
Type_no	Int	Yes	Pk		6	The type number
Type_name	Text	Yes			50	The type name

- Suppliers: this table shows the suppliers of the equipments, and important information about them.

Table (4.3): Suppliers table

Field name	Data type	Required	Key	Reference	Length	Description
Supp_id	Int	Yes	Pk		6	The supplier id
Name	Text	Yes			50	The supplier name
Tel_no	Int	No			15	The telephone number
Fax_no	Int	No			15	The fax num
Address	Text	No			50	The address of supplier
Comment	Text	No			100	The comment about supplier
Email	Text	NO			50	Supplier email

- Campus: this table shows the campuses of the university.

Table (4.4): Campus table

Field name	Data type	Required	Key	Reference	Length	Description
Campus_id	Int	Yes	Pk		6	The campus id
Campus_name	Text	Yes			20	The campus name

- Dept: this table shows the departments of each campus.

Table (4.5): Dept table

Field name	Data type	Required	Key	Reference	Length	Description
Dept_id	Int	Yes	PPk		6	The department id
Campus_id	Int	Yes	PPk, Fk	Campus	6	The campus id
Dept_name	Text	Yes			50	The department name

- Users: this table shows the users of the system, include some important information about them.

Table (4.6): Users table

Field name	Data type	Required	Key	Reference	Length	Description
User_id	Int	Yes	Pk		6	The user id
Fname	Text	Yes			20	The full name of the user
Password	Int	Yes			30	The user password
Email	Text	Yes			50	The user email
Dept_id	Int	No	Fk	Dept	6	The department id
Campus_id	Int	No	Fk	Area	6	The campus id
Login_name	Text	Yes			30	The user login name
Role_id	Int	Yes	Fk	Role	6	The role id

- All_emp: this table shows all employees in the university.

Table (4.7): All_emp table

Field name	Data type	Required	Key	Reference	Length	Description
Emp_id	Int	Yes	Pk		6	The employee id
Emp_name	Text	Yes			50	The employee name
Dept_id	Int	No	Fk	Dept	6	The department id
Campus_id	Int	No	Fk	Campus	6	The campus id

- Guardianship : this table shows the custody of each equipment.

Table (4.8): Guardianship table

Field name	Data type	Required	Key	Reference	Length	Description
Guard_id	Int	Yes	Pk		6	The custody id
Emp_id	Int	Yes	Fk	All_emp	6	The employee id
Guard_date	Date	Yes				The date of adding custody
Barcode	Varchar	Yes	Pk		50	The barcode of the item

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- Status: this table shows the status of each equipment which may be stored, distributed or destructive.

Table (4.9): Status table

Field name	Data type	Required	Key	Reference	Length	Description
Status_id	Int	Yes	Pk		6	The status id
Status_name	Text	No			30	The status name

- Role: this table shows the role of each user, which may be admin, power, view, or main user.

Table (4.10): Role table

Field name	Data type	Required	Key	Reference	Length	Description
Role_id	Int	Yes	Pk		6	The role id
Role_desc	Text	No			30	The role name

4.3 User interface design and navigation

This section describes the main user interface screens of the system especially input/output interface.

1. Login screen
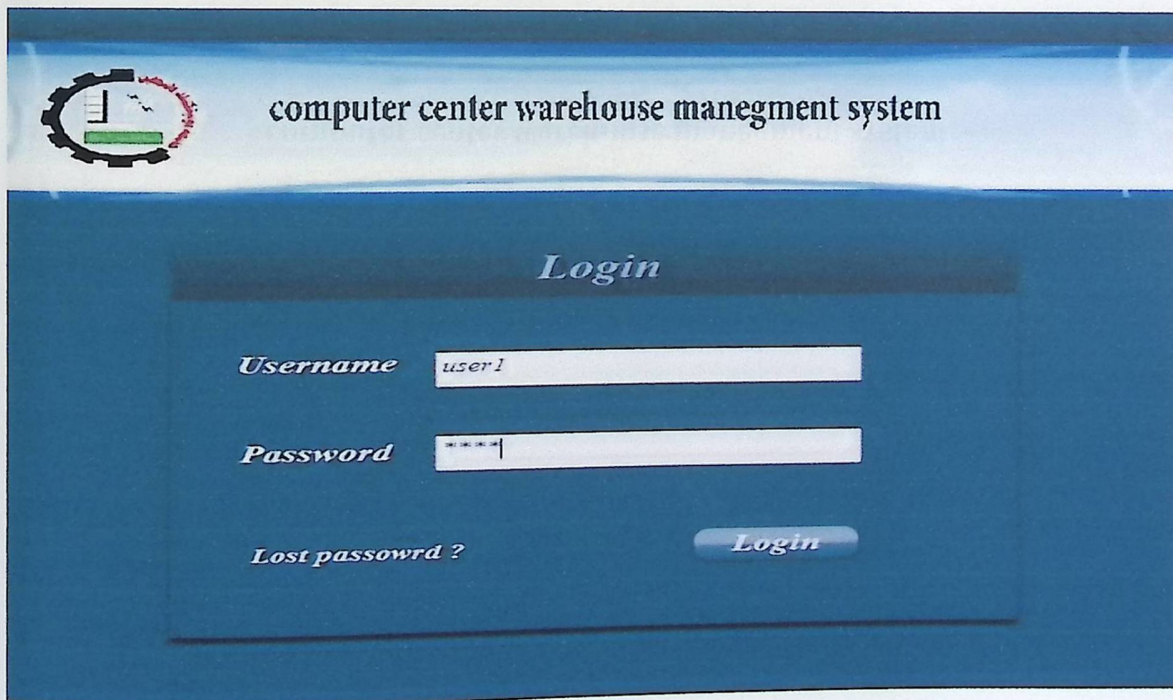
Figure (4.2) Login screen

Table (4.11) description of Login screen

Serial No	Field	Action	Database Table
1	username	Text field to input username	
2	password	Text field to input password	
3	login	Button. When clicked, the system authenticates the user and redirects him/her to the page based on his privileges.	Users
4	Lost password?	Link button that redirects the user to the lost password page.	

2. Administrator screen
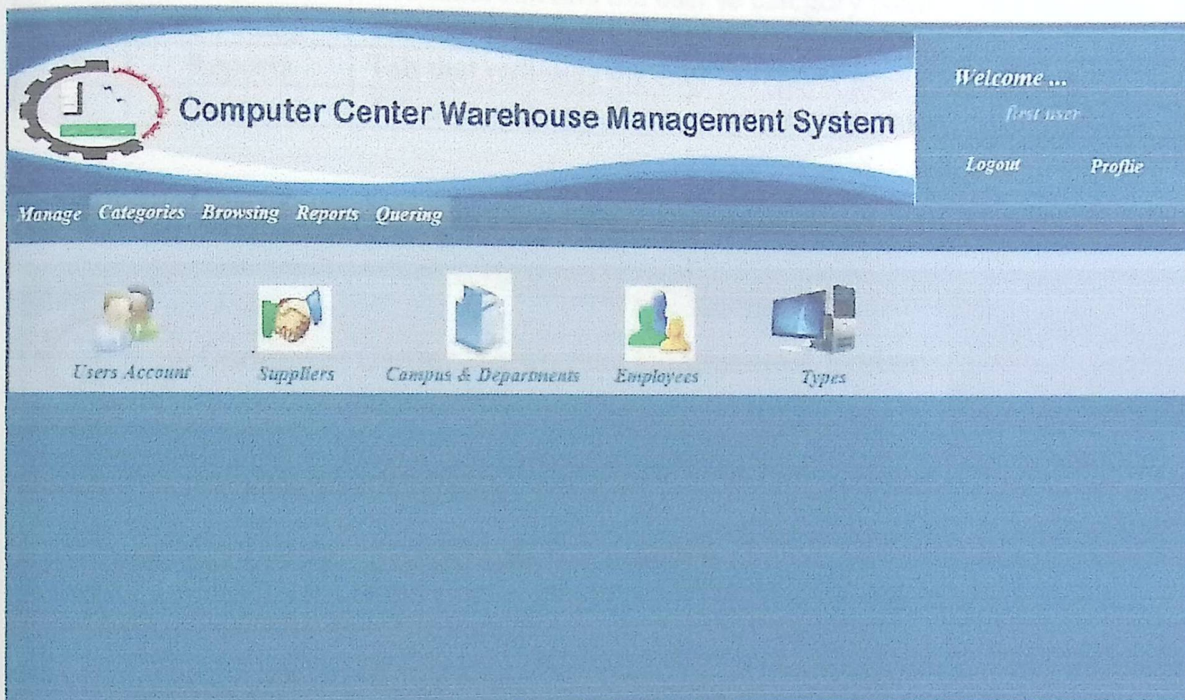
Figure (4.3) Administrator screen

Table (4.12) Description of administrator screen

Serial No	Field	Action	Database table
1	Manage	Tab. When clicked, all fields that are managed by user will display	
2	User Account	Link button that redirects the user to users' page.	
3	Suppliers	Link button that redirects the user to supplier page.	
4	Campus and Departments	Link button that redirects the user to campus and department page.	
5	Employees	Link button that redirects the user to employee page.	
6	Types	Link button that redirects the user to type page.	
7	Categories	Tab that redirects the user to category page.	
8	Browsing	Tab that redirects the user to browsing page.	
9	Reports	Tab that redirects the user to reports page.	
10	Querying	Tab that redirects the user to querying page.	

3. Power user screen

Figure (4.4) Power user screen

Notes:

The power user page looks like the administrator page; it contains all the elements of administrator screen (which described previously) expect the user account function.

Table (4.12) Description of administrator screen

Serial No	Field	Action	Database table
1	Manage	Tab. When clicked, all fields that are managed by user will display	
2	User Account	Link button that redirects the user to users' page.	
3	Suppliers	Link button that redirects the user to supplier page.	
4	Campus and Departments	Link button that redirects the user to campus and department page.	
5	Employees	Link button that redirects the user to employee page.	
6	Types	Link button that redirects the user to type page.	
7	Categories	Tab that redirects the user to category page.	
8	Browsing	Tab that redirects the user to browsing page.	
9	Reports	Tab that redirects the user to reports page.	
10	Querying	Tab that redirects the user to querying page.	

3. Power user screen

Welcome ...

second user

Logout   Proflie

Computer Center Warehouse Management System

Manage   Categories   Browsing   Reports   Quering

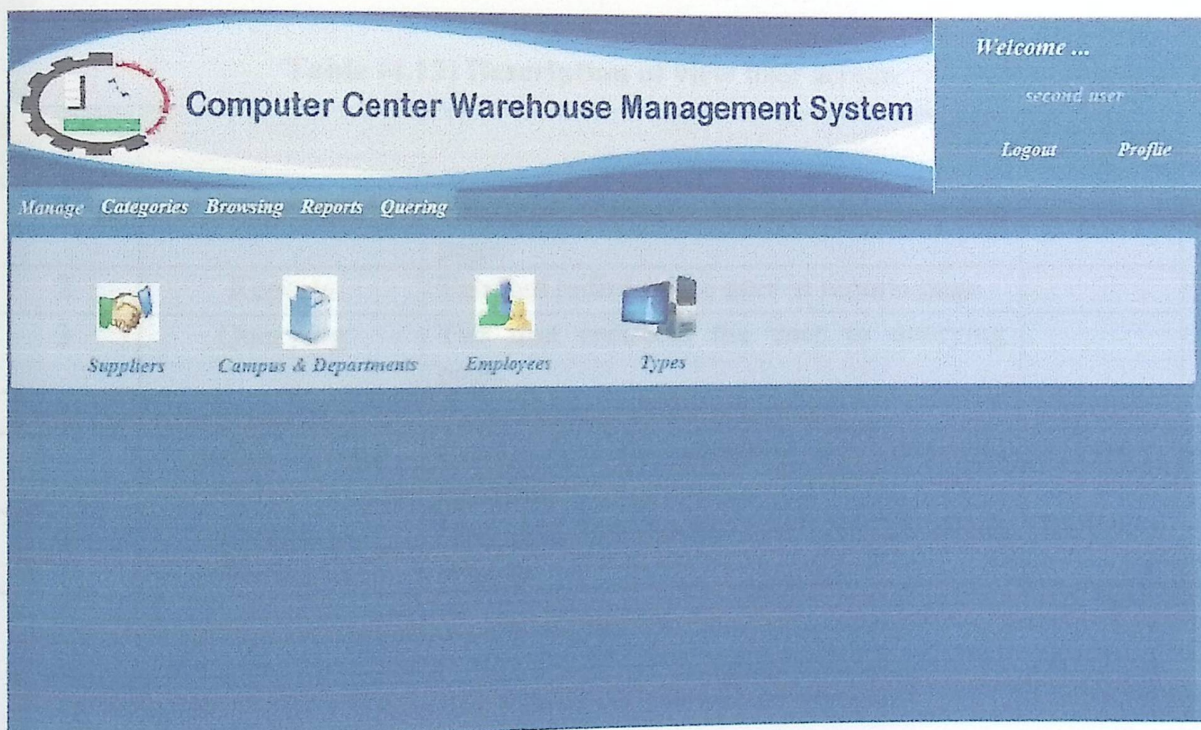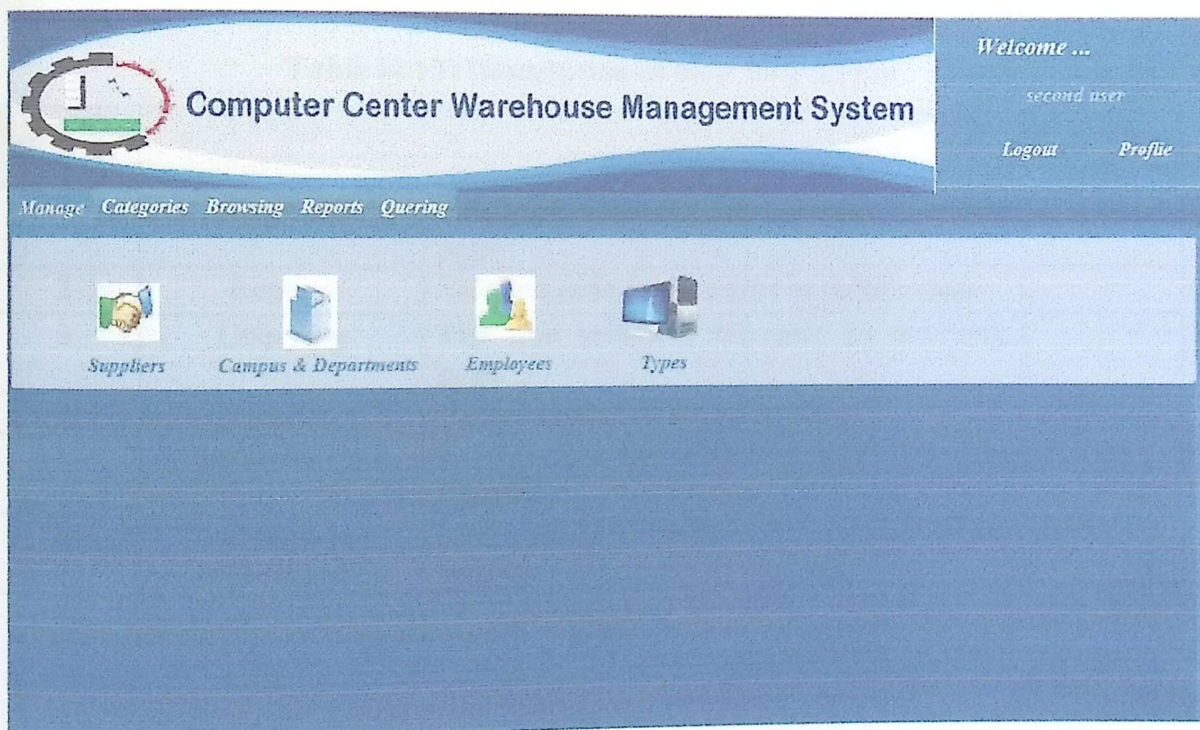Suppliers   Campus & Departments   Employees   Types

Figure (4.4) Power user screen

Notes:

The power user page looks like the administrator page; it contains all the elements of administrator screen (which described previously) expect the user account function.

4. View user screen
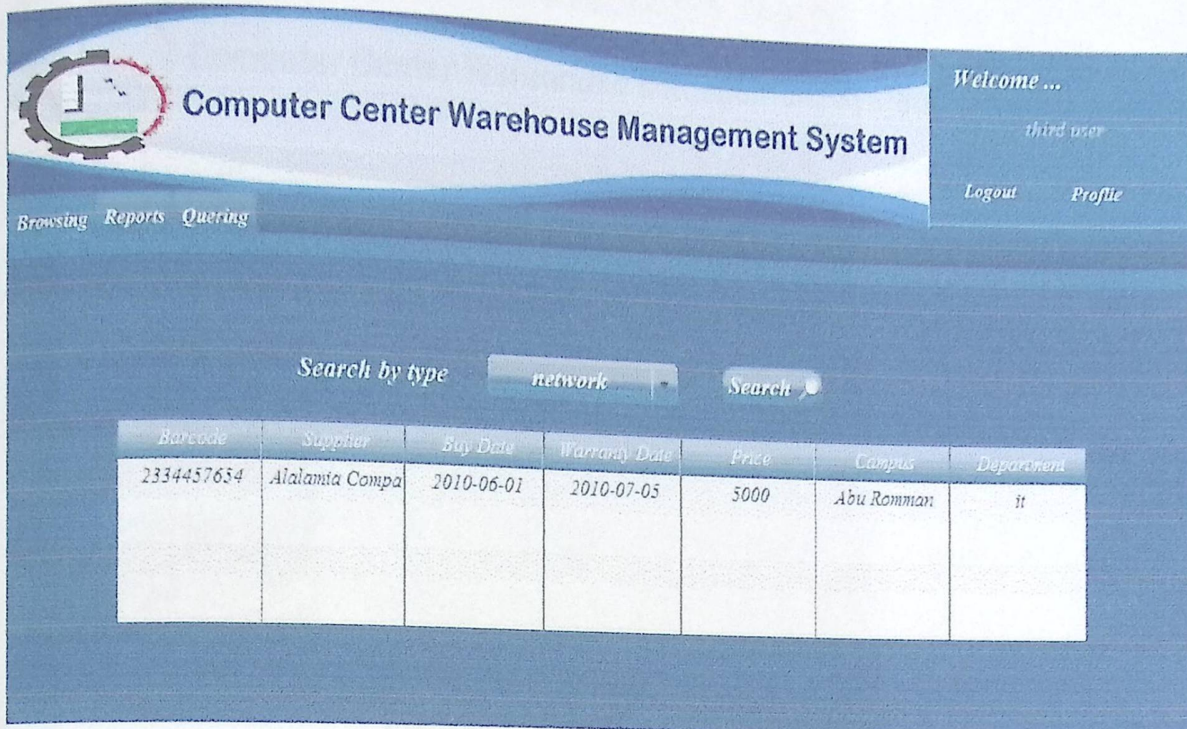
Figure (4.5) View user screen

Table (4.13) Description of view user screen

Serial No	Field	Action	Database table
1	Browsing	Tab that redirects the user to browsing page.	
2	Reports	Tab that redirects the user to reports page.	
3	Querying	Tab that redirects the user to querying page.	
4	Search	Button to search the equipment.	Category
5	Search by type	Combo box for searching the equipment by type	Type
6	Category specification	Data grid that lists the result for the search process	Category

5. Main user screen

Computer Center Warehouse Management System

Welcome ...

fourth user

Logout   Profile

Reports

Custody Report

Custody in a given period

Custody of employee
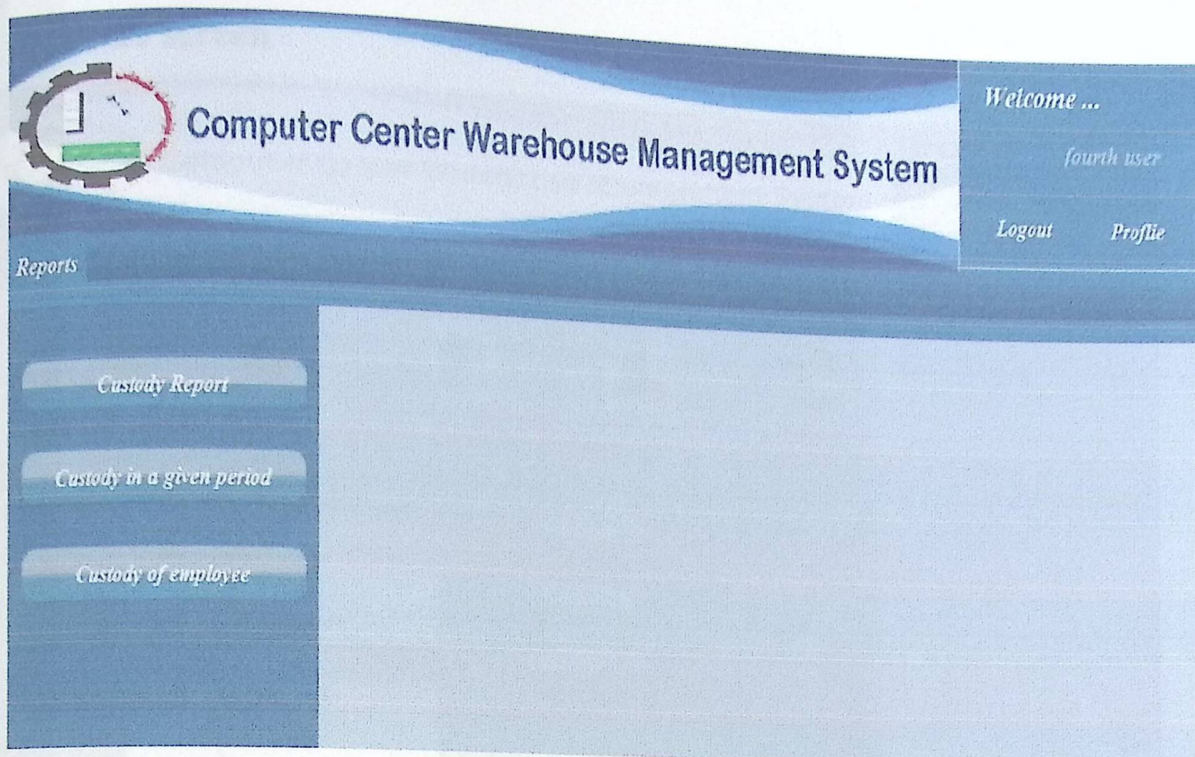
Figure (4.6) Main user screen

Table (4.14) Description of the main user screen

Serial No	Field	Action	Database table
1	Custody report	Button. When clicked, displays the intended report.	Custody
2	Custody in a given period	Button. When clicked, displays the intended report which determine between two dates.	Custody, Category
3	Custody of employee	Button. When clicked, displays the intended report for each employee through searching about him.	Custody, Category, Employee

6. Users screen
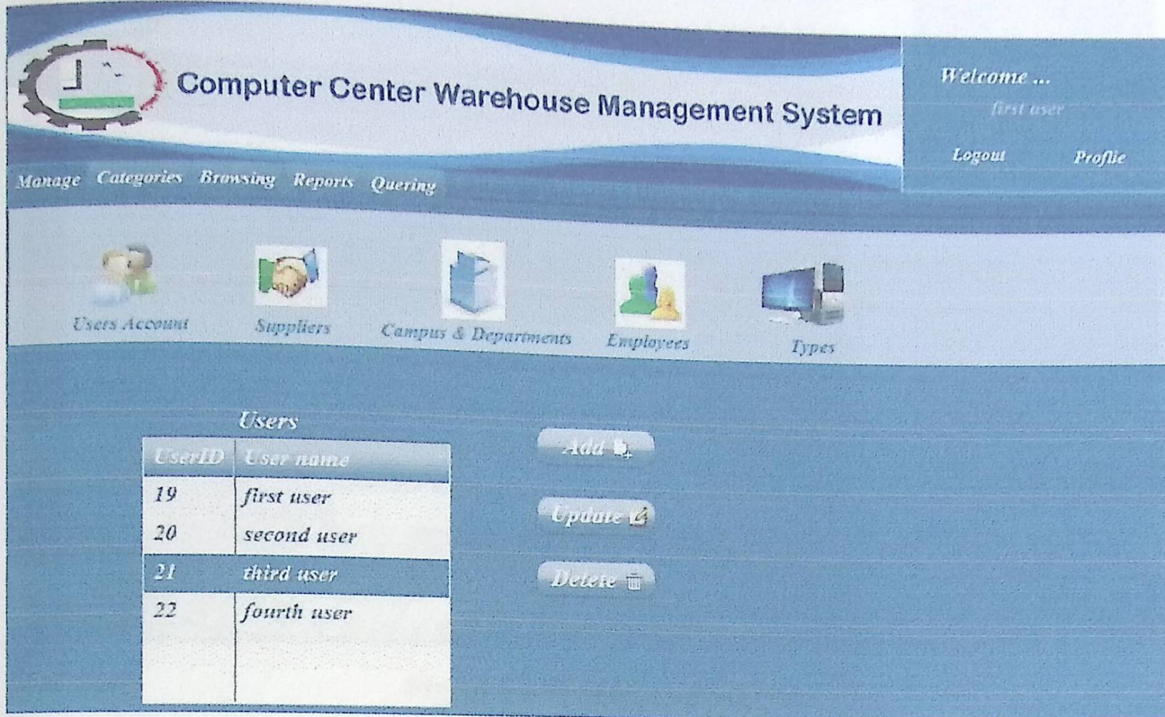
Figure (4.7) Users screen

Table (4.15) Description of Users screen

Serial No	Field	Action	Database table
1	Users	Data grid that display the users of system.	Users
2	Add	Button. When clicked, redirects the user to add user page for adding user.	
3	Update	Button. When clicked, redirects the user to the update user page for updating the selected user.	
4	Delete	Button. When clicked, delete the selected user	User

7. Add user screen

Figure (4.8) Add user screen

Table (4.16) Description of add user screen

Serial No	Field	Action	Database table
1	Login name	Text field to input login name of user.	
2	Full name	Text field to input the full name of user	
3	Password	Text field to input password	
4	Confirm password	Text field to input password for twice time to confirm it.	
5	Email	Text field to input email	
6	Campus	Drop down list to select the campus of university	Area
7	Department	Drop down list that displays the department of university based on the selection of area	Dept
8	Role	Drop down list to select the role of user	Roles
9	Save	Button. When clicked, add new user.	Users
10	Cancel	Button. When clicked, cancel the addition operation and back to the user's page.	

8. Update user screen
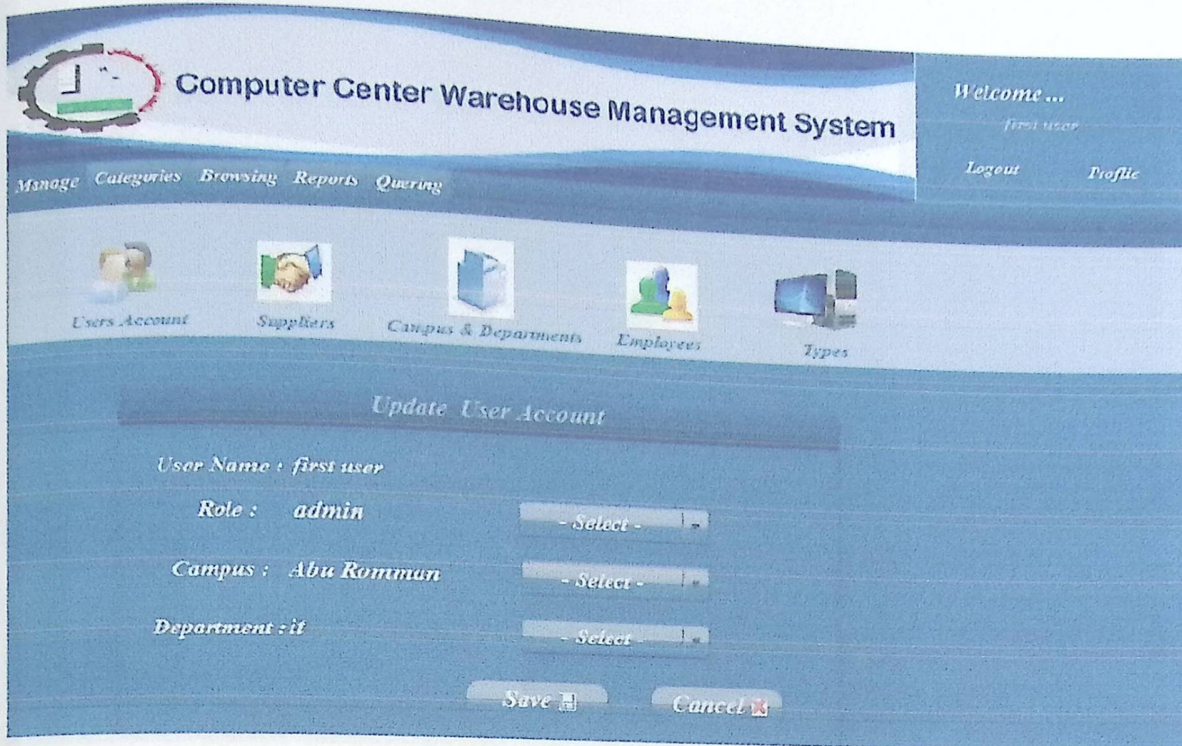
Figure (4.9) Update user screen

Table (4.17) Description of update user screen

Serial No	Field	Action	Database table
1	User name	Label displays the user name was selected	Users
2	Role	Label shows the current role of user	
3	Role	Combo box that displays the role of user	Roles
4	Campus	Label that shows the current campus of user	
5	Campus	Combo box that displays the areas of university	Area
6	Department	Label that displays the current department of user	
7	Department	Combo box that displays the department of university based on the selection of area	Dept
8	Save	Button. When clicked, update the information of user.	Users
9	Cancel	Button. When clicked, cancel the modification operation and back to the user's page.	

9. Suppliers screen
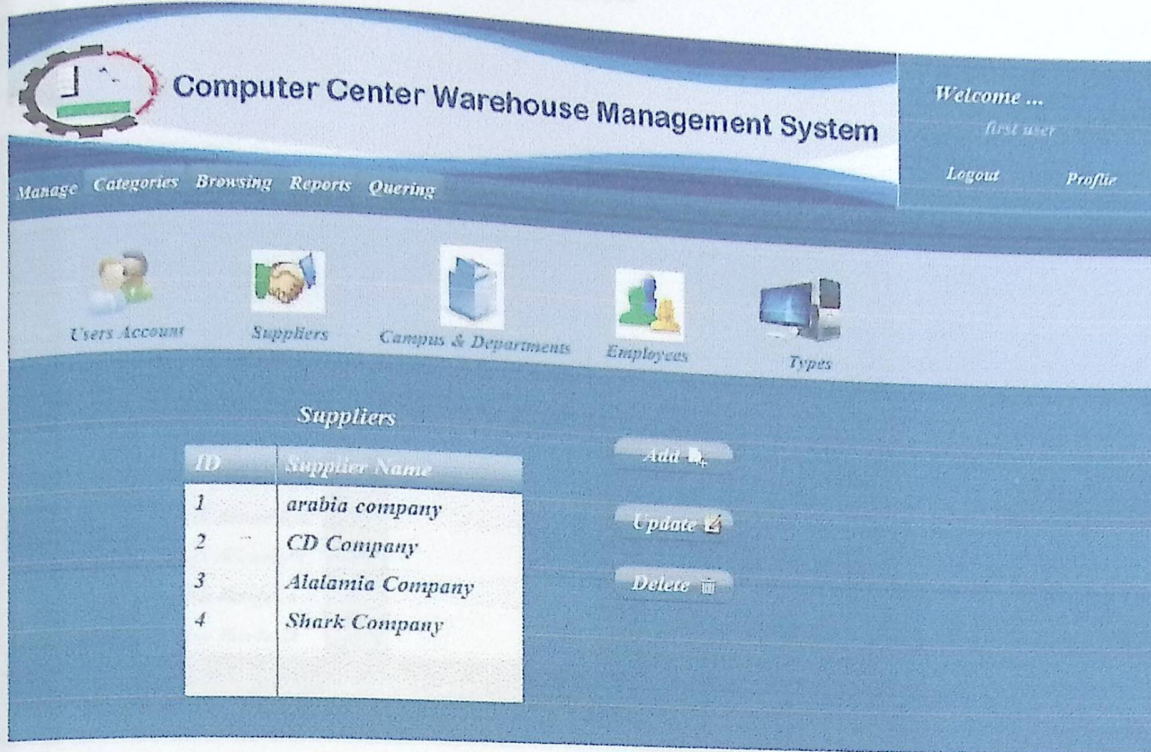
Figure (4.10) Suppliers screen

Table (4.18) Description of Suppliers screen

Serial No	Field	Action	Database table
1	Suppliers	Data grid that display the suppliers of system.	Suppliers
2	Add	Button. When clicked, redirects the user to add supplier page to add new supplier	
3	Update	Button. When clicked, redirects the user to update supplier page to update the selected supplier.	
4	Delete	Button. When clicked, that deletes a supplier.	Supplier

10. Campus and departments screen
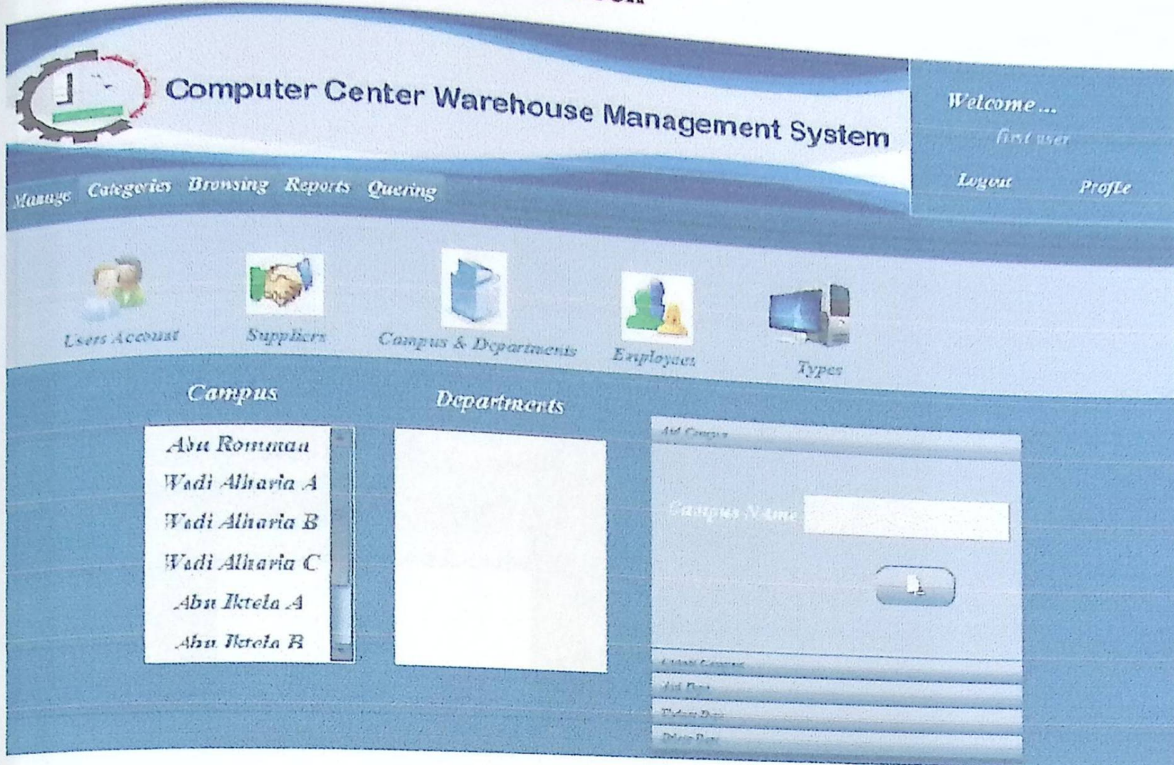
Figure (4.11) Campuses screen

Table (4.19) Description of Campuses screen

Serial No	Field	Action	Database table
1	Campus	List that displays the names of campuses.	Area
2	Department	List that displays the names of department for a selected campus	Dept
3	Add campus	Accordion tab When clicked, displays the canvas of add new campus.	
4	Campus name	Text field to input the name of campus	
5	Add	Button. When clicked, that adds a new campus.	Area
6	Update campus	Accordion tab. When clicked, redirects the user to update campus.	
7	Add dept	Accordion tab. When clicked, redirects the user to add dept.	
8	Update dept	Accordion tab. When clicked, redirects the user to update dept.	
9	Delete dept	Accordion tab. When clicked, redirects the user to delete dept.	

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11. Employees screen
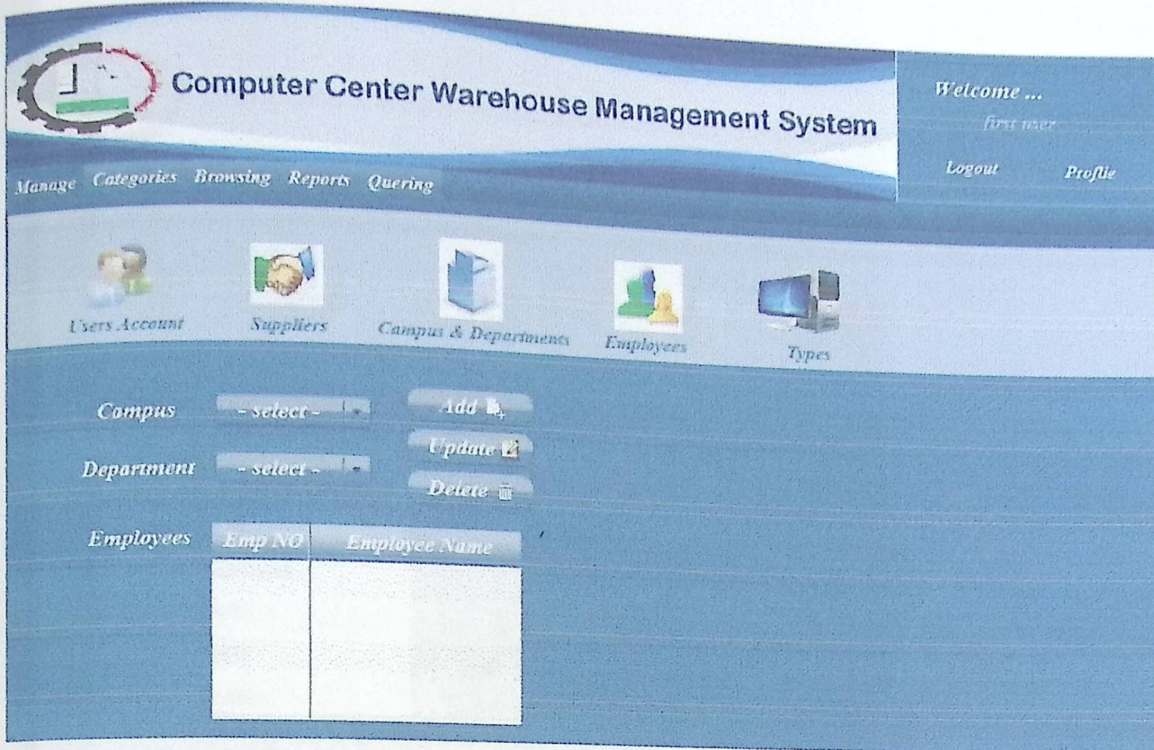
Figure (4.12) Employees screen

Table (4.20) Description of employees screen

Serial No	Field	Action	Database table
1	Campus	Combo box that display the names of areas.	Area
2	Department	Combo box that display the names of departments based on the area selection.	Dept
3	Employees	Data grid that display the names of employees	All_emp
4	Add	Button. When clicked, redirects the user to add employee page to add employee.	
5	Update	Button. When clicked, take to update employee page to update employee.	
6	Delete	Button. When clicked, that deletes an employee.	All_emp

12. Types screen
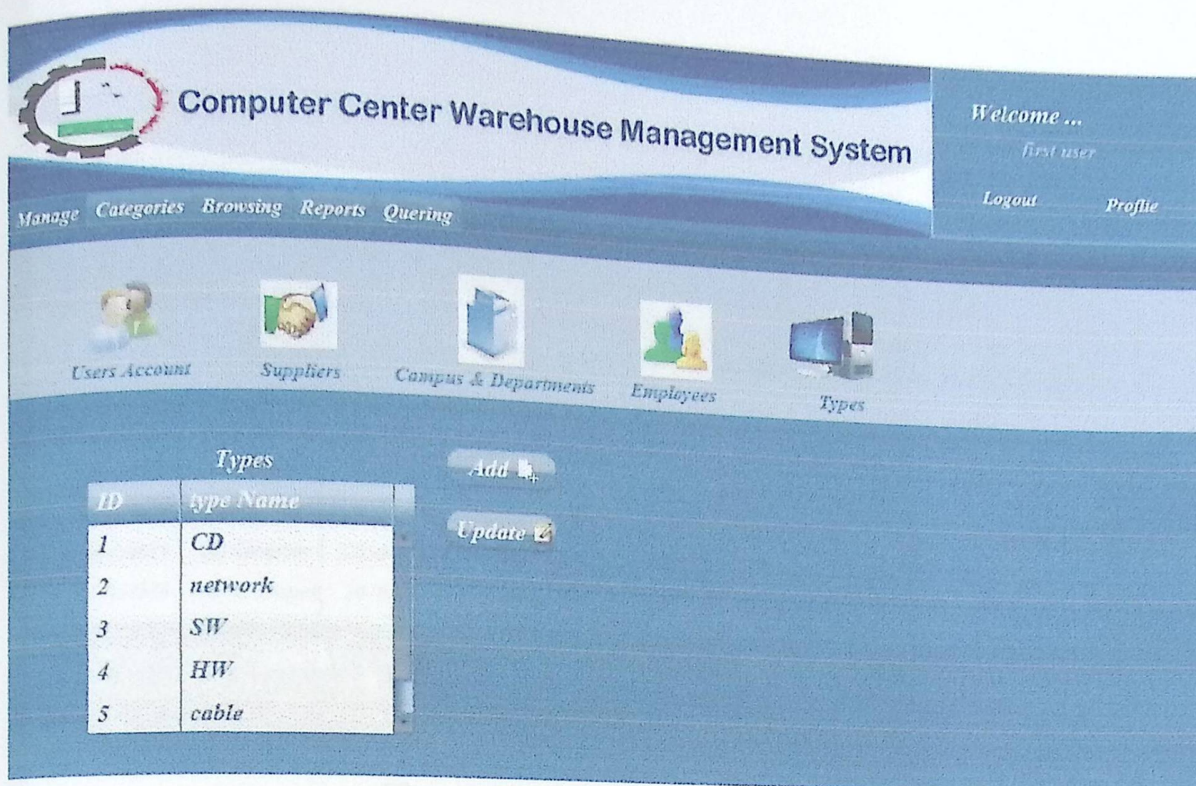
Figure (4.13) Types screen

Table (4.21) Description of types screen

Serial No	Field	Action	Database table
1	Types	Data grid that display the names of types.	Types
2	Add	Button. When clicked, redirects the user to add type page to add a new type	
3	Update	Button. When clicked, redirects the user to update type page.	

13. Category screen
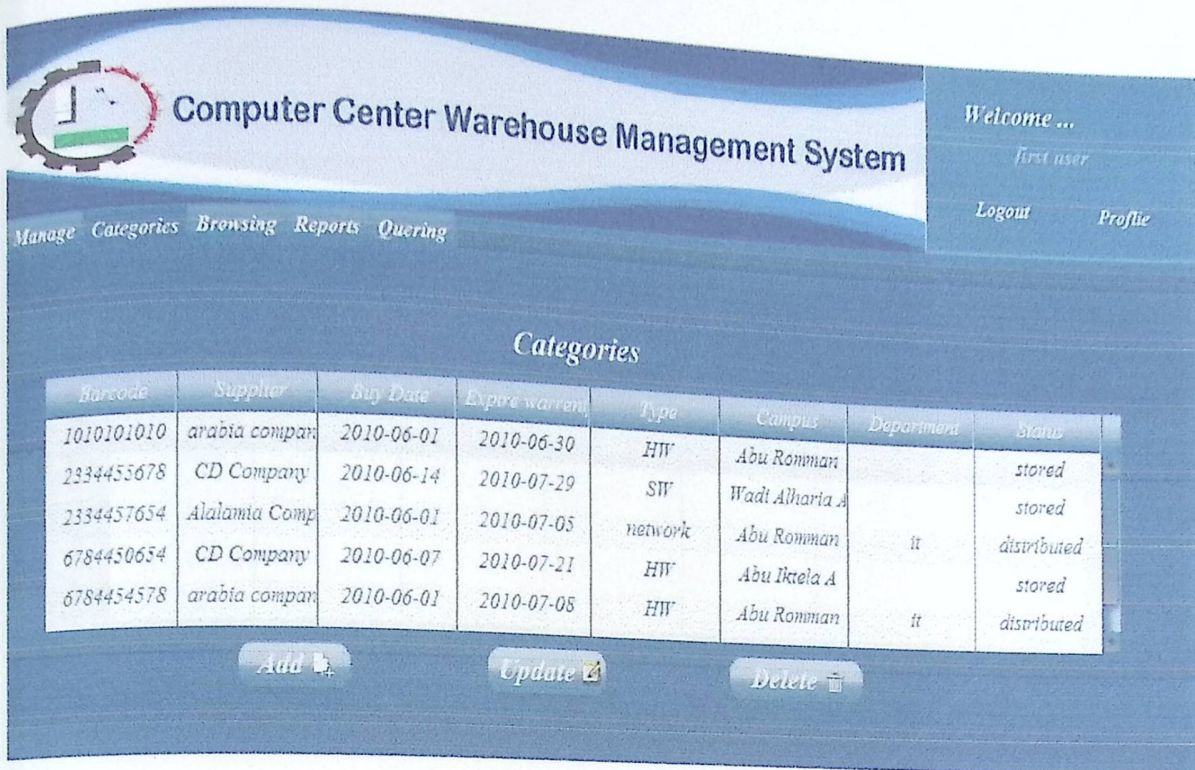
Figure (4.14) Category screen

Table (4.22) Description of category screen

Serial No	Field	Action	Database table
1	Categories	Data grid that displays the specifications and details of all categories.	Category
2	Add	Button. When clicked, redirects the user to add category page to add a new category	
3	Update	Button. When clicked, redirects the user to update category page to update category.	
4	Delete	Button. When clicked, deletes the selected category.	Category

14. Browsing screen
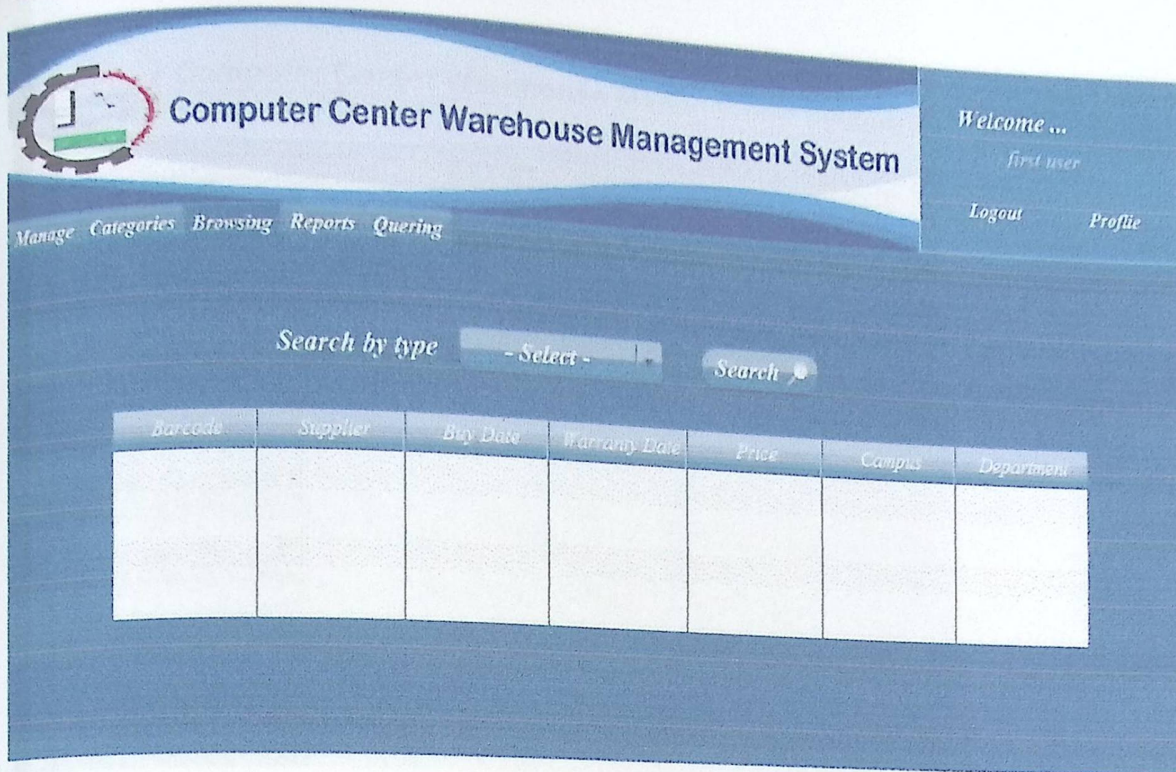
Figure (4.15) Browsing screen

Table (4.23) Description of browsing screen

Serial No	Field	Action	Database table
1	Search	Button to search the equipment.	Category
2	Search by type	Combo box for searching the equipment by type	Type
3	Category specification	Data grid that displays the specifications of categories based on selected type	Category

15. Reports screen
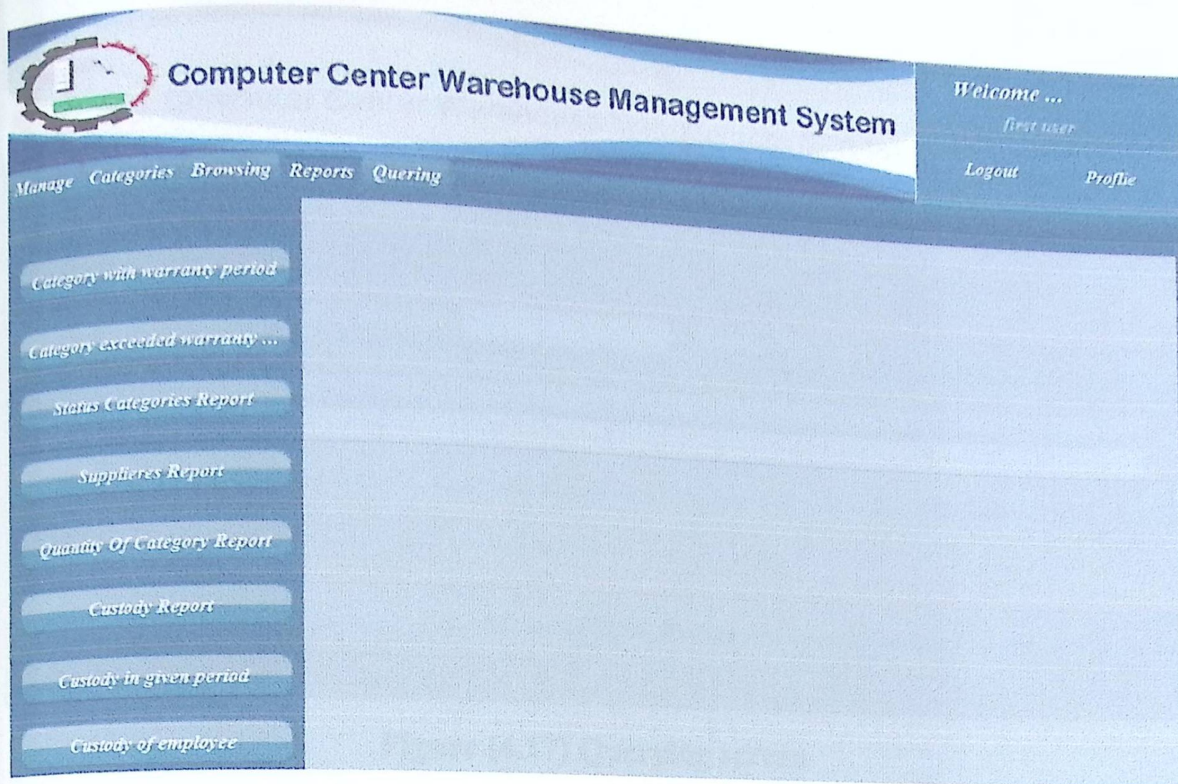
Figure (4.16) Reports screen

Table (4.24) Description of reports screen

Serial No	Field	Action	Database table
1	Category with warranty period	Button. When clicked, displays the intended report.	Category
2	Category exceeded warranty period	Button. When clicked, displays the intended report.	Category
3	Status categories report	Button. When clicked, displays the intended report.	Category, Status
4	Suppliers report	Button. When clicked, displays the intended report.	Supplier
5	Quantity of category report	Button. When clicked, displays the intended report.	Category, type
6	Custody report	Button. When clicked, displays the intended report.	Custody, Category
7	Custody in given period	Button. When clicked, displays the intended report.	Custody, Category
8	Custody of employee	Button. When clicked, displays the intended report.	All_emp, Custody, Category

16. Querying screen
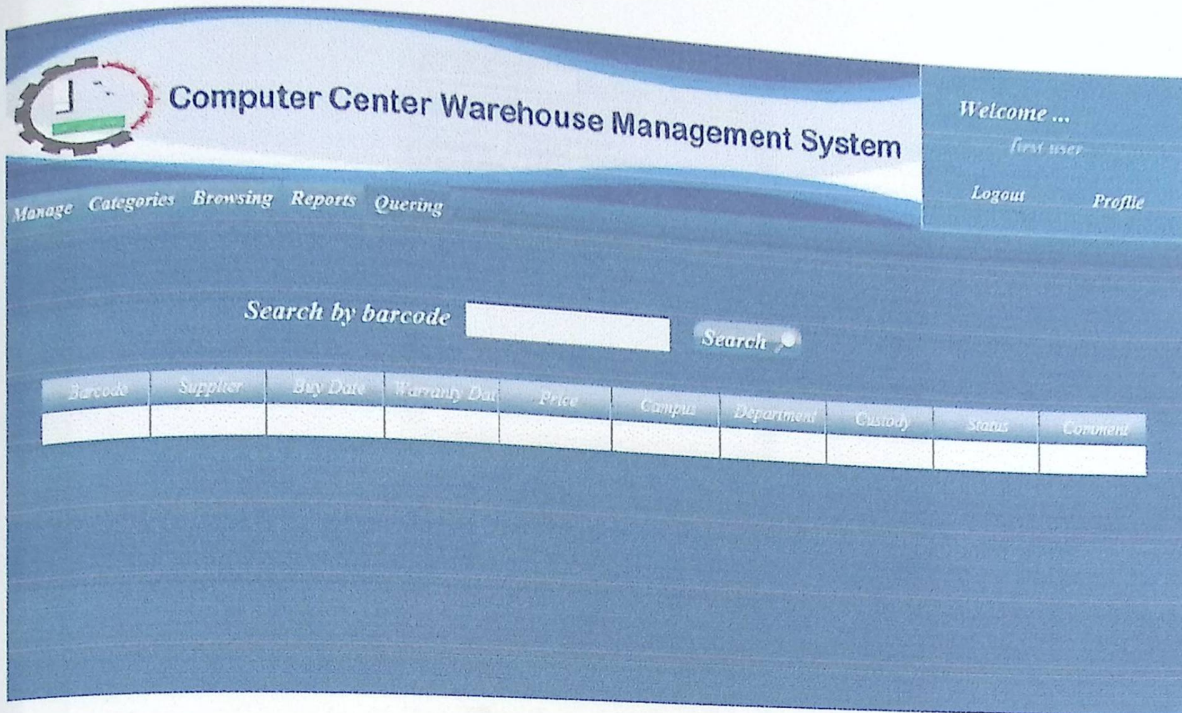
Figure (4.17) Querying screen

Table (4.25) Description of querying screen

Serial No	Field	Action	Database table
1	Search	Button to search the equipment.	Category
2	Search by barcode	Combo box for searching the equipment by barcode number.	
3	Category specification	Data grid that displays the specifications of categories based on selected barcode.	Category

17. Querying on mobile screen
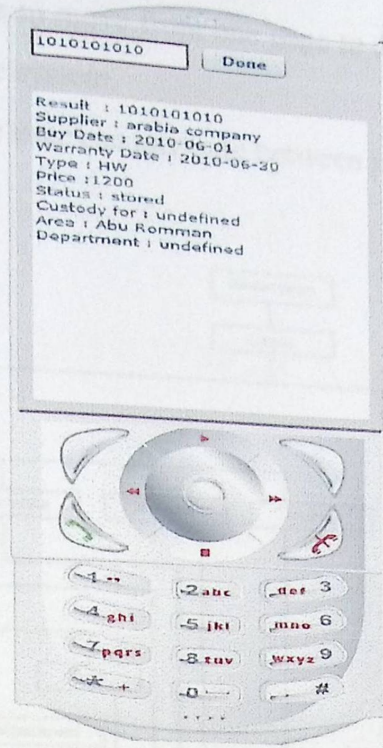
Figure (4.18) Querying on mobile screen

Table (4.26) Description of querying on mobile screen

Serial No	Field	Action	Database table
1	Search	Button to search the equipment.	Category
2	Search text	Text field to input barcode number.	
3	Result label	Text area that displays the result of search	category

Note:

The project contains some other less important interfaces (screen); these interfaces are not described here. The focus in this section is on the most important (major) screens only.

4.1 Navigation charts

Navigation chart helps users to move from one page to another, navigation is achieved by collecting all the page of the system.

Figure (4.16) shows how the user can navigate between pages through the system.

Figure (4.19) Navigation chart

4.1 Navigation charts

Navigation chart helps users to move from one page to another, navigation is achieved by collecting all the page of the system.

Figure (4.16) shows how the user can navigate between pages through the system.
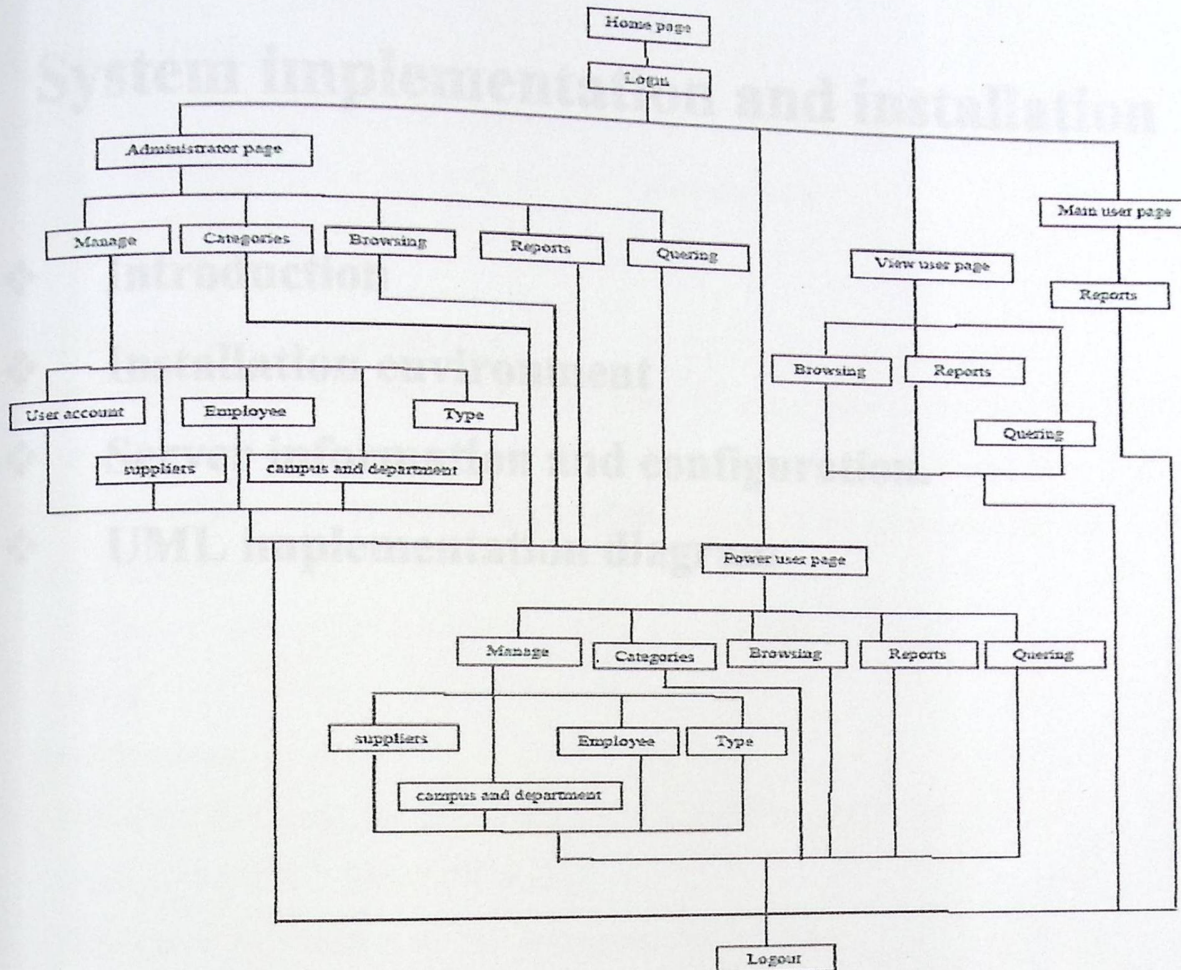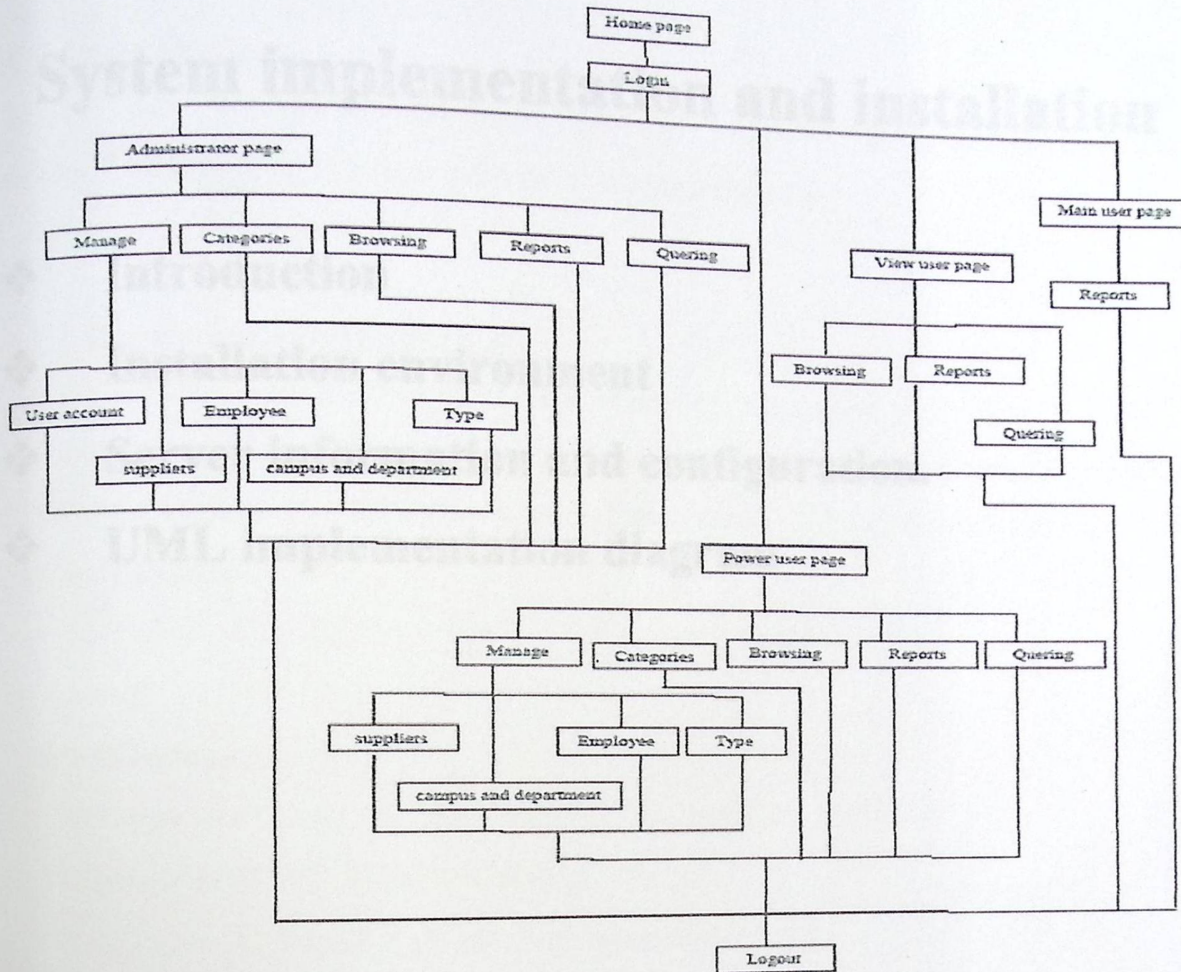

Figure (4.19) Navigation chart

5.1 Introduction

This chapter introduces the implementation phase of the system which includes installation environment, server information and configuration, and UML implementation diagram.

5.2 Installation

A set of hardware and software requirements are needed to set up and implement the system. The following is a description of those requirements.

5.2.1 Hardware requirements

The project team uses a server to implement and run the system to integrate it with PPU website, and uses barcode reader to read the barcode number of equipments and entering them to the system. The following is a brief description of the server and barcode reader used in the system.

1. Server[4]

    Specifications:

    - Processor: 2x Quad Core Intel Xeon E5504 (2.00GHz, 1333FSB)

    - Memory: 8GB PC2-5300DDR2Khkljl

    - Hard Drive: 4x 1466B SAS 15K with integrated RAID5

    - Optical Drive: 16x DVD+/- RW SATA

    - Networking: Dual Gigabit Ethernet NIC

    - Power: Dual power supply.

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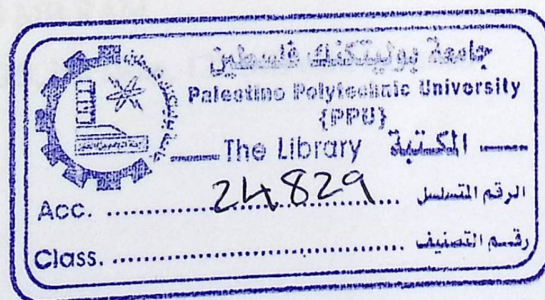
[4] The server already exists at PPU computer center. The specifications of server are taken from the employee at the PPU center.

2. Barcode reader[5]

Type: Datalogic Heron Bar Code Scanner.

Features[6]

- High first pass rate
- Several models available
- Intuitive aiming in hands-free applications
- Datalogic "Green Spot"
- Stand included in the package
- Complete data formatting and data editing.
- Barcode Scanner Repair service available from DataScan.

Specifications:

- INTERFACES RS232, USB.
- Wedge & Wand READABLE BAR CODES 2/5 family.
- Code 39 (plus Code 32, Cip 39).
- EAN/UPC, EAN128, Code 128, Code 93.
- CODABAR, TELEPEN, PLESSEY.
- Code 49, Code MSI, Code Delta IBM, Code 11, Code 16K.
- ISBN/ISSN, ISBT128, RSS variants.

3. N95 mobile Features :[7]

- OS:Symbian OS 9.2, S60 rel. 3.
- CPU: Dual ARM 11 332 MHz processor; 3D Graphics HW Accelerator
- MEMORY:
  - internal : 160 MB storage, 64 MB RAM
  - Card Slot: microSD, up to 8GB, hot swap, 128 MB card included

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[5] The barcode reader already exists at PPU computer center

[6] The barcode features and specifications are taken from the manufacturer's website[13]

[7] Nokia N95 phone features are taken(as is) from the manufacturer's website[22].Any other mobile that has a barcode reader features can also be used.

5.2.2 Software requirements

The project team uses PHP technology to connect with the system database and get data from it, and to perform the basic system operations. We uses Adobe Flex builder 3 to build the web application, design the system interfaces and display the information through them, and send and retrieve data from Mysql database through using PHP files. The following is a brief description of these softwares.

1. Adobe Flex builder 3

It's an open source framework developed on Adobe technology for building interactive web applications that deploy consistently on all major desktops, browsers, and operating systems. It uses Sun's Java Environment for developing Rich Internet Applications (RIA's). It provides many useful ways to send and retrieve data to and from server-side components.[4]

The Flex SDK includes a rich component library with more than a hundred extensible user interface components including list boxes, buttons, data grids, several text controls, layout containers, application states, and form validation for creating rich Internet applications, it is compiled into a file having SWF format called ShockWave Flash files, Flex applications can be written using Adobe flex builder or by using the available flex compiler from Adobe. Flex Builder 3 includes the complete Flex framework, including compilers, debuggers and a component library. [5]

Adobe Flex is embedded with two languages: Action Script and MXML. The following is a brief description of these languages

- **MXML**

It's an XML-based user interface markup language that offer way to build and layout the interface of applications and can also be used to implement internet application behaviors and business logic. It can include chunks of Action Script code, either when data binding where the curly braces ({}) syntax is used, or with creating the body of an event handler function. MXML may be used in combination with action script to develop Rich Internet Application (RIA's) in Adobe Flex.[5] [6]

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- **Action script**

It's a scripting language based on ECMAScript that is used for the development of websites and software and it is also used in some database applications. Action Script is the programming language that can be used along with MXML to create sophisticated Adobe Flex applications. It supports a wide range of features including interfaces, packages, runtime exception handling, runtime data types, and regular expressions. [5]

Action Script is a standard-based, object-oriented language; therefor it can be viewed as a collection of APIs generally in the form of classes. Its coding is done inside the tag <mx:Script> and the execution of file is (.as).
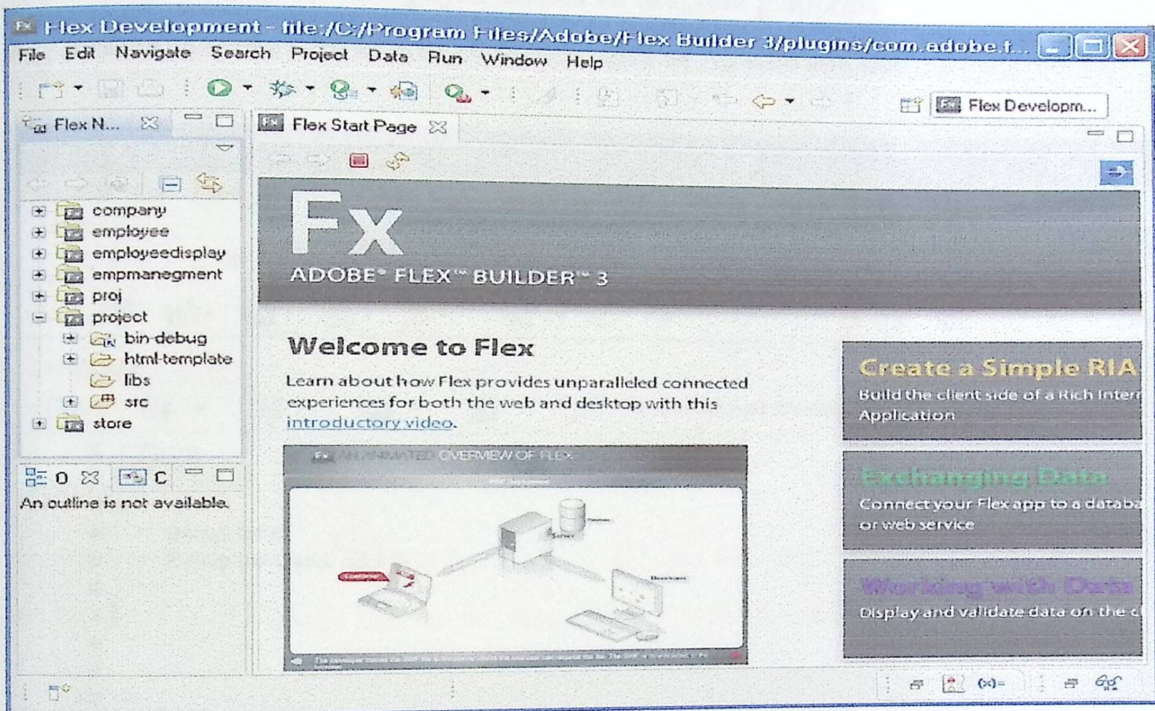

Figure (5.1): Adobe flex default page.

2. PHP

PHP, which stands for Hypertext Preprocessor is a general-purpose server-side scripting language and is free software for creating dynamic Web pages, it can be used on all major operating systems, including Linux, Microsoft Windows, many Unix variants ,and others.[7] [8]

When a visitor opens the page, the server processes the PHP commands and then sends the results to the browser. With PHP, we can do things like login pages, create forums, and check details from a form, picture galleries, and surveys. PHP supports Apache and Mysql and has many open source libraries. [8]

- **The reasons of using PHP:**[8]

1. It is open source and free to download and use.
2. It is powerful tool for making dynamic and interactive WebPages.
3. It supports many database Management System (DBMS) such as Mysql, Oracle, and Solid.
4. It can run on all operating systems and on different platforms.
5. It is compatible with almost all servers such as Apache and IIS.
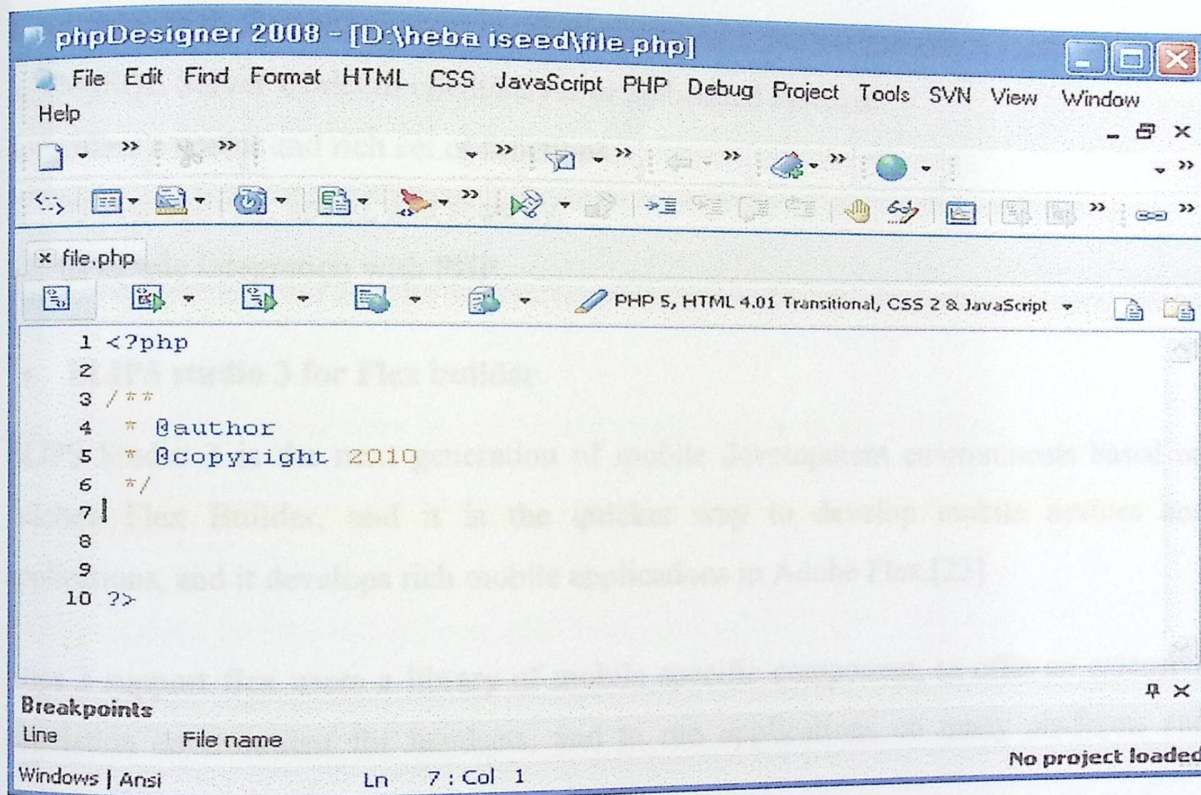
```
phpDesigner 2008 - [D:\heba iseed\file.php]
File  Edit  Find  Format  HTML  CSS  JavaScript  PHP  Debug  Project  Tools  SVN  View  Window
Help

× file.php

                                              PHP 5, HTML 4.01 Transitional, CSS 2 & JavaScript

 1  <?php
 2
 3  /**
 4   * @author
 5   * @copyright 2010
 6   */
 7  |
 8
 9
10  ?>

Breakpoints
Line            File name
                                                                      No project loaded
Windows | Ansi           Ln    7 : Col  1
```

Figure (5.2): PHP designer default page

3. MySQL

It's a relational database management system (RDBMS) based on Structured Query Language (SQL).It's the one of the most popular open source SQL DBMS and it's developed, distributed and supported by Sun Microsystems. It runs as a server providing multi-user access to a number of databases. [10]

---

[8] The reasons of using PHP are taken from [9]

MySQL is used in a wide range of applications, including e-commerce, data warehousing, Web databases, logging applications and distributed applications. Some of the most popular open source PHP web applications, such as Wordpress and Joomla, use MySQL to store their data, and several high traffic website such as Google and face book use Mysql for data storage and logging of user data.[10] [11]

MySQL runs on many different platforms, including Linux, UNIX, and Windows, and many programming languages contain libraries for access MySQL including C, C++, Java, Perl, and PHP. [10]

- **The reasons of using MySQL Database Server:**[9]

1. It is free and open source software.
2. The MySQL Database Server is reliable, very fast, and easy to use.
3. MySQL Server works in client/server or embedded systems.
4. Offers a useful and rich set of functions.
5. Its connectivity, speed, and security.
6. Its simple integration with PHP.

- **ELIPS studio 3 for Flex builder**

ELIPS Studio 3 is the next generation of mobile development environments based on Adobe's Flex Builder, and it is the quicker way to develop mobile devices and applications, and it develops rich mobile applications in Adobe Flex.[23]

Elips 3 support flex users a library of mobile specific component, to offer an extensive simulation environment for handsets, and to run applications on many platforms and models. [23]

The project team implements the querying process on mobile application by using ELIPS Studio 3 which transforms flex languages (MXML and Action script) into native or java code and generates code to run on the platform that they selected. ELIPS 3 uses PHP technology to access the database at the server for retrieving the specification of

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[9] The reasons of using MySQL Database Server are taken (as is) from[12]

equipment through using its barcode number which is entered by special device that is combined with the mobile.

5.3 Server information and configuration

The website of the system will be installed on the existing main web server of PPU; therefore it is essential for the project team to be aware of the configuration of this server and how to install the website on it. The installation process requires the Apache web server (httpd), FTP (requires xinetd or inetd) and Bind (named) software packages with their dependencies.

The main steps to install and create a virtual host for the website on the server are:

1. The Apache configuration file is: /etc/httpd/conf/httpd.conf.
2. Apache may be configured to run as a host for one web site or it may be configured to

serve multiple domains. Serving multiple domains may be achieved in two ways:

- Virtual hosts: One IP address but multiple domains - "Name based" virtual hosting.
- Multiple IP based virtual hosts: One IP address for each domain - "IP based" virtual hosting.

The existing PPU server uses "name based" virtual host with the following settings

<VirtualHost>

DocumentRoot /var/www/staff.ppu.edu/wms

ServerName: staff.ppu.edu/wms

</VirtualHost>

3. Copy the website files on the server and activate it for the first time using following command:

Service httpd start.

4. Give the website domain name by using foreword zone:

vi /var/named/chroot/var/named/warehouse.ppu.edu.zone.

5. Activate the new settings by reloading the service using the following command.

Service httpd reload.

5.4 UML implementation diagram

Deployment diagram is the one of the implementation diagrams which shows the execution architecture of systems and how it will be physically deployed in the hardware environment. It shows the system hardware, the software that is installed on that hardware, and the middleware used to connect the disparate execution environments together. [14]

Deployment diagram has four elements which are: nodes that represent hardware, components that represent software, dependencies which show that one component relies upon another component and links that connect two nodes together. [15]

The deployment diagram shown in Figure 5.3 clarifies the three implementation tires of the system which are users, system, and database.
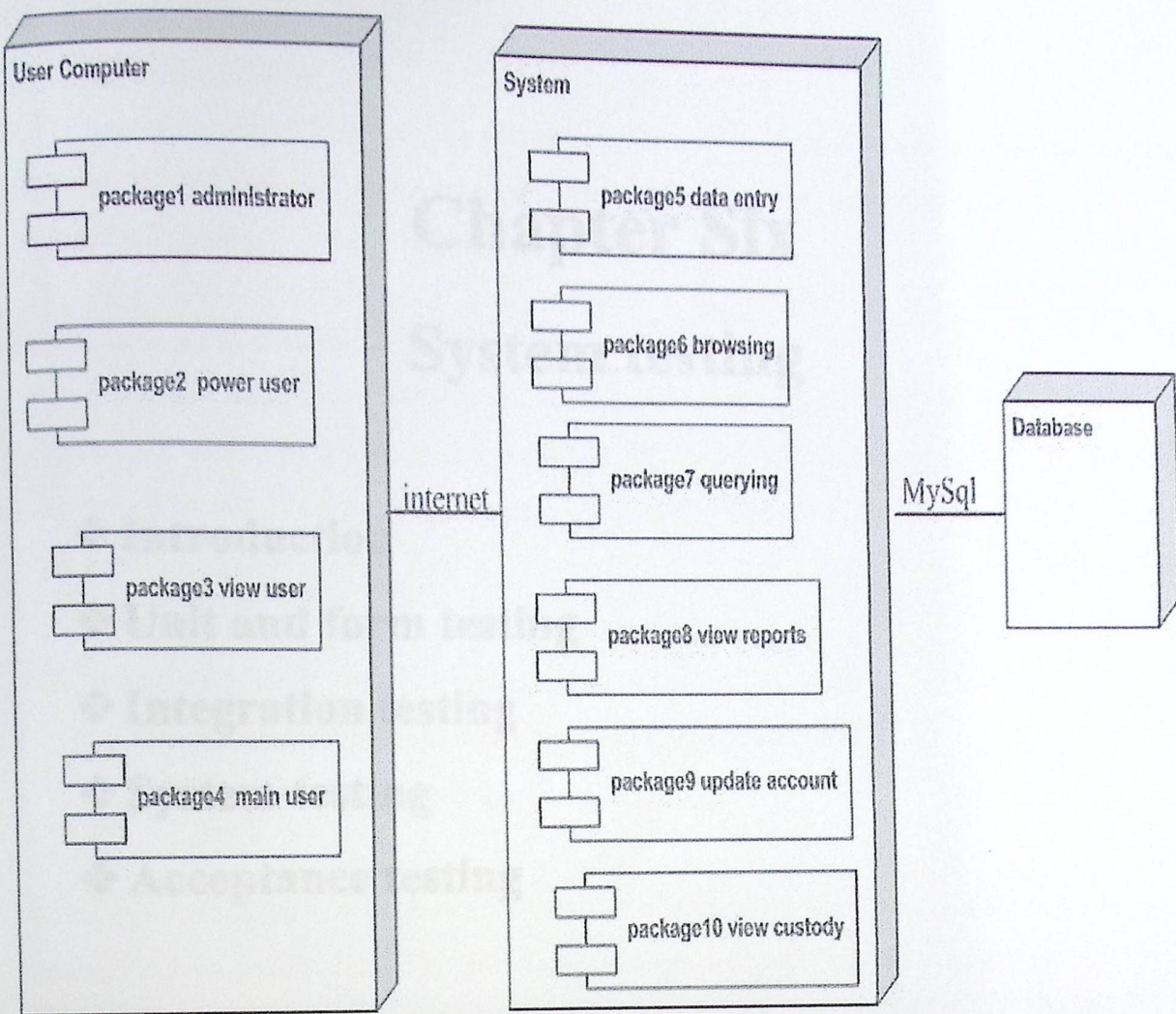
Figure (5.3) UML implementation diagram.

Chapter Six

System testing

❖ **Introduction**

❖ **Unit and form testing**

❖ **Integration testing**

❖ **System testing**

❖ **Acceptance testing**
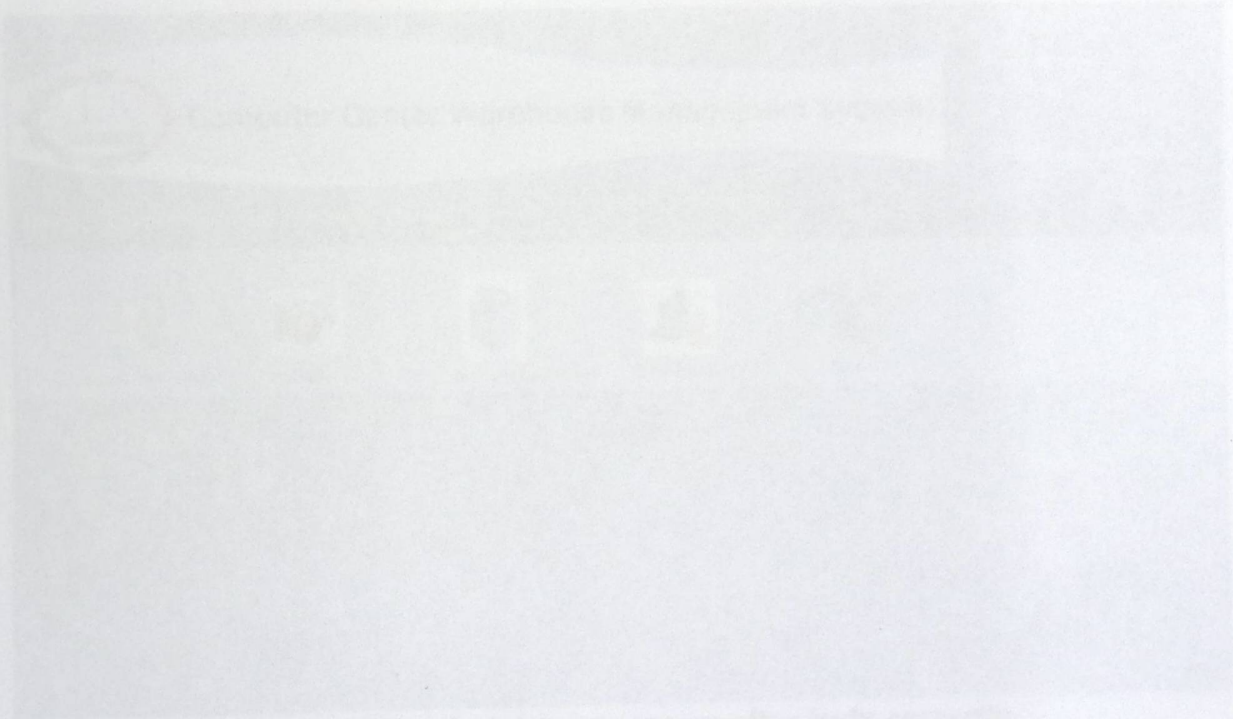
6.1 Introduction

After designing and programming the system, it will be tested to ensure that the system meets its functional and technical requirements and working as properly as planned, and can be implemented with the same characteristics.

6.2 Unit and form testing

This process is carried out by the developer where each module of the system is tested separately in order to discover any errors in the form's code, to ensure that the specific function of units is working as planned, and to ensure that they are operating correctly and meet the specifications.

The project team starts with testing each unit of the system separately as follow:

- Test the operation of each button in all system interfaces.
- Test the operation of each application links.

As an example, figure (6.1) shows a testing of a successful login, and figure (6.2) shows a testing of unsuccessful login (by entering incorrect username and/or password).
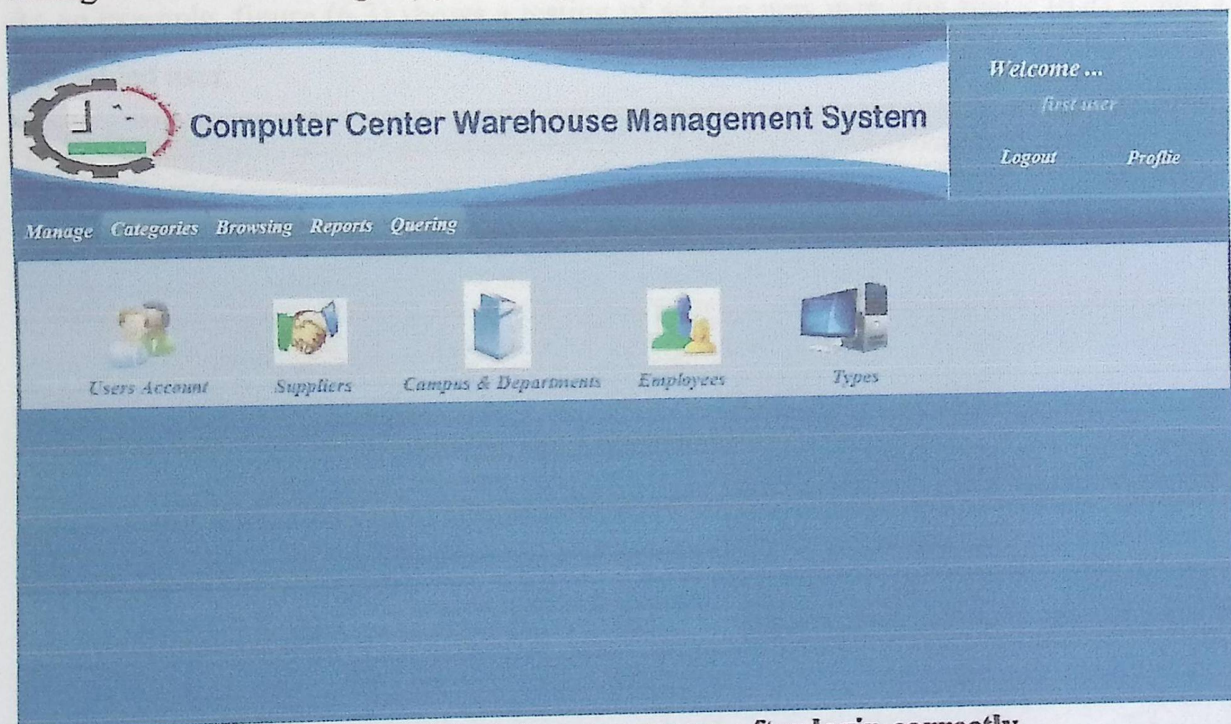

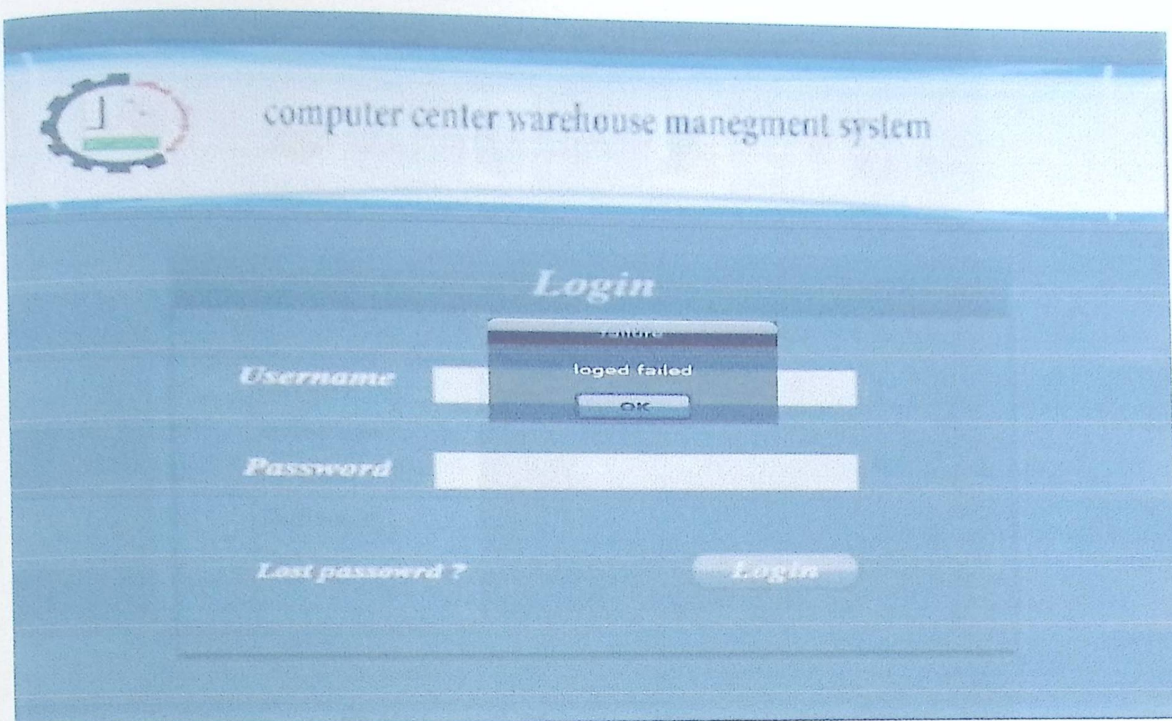**Figure (6.1) Administrator screen after login correctly**

Figure (6.2) Incorrect login screen

6.3 Integrating testing

In this testing stage the individual modules are combined and tested as a group, to ensure that the interactions of components produce satisfy results. [16]

As an example, figure (6.3) shows a testing of adding new user, and figure (6.4) shows a new added user.
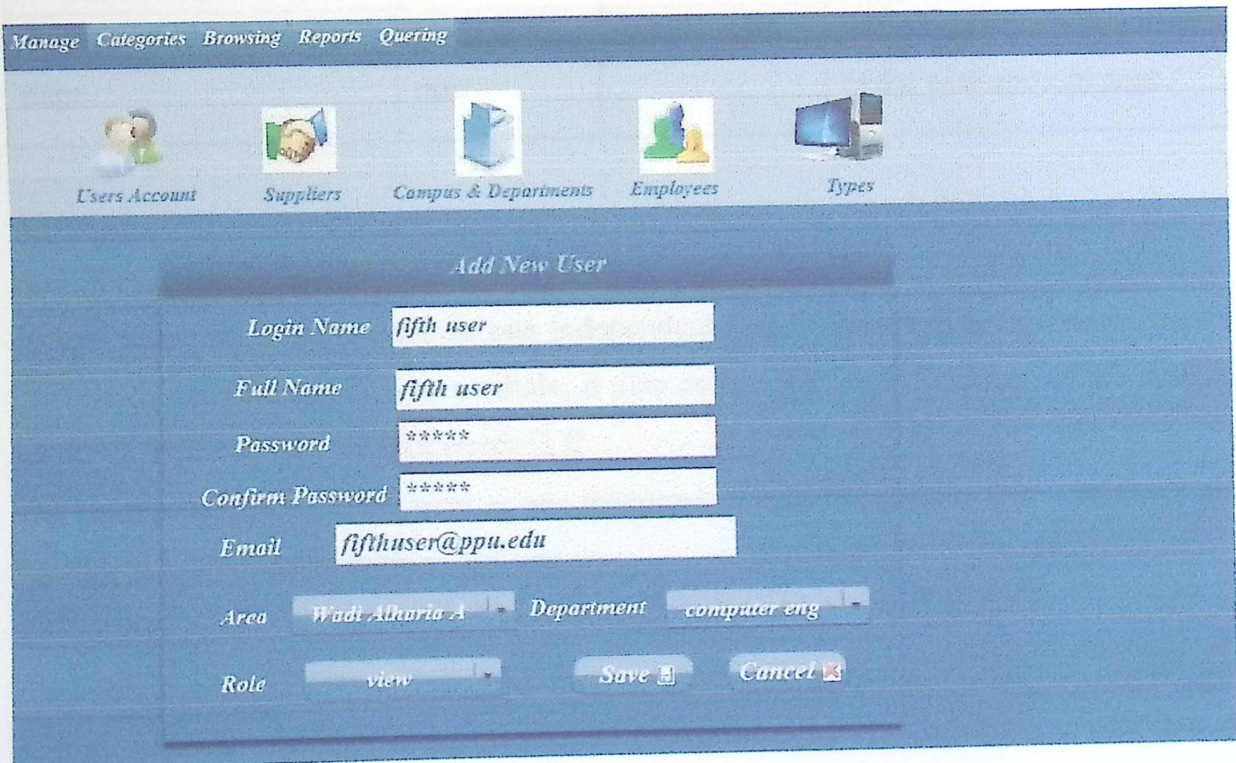

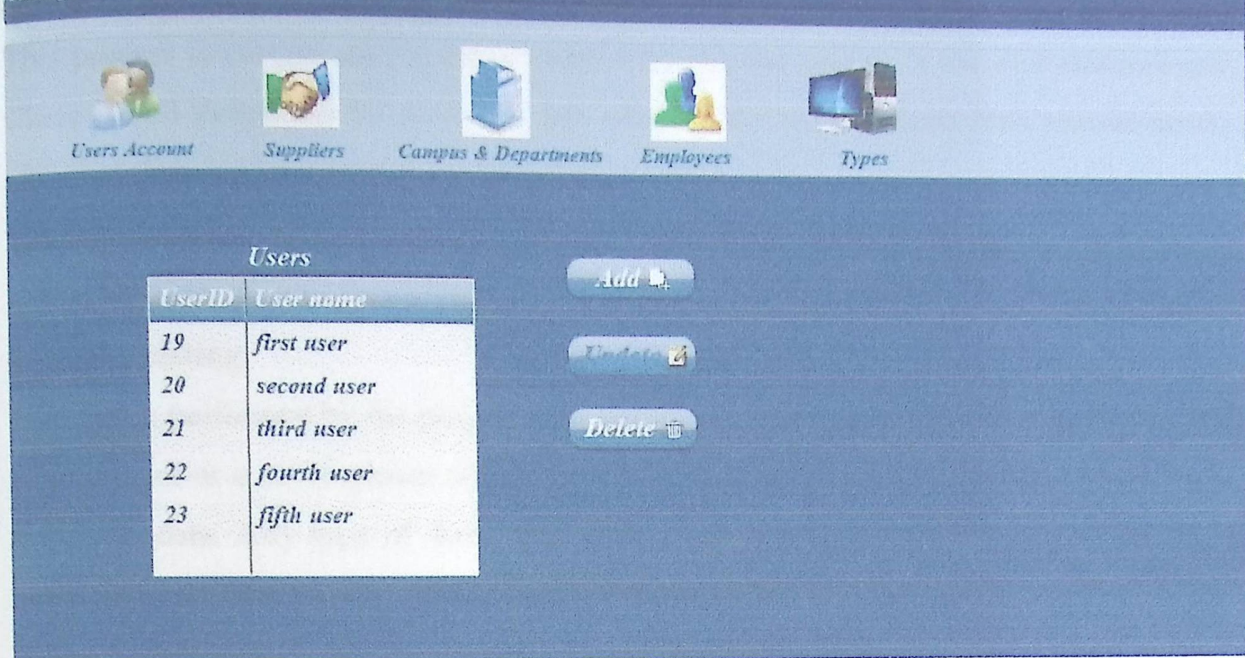**Figure (6.3) Test adding a new user**

Figure (6.4) Showing the new added user

Table (6.1) Integrating testing

State	Input	Expected result	Actual result
Adding a new user to database	User: fifth user	Correct data	Adding the user and store it in the database
Adding user in the user page	User: fifth user	Correct data	Showing the new add user in the user account page

6.4 System testing

In this stage the system tested as one independent unit to ensure that the system works module by module and also as a whole, it also ensure that each function of the system works as expected and without errors.[17]

The team project tests the system as one independent unit and ensures that it achieves all functional requirements without any errors.

6.5 Acceptance testing

This process is carried out by actual users who test the system in the real environment where it will eventually be used, and test whether the system meets their requirements; after that they accept it once they are satisfied with it.

The following is a brief description of the two types of acceptance testing:

- **Alpha testing**

This test is performed by the project team members and some specialists' experts at a test environment or a development center for testing the completed information system using simulated data. Any type of discovered errors and abnormal behavior of the system is noted and corrected by the developers in order to ensure that the system works properly. Alpha testing is often employed for off-the-shelf software. [18]

In this stage the project team tests and verifies the alpha version of the system to ensure that the system meets the functional requirements which are mentioned in chapter two such as: allowing the power user to enter data, querying on the specification of equipments, and to ensure that the system meet the non-functional requirements such as: usability, integrity, and modularity.

- **Beta testing**

This test is performed by some common users with different knowledge and skills at the real user environment for testing a completed information system using real data. Whereas the users explore the software if they find any defect or faults they report them to the developers. This software version is known as beta version. Beta testing comes after alpha testing. [19]

In this stage the computer center staff tests the Beta version of project with real data at the computer center of PPU to ensure that the system meets the functional requirements and working as properly as planned without errors or faults.

6.6 Mobile testing

In this stage the mobile application is tested, to ensure that is correctly connected to the system database, to ensure that is compatible with the system, and to ensure that its retrieve correct specification of each equipment depending on its barcode number.

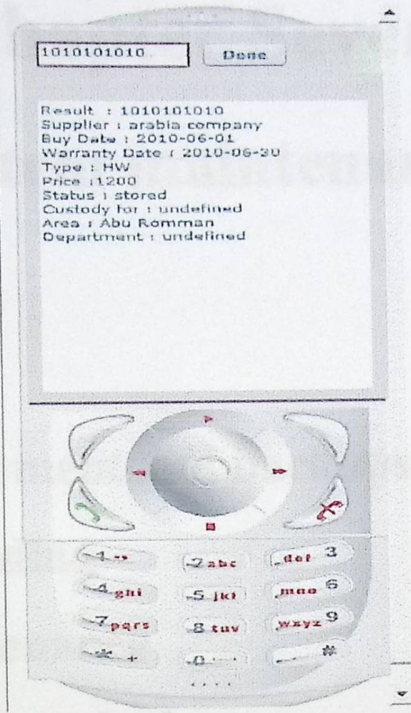Figure (6.5), Figure (6.6) shows the mobile testing process.

Figure (6.5) successful testing of queering on mobile .

Figure (6.6) unsuccessful testing of queering on mobile.

Chapter Seven

System maintenance

- ❖ **Introduction**
- ❖ **System deployment and backups**
- ❖ **System upgrading**
- ❖ **System maintenance**
- ❖ **Apache server maintenance**
- ❖ **MySQL maintenance**

7.4 System maintenance

In the system maintenance we describe various forms of computer or server maintenance, which concerns with a modification of a system to make it compatible with the new environment or changed requirements, to correct bugs and error, to keep a computer system running properly, and to improve its performance. [21]

The outcomes and deliverables from this process are the development of a new version of the software and new versions of all design documents created or modified during the maintenance phase.

7.5 Apache server maintenance

The Apache server of PPU University was used for publishing the website of the system, and publishing the system depends on the accuracy and security provided by the server; therefore it is essential for the project team to maintain the server to keep its running properly and smoothly.

7.6 MySQL maintenance

The database which was build by Mysql database management system is essential and important part in the system because it consists of all tables with which the system can operate and run its function; therefore the project team maintains the database to ensure that it works properly without errors and have a security to provide authorization and authentication to each user to access the database based on his /her privileges.

The project team performs the maintenance through using check error form as can be seen in the following figure:

Bug reporting form

Please fax or mail competed forms to: Warehouse project team Palestine Polytechnic University Palestine, Hebron, Jabal Abu-Ruman St. Phone: 2235505 Fax: 2217248	Beta program contact: Name: ---------------------------------- Title: ---------------------------------- Company: ---------------------------------- Address:---------------------------------- City:------------ State: ----------- Zip: ------ Phone: ---------------------------------- Fax: ----------------------------------

System configuration:

CPU: ------------- Clock speed: ---------- MHz   Manufacture: ------------------
Hard disk capacity: ----------------- Currently available: ----------------- Ram:------------
System software: ----------------------------------- Monitor :-----------------------------------

Summary of the problem:

Description of the bug:

Replication steps:
If the bug is reproducible, please describe how to do so:

Figure (7.1): Check error forms

The project team performs the maintenance through using check error form as can be seen in the following figure:

Bug reporting form

Please fax or mail competed forms to: Warehouse project team Palestine Polytechnic University Palestine, Hebron, Jabal Abu-Ruman St. Phone: 2235505 Fax: 2217248	Beta program contact: Name: --- Title: --- Company: -------------------------------------- Address:--- City:------------ State: ----------- Zip: ------ Phone: --- Fax: ---

System configuration:

CPU: ------------- Clock speed: ----------- MHz   Manufacture: ------------------
Hard disk capacity: ------------------ Currently available: ----------------- Ram:------------
System software: ------------------------------------ Monitor :------------------------------

Summary of the problem:

Description of the bug:

Replication steps:
If the bug is reproducible, please describe how to do so:

Figure (7.1): Check error forms

Chapter Eight
Conclusions and recommendations

- ❖ **Conclusions**
- ❖ **What has been achieved from project goal?**
- ❖ **Recommendations and further work**

8.1 Introduction

Today the world is moving forward rapidly, so that the use of information technology is growing in many aspects of life. In order to accommodate these technological developments ,and in order to overcome the problems of the traditional paper-based method in managing the PPU computer center warehouse we have developed a computerized system that helps users to store, view the equipments and their specifications, and follow-up where they are, using barcode, and web / mobile application technologies.

8.2 What has been achieved from project goals?

This section lists the project goals which have been achieved:

1. We have created an electronic system that manages Computer Center Warehouse accurately and easily, and controls the entry and exit of devices and equipments.

2. The system allows user to query on the specification of equipments and devices using the barcode reader, and localize the current place of tools, and their warranty period.

3. The system allows user to create many of reports of stock and tools which are still guaranteed, and the specifications of stored materials and other information about the sponsors.

4. The system allows user to track the events that happen to the stored tools and equipments which include entry, exit, and destruction operations.

5. We have designed a modular system, so that new features can be added without making any basic change in the system.

6. We have added an extra feature to the system through which the user can read the barcode (by mobile device) of the equipments, By installing the application on the mobile that is connected to the database of server .the application interprets the barcode number by special device that read it and view the specifications of the equipment on mobile screen.

The project team has tested the system through many types of testing which are including unit testing, system testing, integration testing, and acceptance testing.

The testing proves that the system meets its functional and technical requirements and working properly as planned.

8.3 Recommendations and further work

In the future we recommend expanding the system through the following:

1. Expanding the system to include other university stores and integrating the system with the central warehouse of the university.

2. Generaling the system by adding some modification to make it off-the-shelf software. So any kind of store can use it to perform its functions.

3. Implementing the system at PPU computer center .

Appendix A
Technical manual

This appendix clarifies the creation of a new project/file for the following programs which are using in the project.

1. Adobe flex builder 3
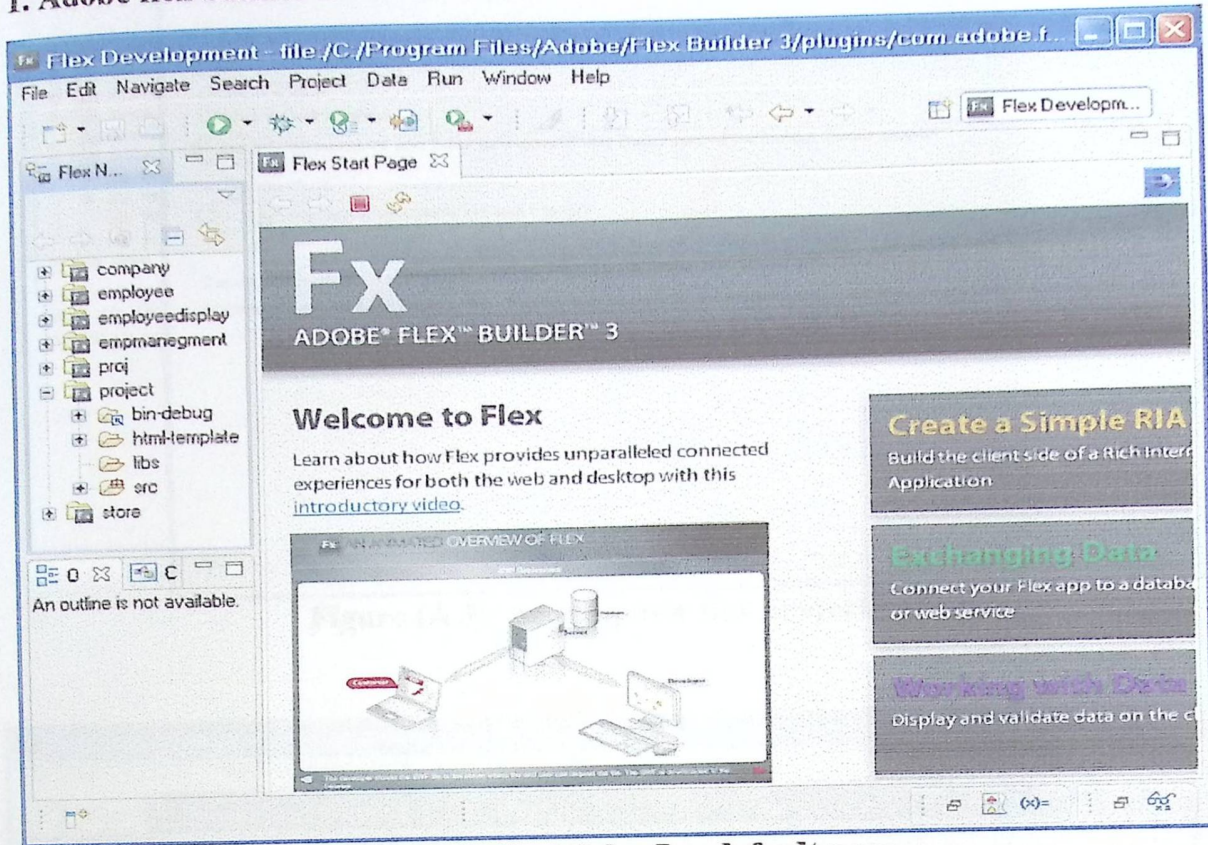
Figure (A.1): Adobe flex default page

- Creating new project
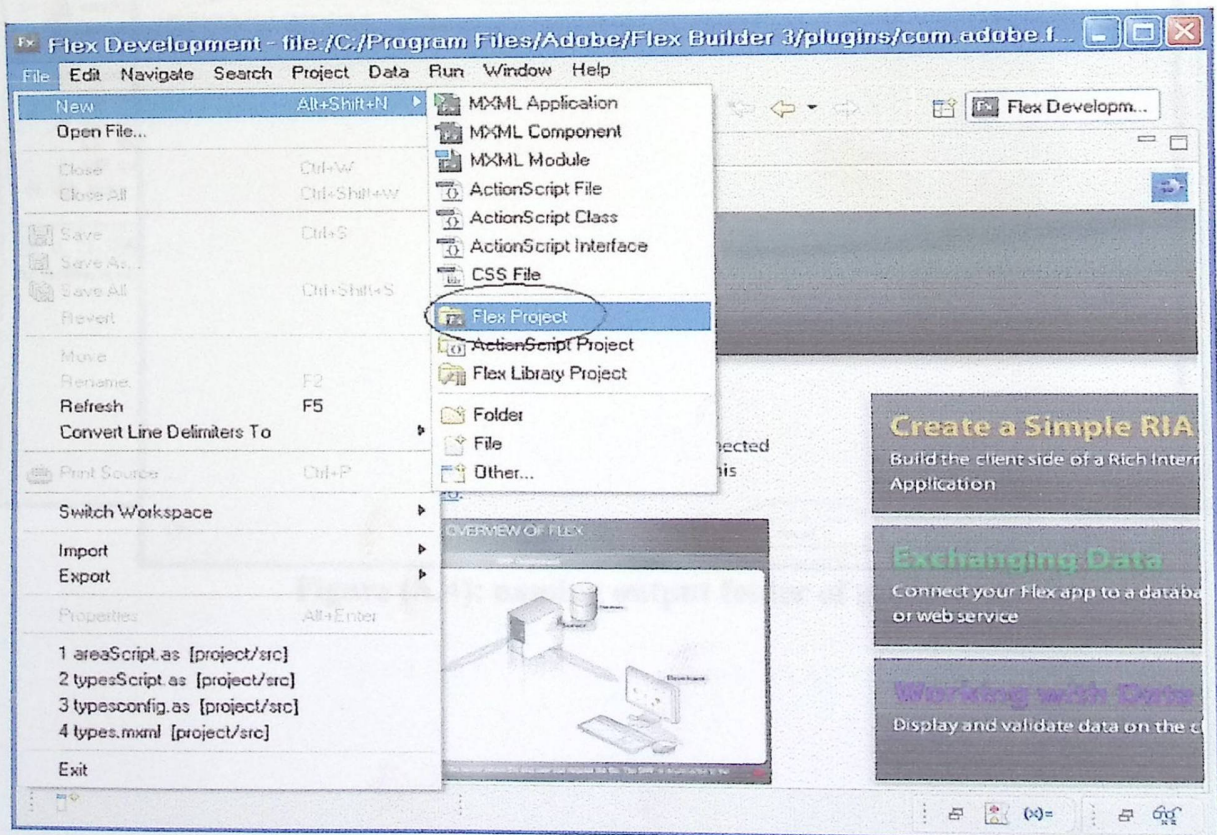
Figure (A.2): creating new flex project.
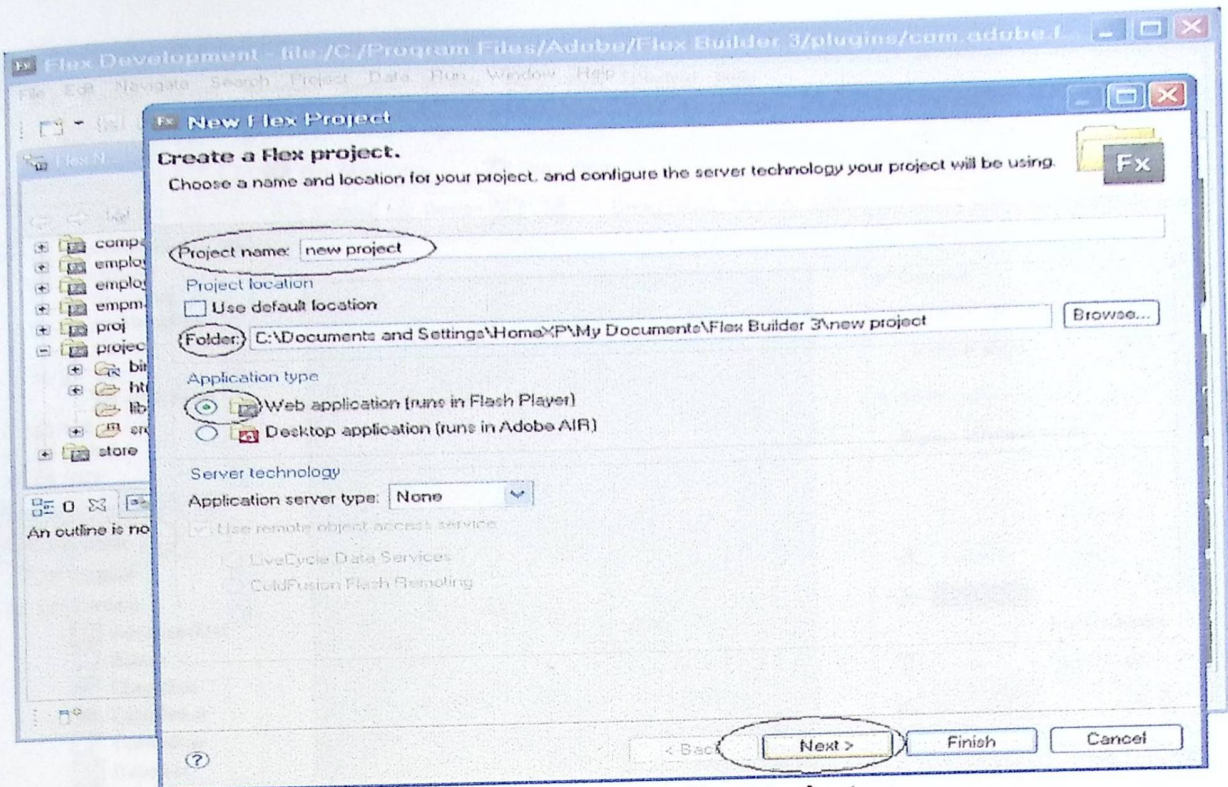
Figure (A.3): naming new flex project.
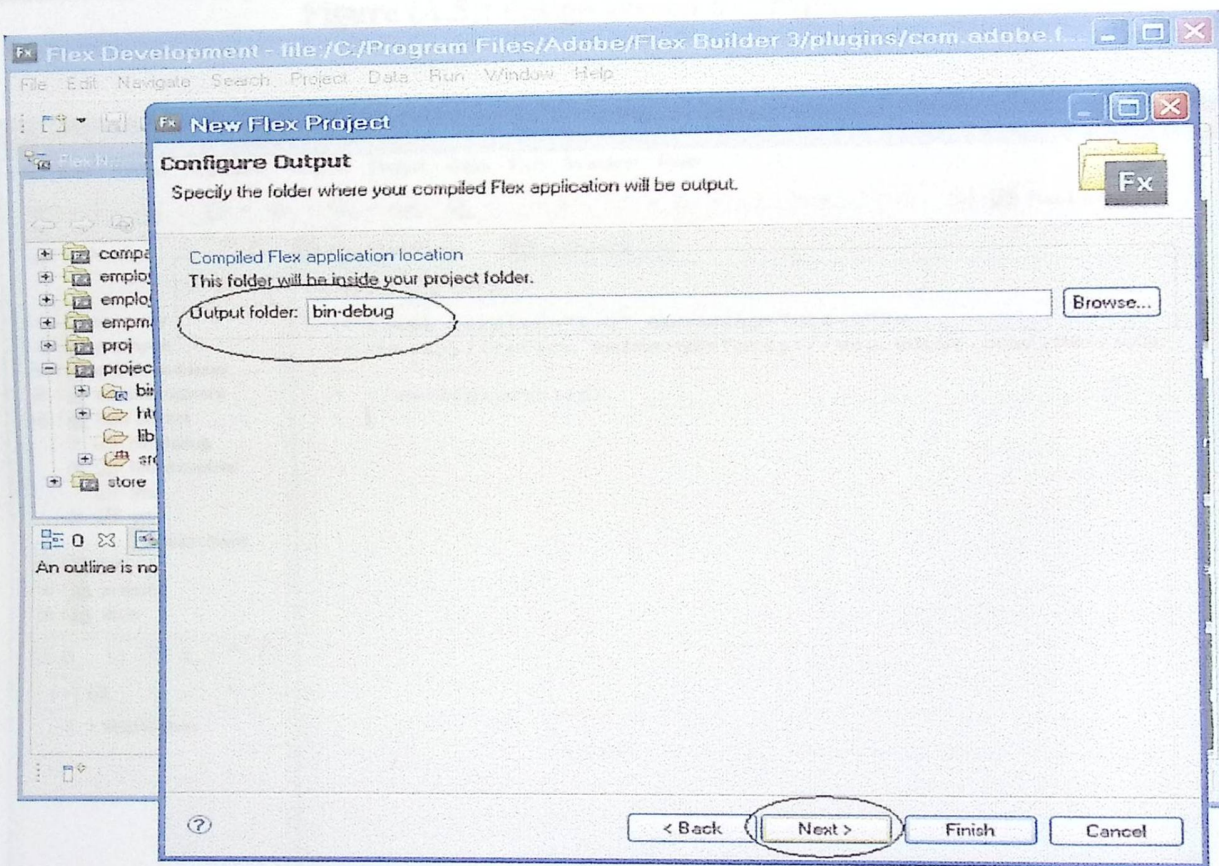
Figure (A.4): naming output folder of project
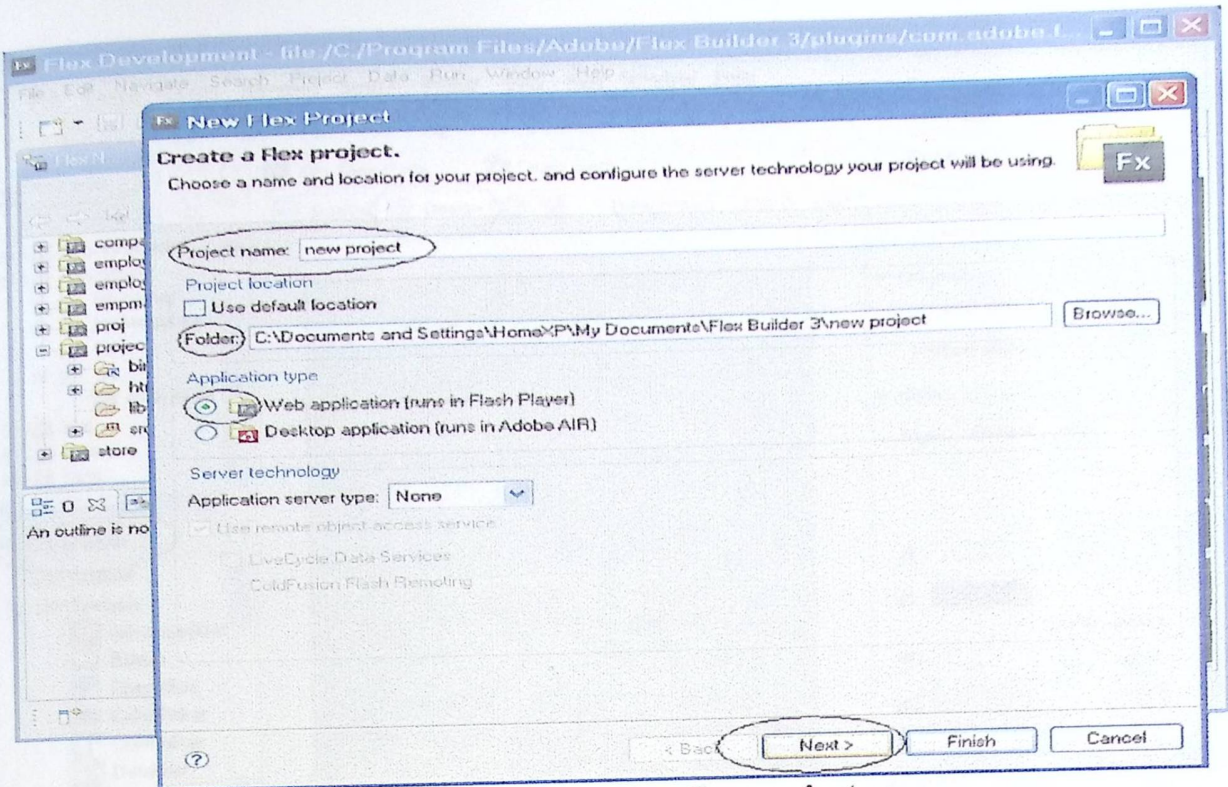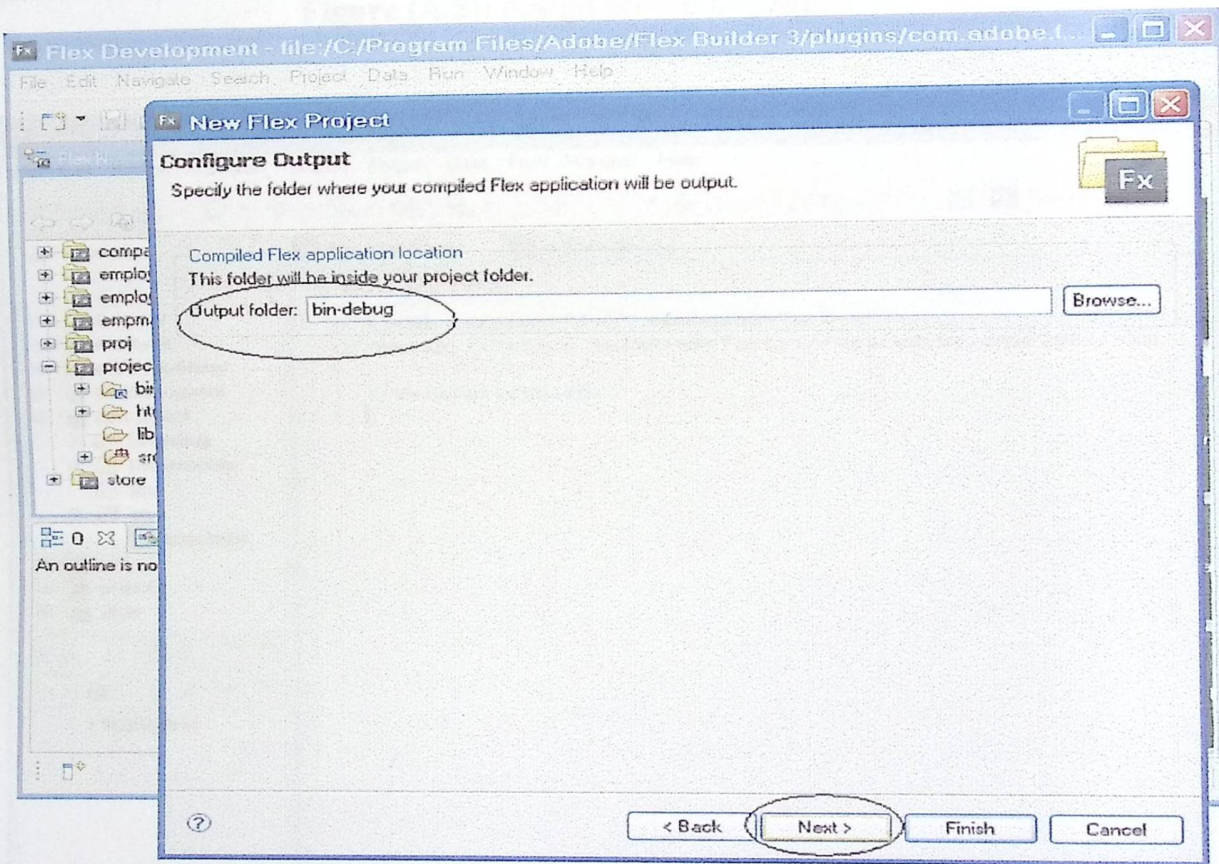
Figure (A.3): naming new flex project.

Figure (A.4): naming output folder of project
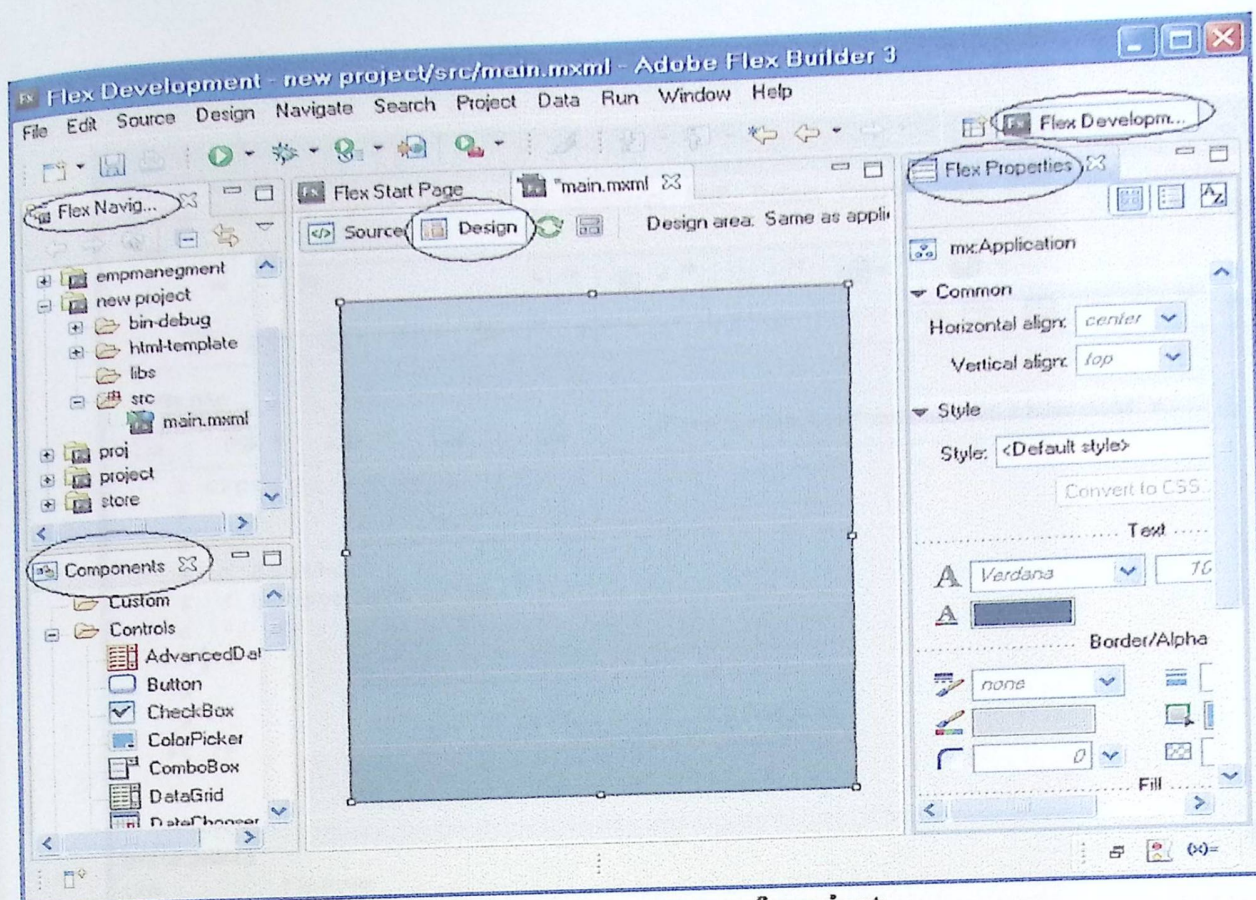
Figure (A.5): design screen of project
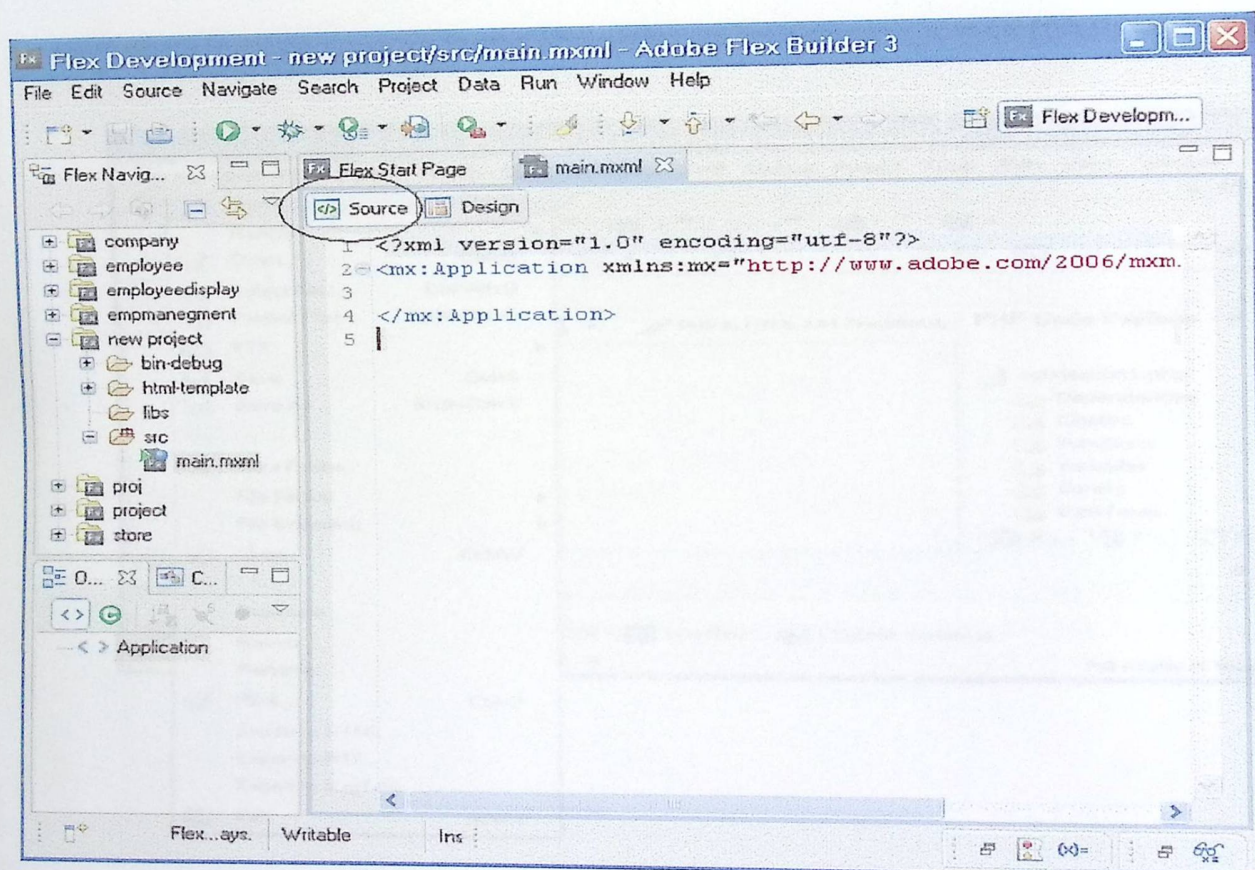
Figure (A.6): source screen of project

2. PHP
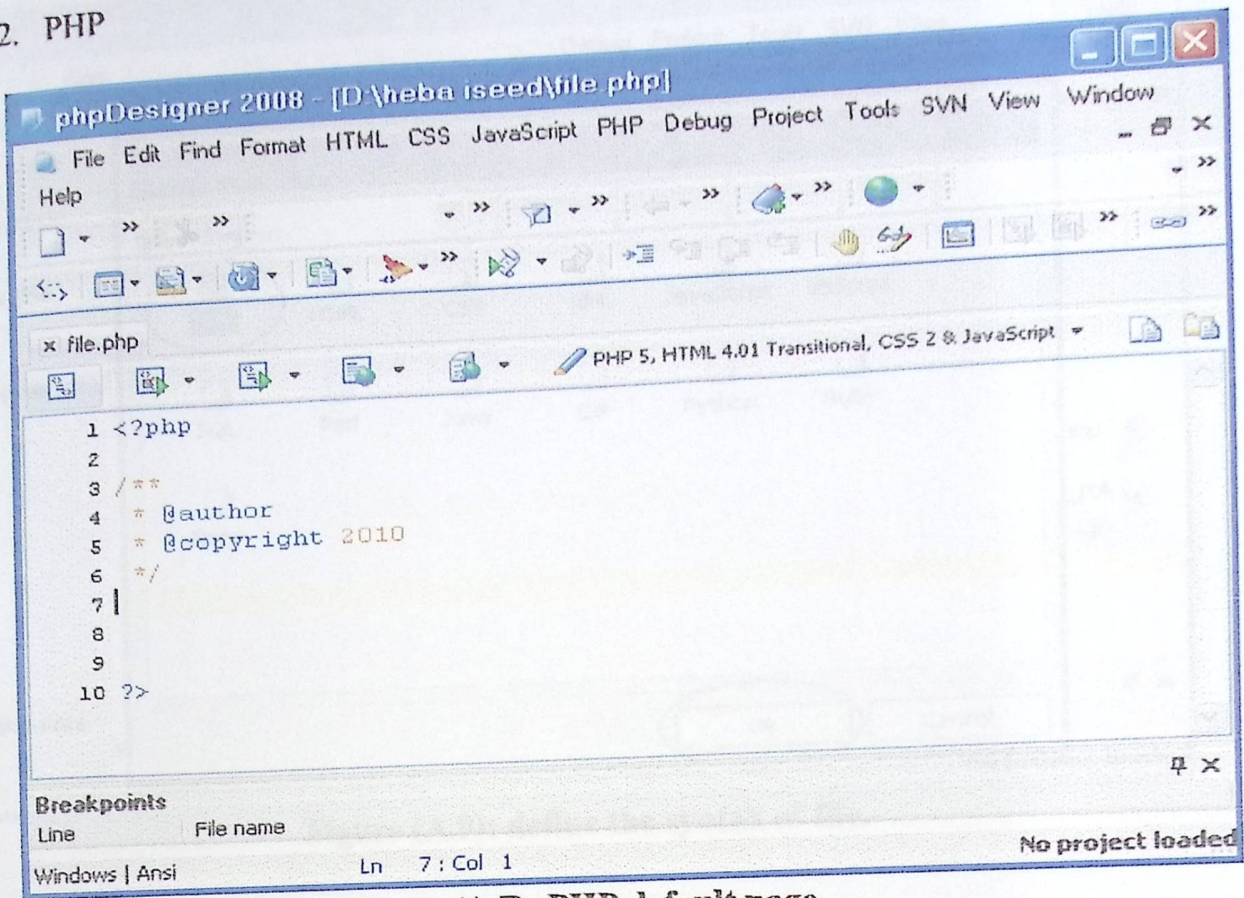
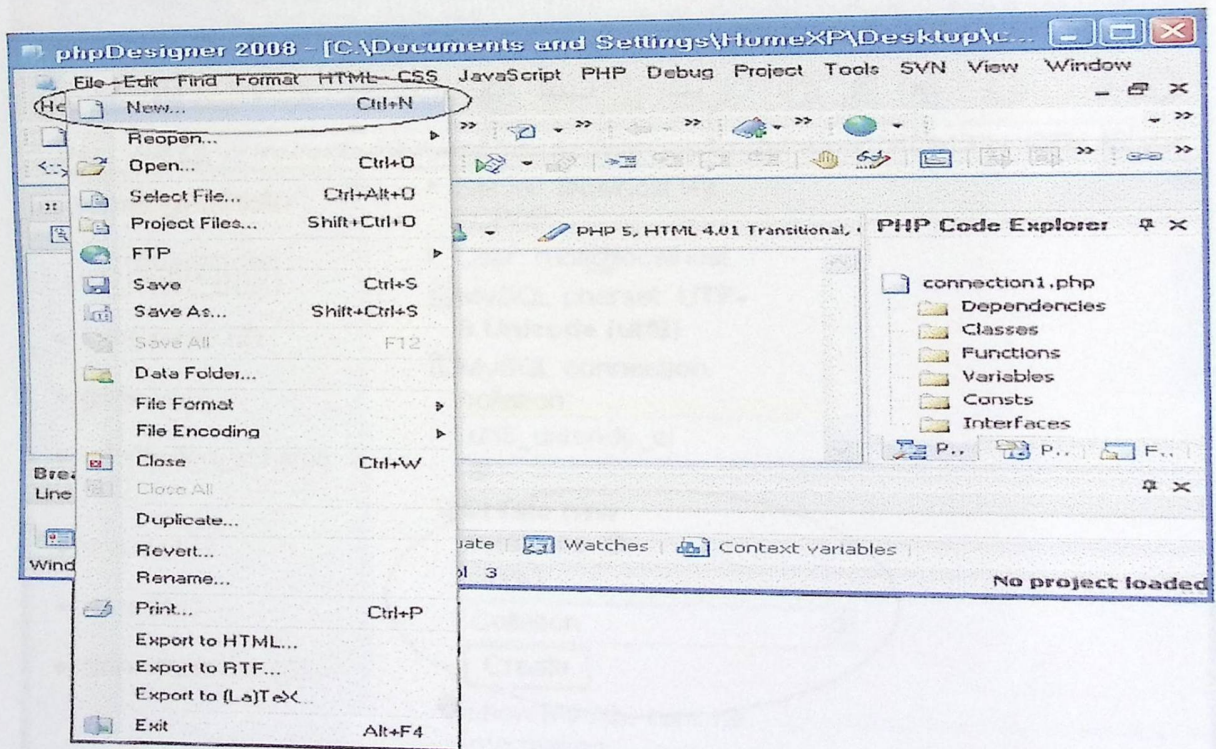**Figure (A.7): PHP default page.**

- Creating new PHP file
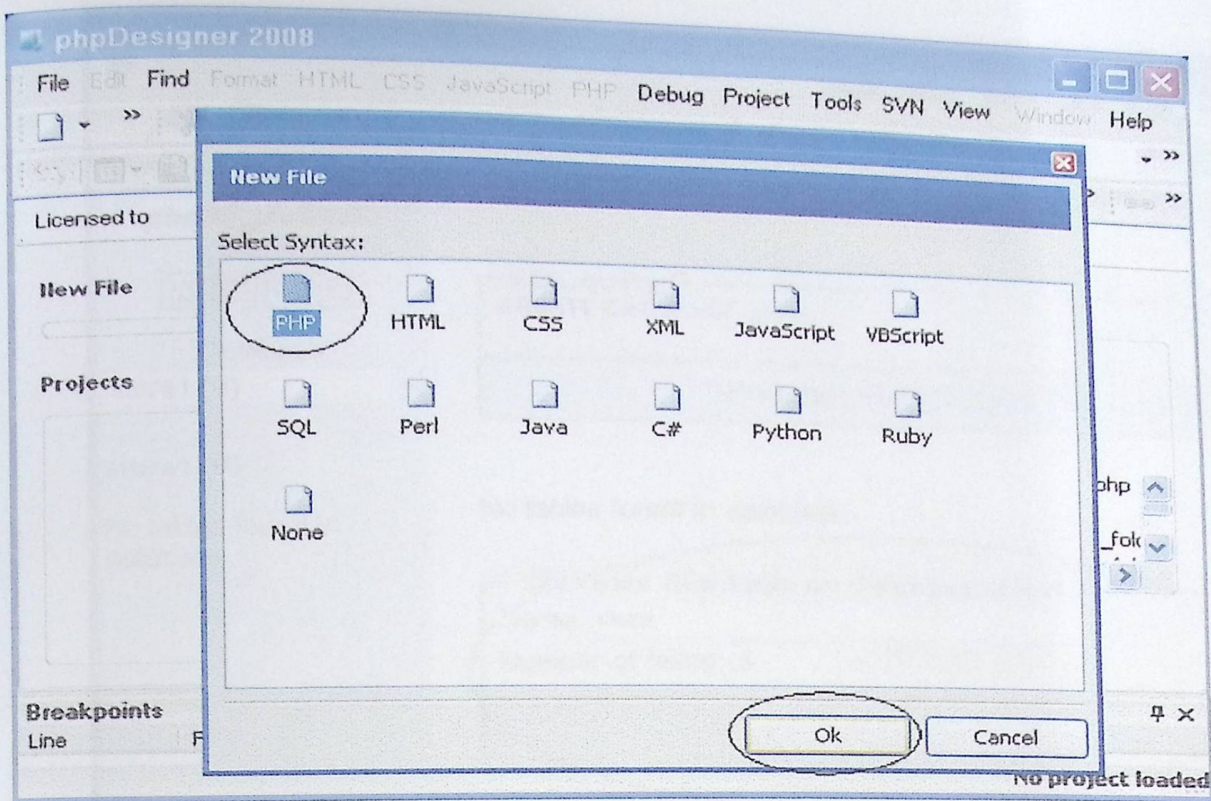

Figure (A.8): creating new PHP file

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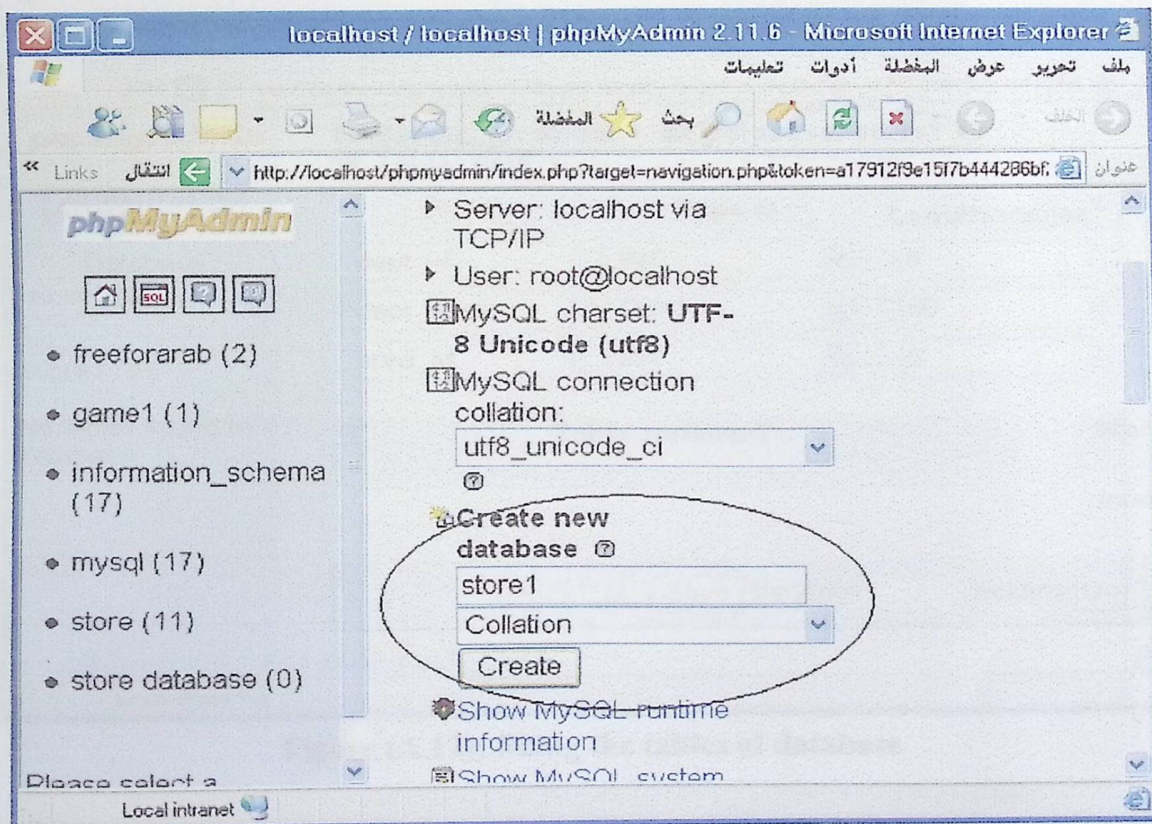Figure (A.9): define the syntax of file.

3. creating database

Figure (A.10): creating new database.
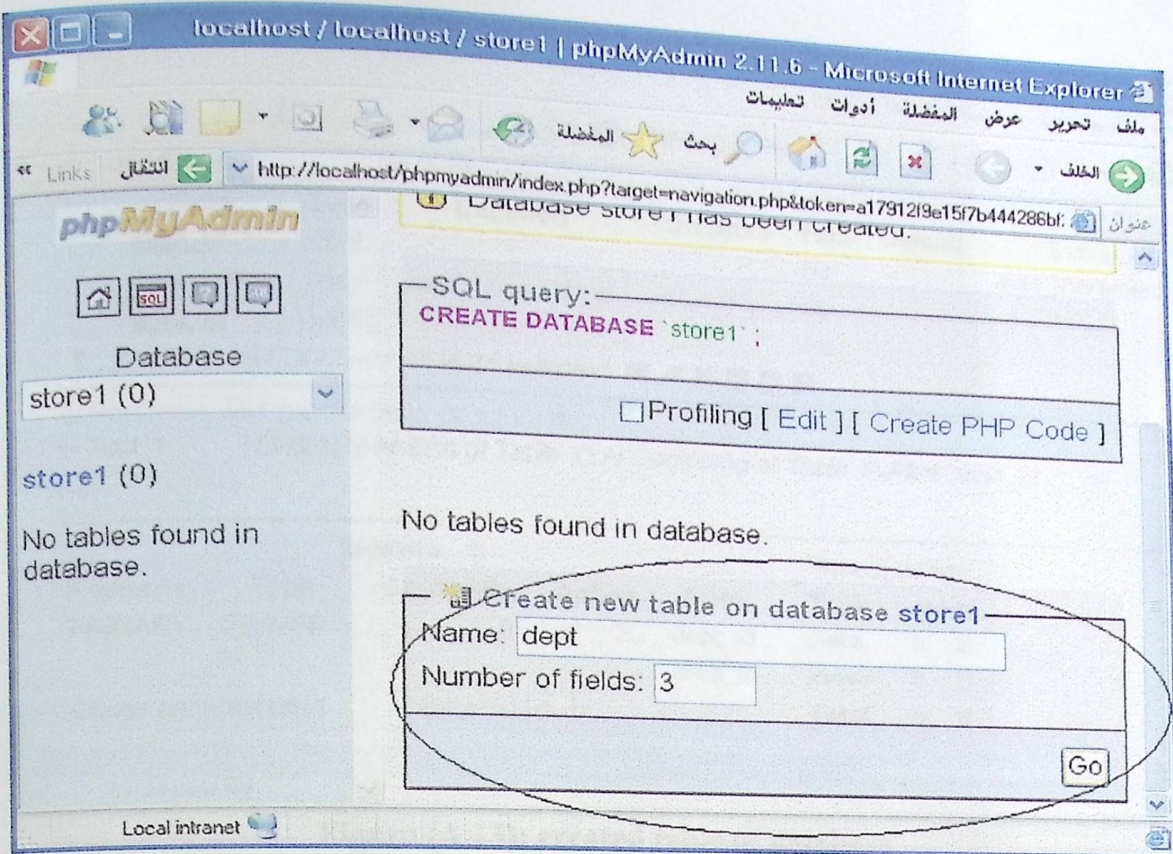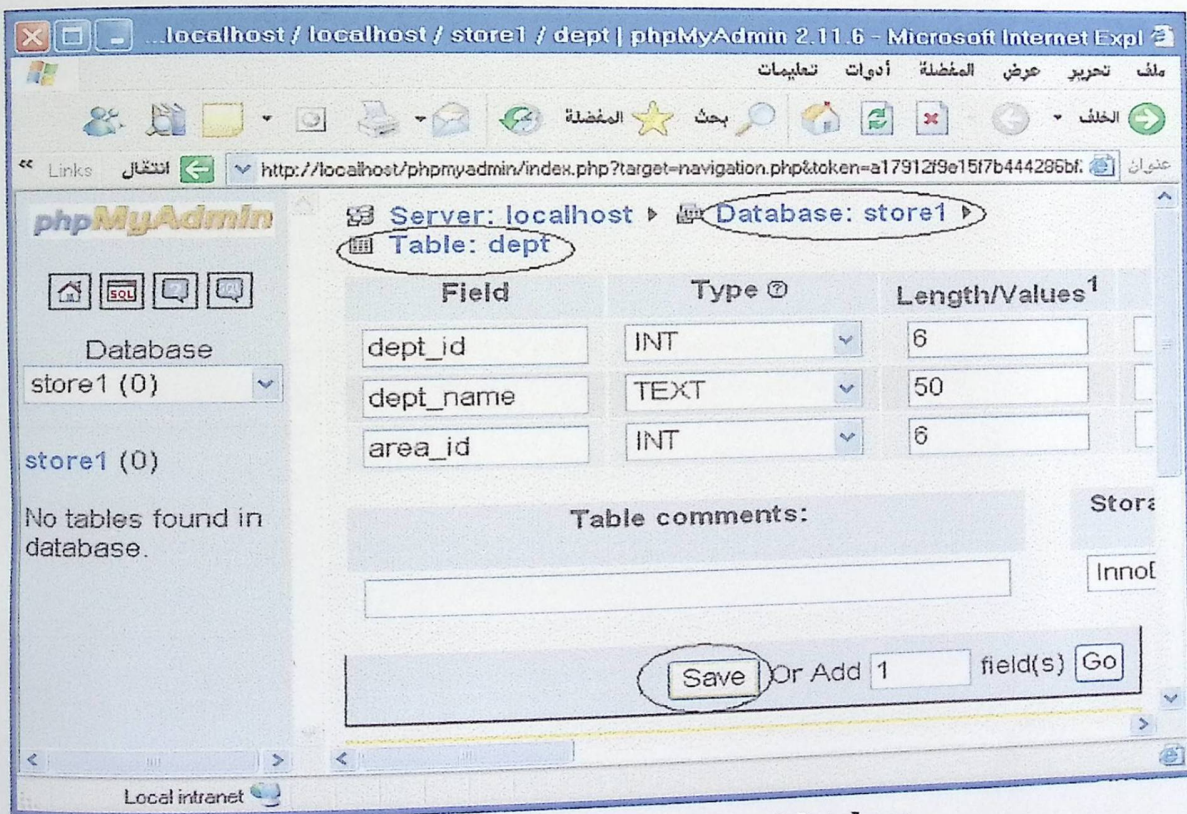
Figure (A.11): creating the tables of database

Figure (A.12): filling the tables of database

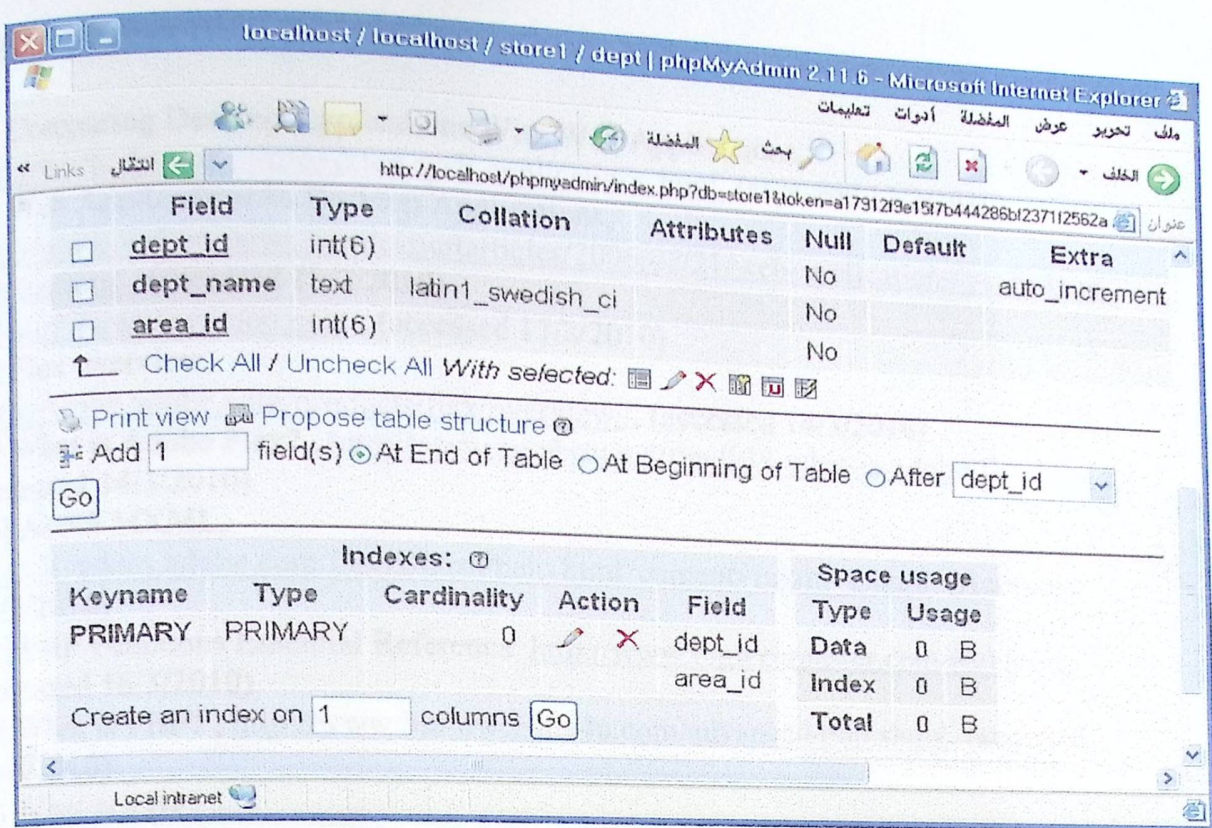**Figure (A.13): created table of database**

(illegible faded text)

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