

**NEAR EAST UNIVERSITY**  
**GRADUTE SCHOOL OF APPLIED SCIENCES**

**AN EFFICIENT INTEGRATED SYSTEM FOR  
MOBILE LEARNING**

**by**

**Mohammad Musa AL-Momani**

**A thesis submitted to the Department of  
Computer Information Systems for the partial  
fullfiment of the degree of Master of Science**

**NICOSIA 2009**

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**Name, Last name: Mohammad Momani**

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**Date:**

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# **ABSTRACT**

## **An Efficient Integrated System for Mobile Learning**

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Mobile learning (m-learning) has become an important research area of interest in recent years due to the development in many technologies especially in the areas of telecommunication and information technology. The main aim of this thesis is the development of a new efficient integrated software system for m-learning in order to bring flexibility to education and make the education available every time and everywhere.

The system was created to give new services that would allow the instructors to create their lectures using new technologies like mobiles phone, PDAs, laptops and so on. By using the developed system an instructor can create quizzes and add questions with five options, and then send these questions to students' mobile phones with date and time stamping. Also, the instructor can send SMS messages, announcements and homeworks to learners phones after adding the text area including date and time. The learners are then expected to attempt and solve these quizzes and send their answers automatically to a server computer for auto marking. After marking, the learners can get feedback about their grades and also get the key of correct answers. In addition to quizzes, learners can receive SMS messages, homeworks and announcements to their mobile phones. The developed system is desktop application-based at the server side (used by the instructor) and has been implemented using NetBeans IDE 6.5.1 J2SE (Java 2 Standard Edition). The client side (used by students) is mobile application-based and has been implemented using NetBeans IDE 6.5.1 J2ME (Java 2 Micro Edition), and the database tables operations were implemented using MySQL Server 5.1.

This thesis is oriented to anyone interested in the e-learning and specially m-learning. The individuals who are usually concerned with this project are teachers, students, and any organizations such as: universities, schools, educational institutes, and anyone who interested in m-learning.

*Keywords:* Mobile learning, m-learning, e-quiz, Visual learning environment, e-learning, online quiz.

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## LIST OF ABBREVIATIONS

**3G:** Third – generation

**4G:** Fourth – generation

**CDMA:** Code division multiple access

**E-learning:** Electronic learning

**EMS:** Enhanced messaging service

**GPS:** Global positioning system

**HTML:** Hypertext markup language

**ICT:** Information and communication technology

**ITV:** International telecommunication union

**J2ME:** Java 2 micro edition

**J2SE:** Java 2 standard edition

**JABWT:** Java Apis for Bluetooth wireless technology

**JDBC:** Java database connectivity

**LANs:** Local area networks

**M-learning:** Mobile learning

**M-LMS:** Mobile learning management system

**MMS:** Multimedia messaging service

**MOCOTO:** Mobile collaborative and educational tool

**MOLT:** Mobile learning tool

**MSN:** Microsoft network

**PCs:** Personal Computers

**PDAs:** Personal Digital Assistants

**QAR:** Question – Answer Relationship

**SMS:** Short Message Services

**TDE:** Test Development subsystem

**TEV:** Test Evaluation subsystem

**TEX:** Test Execution subsystem

**TMA:** Test management subsystem

**U.S:** United State

**UK:** United Kingdom

**UML:** Unified Modeling Language

**VSATs:** Very Small Aperture Terminals

**WANs:** Wide Area Networks

**W-CDMA:** Wideband – Code Multiple Access

**WIFI:** Wireless Fidelity

**WLLs:** Wireless Local Loops

**WML:** Wireless Markup Language

**WWW:** World Wide Web

**XML:** Extensible Markup Language



# **CHAPTER 1**

## **INTRODUCTION**

Education is an essential human activity for the development of any society in the world. When education is mentioned; typical class rooms are recalled as they are known as the traditional way to transfer knowledge to students.

These days with the advancements in various technologies especially in areas like telecommunication, many fields are affected; learning for example is no longer confined to classrooms as lectures are not the only method to convey knowledge. Consequently, a new learning methodology and research field known as electronic learning (E-learning) came to exist.

Olugbenga et al. Olugbenga et al., (2008) defined E-learning as a new learning way utilizing telecommunications and information technology in the education system, which facilitates the education process by using the network. E-learning has made learning possible from anywhere at any time by using the Internet, Wide Area Networks (WANs), or Local Area Networks (LANs). In order to benefit from E-learning, we should have a Personal Computer (PC) and an Internet connection or other network connection.

E-learning, as defined by the E-learning strategy steering committee, is the use of Internet-based programs that are developed and managed in a location that is independent of the learner. E-learning programs are not simply a subset of traditional distance education programs or on-campus programs. Rather, E-learning is an umbrella for all Internet-based programs that are used in learning environments. This distinction is important in avoiding duplication and conflict among competing technologies and services.

Most forms of E-learning depend on access to electronic communication technologies. In general, the more interactive the approach, the greater the demand on

the communication network, although the transmission of text is less demanding than the transmission of visual images and sound.

Many of the recent advances in E-learning have been driven by the expansion of fixed-line network capacity and the growth in Internet use. Of particular interest to many in the E-learning field has been the emergence of the World Wide Web (WWW), which offers a user-friendly graphical user interface through which learners can gain access to a huge range of information, including images, data files and sound as well as text. More recently, there has been a rapid growth of new mobile communications technologies that offer Internet access while bypassing both the fixed-line network and the Web.

## **1.1. Mobile Devices and Technology**

Attewell (2005) Explores that there are estimated 1.5 billion mobile phones in the world today. This is more than three times the number of personal computers (PCs), and today's most sophisticated phones have the processing power of a mid-1990s PC. These facts and the range of computer-like functionality offered by top-of-the-range devices led some observers to speculate that many people in the no distant future will start to see mobile phones as an alternative to PCs. For example Jeff Hawkins who is an inventor of the Palm Pilot, was recently quoted (Stone 2004) *"One day, 2 or 3 billion people will have cell phones, and they are not all going to have PCs ... The mobile phone will become their digital life"*. Sean Maloney, an executive vice-president at Intel (also interviewed by Stone) disagrees, on the grounds that, *"Hundreds of millions of people are not going to replace the full screen, mouse and keyboard experience with staring at a little screen"*. Clearly, neither view is likely to be completely objective, but the fact that the debate is happening as an indication of how powerful and sophisticated mobile devices are becoming.

This section analyzes two mobile devices: Personal Digital Assistants (PDAs) and cell phones. PDAs are pocket-sized computers. PDAs are extensible, with optional hardware (e.g. keyboards and wireless network cards) and software (e.g. word processors, databases, bilingual dictionaries, flash-cards).

Cell phones use the wireless Internet to exchange voice messages, emails, and small web pages, anywhere and anytime. While they lack the flexibility of PDAs, cell phones compensate using the web: students study foreign-language vocabulary using a PDA's custom flash-card program or hangman game; Students study using a cell phone's similar website. Cell phones also are basically cheaper than PDAs.

Since most students already carry phones, most classes are already equipped. Mobile devices perform many of the functions of desktop computers, with the advantages of simplicity (being easier to learn and use) and improved access (being usable anywhere and anytime).

#### **1.1.1. Handheld devices**

Handheld devices and PDAs have been rapidly adopted by businesses in many countries. PDAs are basically small, handheld devices with computing, data storage and retrieval capacity. While PDAs were originally used for keeping schedules and address book information that could be synchronized with a computer, the newer devices have powerful scanning capabilities and can also record, transfer and interrogate data. They can scan bar codes, use scaled-down applications previously found only on more powerful computers, use wireless transmission to communicate and update central databases, and sort data required for immediate decision making. These devices are now capable of many functions previously performed only by computers (AlZarouni 2006).

#### **1.1.2. Mobile phone technology**

Mobile technology is rapidly evolving to support data applications. Mobile phones can be used to send and receive short message services (SMS), take and send pictures, send and receive data like (music, video), and browse the Internet. Third-generation (3G) mobile technologies such as CDMA-2000 and wideband CDMA (W-CDMA) can transmit data at speeds of up to two megabytes per second. At such speeds, mobile phones will be able to offer vast array of new services (Bhavnani, et al. June 15, 2008)

Because of these technologies, searching for new ways that can help learners to get knowledge anytime, anywhere is needed. In order to achieve these objectives, new

technologies should support the learning scenarios where the user device could be a handheld mobile device or when the learning society itself is mobile. Mobile technology available in cell phones and other mobile devices fit with the characteristics of the above scenarios, this type of E-learning is called Mobile learning (M-learning).

### **1.1.2. WiFi technology**

Lehr and McKnight (2003) defined that WiFi is the popular name for the wireless Ethernet 802.11b standard for WLANs. Wireline local area networks (LANs) emerged in the early 1980s as a way to allow collections of PCs, terminals, and other distributed computing devices to share resources and peripherals such as printers, access servers, or shared storage devices. One of the most popular LAN technologies was Ethernet.

WiFi LANs operate using unlicensed spectrum in the 2.4GHz band. The current generation of WLANs supports up to 11 Mbps data rates within 100m of the base station. Most typically, WLANs are deployed in a distributed way to offer last-hundred-meter connectivity to a wireline backbone corporate or campus network. Typically, the WLANs are implemented as part of a private network. The base station equipment is owned and operated by the end-user community as part of the corporate enterprise, campus, or government network. In most cases, use of the network is free to the end-users (that is, it is subsidized by the community as a cost of doing business, like corporate employee telephones). Although each base station can support connections only over a range of a hundred meters, it is possible to provide contiguous coverage over a wider area by using multiple base stations.

In the last 2 years, we have seen the emergence of a number of service providers that are offering WiFi services for a fee in selected local areas such as hotels, airport lounges, and coffee shops.<sup>19</sup> In addition, there is a growing movement of so-called “FreeNets” where individuals or organizations are providing open access to subsidized WiFi networks. In contrast to mobile, WLANs were principally focused on supporting data communications. However, with the growing interest in supporting real-time services such as voice and video over IP networks, it is possible to support voice telephony services over WLANs

## 1.2. Mobility Definition

Masters (2005) defined that Mobile computing, is new way which refer to access to information or applications using networked computing devices or technology untethered like mobile devices (PDAs and cell phones).

Mobility can also be described as providing a consistent user experience to a diverse workgroup that has different device approaches to do their different jobs and tasks. What really becomes important is understanding what people do, how they do it, where they do it across the entire day? And what tools they use to do their job?

## 1.3. M-learning Definition

Laroussi and Derycke (2006) defined that M-learning is learning that use the mobile devices like digital cell phone, PDAs and laptops.

M-learning is part of Information and Communication Technology (ICT) assisted learning. Although M-learning is related to E-learning and distance education, it is a distinct in its focus on learning across contexts and learning with mobile devices. Typically, mobile devices are the new, sophisticated wireless Personal Digital Assistants (PDA), mobile telephones and laptop computers.

One definition of mobile learning is: Learning that happens across locations, or that takes advantage of learning opportunities offered by portable technologies. In other words, mobile learning decreases limitation of learning location with the mobility of general portable devices.

### 1.3.1. Characteristics of M-learning

For many reasons, M-learning becomes a good way in education using a handheld technologies. If we take a look at some characteristics of M-learning, we can find the importance of M-learning in our life.

- **Mobility of learning forms:** In the mobile learning environment, learners are no longer subject to time, space and cable network straitens. They can learn flexibly, conveniently and at anytime, anywhere for different purposes, in different ways. Learning institutions, learning tools, learning resources, learning supporters of the learners can be mobile.

- **Interactive learning process:** Mobile learning technology is based on network communication technology and mobile computing technology. The digital learning information, resources and services of the transfer can be used by these technologies to achieve two-way communication. This learning process will help learners improve their grades and confidence, form learner's optimistic about the treatment of learning, train learner's ability to communicate, and develop learner's personality (Hughes, et al. 2006).
- **Integration of learning technology:** Mobile learning integrates multiple technologies, such as personality, multimedia, smart context, tactile interaction, mobile devices etc. It implements, for example, some changes from the virtual learning environment to a wireless virtual learning environment. Therefore, mobile learning is different from network learning and digital learning which are based on cable network and desktop computer.

#### 1.4. Integrated M-learning System (IMS)

In order to reach an efficient M-learning system we have to utilize the advantages and characteristics of the mobility. So for these reasons we put the initial scenario for this system.

- **IMS services**

The following table shows the system's users and the provided services.

Table 1.1: IMS services

<b>Mobile Users Services (Students)</b>	<b>Instructor services</b>
<b>Get Announcements</b>	<b>Send Announcements</b>
<b>Get homework</b>	<b>Send Homework</b>
<b>Apply exams</b>	<b>Provide exams</b>
<b>Receive SMS</b>	<b>Send SMS</b>

- **IMS network connection**

The network connection between the client and the server could be WiFi or Bluetooth. In this research WiFi connection is going to be used. WiFi is more secure, with higher transmission range and bandwidth than Bluetooth which makes it more efficient, especially for media transmission.

- **IMS components**

The following Figure shows the IMS components of the system, which are mainly divided into two parts:

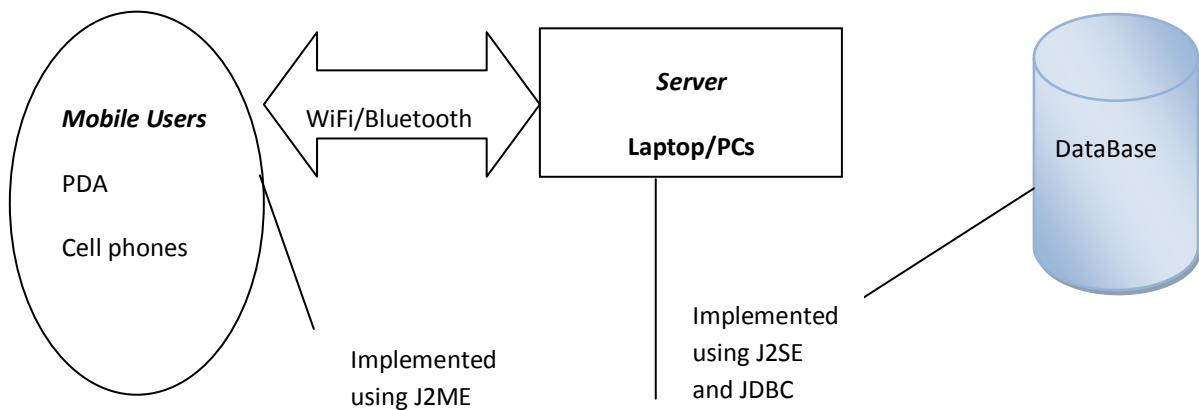


Figure 1.1: IMS components

- **Server side:**

This part will give the permission to a client to access IMS services. It allows authorized instructor to use the system to submit homeworks, send announcements, SMS and Upload the exams (Quizzes) using WiFi network.

The server side is implemented using Java 2 Standard Edition (J2SE) technology and Java DataBase Connectivity technology (JDBC) with available components like Laptop or PCs devices.

There could be a web service that will be used to facilitate the provision of the instructor services.

- **Client side:**

This part is related to the student who has permission to use the system. It allows the client device to connect to the server and receive homeworks, SMS, announcements and answer the exams and receive a feedback by using WiFi network.

The client side is implemented by using Java 2 Micro Edition (J2ME) technology with available components like cell phone and Personal Digital Assistant (PDA) devices.

## **1.5. Thesis Outline**

The rest of this thesis is organized as the following:

- **Chapter 2: Literature Review**

This chapter reviews current M-learning systems and trends. A detailed illustration of these systems and the technologies used by them will be provided and explained.

- **Chapter 3: The Proposed System Analysis**

This chapter proposes a new M-learning system. The proposed system architecture, scope and design will be illustrated.

- **Chapter 4: The Proposed System Implementation**

This chapter explains how the proposed system is implemented. Technical issues related to the software and hardware used by the proposed system will be illustrated.

- **Chapter 5: Conclusions and Future Work**

This chapter summarizes the work presented in this research and draws different conclusions. It discusses the improvements and advantages that the proposed system adds to M-learning. In addition to that, it provides more future work that can still be done to improve M-learning systems.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1. Introduction**

Mobile learning (M-learning) is a new learning model following the E-learning. How to assist mobile learning with new mobile communication technology effectively has been a hot spot in the modern educational research.

Therefore, before we begin working on this thesis, it is helpful to review the field of M-learning, and describe the current generations of M-learning, also it would be helpful to describe the limitations of M-learning and discuss possible improvements.

How to use wireless technologies in education to help students get the knowledge is the main question, so when we want to use new technology in education; E-learning is recalled as new technology using networks and internet with special components like PCs and laptops but we are searching for new technology with available devices for everyone which can use it anywhere and anytime, consequently M-learning came into existence.

#### **2.2. Wireless Technologies**

Attewell (2005) stated that Wireless technologies are expanding their range of functions and services. Wireless communications are particularly useful for supplying data services to remote communities (and some urban areas) that do not have access to high-speed fixed-line connections. The use of wireless technologies to support networks has been hampered by differences in standards, which have hindered interoperability across networks by different devices. Increasingly; however, hardware manufacturers are producing devices that can adapt to either of the two major standards that utilize spectrums 802.11a and 802.11b (WiFi).

Although these two systems are able to operate on these spectrums, they are certainly not the only or most likely long term options (i.e. 802.11g and 802.16 offer important

alternatives), high speed, broadband connectivity between different wireless technologies is now possible. Wireless local loops (WLLs) centered on Very Small Aperture Terminals (VSATs) and satellite technologies now permit wireless and satellite connectivity at speeds of more than two megabytes per second both ways (upload and download). Within the network, data can be distributed at rates of up to fifty- four megabytes per second. Wireless technologies are now competitive with other mobile technologies, particularly 3G technologies.

Masters (2005) defined that Bluetooth is a wireless protocol for exchanging data over short distances from fixed and mobile devices, creating Personal Area Networks (PANs). It was originally conceived as a wireless alternative to RS232 data cables. It can connect several devices, overcoming problems of synchronization.

### **2.3. Mobile Learning Format Based on 4G Technology**

Song (2008) made a research at Kingston University (UK) to test the effectiveness of a two-way SMS campaign. The team has developed a system that sends SMS to students registered to the service about their schedule, any changes to the schedule, examination dates and places, students marks, etc. After registering, students were automatically separated into five different groups. One group was receiving announcements via e-mail, three groups via SMS (but different interaction was used for each group) and the last group was interacting via the web. The conclusions of the experiment were that the students in scenarios where a certain type of response is required preferred SMS as a medium to e-mail or web based announcements. They felt the data is more personal and they like this. SMS could be efficiently used in education (M-learning) as a complementary medium. As the technology improves (i.e. EMS and MMS, potential more user-friendly interfaces), the potential increases too.

But with the evolution on many generations of technology (He and Zhao ,2008) in the past few decades, the mobile communication technology has reached a rapid development stage and a wide application stage. Since the first time the mobile communication technology was used, there has been three generations. At present the International Telecommunication Union (ITU) has begun to formulate the standards of fourth-generation mobile communication, and has reached a consensus: With the

mobile communication system and other systems (such as wireless LAN etc.) combined, The 4G technology was produced, therefore before 2010 the data transfer rate will reach 100 Mbps, which can provide a variety of business more effectively. Thus 4G technology not only can afford convenience for people but also can bring a learning revolution. The development of education and the progress of technology have deep relationships. With the development of the network technology and information technology, the modern distance education developed rapidly which is based on internet and multimedia technology, and the learning models have been changed enormously. The mobile learning has become a hot spot.

People communicate with each other freely by the fourth-generation mobile communication technology. It will change our way of life and our even social patterns completely. The followings are the 4G's characteristics:

- Faster spread rate.
- More flexible communication.
- Complete integration of business.
- High intelligent network.
- Stronger compatibility.
- High-quality multimedia communications.
- Cheaper communications costs.

He and Zhao (2008) underlined that mobile learning based on the short message not only can provide voice services, but can also provide short message service. Through short messages, we can transmit limited characters not only among learners, but also between learners and the Internet server. With 4G technology we can provide high-quality multimedia communications. Mobile phones can send and receive multimedia messaging including text, sound, images and video. Learners sent a text message to internet teaching servers by mobile phone terminals, teaching server analyses the user's text message then change it into data requests, and then make a data analysis, processing, finally, it sends the response to learners on their mobile phones. The use of this property, students can complete teaching and learning activities through a wireless mobile networks and the internet.

Because 4G technology is more mature than 3G technology, it can provide more rapid dissemination speed and higher-quality multimedia communications. Therefore, we can use 4G technology to develop some software's for students to watch and simulate learning course content. To some extent, 4G technology-based mobile learning will have a great's impact on the traditional distance education. The reason is that 4G-based video services for mobile learning is more flexible and more suitable for modern fast-paced learners.

There are many advantages of mobile learning that are based on 4G technology due to the fact that the 4G mobile technology-based learning models will emerge of a strong impetus to mobile communications. The integration of the internet and mobile communications and education are combined to make full use of educational resources, this will improve people's learning experience, in addition to its advantage of fixed distance learning including the interactive, shared advantages. This kind of mobile learning also has the following characteristics: embodied in portability, efficiency, individual and low-cost (He and Zhao 2008).

## **2.4 Integrating M-learning with E-learning**

Wains and Mahmood (2008) proposed a design as a solution for the integration of M-learning into E-learning to extend the distribution of learning materials by using a light weight and low price devices, specifically mobile phones.

The proposed architecture extended the system by placing M-learning Management System (M-LMS) in parallel with the existing system, so the system can be divided into four parts: E-learning environment, traditional learning environment, M-learning environment and distance learning institution.

## **2.5. Usability Guidelines for Designing Mobile Applications**

Seong (2006) suggest ten golden usability guidelines as principles which aim to design a highly efficacious user friendly and usable mobile interface to support dynamicity of mobile and handheld devices.

It divided usability guidelines into three categories: user analysis, interaction, and interface design.

- U1: The user/learner
- U2: Human-mobile interaction
- U3: Map between mobile learning portals and the real world
- U4: Help users recognize, diagnose, and recover from errors
- U5: Visibility of the status
- U6: Minimize human cognitive load
- U7: The small screen display
- U8: Do not overuse
- U9: Navigation
- U10: Consistency

It explains that the Architectural Design of the Mobile Learning Course Manager consists of: Mobile Server and portal connects to the Internet based on the socket connection between mobile phones and the Mobile Server.

Black and Hawkes (2006) examined the design and development of an architectural model for a user-centered collaborative mobile learning environment:

*Collaborative learning:* is a methodology where students acquire and build their knowledge base by interacting with others within a group. Some research showed that students often learn better in this type of environment rather than in the standard classroom

*Reading Comprehension:* has the problem which can benefit from advanced technologies.

*Question-Answer Relationships (QAR):* teaches students to read by recognizing relationships between questions and information found either in the text or the reader's background.

The proposed implementation layout architecture for design collaborative mobile learning environment is divided into two parts:

A - Server side part which consists of:

- 1- Image Manager Servlet.
- 2- File Manager Servlet.
- 3- Message Manager Servlet.
- 4- Session Manager Servlet.

B- Client side part which consists of:

- 1- Interface Manager.
- 2- MIDlet Session Manager.
- 3- Local cache.

Also, Roschelle et al., (2005) presented a design framework for mobile, handheld device-supported collaborative learning (mCSCL). Social Constructivism: The classroom learning improves significantly when students participate socially.

They suggested five principles for an educational activity which are: Constructive, Active, Significant, Reflexive and Collaborative.

How People Learn: They suggest that Students come to school with prior knowledge that strongly affects how they learn new subject matter. If this incoming knowledge is not engaged in the course of instruction, students frequently fail to learn desired subject matter concepts.

They are work in collaborative Learning: They seek to use small groups for instructional purposes in such a way that students work together to maximize their own learning and the learning of others.

For this they proposed a design framework via activity which is coupled in two facets: relationship facets and content facets. These facets supported with Social mediation and Technological mediation.

In addition Brown et al., (2006) designed a case study for a mobile learning environment by considering different user requirements for the university students (e.g. discover locations of lecture). They proposed architecture module; firstly users sends request for information, with their current location to the PDA server. Then server builds the query for the SQL server, which retrieves the client's information

from the database. Then PDA server returns the information to the user's Mobile Helper. As users move through university area.

Laru and Järvelä (2008) used web 2.0 and mobile devices to explore how mobile technologies and social software can be used for collaborative learning, sharing understanding and building virtual communities. They also attempted to find the students' online interaction during the course, and the mobile tool features which affected collaboration during the course by qualitative case study. They presented a design scripts that can be defined as "a set of instructions prescribing how students should perform in groups, how they should interact and collaborate and how they should solve the problem". They are describing self-regulated learning theory concerns how learners develop learning skills and use learning skills effectively.

Moura (2008) Computed several statistics regarding students' satisfaction in his project which assesses the implications of mobile technologies in individual and collaborative learning. In this research reference was only made to the experiment involving mobile phones, MP3/MP4 players and Podcasts and present the students' perceptions about the use of the mobile phone in education. This statistics showed that all students have a mobile phone, 67% of them have MP3 player and only 27% have MP4 player. The possession of these mobile devices met the minimum conditions necessary for the development of curricular activities offered to the students. It was also found that the students' perception of the implementation of the phone in school, the majority of them (66%) considered that the phone aids collaborative work, provides motivation for school activities (73%), allows quick access to course material (73%) and allows necessary information to be accessed at anytime and anywhere (73%).

After this statistics a conclusion was made that mobile devices are tools, which are becoming increasingly powerful and they can help teachers to create mixed educational opportunities, extending the boundaries of the classroom, thus giving students more options about the time and place to learn. Mobile technology is helping to develop new methods and resources for accessing information. Despite the fact that students are still in the early stages of the use of mobile phones in an educational context, the project present already shows positive perception about their usefulness and its value as a tool to support the education process. the research highlight the fact

that the students find all the services available in their phones to be easy to use, especially the newer features such as the internet, MSN, GPS, and email. In the future teachers and students will no longer have to be restricted to a place and a time to teach and learn. Mobile devices and wireless technologies will, in the near future, become routine both inside and outside the classroom.

## **2.6. Mobile Learning Based On the Short Message Services**

SMS texting has assumed a vast social importance over the past five years and has transformed cultural life and social behavior with the take-up of mobile phones in many parts of the world. Since the idea of mobile phones' potential for supporting learning occurred, SMS has become the most straightforward application of the usage of mobile phones as an educational supporting tool. Many different educational bodies have experimented in this area.

The survey conducted by Cavus and Ibrahim (2007) showed that only a very small percentage of students owned PDAs, but mobile phones on other hand are available almost for everyone. The aim of this experimental study was to find out the potential of using mobile phones in teaching new technical English language words to first-year undergraduate students. For this aim a system called Mobile Learning Tool (MOLT) was created using SMS text messages that were sent to a mobile phone attached to a PC via the Bluetooth interface. The mobile phone receives messages and phone numbers from the PC and then forwards these messages to recipient students at the times requested by the PC. The survey results were very positive and in favor of the mobile phone based teaching system. Students who evaluated this system found it to be very useful and they suggested that other lectures should also use mobile phone based teaching support the main teaching activities in the class room. In addition, students preferred to receive university notices, exam dates, exam results etc to their mobile phones.

## **2.7. Mobile Learning with Quizzes-based on Bluetooth Network**

Several systems were proposed to apply quizzes over mobile phones, mostly utilizing short-range Bluetooth devices.



Hürst, Jung and Welte (2007) presented a system that enables users to easily generate quizzes for mobile devices. System can create multiple choice tests and general question-answer pairs by just entering (or copy-pasting) text into an input mask, therefore all issues related to the actual document production will be generated automatically.

Zhang, et al. (2006) shown that WiFi technology is not available for cell phones, the most popular portable devices in students. Besides, PDA with WiFi card is more than 300 U.S. dollar, which is a bit too expensive for an average student. In cases where people are relatively gathered, for example, tourists with a tour guide, or a teacher surrounded by students, WiFi technology may not be the best choice. A shorter range communication with lower power consumption and low price is preferred. Wireless personal area network, such as Bluetooth technology, is right fitted here.

The Bluetooth-based E-learning system is based on client/server architecture. The client side can be cell phones, PDAs, or laptops, and the server side can be desktops, or laptops. The communication media between client and server is Bluetooth. Three sub-systems are involved: the client-server communication sub-system, the instructor server sub-system, and the student client sub-system. In terms of hardware, laptop was chosen as the server in order to provide more functionality and cell phone as the client for its popularities in students.

- **The Client-server Communication Sub-system:** The communication between client and server is established using JSR-82, the Java APIs for Bluetooth Wireless Technology (JABWT), which exposes the Bluetooth software stack to developers working on Java platform.
- **The Instructor Server Sub-system:** The main purpose of the instructor sub-system is to reflect students' feedback and performance in a clear, user-friendly way, three main functions are provided:
  1. Lecture Reflector: Three progress bars labeled Speed, Content, and Difficulty provide the instructor a rough idea about how students think of the lecture.

2. Students' Status: The status area provides the number of students currently in the system, the percentage of students that have answered the current question and the instant comments from the students for the instructor.
  3. Statistics Information: Statistic function provides the instructor visualized information of the performances of the students.
- **The Student Client Sub-system** : Three main functions that are provided:
    1. Connect to the Server.
    2. Answer Questions. After the student logs in the system, a Bluetooth connection is setup between the client and the server.
    3. Instant Feedback of the Lecture. In addition to answering questions, students can also send instant feedbacks to the instructor.

This previous research described a Bluetooth-based E-learning system that can be used in outdoor environment where involved people are relatively gathered, such as a tour guide with tourists, or an instructor surrounded by students. The main advantages of the system are its low learning cost, secured connection, low power consumption, and ability for students to use cell phones as the communication devices.

### **2.7.1. M-learning environment**

To make any research about any science we should firstly have a good background about its environment. To this end, many research starts study the environment of M-learning. Vargas and Lu's (2007) created a new paradigm that improves the cooperation between students and teachers, overcoming the classroom borders. This research proposes an ubiquitous testing system (UbiSysTest) for M-learning environments. The goal of UbiSysTest is to provide an infrastructure for creating, storing, applying and correcting academic test. The UbiSysTest running over an infrastructure named MoCoTo (Mobile Collaborative and Educational Tools). The objective of MoCoTo is to offer set of services supporting the teaching/learning process in both indoor and outdoor environments by means of portable devices. The following mechanisms allow the MoCoTo project exploit some of these possibilities:

- **Content management:** MoCoTo provides tools for developing course materials and access them through cell phones, for instance.
- **Collaboration tools:** An important feature in M-learning systems is to support collaboration. MoCoTo offers the following mechanisms for collaboration between users (teachers and students):
  1. Chat rooms
  2. Virtual shared whiteboard
  3. Classroom integration
- **Test Management:** Teachers can create pool of questions to be used in order to evaluate students' learning degree. This research presented design and architecture of a ubiquitous testing system (UbiSysTest) for M-learning environments. Through UbiSysTest, students can download and execute tests by means of cell phones. This application runs off-line and only connects through Internet whenever it is required. The architecture of UbiSysTest is composed by four subsystems: Test Management Subsystem (TMA), Test Development Subsystem (TDE), Test Evaluation Subsystem (TEV) and Test Execution Subsystem (TEX).

## 2.8. Mobile Devices Characteristic

What kind of mobile devices should the students use? And what are the characteristics of these devices? What are some of the questions that should be raised when a new mobile learning environment is to be set.

Differences among mobile devices, for example different show patterns, different screen sizes and so on bring a choke point to the development of mobile learning to ubiquitous learning or to seamless learning. For these, Wang and Li (2008) discussed how to construct a mobile learning platform supporting device adapting and device adapting model using agent, with the result that learners can learn the same learning

resources by difference devices (e.g. mobile telephone and PC and PDA and notebook PC and so on), rather than by different copies of learning resources. So that seamless learning environment will be invented in the future. To build the structure they designed a model that contains three layers:

1. **The first layer (Presentation):** It is sited at the client's location. The main task of it is the web browser supporting all kinds of languages sending learning request to one web server, then the web server returning information adapting to the client after the user's identity is assured, finally the client receives the information and shows that in the web browser.
2. **The second layer (Business Logic):** It is sited at the web server, and it contains the business logic of device adapting. The main task of it is to receive requesting information from the client, analyze the original datum, and transfer them into requesting information in style of XML. Then it sends that information in style of XML to database server. After the database server returns the results to it, it transfers the results into the files as the style of HTML or WML and so on.
3. **The third layer (Data Service):** It is sited at the database server; it contains the data processing logic. The main task of it is to receive requesting information from the web server, then complete the function of querying, refreshing and changing datum in the database, at last return the results to the web server.

Mobile agent and multi-agent technologies are useful as initial attempts for constructing high efficiency and high-performance mobile learning platform. This research provides a mobile learning platform supporting three layered structure and a device adapting model. The main function and characteristic are that the mobile learning platform can support all kinds of devices such as all kinds of brand mobile phones, PDAs, various types of portable computers and PCs, etc, and can shorten the time of constructing education-resource website effectively.

Previous researches are focused in how to use the mobile technology in order to send SMS and to create quizzes-based in Bluetooth network which can serve a small area

because the Bluetooth can cover small range and this mean that the systems can't help the education system in wide range.

The following chapter is proposed a new M-learning system. It aims to improve the M-learning systems in particular in order to provide the requested knowledge to the learners with less constraint in terms of devices, locations and networks in use. Our system is using WiFi network and it has many services to improve the education process which makes our system a full system that has SMS, Announcement, homework and quiz services and give feedback for learners.

## **2.9. Summary**

As it was mentioned in this chapter, there has been much research done on mobile learning over the past several years that have used many technologies and scenarios to create new systems such as SMS system which is used to send short messages to student and quizzes based on Bluetooth network which help to developing the education and make it more flexible by using the available devices that using by learners in every time and everywhere.

## **CHAPTER 3**

### **SYSTEM ANALYSIS**

#### **3.1 Introduction**

In this chapter a new system for mobile learning will be discussed in details, system analysis and design is explained, documentation of the system proposed in this thesis is provided. Design decisions used in designing system are discussed. It is the suitable way to understand the system through its developing and applying phases. By applying this method, we will be able to analyze and design the system and know how each user will interact with it.

Analyzing the system makes the system understandable by users, or the end user, whatever their type of interaction with the system. In order to analyze the system, we have to decide the method which will be used and followed in developing this system. The Unified Modeling Language (UML) technique was used in order to analyze the users' requirements and their processes.

#### **3.2 System Architecture**

Figure (3.1) shows the system components, which are mainly divided into two parts:

- Server side
- Client side

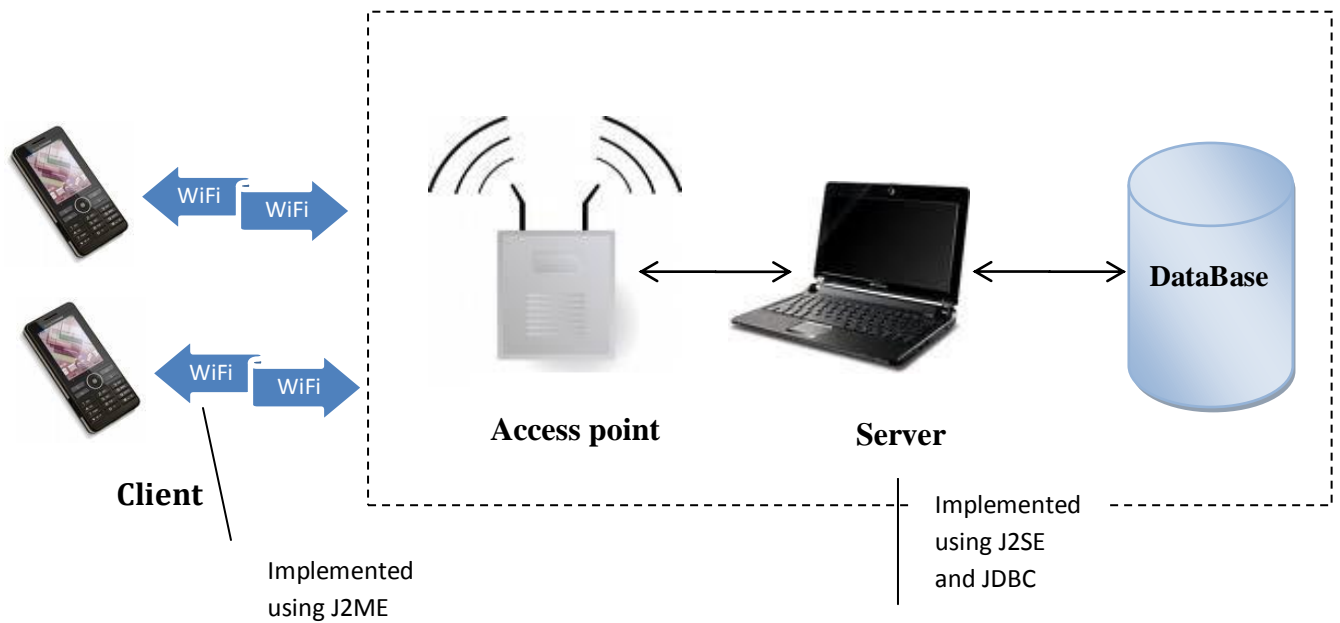


Figure 3.1: System architecture

The server part will give the permission to a client to access system services. It allows authorized instructors to use the system to create homeworks, send announcements and SMS and Upload the exams (Quizzes) using WiFi network.

The client part is related to the student who has permission to use the system. It allows a client device to connect to the server and receive homeworks, SMS, announcements, apply the exams and receive feedback using WiFi network.

### 3.2.1. Subsystem description

Mobile Learning System has several subsystems that cooperate with each other to do its job and to serve the clients in the way that it should.

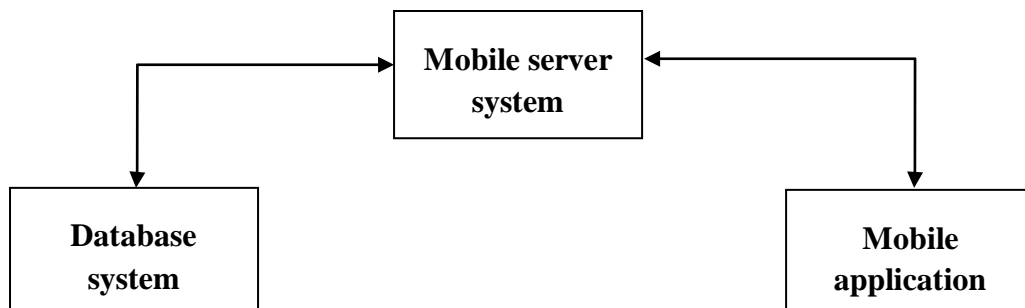


Figure 3.2: Main subsystems

The subsystems described in Figure 3.2 are the main parts of the system and the cooperation between them will lead to run the system as suspected, now we will present some description about these subsystems:

- **Mobile Server:** This subsystem is the intermediary system between the database and the mobile phone (Student). This server can connect to the mobile phone, sends and receives packets which contain data to and from the mobile phone, and then the server which is connected to the database can make the suitable operation to manipulate the database.
- **Mobile Application:** This subsystem is used by the client who can view all information he/she needs, add to that the client can also take advantage of the system's services that were previously sent by the instructor, this subsystem is connected to the mobile server which is connected to the database.
- **Database System:** This subsystem contains the database which is used by the previous subsystems to maintain the correct data for a specific command.

In this thesis a new M-learning system is proposed. It aims to improve the M-learning systems in particular in order to provide the requested knowledge to the learners with less constraint in terms of devices, locations and networks in use. Our system is using WiFi network and it has many services to improve the education process which makes our system a full system that has SMS, Announcement, homework and quiz services and give feedback for learners.

### 3.3. UML Use-Case Diagrams

In use-case analysis we illustrate the way the system behaves, relations between the user and other subsystems and how the sequence of actions for each request is applied. Here we will explain how the user can get our system benefits through some possible usage scenarios; also we will explain some scenarios which are included in this use-case.



### 3.3.1. Administrator action

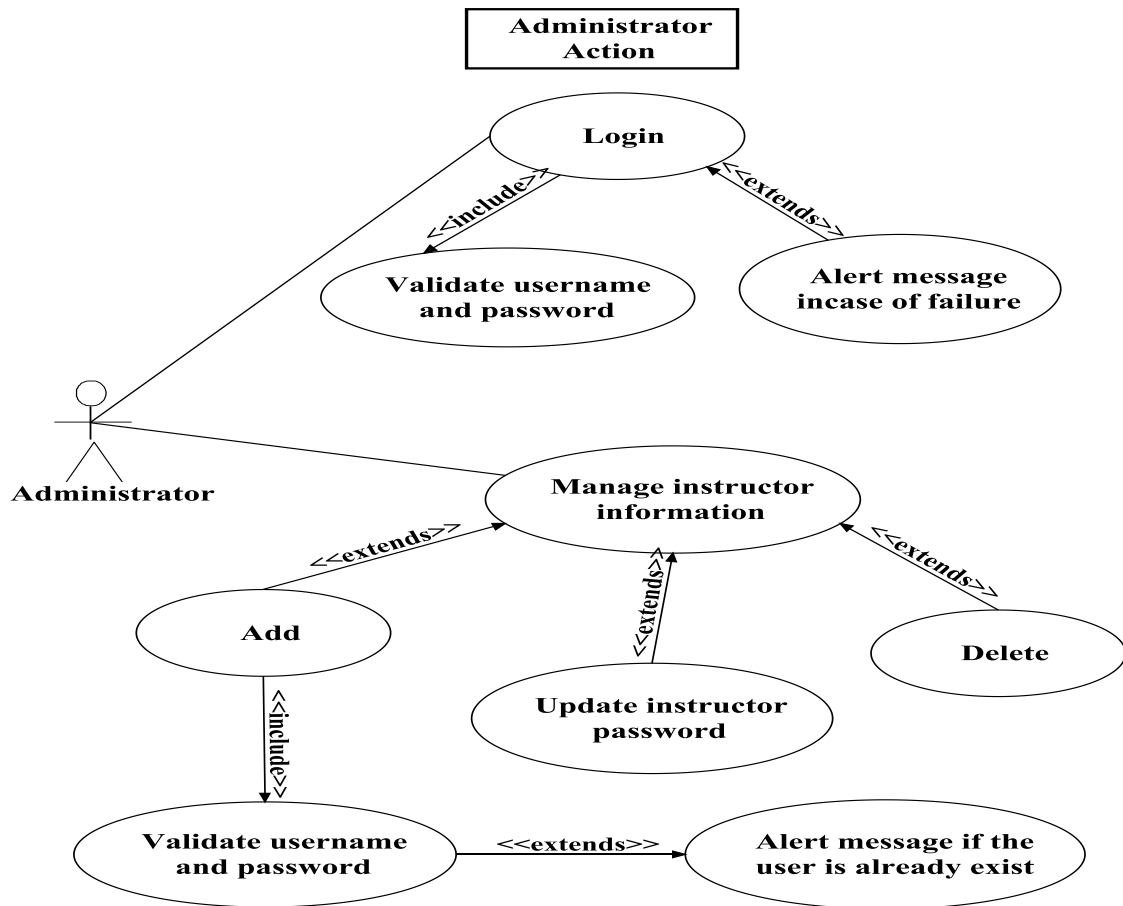


Figure 3.3: Administrator action

The administrator is the person who is managing the instructors and other administrators' information by adding, updating or deleting them. At the same time the system will give alert message for each action the admin does, at the same time the system checks if the instructors information already exist as shown in Figure 3.3.

### 3.3.2. Instructor action

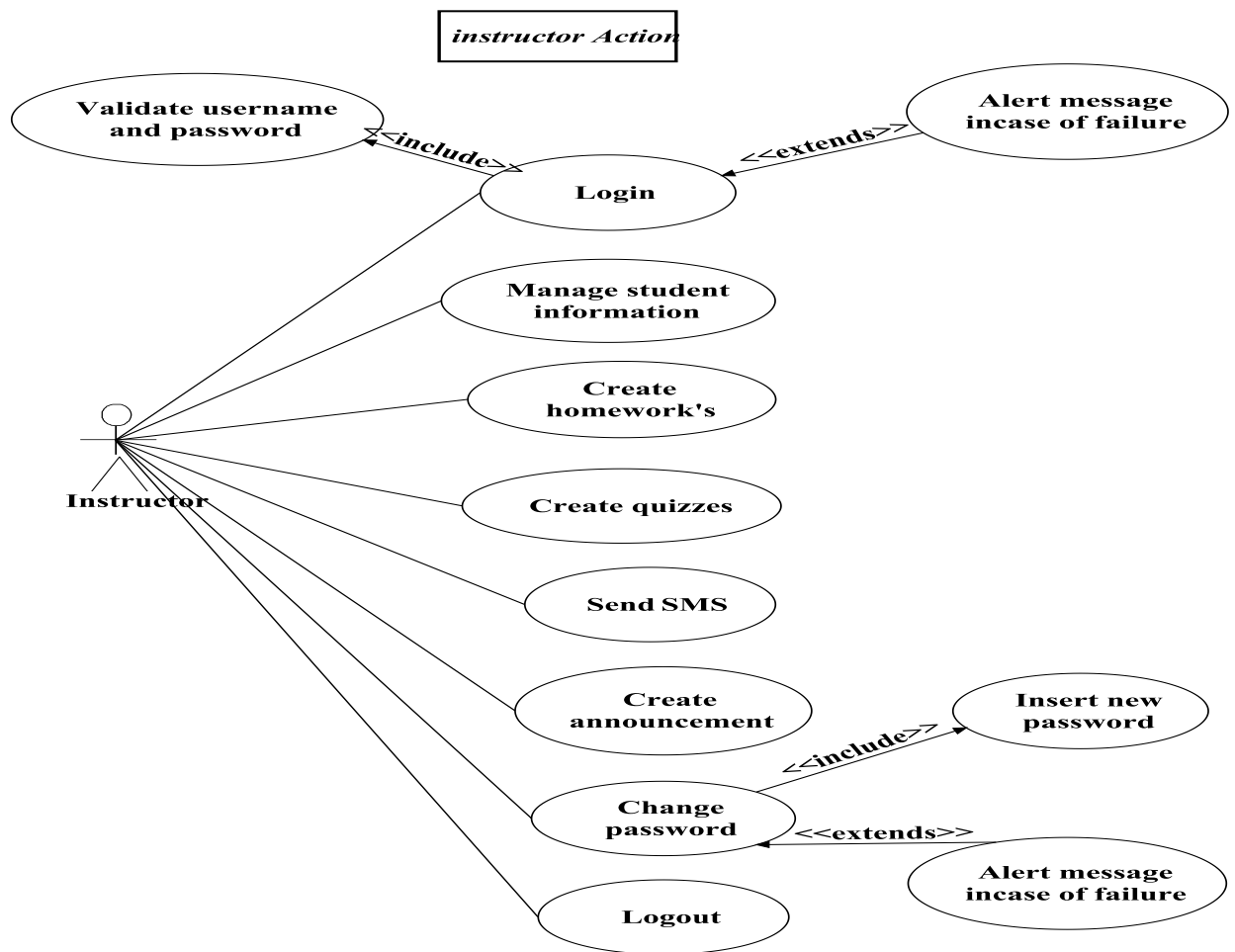


Figure 3.4: Instructor action

Figure 3.4 shows the services that can be created by the instructor who can use the system after a correct username and password are entered, after that the instructor can add new student, send homework, SMS, or announcement. Also the instructor has other options such as change his/her password, each service will be explained as following:

Managing student information is one of the actions that can be done by the instructor, for this service he/she can add, update or delete student information. The system will give alert message for each action that the instructor does as shown in Figure 3.5.

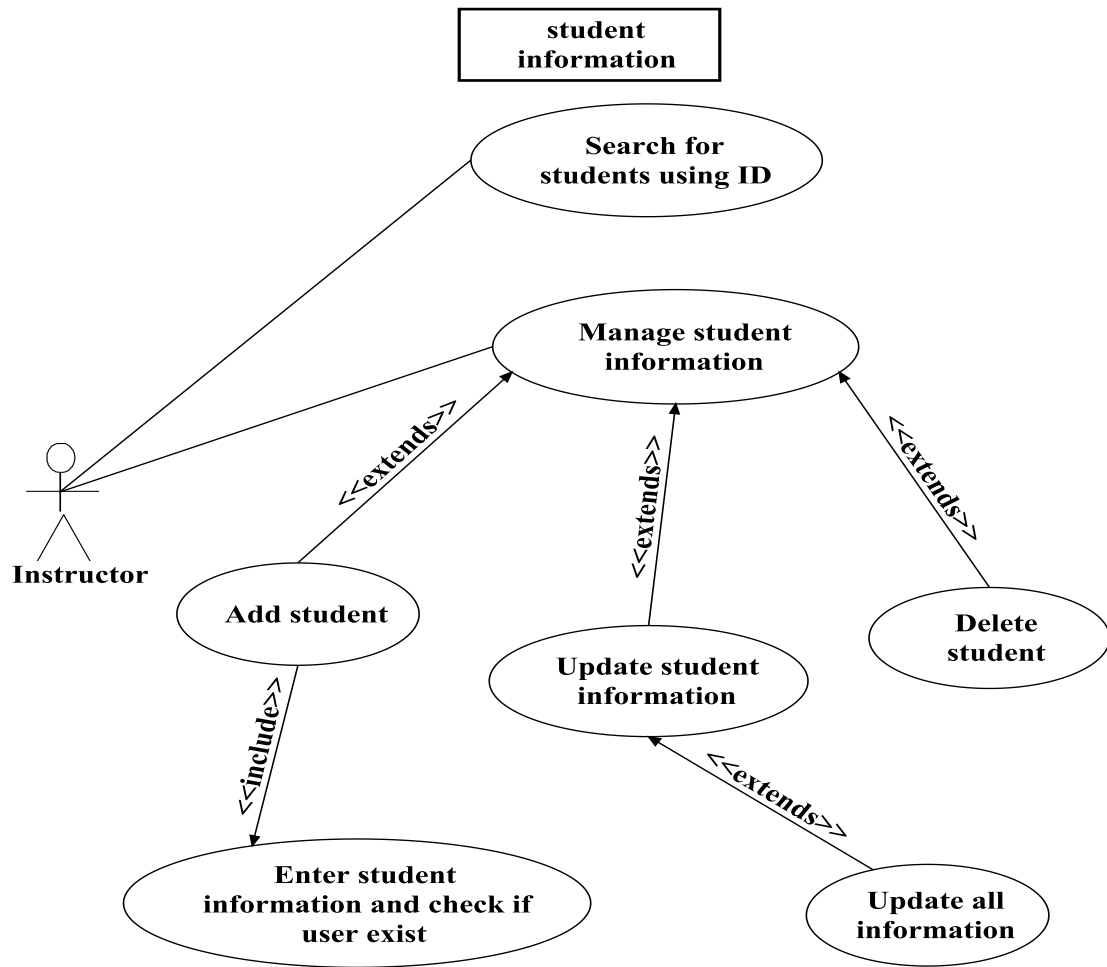


Figure 3.5: Student information action

The second service that the instructor can do using WiFi network is creating homework and announcement to be sent to the students after entering the date and time. Also the system will give alert message for each action that the instructors do it as shown in Figure 3.6.

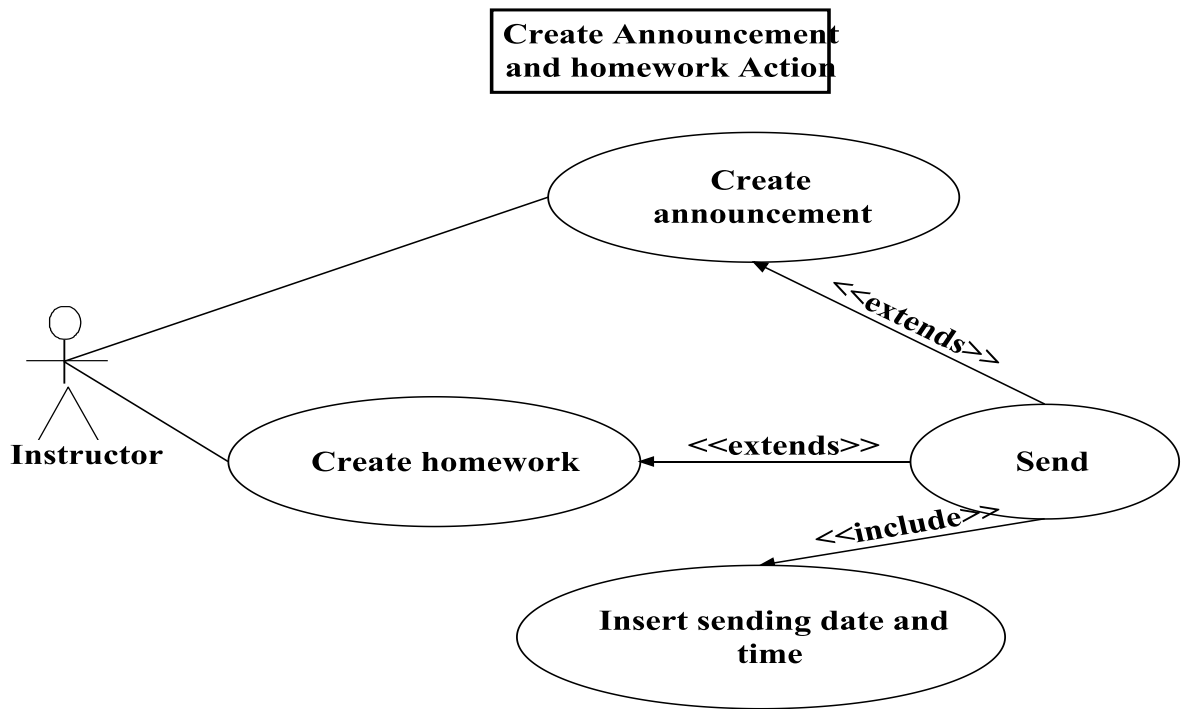


Figure 3.6: Create announcement and homework action

One of the important services in our system is SMS which is used to send short messages to students. As shown in Figure 3.7 the instructor can send messages in two ways:

1. Send now: This way allows the instructor to send messages directly to all students or he/she can choose some students.
2. Save for future sending: This allows the instructor the option to send the messages automatically in the future but the date and time of sending should be specified.

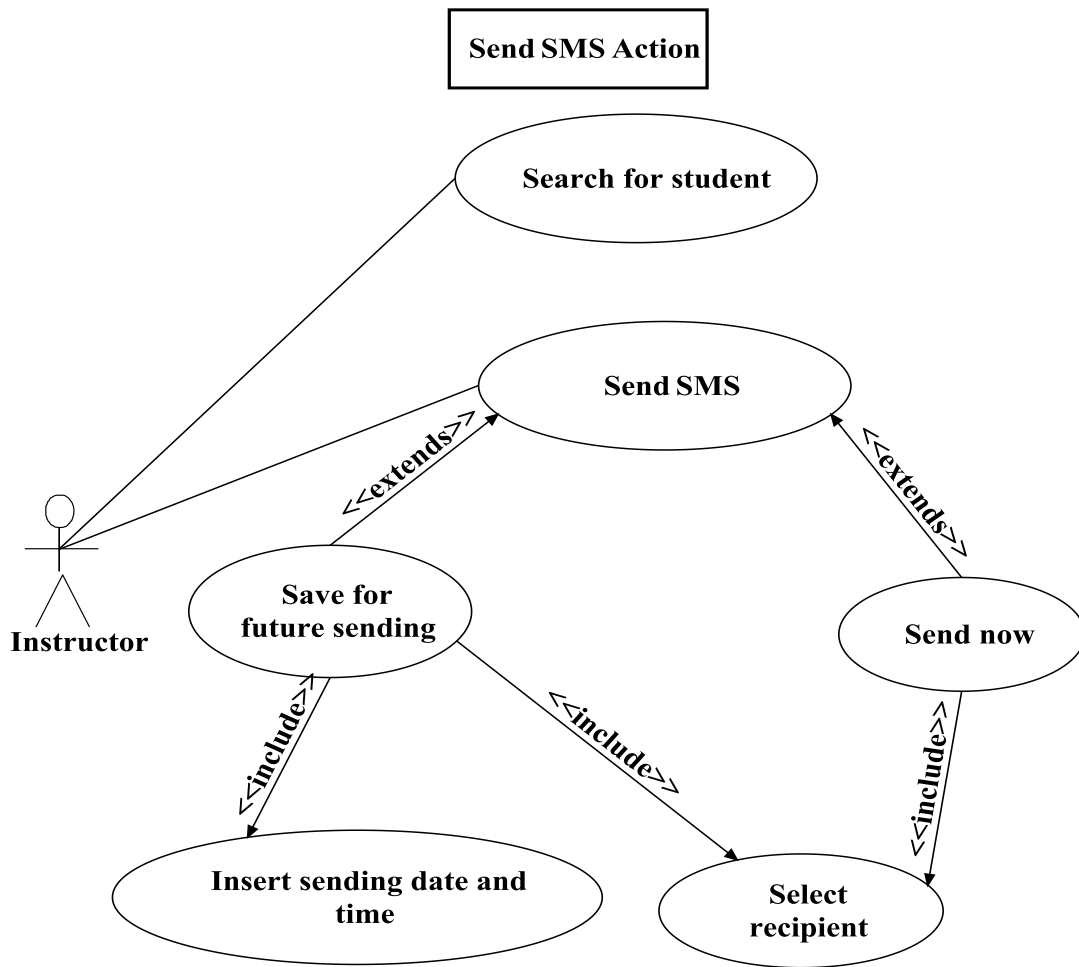


Figure 3.7: Send SMS action

One of the main services in our system is creating quizzes, in other words it is one of the subsystems which the instructor can use to manage quizzes by adding, updating or deleting quiz information that will be sent automatically by the system after inserting the date and time of sending. In addition the instructor can manage the quiz questions (add, update and delete) and search for the available and existing quizzes as shown in Figure 3.8.

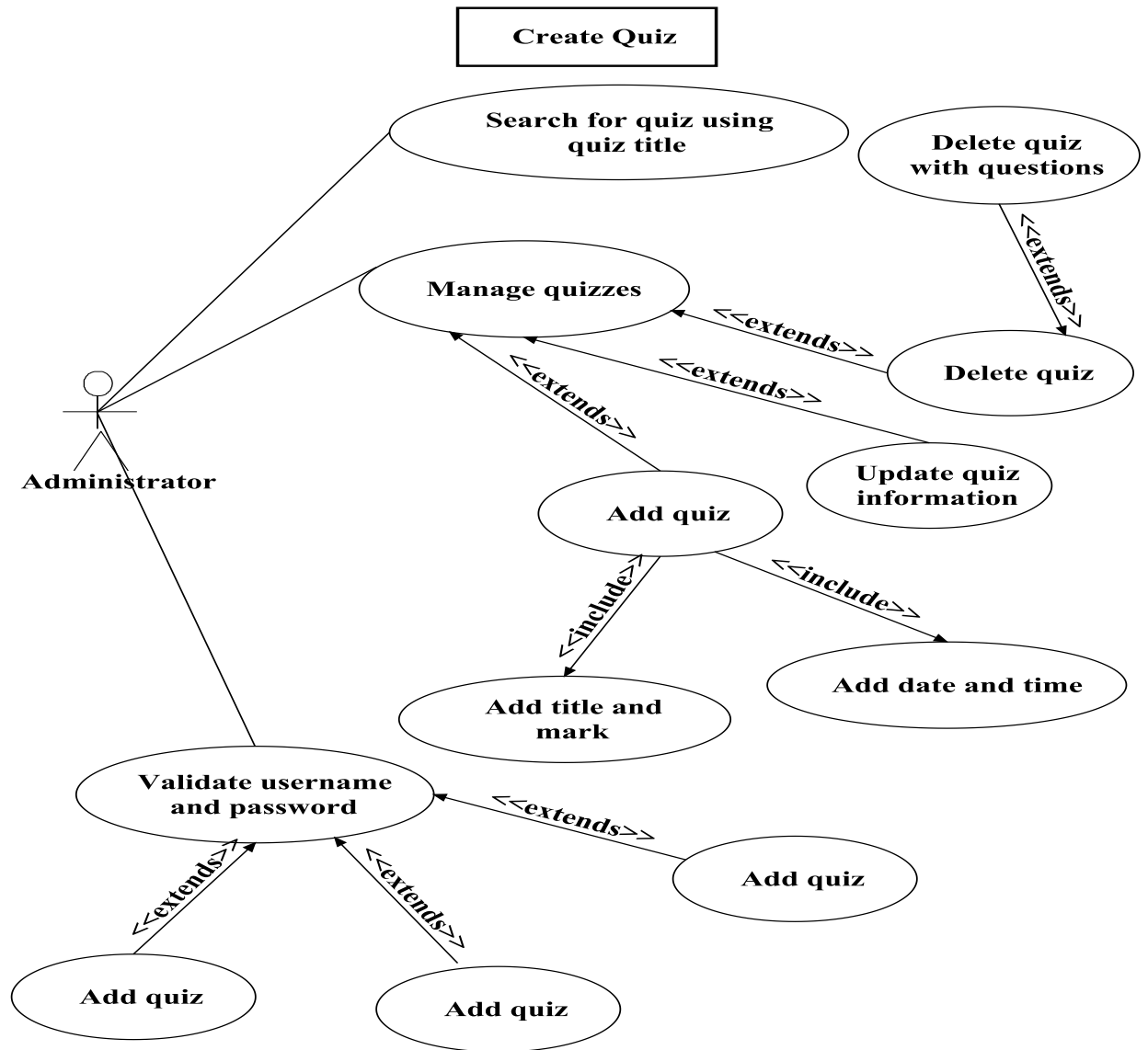


Figure 3.8: Create quiz action

### 3.3.3. Student action

Students are one of the main actors in our system who can obtain services from our system. Students can read the announcement, SMS, get homeworks and solve quiz questions using their mobile phone. In addition students can use other options in our system such as download the quiz key and change their passwords as shown in Figure 3.9.

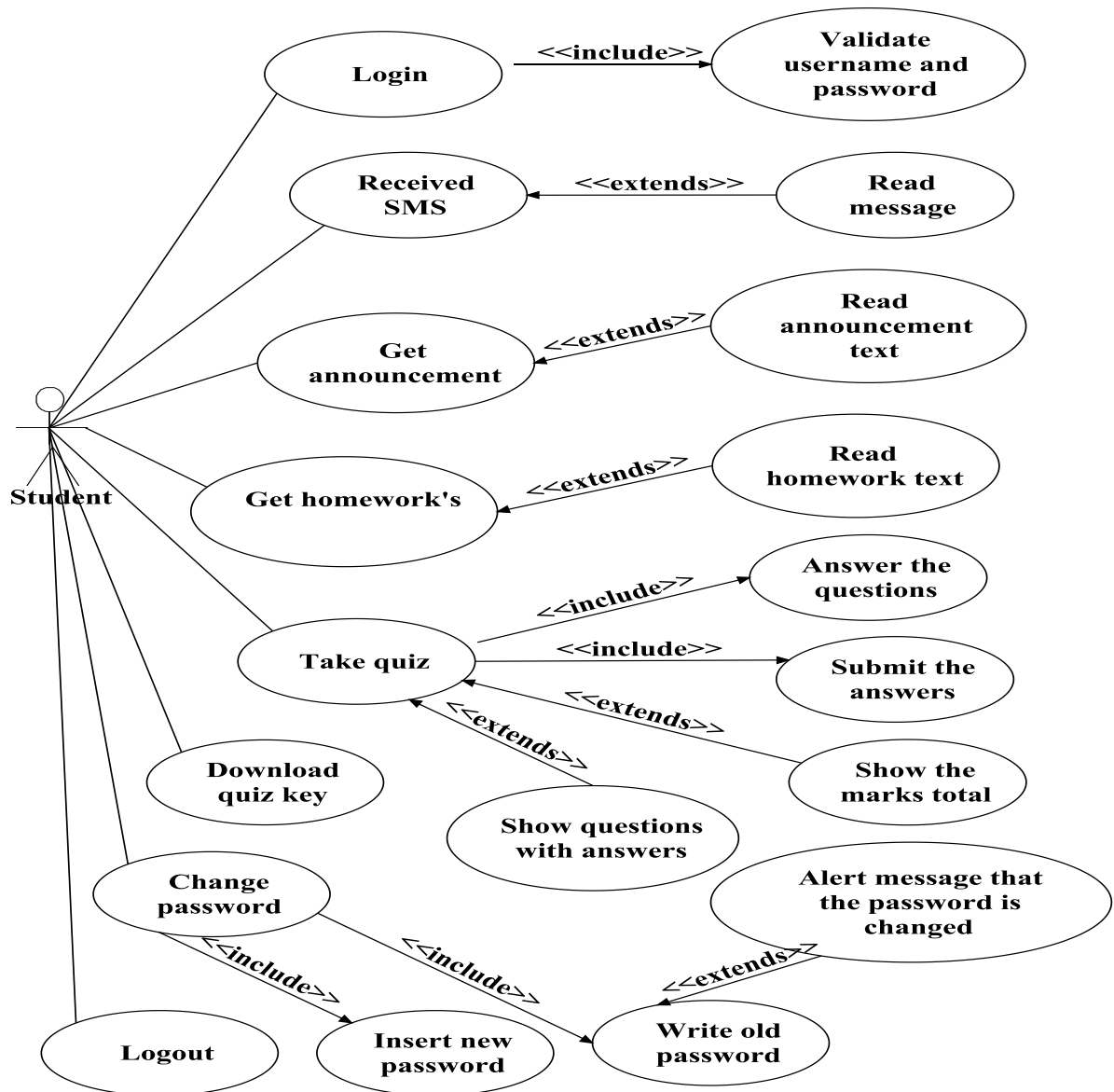


Figure 3.9: Student actions

### 3.4. UML Sequence Diagrams

The sequence diagrams illustrate some actions that the system does, but each diagram is an independent action that explain a certain part of the system, if we collect all of the diagrams we will obtain the functionality of the whole system.

### 3.4.1. Instructor sequence action

To use the system, the instructor should have an account to enter to main menu, so when an instructor enters a valid user name and password, the system will send a request to check the database to see if this account exists or not, if it exists, the system will give the instructor a permission to use or system, otherwise the system will give a message to indicate that the user name and password do not exist. This is illustrated in Figure 3.10.

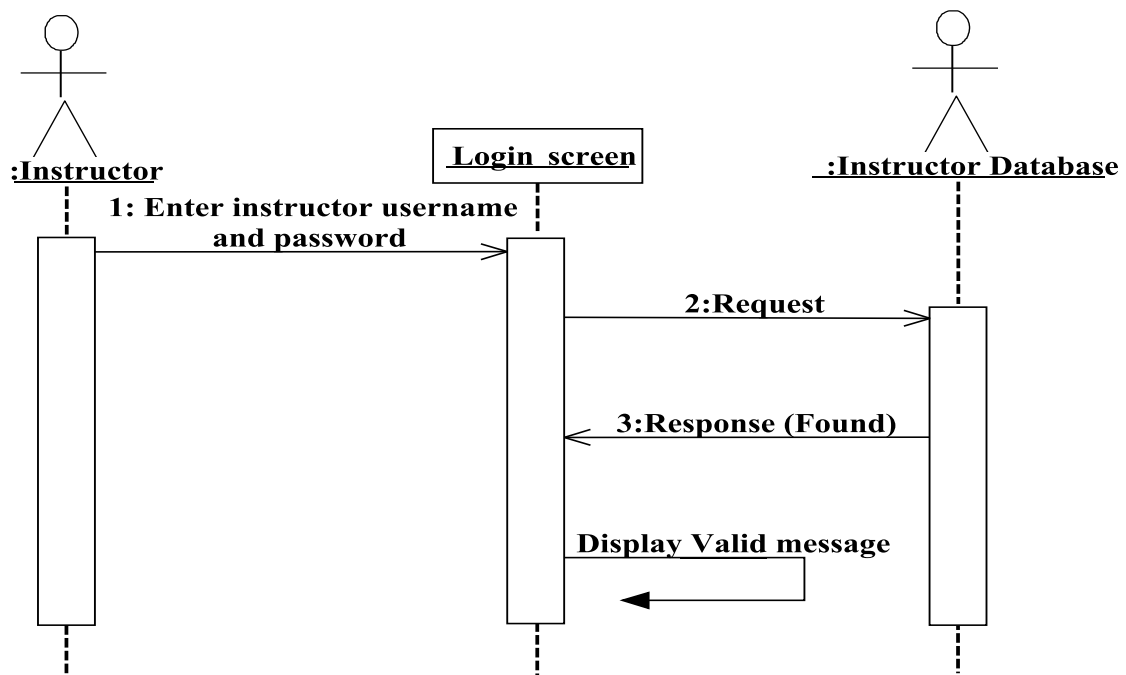


Figure 3.10: Instructor login

After the database is verified for the instructor information, the instructor can see the main menu. When the student information button is clicked a new window is displayed in which he/she can add the information for a new student including the first name, surname, student ID, password and phone number of student and when he/she clicks add, the system will take this information and save it in the database. In addition the instructor can update, delete or search for student information and the system will display alert messages for each actions like “Add done”.



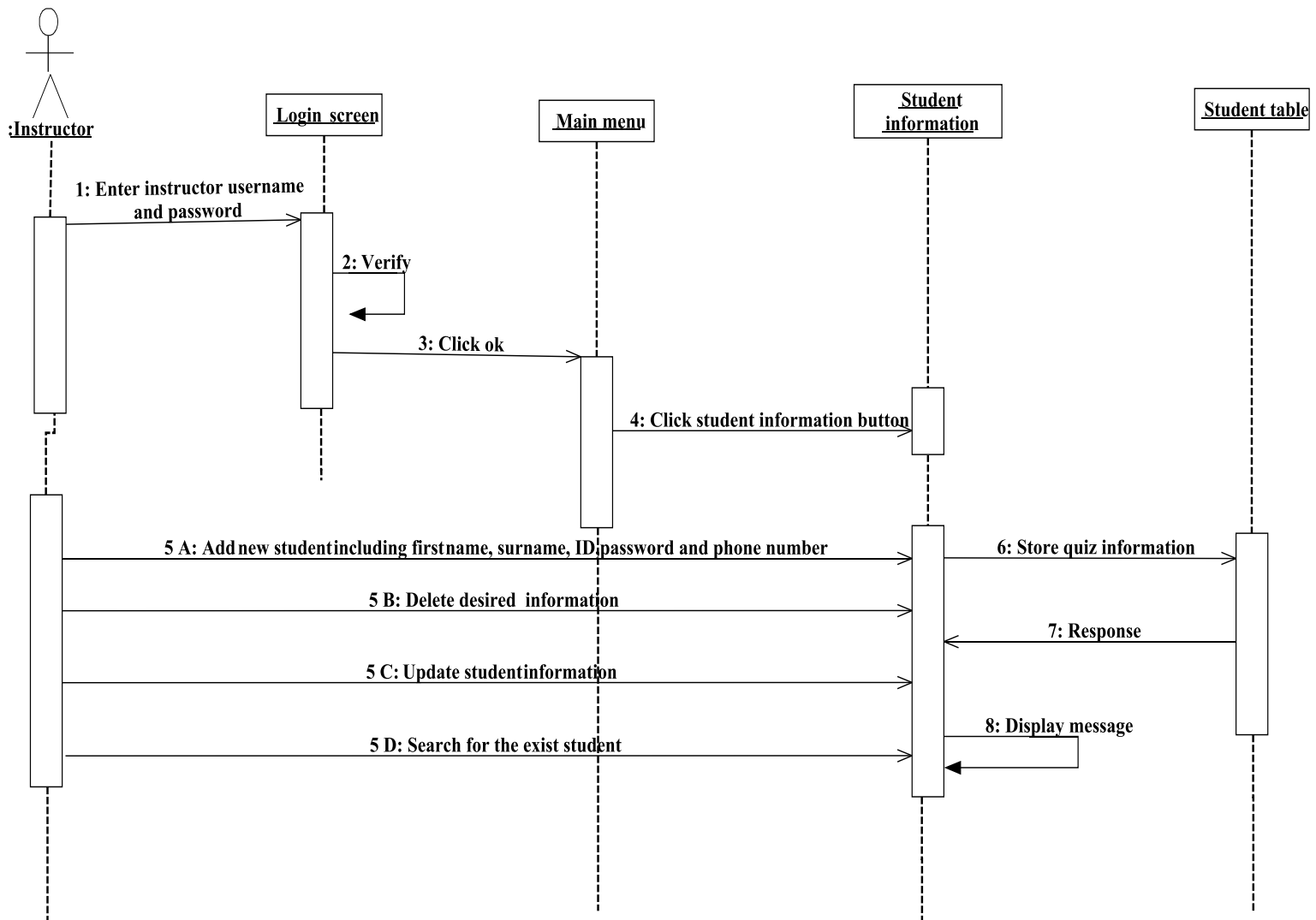


Figure 3.11: Student information

The other service that the instructor can use is sending short messages (SMS), just click the SMS button to move to SMS window and create SMS and send it either directly or save it to be sent in future and the system will give alert message “the SMS sent successfully” and the SMS information will be stored in database.

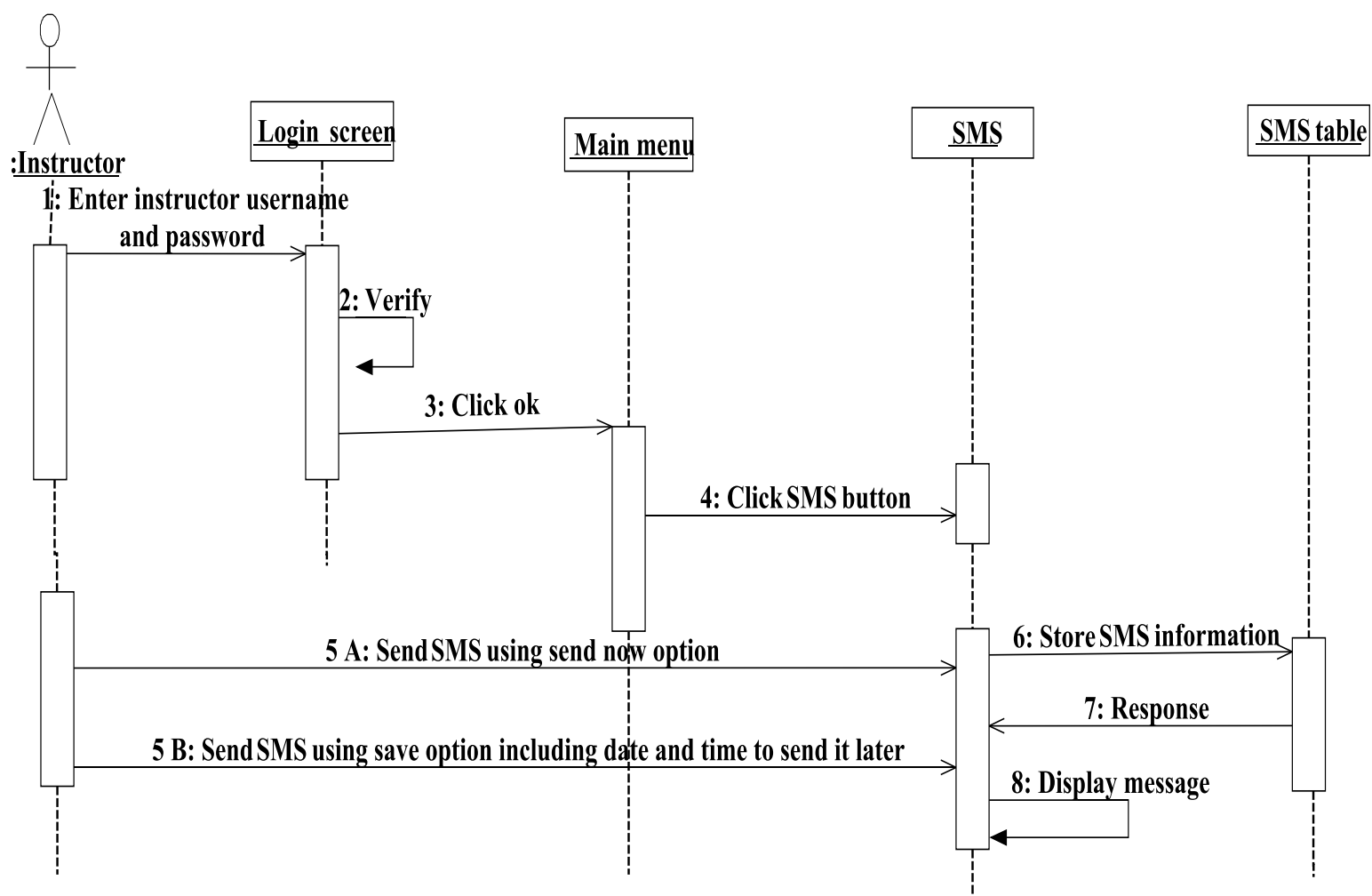


Figure 3.12: Send SMS

The homework and announcement services as shown in Figures 3.13 and 3.14 have the same scenario which is the instructor can enter to main menu and click the announcement or homework buttons to create an announcement or a homework including the date and time of sending and after that when he/she clicks send button to store the information in the database at the same time the system will give alert message like “your homework send successfully”.

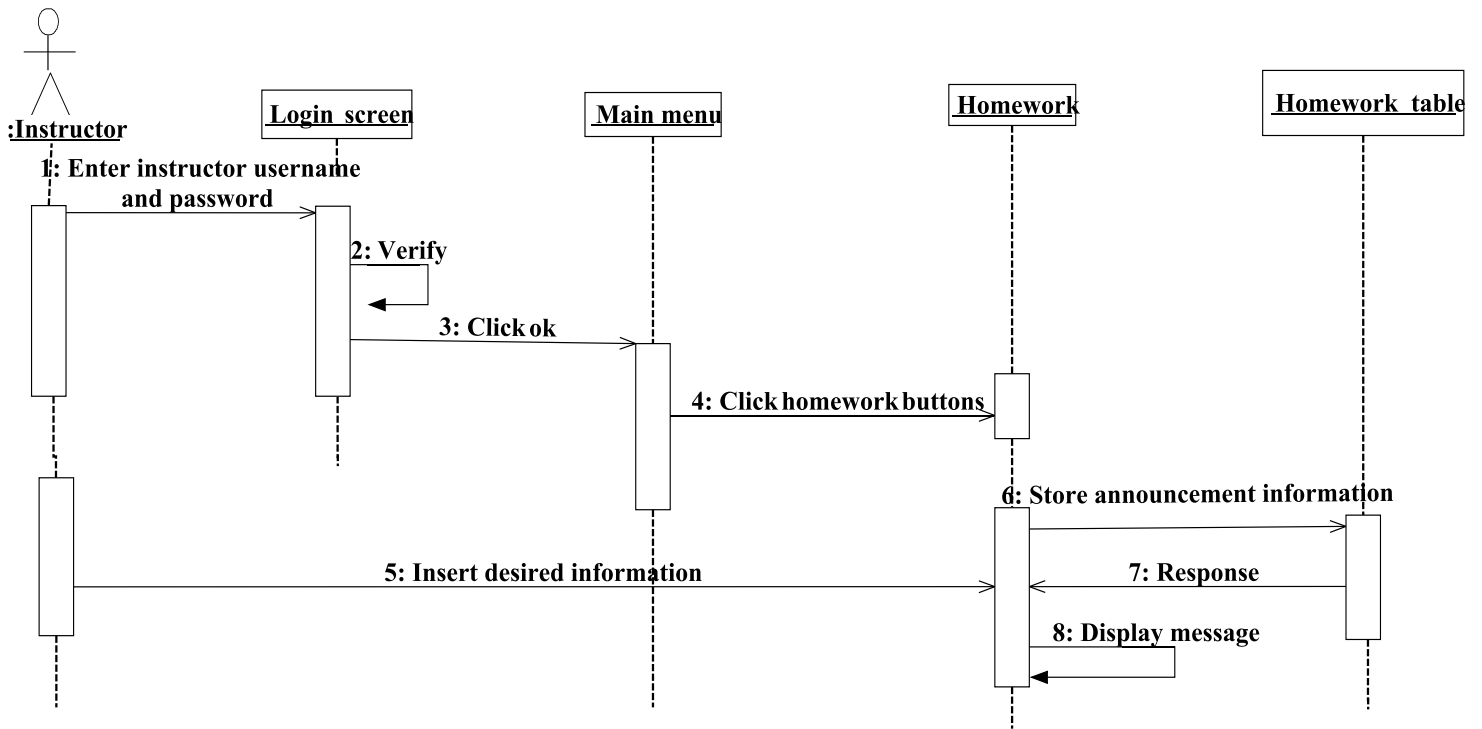


Figure 3.13: Send homework

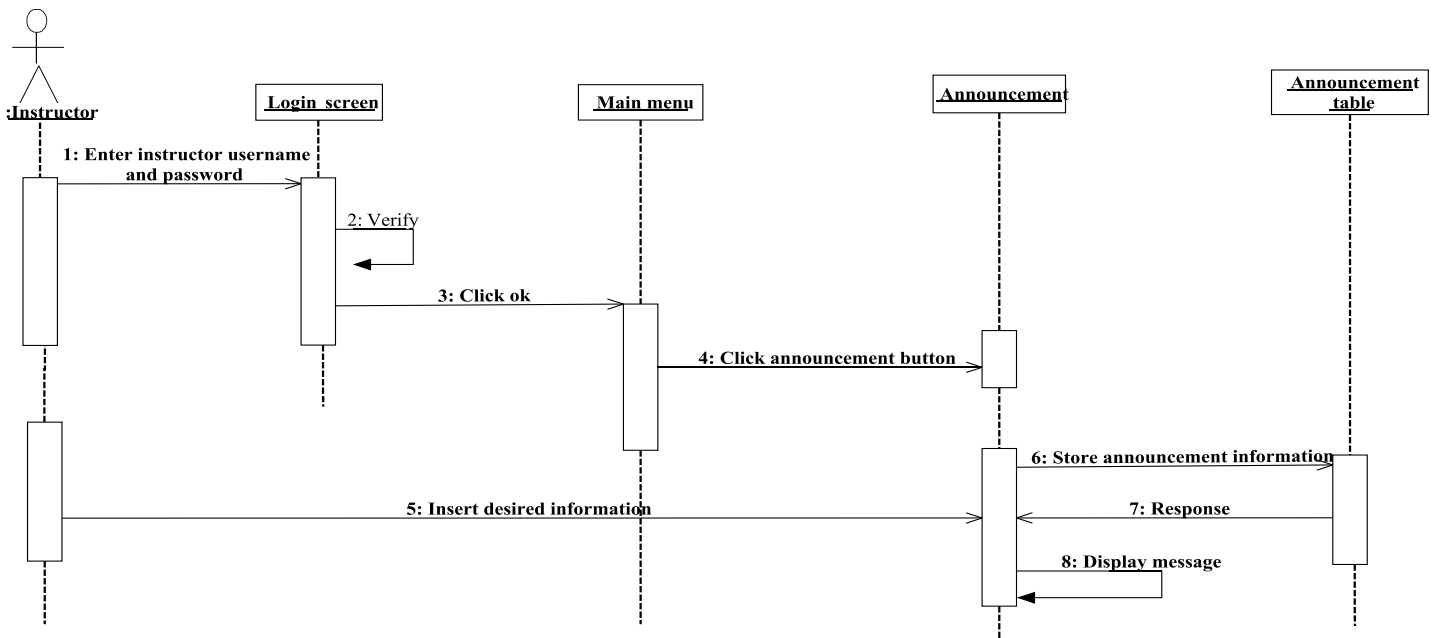


Figure 3.14: Send announcement

The instructor can create a quiz by clicking the quiz button from the main menu. After fills the information about the quiz such as the quiz title, date time and mark of quiz or after searches for an existing quiz and make any needed changes, the system will store the information in the database and the instructor can start adding the questions with five choices and a correct answer for each question. Also instructor can update or delete the questions with its choices and the system will give alert message for each action as it happens like “your quiz added successfully”.

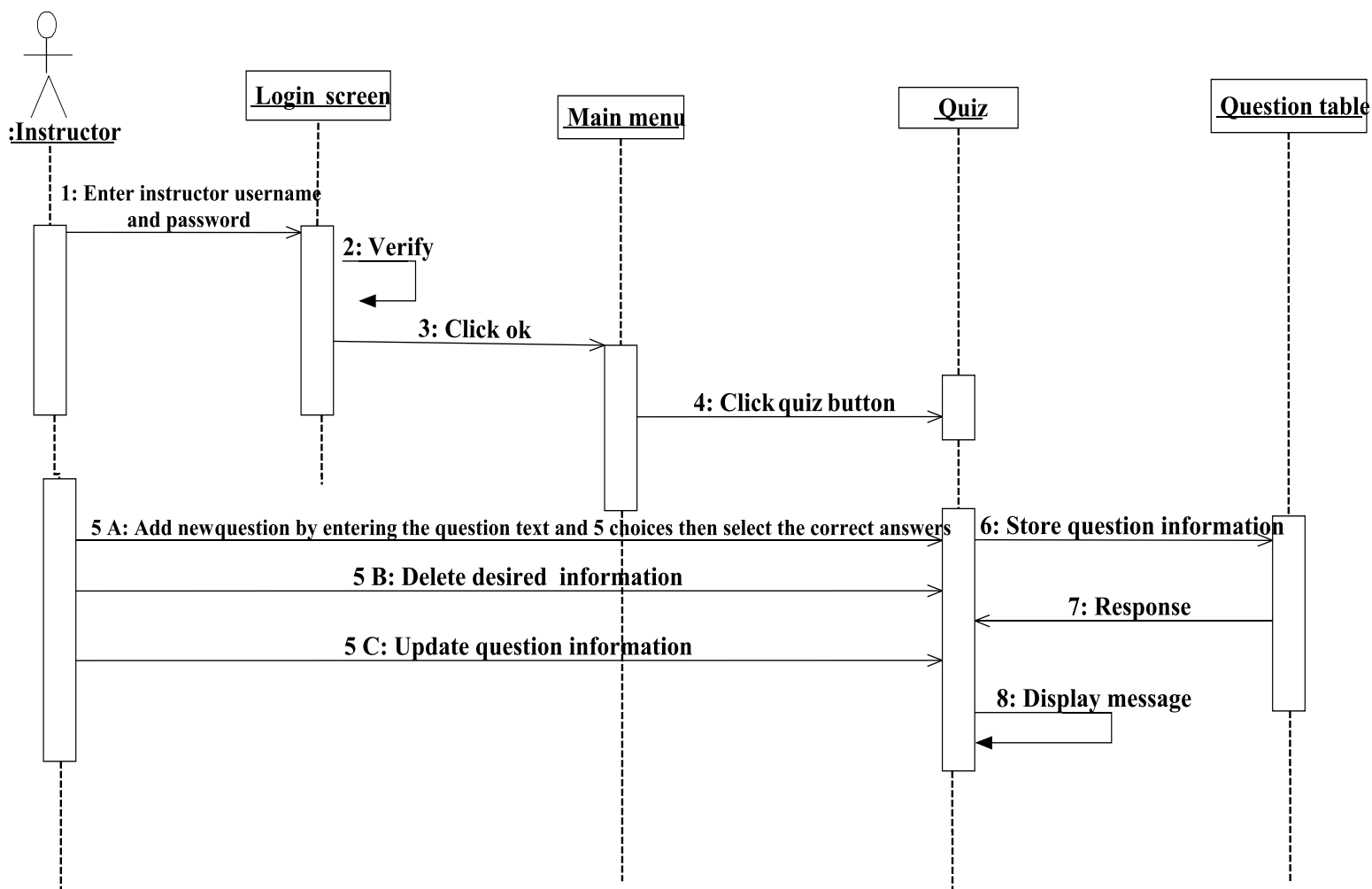


Figure 3.15: Create quiz

### 3.4.2. Student sequence action

Using the mobile device, students can connect to the server and enter their usernames and passwords after that main menu is displayed.

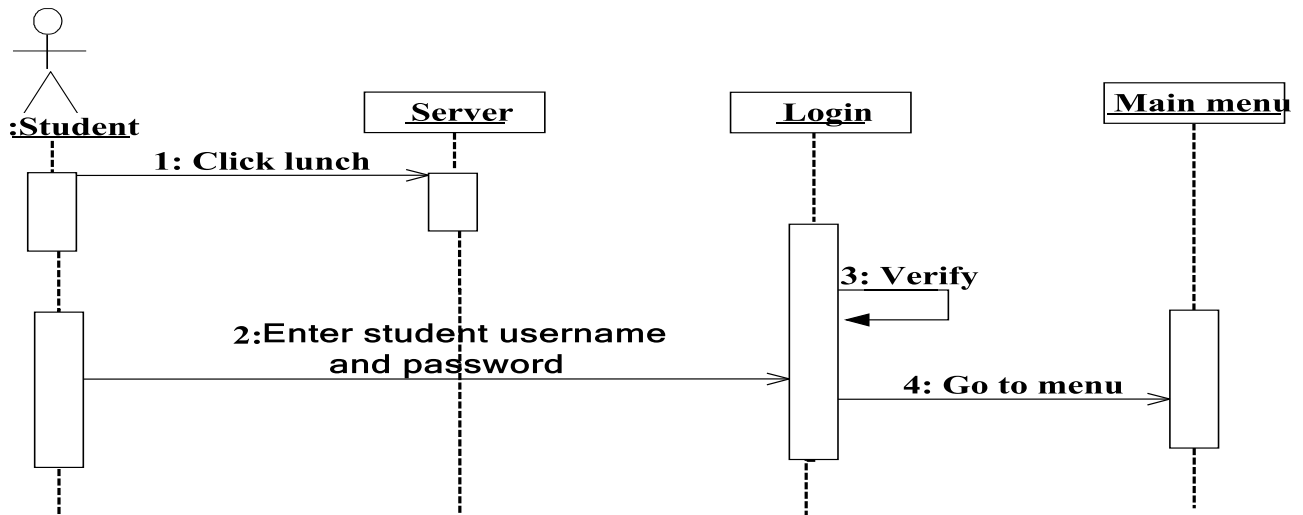


Figure 3.16: Student login

From the main menu the students can enter to SMS service available in the SMS form by clicking SMS button where their can read the messages, after that the students can click back to go back to main menu.

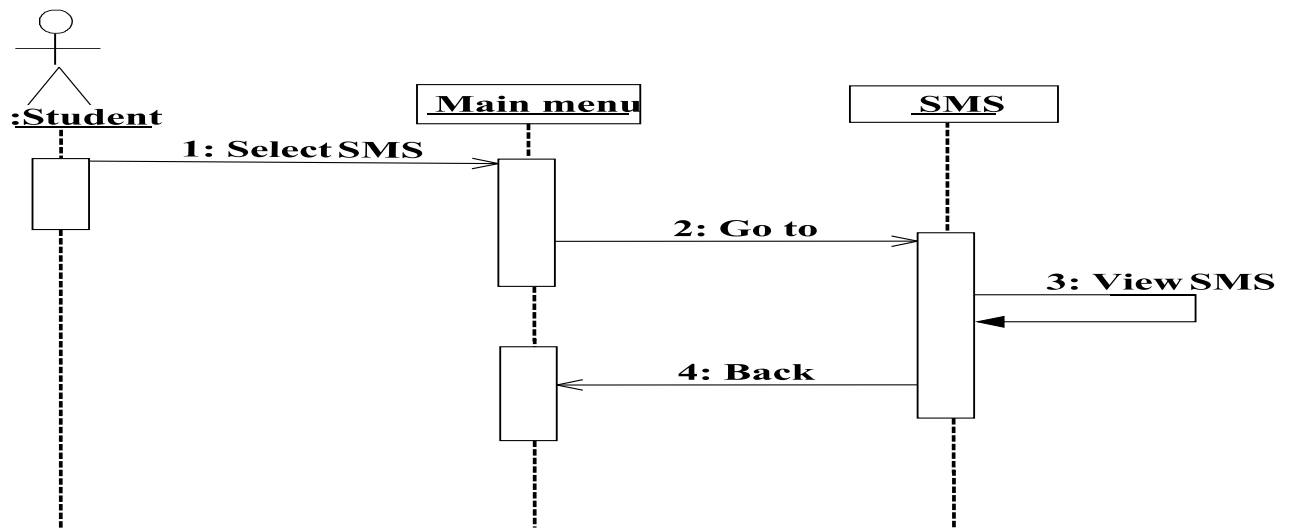


Figure 3.17: Student SMS

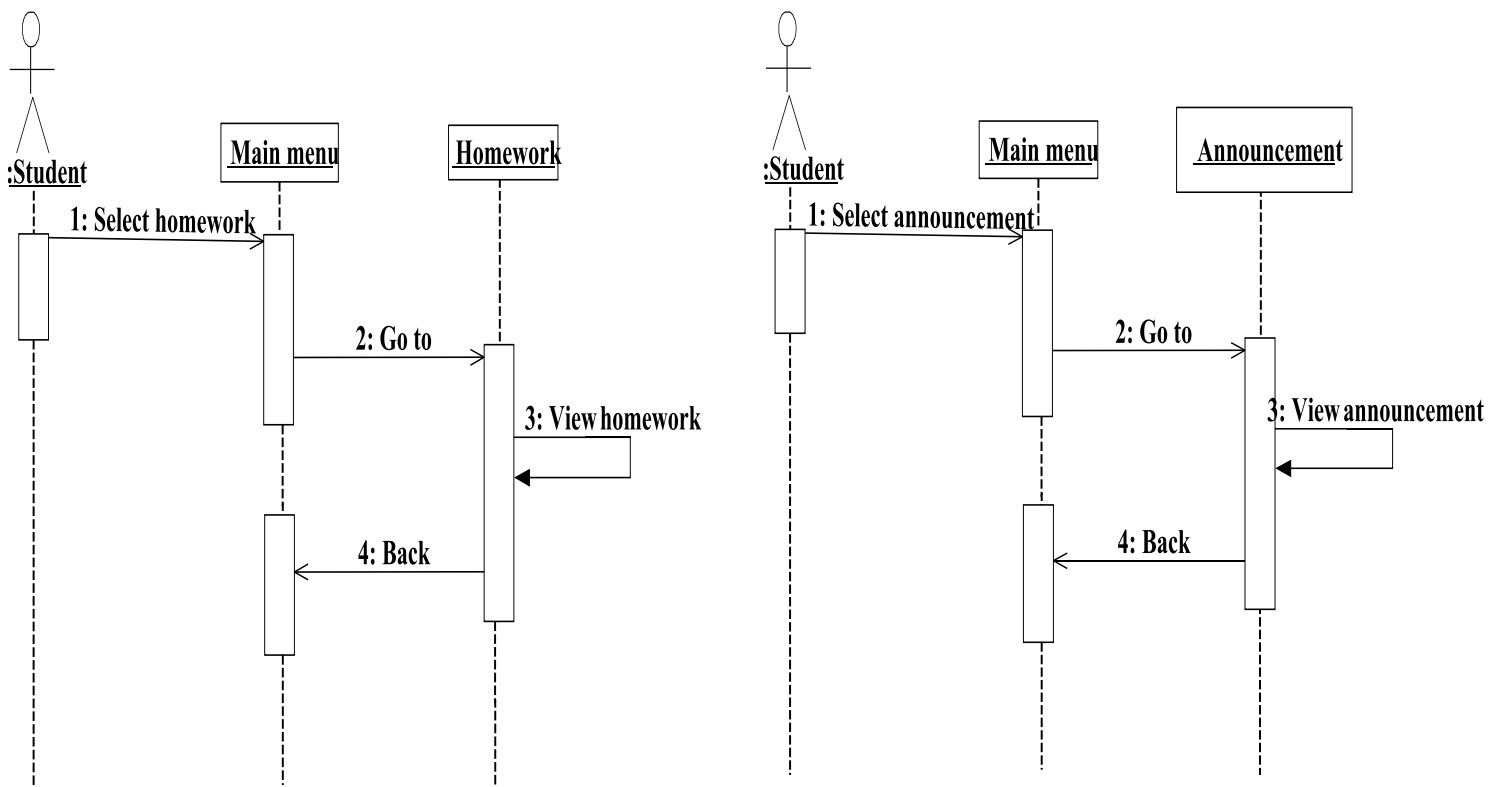


Figure 3.18: Student homework and announcement

When the students clicks the announcement or homework buttons, their will move to new forms to read the announcement or homework that was sent by the server and when their clicks back button, the main menu is displayed again. To move to the quiz form and start taking the quiz, the student should click the quiz button to start the quiz; the students will be able to answer the questions (multiple choice questions). When their reaches the last question, a submit button will appear that allow them to send their answers to the server. After that the server will mark the quiz and send the mark with the correct answers to the student. When the mobile receives the correct answers, the students will be able to see correct answers through show correct answers button.

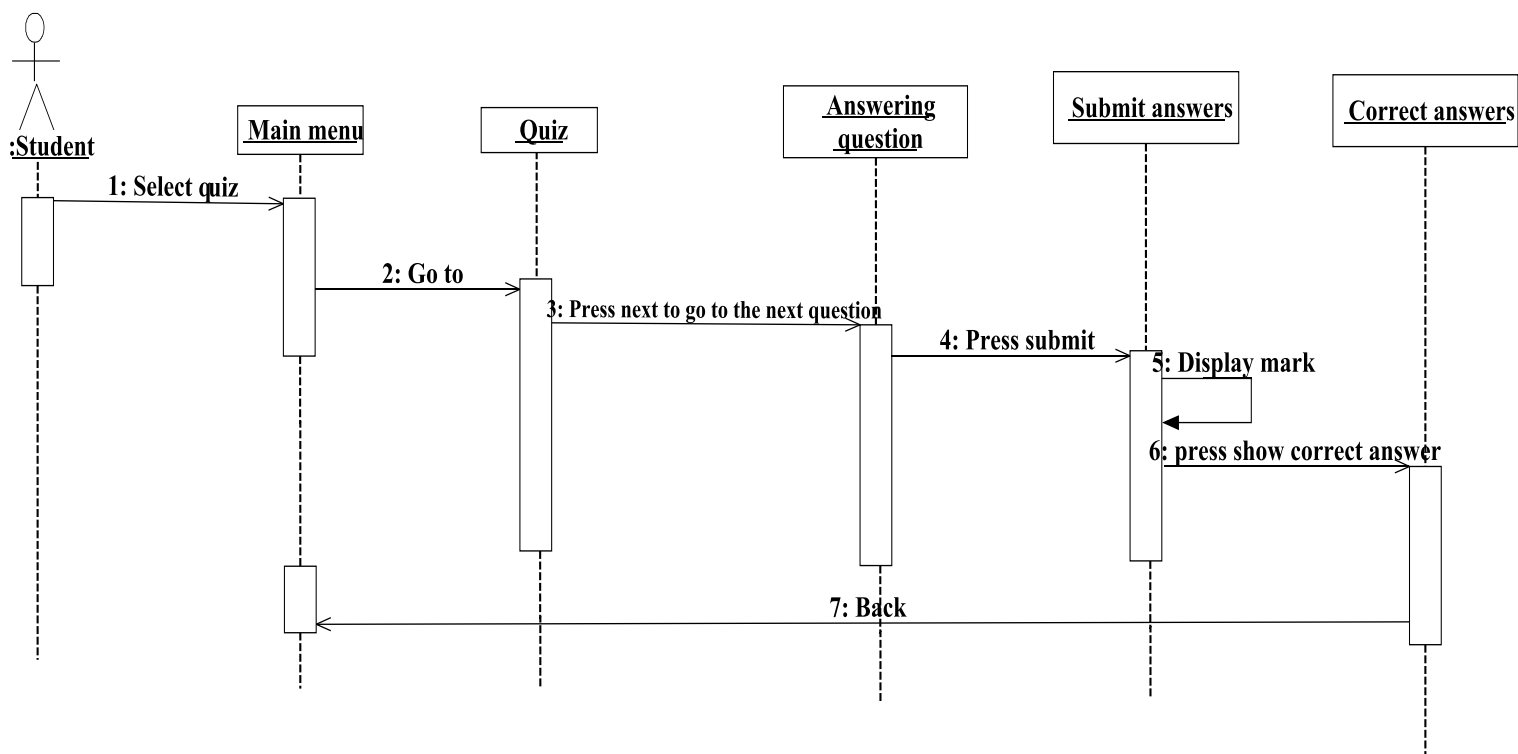


Figure 3.19: Student receives a quiz

### 3.5. Database Design

The system contains a database to store all system information and the data related to the evaluation and comparison operations. This database contains twelve (12) tables stored in a MySQL Server 5.1 database.

Table 3.1: List of database tables

Table Name	Definition
<b>Administrator</b>	Store all data related to the administrating team members and their accounts.
<b>Teacher</b>	Store all data related to instructors and their accounts.
<b>Student</b>	Store all data related to students such as first name, surname, student ID and their accounts.
<b>Quiz</b>	This table is used to store the quiz information such as quiz ID, time, date and mark of it and other information.
<b>Question</b>	Store the question ID, text and the answer choices with correct answers.
<b>SMS</b>	Store the SMS information which include: the SMS ID , date, time of SMS, also information include a SMS status to check if the SMS was sent or not.
<b>Homework</b>	To store the homework text with other information such as homework ID, date and time.
<b>Announcement</b>	To store the announcement text with other information such as announcement ID, date and time.
<b>Reada</b>	This table is created from the relation between the announcement and student and it contains the student ID and announcement ID.
<b>Solve</b>	This table is created from the relation between the homework and student which include the student ID and homework ID.
<b>Takes</b>	This table is created from the relation between the quiz and student which include the student ID, quiz ID, and the mark that student take after the submitting the quiz answers.
<b>Received</b>	This table is created from the relation between the SMS and student and it includes student ID and SMS ID.



Table 3.2: List of fields for all database tables

Table name	Field Name	Description	Data Type	Constraints
<b>Administrator</b>	ID	The administrator ID	Int (20)	PK
	Username	Admin login name	VARCHAR (45)	
	Password	Admin login password	VARCHAR (45)	
<b>Teacher</b>	Teacher ID	The teacher ID	INT (20)	PK
	Username	Teacher login name	VARCHAR (45)	
	Password	Teacher login password	VARCHAR (45)	
	Admin ID	Admin ID	INT (20)	FK
<b>Student</b>	STD_ID	Student login ID	VARCHAR (45)	PK
	F_NAME	Student first name	VARCHAR (45)	
	L_NAME	Student surname	VARCHAR (45)	
	Password	Student login password	VARCHAR (45)	
	PHONE	Student phone number	VARCHAR (45)	
	Teacher ID	Teacher ID	INT (20)	FK
<b>Quiz</b>	Q_ID	Quiz ID	INT (20)	PK
	Q_date	The date of quiz	VARCHAR (45)	
	Q_time	The time of quiz	VARCHAR (20)	

	MARKS	The mark of quiz	VARCHAR (45)	
	TeacherID	Teacher ID	INT (20)	FK
	Q_TITLE	Title of quiz	VARCHAR (45)	
	Q_START	Check if the quiz start or not.	INT (20)	
<b>Questions</b>	Q_number	Question ID	INT (20)	PK
	Option1	Choice number one	VARCHAR (45)	
	Option2	Choice number two	VARCHAR (45)	
	Option3	Choice number three	VARCHAR (45)	
	Option4	Choice number four	VARCHAR (45)	
	Option5	Choice number five	VARCHAR (45)	
	Correct_answers	The correct answers	VARCHAR (45)	
	QID	Quiz ID	INT (20)	FK
	Q_Area	Question text	VARCHAR (45)	
<b>SMS</b>	SMSID	SMS ID	INT (20)	PK
	Msg_date	The date of message	VARCHAR (20)	
	Msg_time	The time of message	VARCHAR (20)	
	Msg_Area	The message text	VARCHAR (100)	
	TeacherID	Teacher ID	INT (20)	FK
	Sms_statues	Statues of message if	INT (1)	

		send it or not		
	Sms_creattime	The date and time of creation.	VARCHAR (50)	
<b>Homework</b>	HwID	Homework ID	INT (20)	PK
	Hw_Type	Homework text	VARCHAR (20)	
	Hw_time	Homework message time	VARCHAR (20)	
	Hw_date	Homework message date	VARCHAR (20)	
	TeacherID	Teacher ID	INT (20)	FK
	Hw_Currently	The date and time of creation.	VARCHAR (45)	
<b>Announcement</b>	AnnID	Announcement ID	INT (20)	PK
	Ann_area	Announcement text	VARCHAR (45)	
	Ann_time	Announcement message time	VARCHAR (20)	
	Ann_date	Announcement message date	VARCHAR (20)	
	TeacherID	Teacher ID	INT (20)	FK
	Ann_Currently	The date and time of creation.	VARCHAR (45)	

<b>Reada</b>	STD_ID	Student ID	VARCHAR (45)	PK/FK
	AnnID	Announcement ID	INT (20)	PK/FK
<b>Solve</b>	STD_ID	Student ID	VARCHAR (45)	PK/FK
	HwID	Homework ID	INT (20)	PK/FK
<b>Takes</b>	STD_ID	Student ID	VARCHAR (45)	PK/FK
	QID	Quiz ID	INT (20)	PK/FK
	Mark	The summation of student's mark in the quiz	INT (20)	
<b>Received</b>	STD_ID	Student ID	VARCHAR (45)	PK/FK
	SMSID	SMS ID	INT (20)	PK/FK
	Sent	The message that sent (0 mean the message was send)	INT (1)	

Table 3.2 explain the attributes for each table and how we give a unique ID for each table to be a primary key, in addition it shows how some tables have a relations and explain that some primary keys become a foreign keys in other tables in order to make a relations between the tables.

Figure 3.20 shows the Entity Relationship Diagram for the system. It shows the entities and relationships between entities. It also shows the cardinality of the relations. i.e. whether the relation in one-to-one, one-to-many, many-to-one, or many-to-many. In our database we have two relations, the relation between the instructor and all entities in our database is one-to-many (e.g. the relation between the teacher and any other tables like student in our system is one-to-many like one teacher can register many student) in this relation we take the primary key of the One Side (Teacher) to be as foreign key in Customer Many Side (student). The relation between the student and any services in our system is many-to-many (e.g. many students can receives many SMS) in this case we create a new relation (Received) to represent the relationship and include any attributes that are part of the relationship. We post a copy of the primary key attribute(s) of the entities that participate in the relationship (Student and SMS) into the new relation (Received), to act as foreign keys. These foreign keys will also form the primary key of the new relation (Received).

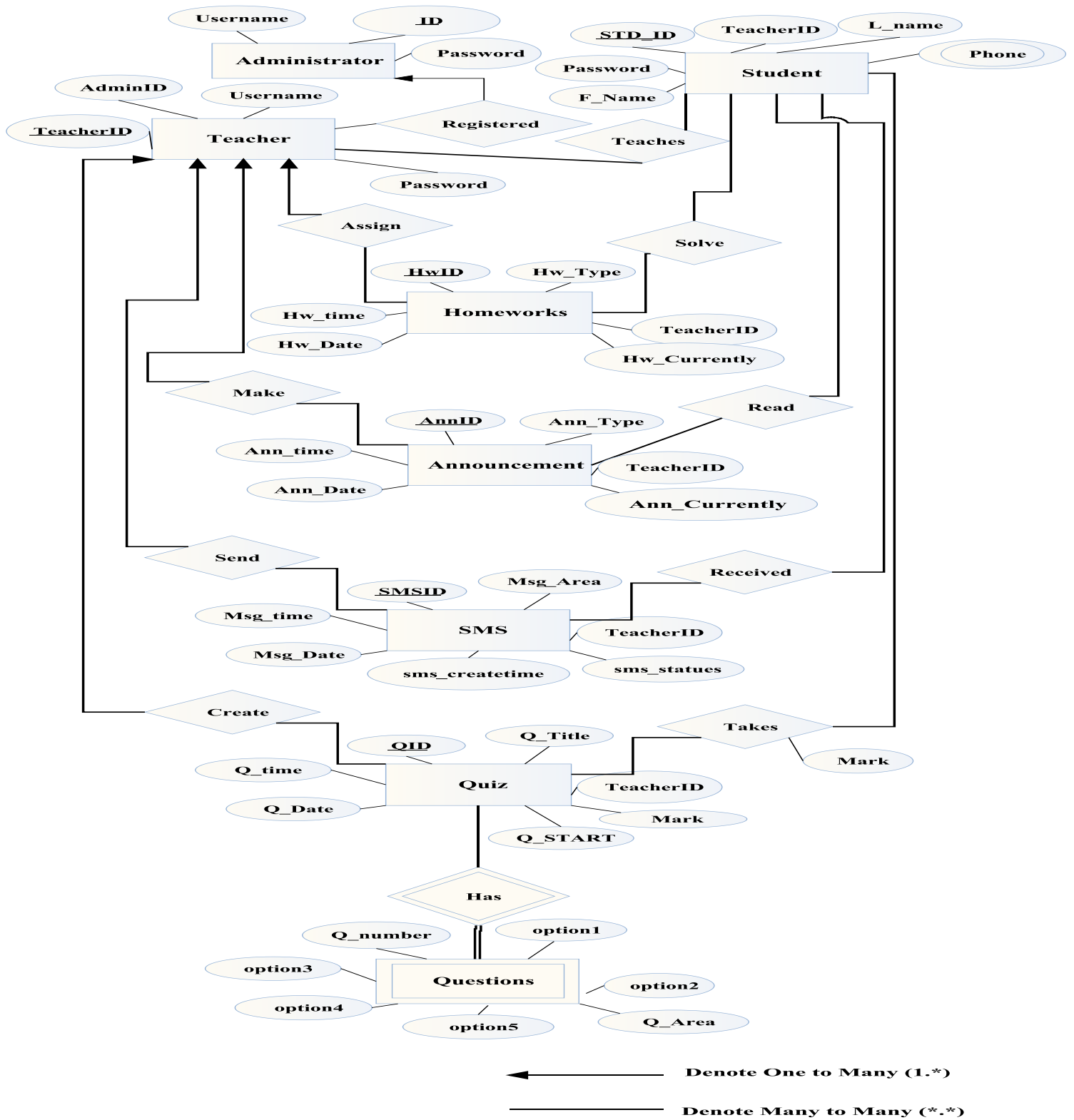


Figure 3.20: ER-Diagrams

### 3.6. Design Phase

Once the requirements specifications have been completed, the next major phase in the software development life cycle is the design phase.

The design phase consists of two major activities:

- The preliminary design of the user interface.
- The preliminary design of the software structure.

#### 3.6.1. The Preliminary Design of the User Interface

The interface design of our system is very crucial for the success of the system. Before designing the system, it is very important to know the kind of users and their experience. Therefore, we divided the users into three categories according to their experience in using our system as following:

- Novice (e.g. normal user).
- Intermittent (e.g. teacher, student).
- Professional (e.g. M-learning administrator).

#### 3.6.2. The Preliminary Design of the Software Structure

- **Computer Server System:** The server should have high capabilities in order to tolerate with the heavy load of users who will use the system, the recommended server should also has high space storage and high processing power, in addition to high specification Network Interface Card (NIC) that supports wireless connection (to connect to mobile phones) to serve the users with high quality service.
- **Access Points:** We need a collection of access points to make a wireless network that covers a huge area to make the service available for users in a wide range, the access points should be with high capabilities to ensure high quality of service.

- **Client System:** To run the system at the client side, we recommend a mobile phone or PDAs that supports TCP connections, to send and receive packets using TCP connection, and the mobile should support java environment, in our system we use Sony Ericsson G900.

### 3.7. Summary

The recommendation process that is described in this chapter mainly depends on the UML diagrams that explain who is using the system and what is the usage scenario for each services, in addition this chapter talks about the actors of our system and how they use it, also we explain the database design and the fields for each table and we show the relation between these tables.



# CHAPTER 4

## SYSTEM IMPLEMENTATION

This chapter is about the system implementation, a description will be given about the purpose of the system, screen shots will also be given to illustrate the use of the system.

### 4.1 Introduction

This system is an M-learning project which is dedicated to use mobile devices in the education process, the instructors can use this system to make different actions and upload their lectures and also they can keep in touch with their students using several options in the proposed application.

In an important part of the system, the instructors can create quizzes and send them automatically to their students and give them the marks.

The students can exploit their mobile devices to take lectures in a new way that helps them to run away from the traditional way in education and try to get knowledge in every time and everywhere. The students can enter to their account and get SMS, homework's, announcements, solve quiz and get their mark directly.

### 4.2 System Requirement Specification (SRS)

In this section different stakeholders are described, also functional and non-functional requirements are described.

#### 4.2.1. Stakeholders

The people who will be using the developed system are:

- Administrator
- Instructor
- Student

The role for each user is shown in Table 4.1.

Table 4.1: System stakeholders

Administrator	The person who register the instructor and another administrator.
Instructor	The person who will use the system for viewing data , register students, create and send SMS, announcement, homeworks, quizzes and other information.
Student	The person who will use the system for getting data that he/she needs such as(SMS, announcements, homeworks and quizzes) and other information.

#### 4.2.2. Functional requirements

The system has several functional requirements that must be met with the basic services of the system as described in Table 4.2.

Table 4.2: Functional requirements

FR#	Description	Stakeholder
R1	The system allows only administrator to add the instructor and another administrator and also has permission to view instructor's and administrator's information.	Administrator
R2	The system allows only instructors to login to the system by entering a correct id and password.	Instructor
R3	Change his/her password.	Instructor
R4	The system allows the instructor to add student's information.	Instructor

R5	The system allows the instructor to update the student's information.	Instructor
R6	The system allows the instructor to delete the student's information.	Instructor
R7	The system allows the instructor to search about the student's information	Instructor
R8	Create announcement including the date and time of creation.	Instructor
R9	Every instructor has a unique id	Instructor
R10	Every announcement has a unique id	Instructor
R11	Send SMS in direct way or automatically.	Instructor
R12	Every SMS has a unique id	Instructor
R13	Send homework to all students in his/her course.	Instructor
R14	Every homework has a unique id.	Instructor
R15	The system allows the instructor to create a new quiz by specifying its properties which are quiz title, Quiz time, quiz date and mark.	Instructor
R16	Every quiz has a unique id.	Instructor
R17	The system allows the instructor to update the quiz information.	Instructor
R18	The system allows the instructor to delete the quiz information.	Instructor
R19	The system allows the instructor to search for an existing quiz.	Instructor
R20	Each quiz should have at least one questions (Multiple-choice).	Instructor
R21	Every multiple choice question has a unique id.	
R22	Every multiple choice question has at most five choices.	
R23	The system allows the instructor to add multiple choice questions to an existing quiz	Instructor

	(he/she should enter question text, five choices, and choose correct answer).	
R24	Each question has a unique id.	Instructor
R25	The system allows the instructor to update multiple choice questions.	Instructor
R26	The system allows the instructor to delete multiple choice questions.	Instructor
R27	The system allows the instructor to send the quiz automatically.	Instructor
R28	The system allows more than one student to take a quiz at the same time.	
R29	The system provides a database to store all information about quizzes.	
R30	The system provides a database to store all information about questions.	
R31	The system provides a database to store the student's marks.	
R32	When the student submits the answers to the instructor, the system do marking for it.	
R33	Marking is done by comparing the correct answer that is stored in the database with the student answer, if they are the same the system will give it one point else zero point. After that the system will sum these points to get the mark.	
R34	The system store students marks in the database after marking them.	
R35	The system allows only registered student to make a login to the system using their enabled mobile phones by entering a correct student id and password.	Student
R36	The system allows the registered student to get	Student

	the SMS messages.	
R37	The system allows the registered student to get the announcement.	Student
R38	The system allows the registered student to get the homeworks.	Student
R39	The system allows the registered student to take the quiz with multiple choice questions.	Student
R40	The system allows the registered student to submit answers to the server.	Student
R41	The system allows the student to receive the mark of quiz.	Student
R42	The system allows the student to retrieve correct answers of the questions.	Student
R43	The system allows the student to download the quiz (questions with the correct answers) in text file.	Student
R44	The system allows the student to change his/her password	Student
R45	The system allows the student to logout from the system.	Student

#### 4.2.3. Non-Functional requirements

The system should have these requirements to serve the client in the perfect way. They are general requirements not specific to the type system. Non-functional requirements for the system are shown in Table 4.3.

Table 4.3: Non-functional requirements

<b>NFR#</b>	<b>Description</b>
R1	High performance for this system.
R2	This system is easy to use from any instructor.
R3	This system is very secure that each instructor has user name and password that allows him/her to login to the system.

R4	Speed for retrieving information.
R5	It realizes the scalability; we have a large database to save the information so the system can contain very large amount of data if the number of quizzes and questions has increased.
R6	Flexibility in conserving, modifying and retrieving the information about quizzes and questions.

### 4.3. Feasibility Element

To evaluate if it is feasible to implement this system, and to do this evaluation we should have some main points to do the evaluation based on them and they are:

- Technical Feasibility
- Operational Feasibility
- Economic Feasibility

#### 4.3.1. Technical feasibility

This system does not require many physical parts (hardware), because there are two sides the server side and the client side. The server side should be a high performance server (for connection with database and mobile phones) to manage the heavy load that will occur when the system start working and many students attempt to connect to the database. The client side is for the students and it requires a mobile phone that supports Wi-Fi technology. We need wireless network coverage (Infrastructure Network). The system also needs database software to manipulate the data that we will use in the system in addition a mobile-development software is needed to program the student side, and the server side that will handle the connection issues.

### 4.3.2. Operational feasibility

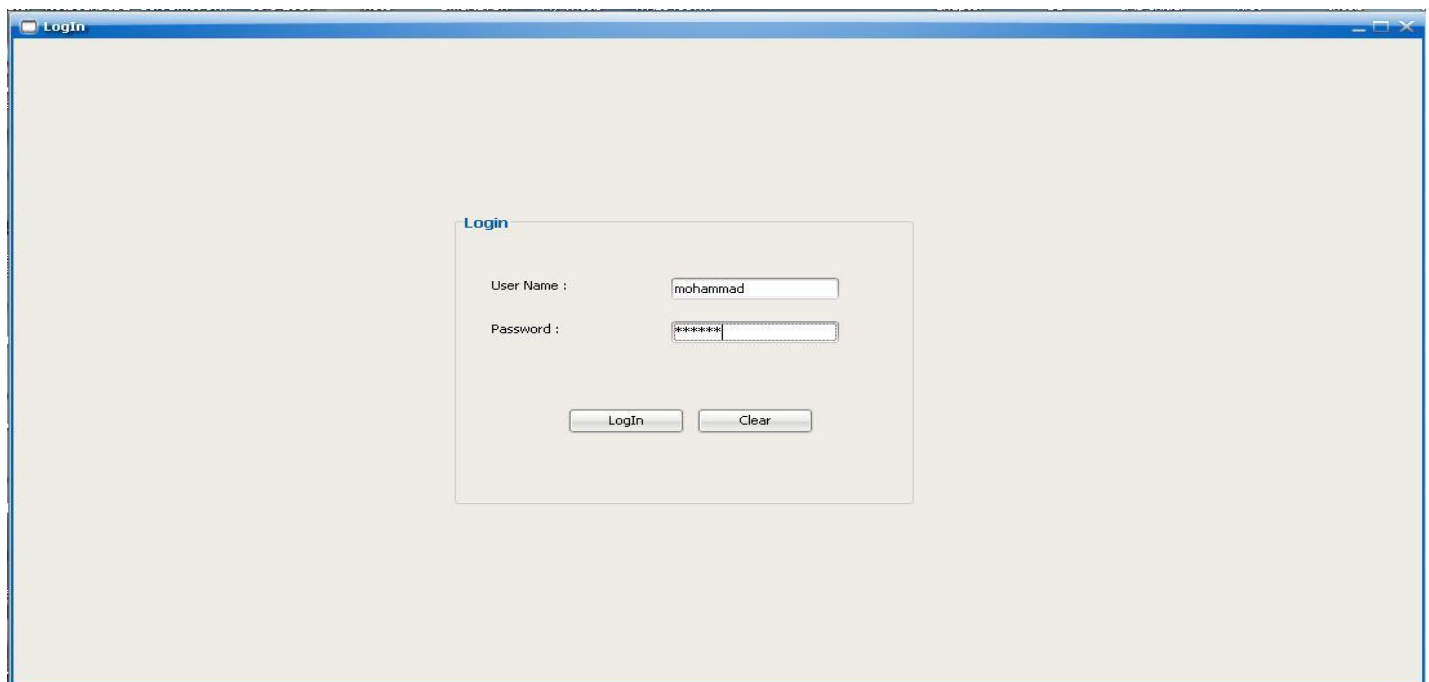
We designed this system to anyone who wants to benefit from our service with free of charge fee. In addition, it is easy to use and users do not need to have huge knowledge in mobile phones, basic knowledge will be enough to use the system on mobile phone.

### 4.3.3. Economic feasibility

The hardware and software required by the system does not have high cost if we compare it with the benefits that we will get by applying this system, the cost of the system can be covered by the fees students pay each semester. Therefore in economic-wise we can conclude that the system is feasible economically.

## 4.4. Administrator side

The administrator in Figure 4.1 should insert a correct user name and password to take a permission to enter to the administrator home page which shows in Figure 4.2.



The screenshot shows a web browser window with the title 'Login'. The main content area is a light beige color. In the center, there is a white rectangular box containing the login form. The form has a title 'Login' in blue. It includes two labels: 'User Name :' and 'Password :'. The 'User Name' field contains the text 'mohammad'. The 'Password' field contains seven asterisks '\*\*\*\*\*'. Below the input fields, there are two buttons: 'LogIn' and 'Clear'.

Figure 4.1: Administrator login page

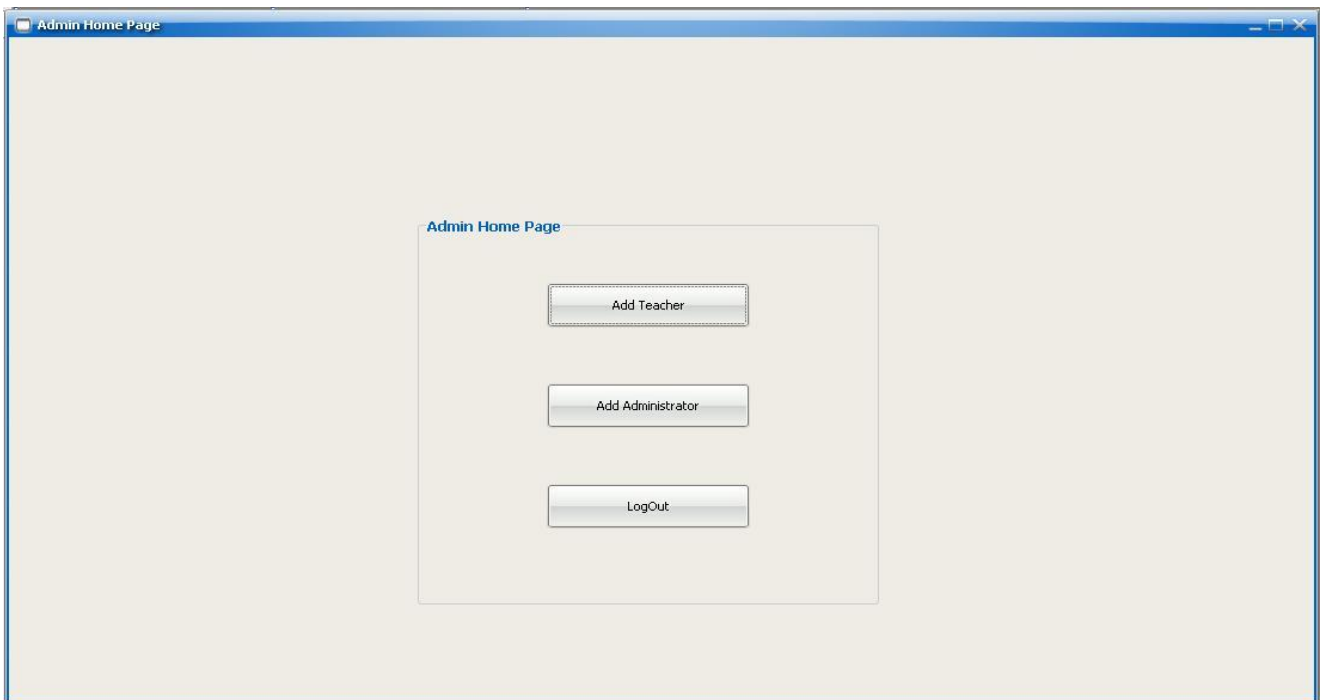


Figure 4.2: Administrator homepage

- The administrator can show all the instructors name and password also add and delete instructors and also the administrator can update their password.
- The administrator can show all the administrators name and password in addition he/she can add and delete the administrators and also he can update their password.

## 4.5. Instructor side

This part is used by the instructor who is working at the server side and only the instructor who has a username and password can use the services of the system.



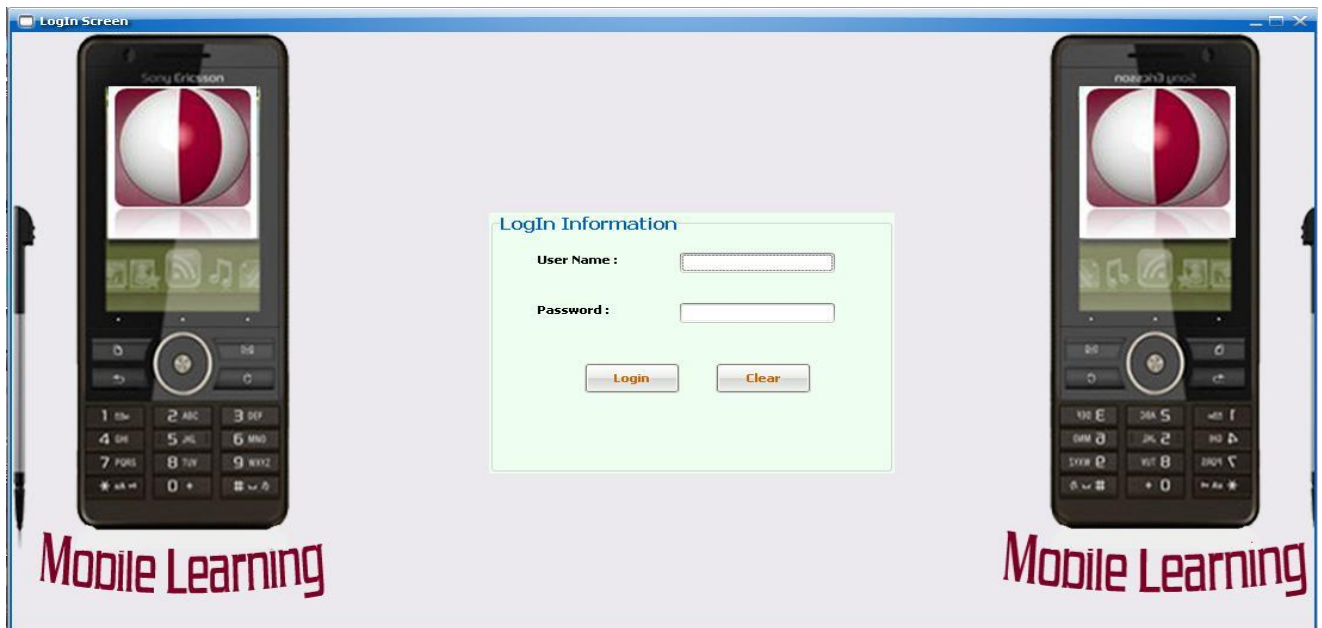


Figure 4.3: System login page

Figure 4.3 shows login window which give the instructor a permission to enter to the system and use the provided services when he/she enters valid login details.

#### 4.5.1. Home page

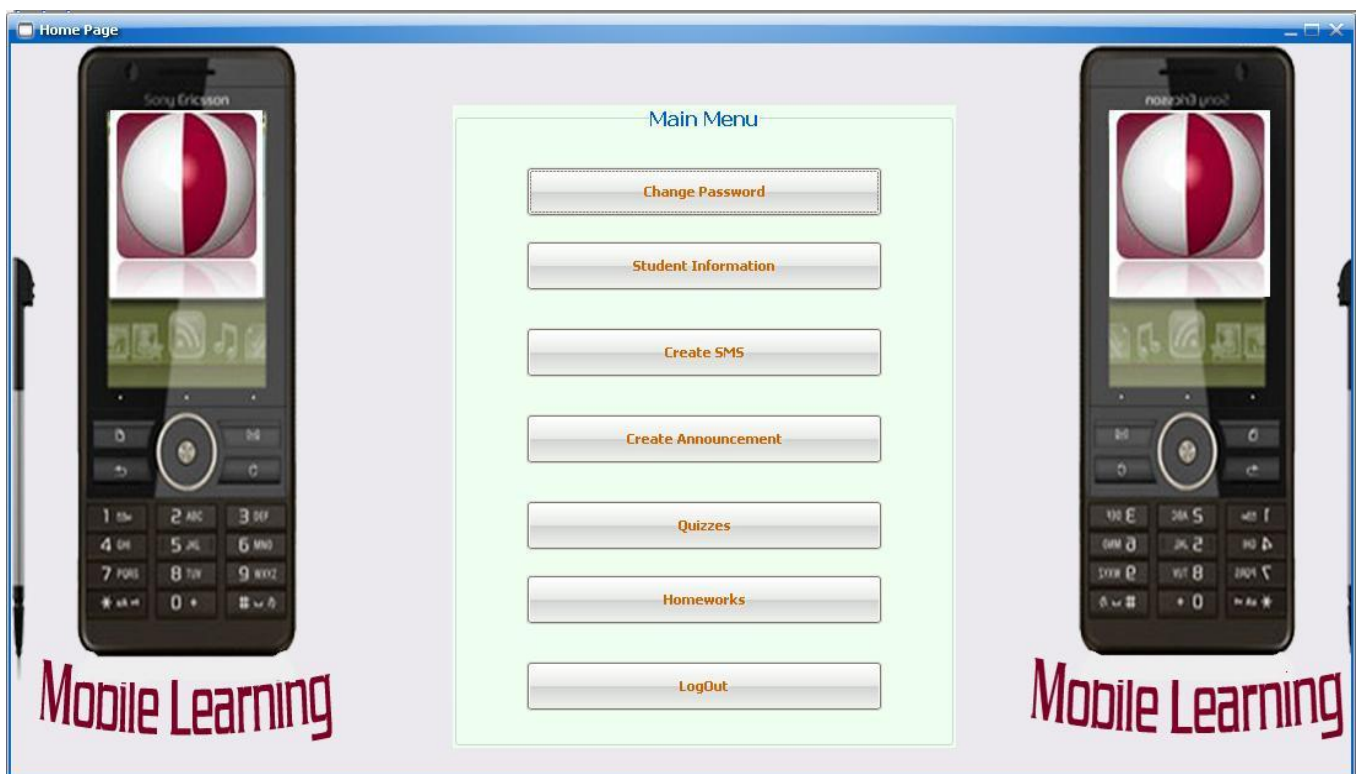


Figure 4.4: Instructor home page

From the home page the Instructor can use the full system and do any of the following:-

- Change password
- Student registration
- Send SMS
- Send announcement
- Create quizzes
- Send homeworks

The main menu can help the instructor to manage his/her lectures and use all options and services that the system is given.

#### 4.5.2. Change password

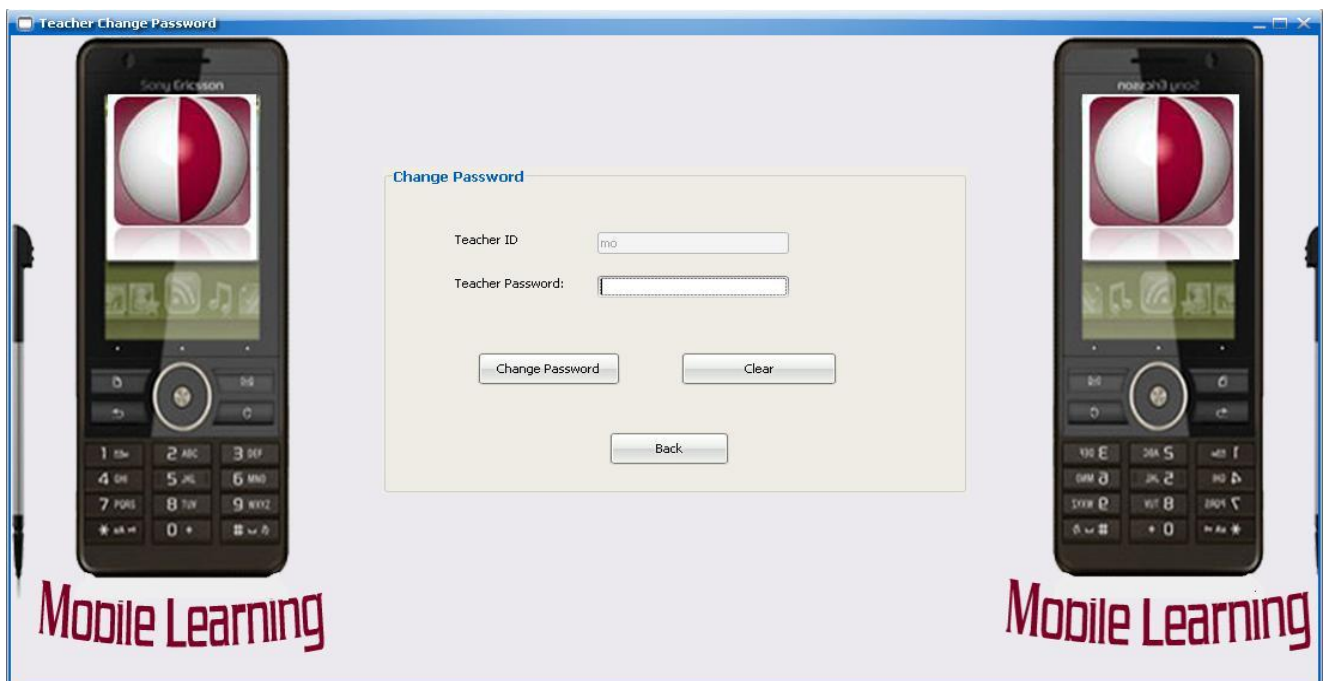


Figure 4.5: Change password page

The first option that the instructor can use is to change his/her password by choosing a new password and click “Change password” button to get his new password.


### 4.5.3. Add student information

Student Information

Student registry


First Name :

Surname :

Student ID :  

Password :

Phone Number :



Mobile Learning

Mobile Learning

Figure 4.6: Student information page

In Figure 4.6 the instructor can insert the student information (first name, surname, student ID, password and phone number). After the insert, the system give many options like update and delete the information, but to use these options the instructor should search for the students' information first, therefore a "search button" using the ID of student was created.

When the instructor enters the student ID and click search, the system automatically refills the information in the fields and the instructor can change any of them and after that he/she should click update button to save the new information in the database.

Also if the instructor does not know the student ID, the instructor select the row for required student and the system fill the students' information in the main pages as shown in Figure 4.7.



1. Send message now:

This option helps the instructor to send his/her message immediately; in this way he/she can send messages to all students or to some of them as following:

In Figure 4.8 when the instructor sends a message to all students using “send now” button, the instructor just write his/her message and choose “All” and click send now to send the message to all students and the system will display him/her a message that “your SMS sent successfully”.

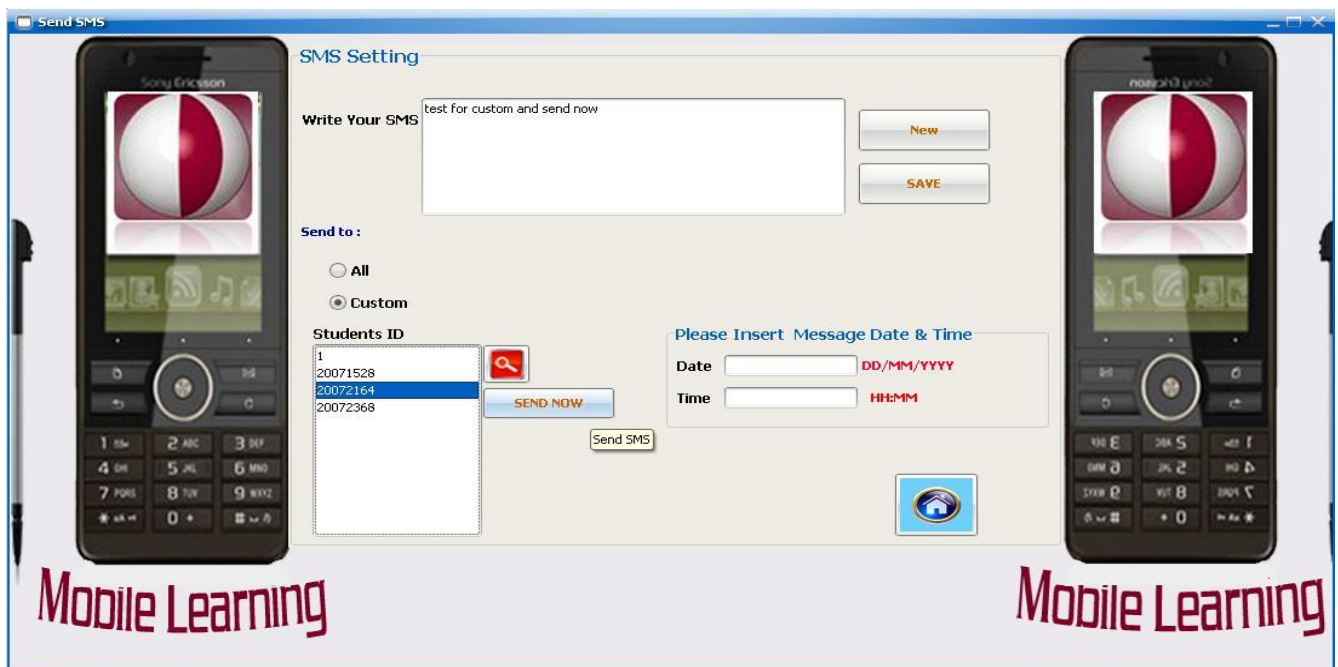


Figure 4.9: Custom sends now

In Figure 4.9 the instructors can choose some students which they want to send them a message, so when they clicks custom choose the students numbers will be viewed in the drop list and they can choose the student they want, and if the they forgot the student number just click search button which help them to see all student's information.

2. Save message and send later:

In this way the instructors can write a message and save it with date and time they wants it to be sent and the system will automatically send it. Figure 4.10 shows how to send the message using this way to all the students



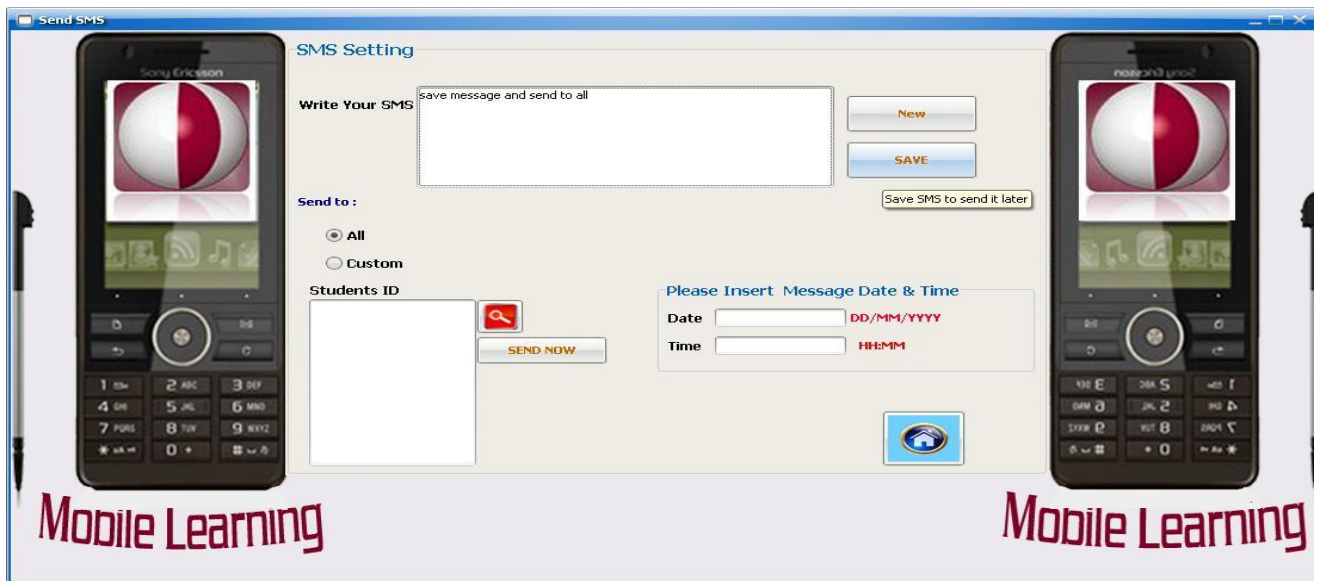


Figure 4.10: Save SMS and send it to all later

The system will ask the instructors to enter valid date and time, otherwise they will not be allowed to save the message, Also they can save their message and send it later for some students using “custom” as shown in Figure 4.11, in this case also the date and time should be entered.

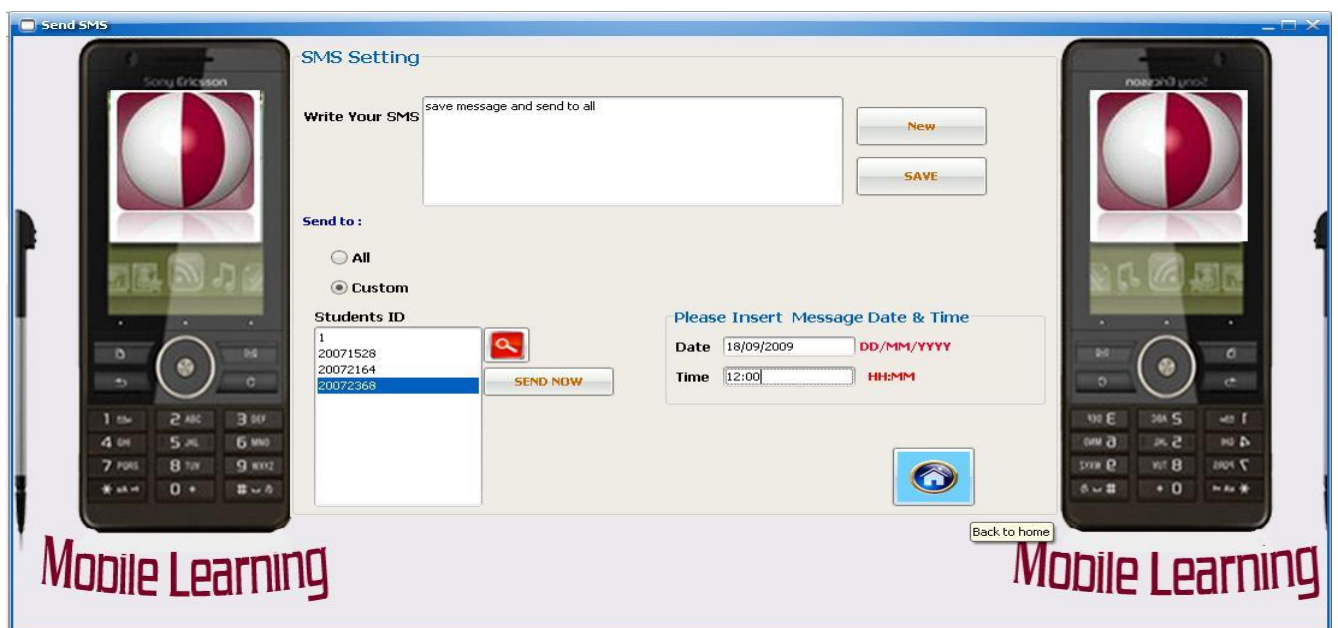


Figure 4.11: save message and send it to some students later

#### 4.5.5. Announcement page

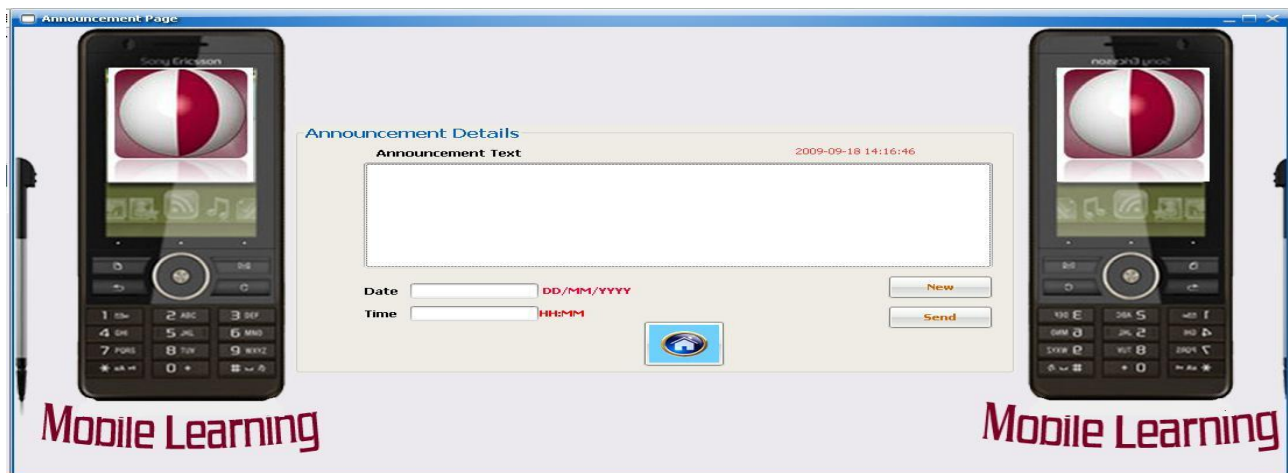


Figure 4.12: Announcement page

In Figure 4.12 the instructor can insert the student Announcements. This page gives the current date and time for the current day which will be automatically saved in the database, at the same time the instructor should define the date and time that he/she wants the announcement to be sent.

#### 4.5.6. Quiz page

This page is one of the important parts in my thesis which is divided into two main parts:

## 1. Quiz Option

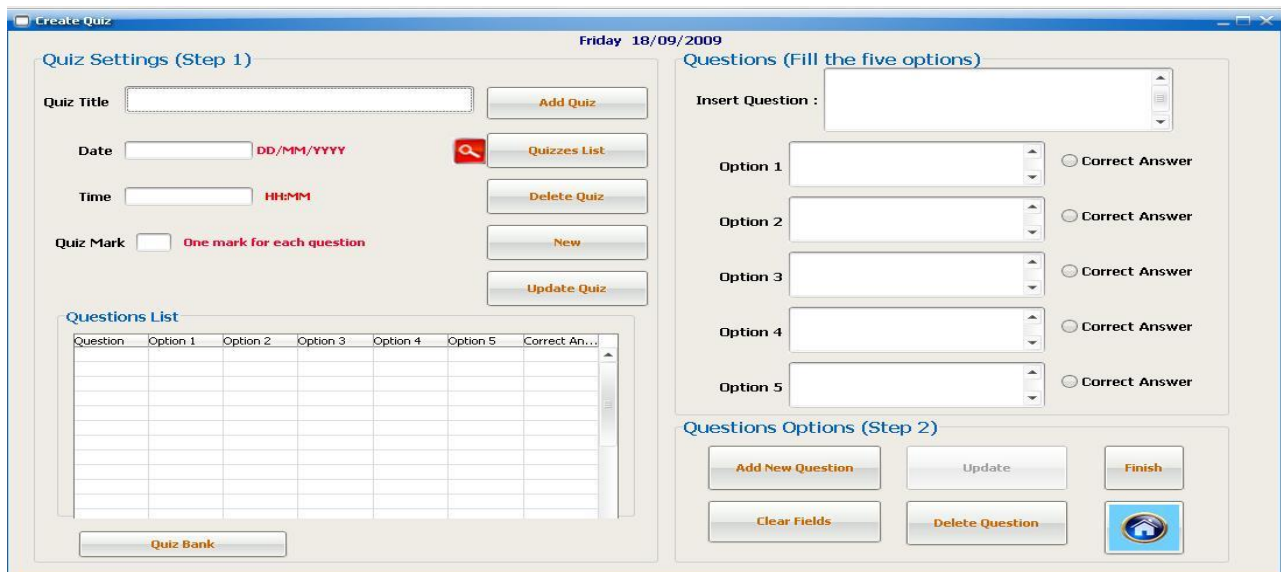


Figure 4.13: Create quiz page

In this part the instructor can add, search, update and delete the quizzes, Also he/she should define the date, time and mark for the quiz.

- **Add quiz:** When the instructors want to add new quiz they should fill quiz fields like title of quiz, time, date and mark for this quiz to be created.
- **Search for quiz:** The search using the “quiz title” therefore when the instructor writes the name of the quiz and click search system automatically refill the date, time, mark and the questions for this quiz, also if he cannot remember the name of the quiz he/she can click search directly and it will open new window that have the information of the quiz, he/she just click in the name of the quiz /she wants and click OK and the system will refill the information in the fields.
- **Update quiz information:** when the instructor clicks the update button the new window will open to update the quiz option which the instructor can update the name, date, time and mark for the quiz.
- **Delete quiz:** When the instructor deletes the quiz, the system will delete the date, time, title, mark and questions of this quiz.

## 2. Question part:

In this part the instructor can add, update and delete the question as following:

- **Insert the question:** in this option we should write the question formula.
- **Insert the options:** in this part we should insert the choices (Options) for the question.
- **Choose the correct answer:** we should click the correct answer.

After that clicking on “add” to add the first question, after that the system will clear all the fields to add the next question and put the question in the table after that when the instructor finishes the quiz he/she should click finish.

- **Update question:** Just click in question from the table that needs to be updated and automatically the fields will be refilled. The instructor can then make the changes that he/she wants then click update.



- **Delete question:** The instructor can delete any question he/she wants with all of the options.
- **Question Bank:** This service can help the instructor to choose any questions for any previous quizzes and add it for new quiz; only select the question then click ok.

#### 4.5.7. Homework's page

Figure 4.14: Homework's page

Figure 4.14 shows the homework's page; in this stage the instructors can send homeworks to the students. This page gives the current date and time for the current day and saves automatically in the database, at the same time the instructors should define the date and time that they wants to send the homework.

### 4.6. Sample Code for the System Server Side

In this section, simple code examples for the server side are given, also explanation is provided on how to make a relation between our services to be a full system also the main classes that are used in the system are explained.

- **Sample code of the home page services**

### **The main class for the home page**

```
public class HomePage extends javax.swing.JFrame {

    public HomePage() {

        initComponents();

    }

    private void
quizzesActionPerformed(java.awt.event.ActionEvent evt) {

        Create_Quiz CQ = new Create_Quiz(Tid);

        CQ.setVisible(true);

        CQ.pack();

        this.setVisible(false);

    }
}
```

This simple code for the system home page helps the instructor to use the services of the system and move from one option to another in easy way by just clicking on the button that he/she want to use to enter and use the service.

### **The main class for the student information page**

```
public class Student_information extends javax.swing.JFrame {

    public Student_information() {

        initComponents();

    }

    DataBaseConnection dbcon = new DataBaseConnection();

    ResultSet result;

    int TID=0;

    private String STDID = "" ;

    private String FNAME = "";

    private String LNAME = "";

    private String PASSWORD = "";

    private String PHONE = "";

    public String getFNAME() {

        return FNAME;

    }

}
```

```

public String getSTDID() {

    return STDID;

}

public void setSTDID(String STDID) {

    this.STDID = STDID;

}

```

The main class is for the student information and how to insert (set) the new data for a new student and how we can read it (get) after the addition.

```

private void AddActionPerformed(java.awt.event.ActionEvent
evt) {

    try {

        result = dbcon.getResult(" SELECT STD_ID FROM
STUDENT_INFO WHERE STD_ID='" + S_ID.getText() + "'");

        if (result.next()) {

            Ann_Lable.setText(" Student Already Exist");

        } else {

            dbcon.executeUpdateChange("INSERT INTO
STUDENT_INFO VALUES ('" + F_name.getText() + "','" +
L_name.getText() + "','" + S_ID.getText() + "','" +
Password.getText() + "','" + Phone.getText() + "','"+TID+"");

            Ann_Lable.setText("Insert Done..");

            clearFeiled();

        }

    }

```

```

    } catch (SQLException ex) {

        Logger.getLogger(Student_information.class.getName()).log(Level.SEVERE,
null, ex);

    }}

```

The system will first check if the student already exist or not by using the select statement so if the student exist the system will give a message “Student Already Exist”, else the system will accept the new student information and add this information using the insert statement and get the information’s form the fields and save it in the database.

### **The main class for the SMS page**

```

public class SMS extends javax.swing.JFrame {

    public SMS() {

        initComponents();

    }

    try {

        maxSMS = dbcon.getResult("SELECT MAX(SMSID) FROM sms");

        if (maxSMS.next()) {

            maxnumSMS =

maxSMS.getInt(1);

        }

        dbcon.executeUpdateChange("INSERT INTO SMS VALUES(" +
(maxnumSMS + 1) + ",'" + date.getText() + "','" +
time.getText() + "','" + MSG_AREA.getText() + "','" +
getTid() + "," + 1 + "','" + now() + "')");

        Object lestSelected[] = jList1.getSelectedValues();

```

```

stdnoCustom.clear();

for (int i = 0; i < lestSelected.length; i++) {

stdnoCustom.add(lestSelected[i]);

        }

    for (int i = 0; i < stdnoCustom.size(); i++) {

        STDID = Integer.parseInt(stdnoCustom.get(i).toString());

dbcon.executeUpdateChange("INSERT INTO RECEIVE VALUES(" +
STDID + "," + (maxnumSMS + 1) + "," + getTid() + "," + 1 +
")");

announcement.setText(" SMS Saved Successfully");

clearFeiled();

        }

if (message.startsWith("MESSAGES__NOW__")) {

    SMSID_Result = dbcon.getResult("select smsid from receive
where std_id =" + getconn_no() + " AND SENT =0");

        while (SMSID_Result.next()) {

            int smsID = SMSID_Result.getInt(1);

            MESSAGES_Result = dbcon.getResult("SELECT
MSG_DATE,MSG_TIME,MSG_AREA FROM SMS WHERE SMSID=" + smsID +
" AND sms_stautes =0");

                while (MESSAGES_Result.next()) {

                    message = "MNOW__" + MESSAGES_Result.getString(3)
+ "***" + MESSAGES_Result.getString(1);

                    sendToSTD(getconn_no(), message); }

```

user want to send the message and when the time and date which the instructor's defined the system change the sms\_statues to 0 which mean the SMS is sent.

### **The main class for the SMS page**

```
public class Create_Quiz extends javax.swing.JFrame {

    public Create_Quiz() {

        initComponents();

    }

    if (message.startsWith("GET_QUIZ_START__")) {

        Tid = dbcon.getResult("SELECT
TEACHEID FROM student_info WHERE STD_ID=" + getconn_no());

        if (Tid.next() == true) {

            setTID(Tid.getInt(1));

            QStart =
dbcon.getResult("SELECT QID FROM QUIZZES WHERE Q_START = 1
AND TEACHEID =" + getTID());

            if (QStart.next()) {

                START = QStart.getInt(1);
```

```

QQNUM = dbcon.getResult(" SELECT MAX(Q_NUMBER) FROM
QUESTIONS WHERE QID=" + START);

        if (QQNUM.next()) {

            questionnumber = QQNUM.getInt(1);

            QQustion = dbcon.getResult(" SELECT
Q_AREA,OPTION1,OPTION2,OPTION3,OPTION4,OPTION5 FROM
QUESTIONS WHERE QID=" + START);

            while (QQustion.next() == true) {

QArea = QQustion.getString(1);

Option1 = QQustion.getString(2);

Option2 = QQustion.getString(3);

Option3 = QQustion.getString(4);

Option4 = QQustion.getString(5);

Option5 = QQustion.getString(6);

QUIZ = "QUESTION_NUMBER" + questionnumber +
"**QUIZ_START_FLAG" + QArea + "__" + Option1 + "____" +
Option2 + "____" + Option3 + "____" + Option4 + "____" +
Option5 + "____";

sendToSTD(conn_no, QUIZ);

        }}}} }

```

The server code which is used to send the quiz to the client side and check if the date and time of the quiz is defined to send the quiz automatically to client. The system make a check for the Q\_START field if it is 0 that means the quiz is sent and if it is 1 that mean the quiz has not been sent yet.



## 4.7 Student Side

This part is used by the student who is working at the client side and only student who have a valid username and password can use the services of the system.

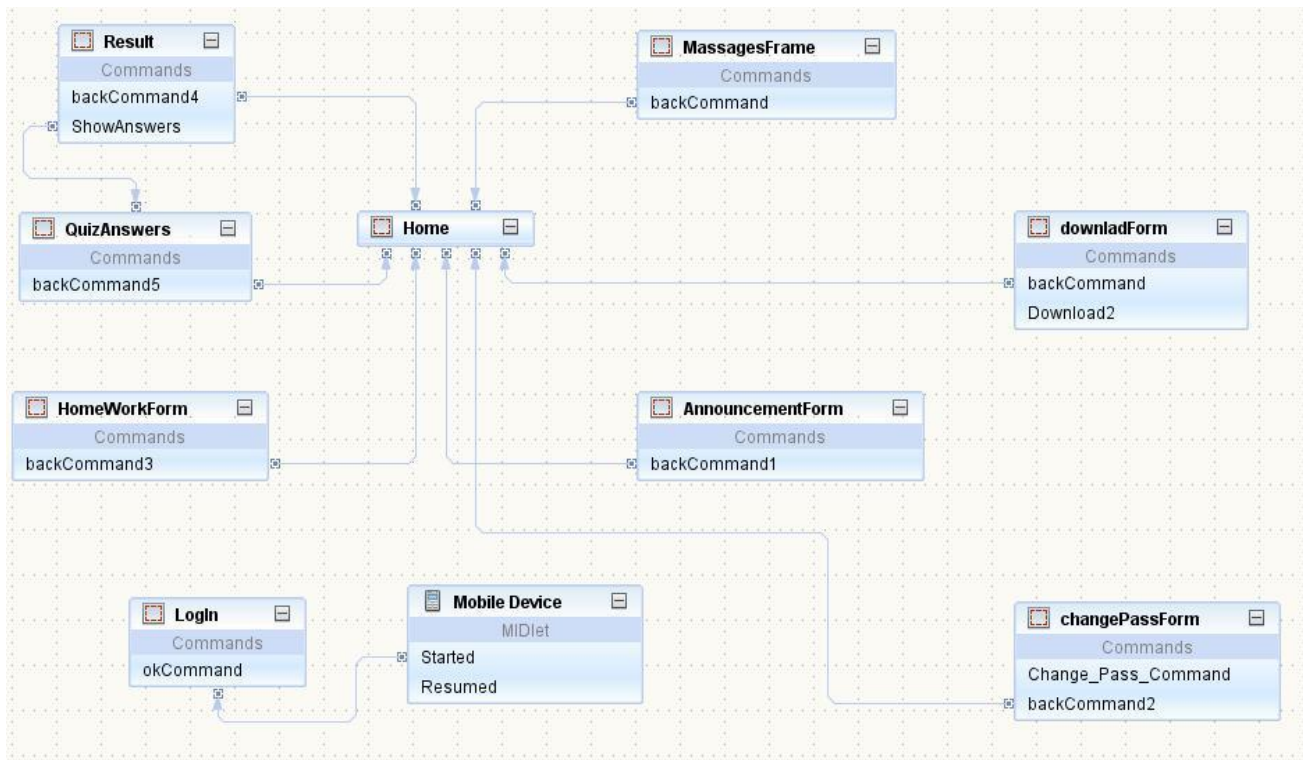


Figure 4.15: Client side flow chart

The relation between the forms at the client side gives the application that installing in the students mobile. Figure 4.15 shows the client side flow chart which illustrate the architecture of the client side which have the login page and main menu. the main menu have the SMS, Announcement, homeworks, quizzes, quiz key, change password and logout and the relation between these forms. In addition students should run the application from their mobile phones by selecting the application then launch it after launching the application; the student will see a login screen.

#### 4.7.1. Login page

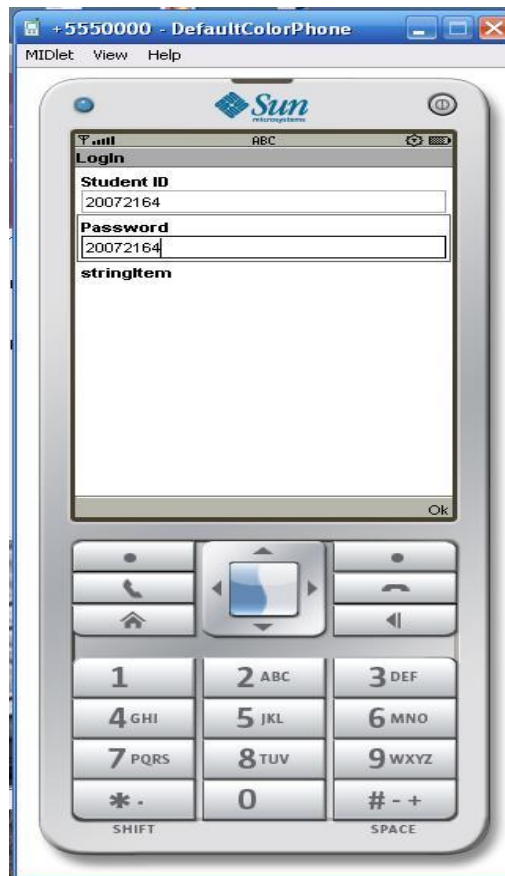


Figure 4.16: Client login service

The user sends his/her username and password through the mobile to the server, where they are checked by connecting to the DataBase using the JDBC interface. If the user name and password are correct, the user is allowed to use the services provided by the system.

#### 4.7.2. Client home page

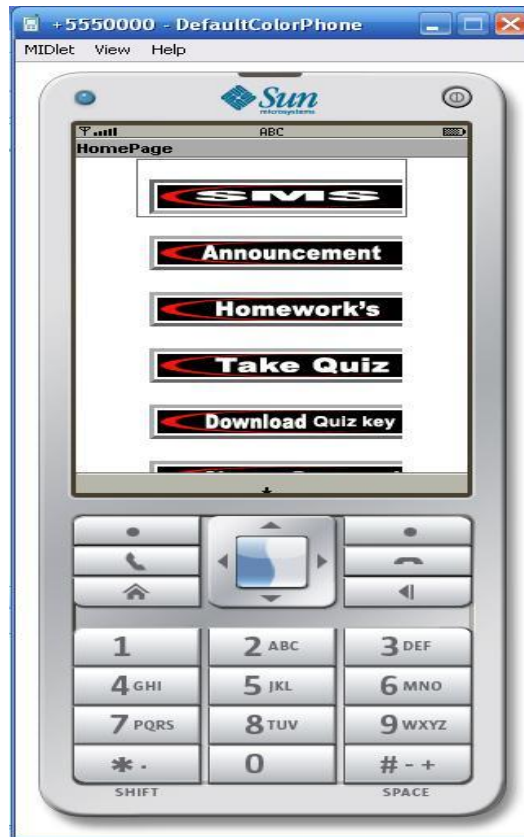


Figure 4.17: Client home page

If we assume that the student entered correct id, then the student will be able to enter to the home page the student can use the full system and do any of the following:-

- SMS
- Announcement
- Homeworks
- Take quiz
- Download quiz key
- Change password
- Logout

This window helps the student to choose an options and service of the system.

#### 4.7.3. SMS page

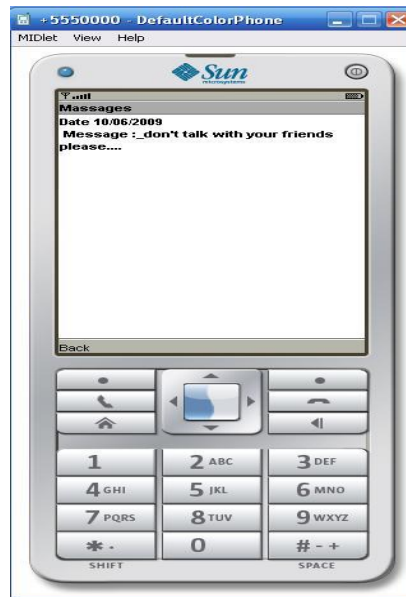


Figure 4.18: Client SMS page

SMS form shown in Figure 4.18 where the client (student) gets the message with the date that it was sent on it. The system saves more than one message in the form so the student can read old and new messages.

#### 4.7.4. Announcement page

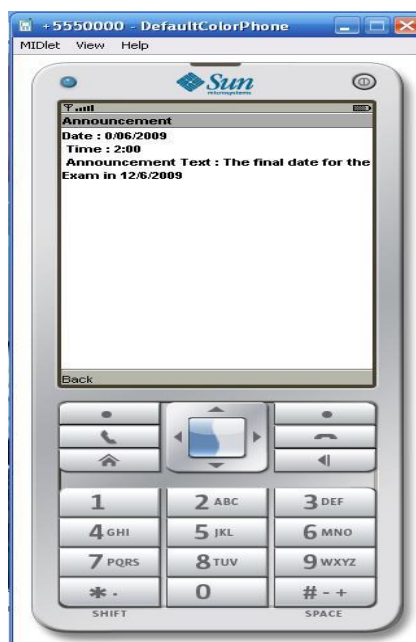


Figure 4.19: Client announcement page

When the client clicks the announcement button, it gives him/her the permission to enter to the announcement page (Figure 4.19) to get the announcement message and the date that it was sent on it.

#### 4.7.5. Homework's page

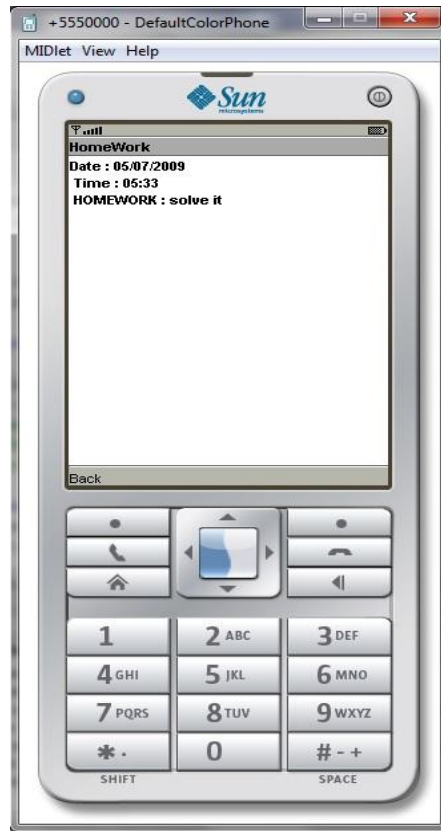


Figure 4.20: Client homework page

When the server sends the homeworks, the client side receives the homework message with date and time that sent in it by click the homeworks button from the home page.

#### 4.7.6. Quiz page

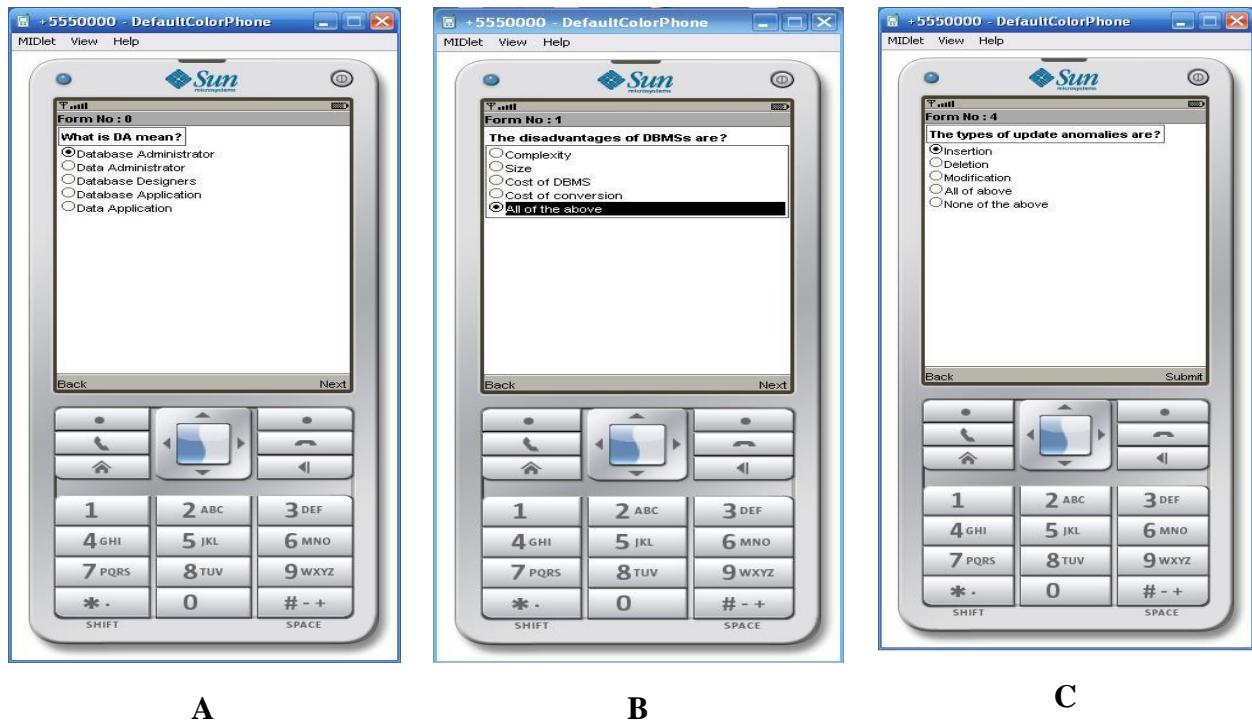


Figure 4.21: Client quiz forms

Figure 4.21: A, B shows the quiz forms and how the questions are displayed. Each form has “Next” and “Back” buttons that make the quiz more flexible and help the student to navigate from a question to another and to change his/her answer as defined.

In the last question the “Next” button changes to “Submit” as shows in Figure 4.21:C, therefore when the student clicks it, the quiz will be finished and the student will move to the “Mark form” to get his/her mark.

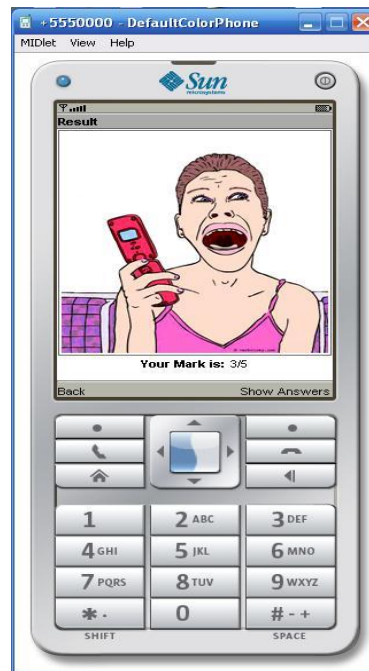


Figure 4.22: Client result form

Figure 4.22 shows the result and the moment when the student is given his/her mark as the sum of correct answers. This form has two buttons the first one is “Back” button to return back to the home page and the second one is “Show Answers” button which provides with a feedback about the submitted quiz as shown in Figure 4.23.

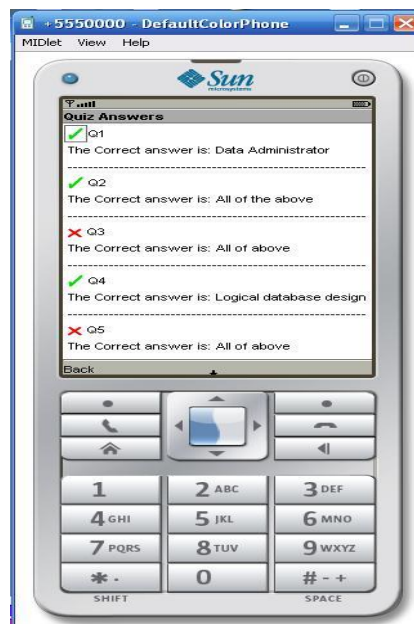


Figure 4.23: Client quiz answers form

In Figure 4.23, the student gets the key answers, which shows the correct answer for each question in the quiz.

At the client side, the student can download the quiz key and the system will save it in a text file in the memory card. Also the client can change his/her password by providing the old one and the new one he/she wants and by clicking change the new password will be sent to the server to update the record in the database as shows in Figure 4.24.



Figure 4.24: Client change password page

## 4.8. Sample Code for the System Client Side

The simple code for system client side and how we make a relation between our services to be a full system also it talk about the main classes that use in it.

- **Sample code of the client home page services**



### **The main class for the home page**

```
public class HelloMIDlet extends MIDlet implements
CommandListener, ItemCommandListener {

public void commandAction(Command command, Item item) {

    if (command == cmdImage) {

        if (item == quizHome) {

            pda.SendToServer("GET_QUIZ_START__");

            if (pda.quizflag.equals("TRUE")) {

                QNUM = pda.getQUESTION_NUMBER();

                DBAnswer = new String[QNUM];

                showMultipleChoiceQuestions();

            } else {

                switchDisplayable(null, getHome());

            }

        }

        if (item == download) {

            /* pda.SendToServer("GET_MATERIAL__");

            while (pda.Filename == null) {

                */

                switchDisplayable(null, getDownladForm());

            }

        }

    }

}
```

```

        } else

switchDisplayable(null, getHome());

        } }

        if (item == passwordchange) {

            switchDisplayable(null,
getChangePassForm());

        }

        if (item == logout) {

            pda.SendToServer("LOGOUT__");

            Std_ID.setString("");

            Pass.setString("");

            switchDisplayable(null, getLogIn());

        } } else { } }

```

This simple code for the client home page help the student to use the services of the system and move from one option to another in an easy way just by clicking on the button that he/she wants to use it to enter and use the service also it shows the main class that used in the code.

### **The quiz form code**

```

public void showMultipleChoiceQuestions() {

    fx = new Form[QNUM];

    next = new Command[QNUM];

    back = new Command[QNUM];

    submit = new Command("Submit", Command.OK, 2);

```

```

        title = new StringItem[QNUM];

        y = new ChoiceGroup[QNUM];

        for (int i = 0; i < QNUM; i++) {

            String q = "";

            fx[i] = new Form("Page : " + q.valueOf(i));

            next[i] = new Command("Next", Command.OK, 2);

            back[i] = new Command("Back", Command.EXIT, 2);

            title[i] = new StringItem("StringItem", null);

            y[i] = new ChoiceGroup("", Choice.EXCLUSIVE);

            title[i].setLabel(pda.v.elementAt(index).toString());

            for (int j = 1; j <= 5; j++) {

                y[i].append(pda.v.elementAt(index +
j).toString(), null);

            }

            fx[i].append(title[i]);

            index = index + 6;

            fx[i].append(y[i]);

            fx[i].addCommand(next[i]);

            fx[i].addCommand(back[i]);

            fx[i].setCommandListener(this);

        }

        switchDisplayable(null, fx[0]);

        fx[QNUM - 1].removeCommand(next[QNUM - 1]);

```

```
fx[QNUM - 1].addCommand(submit);  
  
fx[QNUM - 1].setCommandListener(this);  
  
}
```

## 4.9 Technology Used

The server side code was implemented using

- NetBeans IDE 6.5.1 J2SE (Java 2 Standard Edition).

The server side code was implemented using

- NetBeans IDE 6.5.1 J2ME (Java 2 Micro Edition).

The database tables and DML operations were implemented using

- MySQL Server 5.1.

## 4.10 Summary

Chapter 4 is dedicated to the technical implementation of the system and the system requirement specifications. The system is divided into three parts: the first one for the administrator which he/she is responsible for the instructors and other administrators. The second part is the server side where the instructor should have a valid username and password to use the services which are send SMS, create announcement, give homeworks and create a multiple choice questions. The last part is client side; in this part the student should insert valid username and password using the mobile phone to use the services and received the options from the server which are SMS, announcement, homework, take quiz and download the quiz key. In addition this chapter has some examples for the code that used in this system and what these codes do in the system.

## **CHAPTER 5**

### **CONCLUSIONS AND RECOMMENDATION**

#### **5.1. Conclusions**

As the education process is continuously evolving especially with the advancements in various technologies, several learning models became to exist. M-learning provides further flexibility for the learner to learn anytime, anywhere on the move while he/she is mobile or moving. The learning utilizes the networking technology and there is the freedom of the learner to exist in different location than the teacher, he/she has the freedom to study in the time that suits him/her provided that he/she has the required hardware and network infrastructure. The biggest problem facing the user of any mobile learning system is how to choose a system that can meet the identified needs of the learners and teachers, at the same time how to find available devices that support the new systems in a flexible way. The proposed work in this thesis is focused on how we can create new system with clear scenarios and stricter to serve the learners and make the education process more flexible and interesting.

The developed system is a friendly system that is expected to improve the learning ability of the user. The system was built and started to serve the actors of the system with academic interface that make the system more friendly and easy to use for anyone interested in the mobile learning field. With the available devices, users can make their actions to benefit from the system easily. An access point was used to make a wireless network that covers a huge area like classroom to make the service available for users in a wide range. The access points should have high capabilities to ensure high quality of service. At the same time a database was created to save all the information that added to the system from the server side and from the client side. The relation between tables is very important part to build any database system in order to receive huge amount of information at the same time.

The developed system has two main parts: Server side and Client side. In the server side SMS, announcements, homework and quiz services are added. In SMS the instructor can send his/her message by writing it and sending it in two ways: The first one is by sending it directly to all students or to a group of them, and the second one where the instructor can save and send it later to all students or to some of them at the date and the time that he/she wants. In addition, the instructor can send announcements or homeworks to learners. The quiz is a main service in our system in which we added a new idea in the education field that uses the new generation of technologies. This service provides students with new kind of learning and gives them a good feedback about the new education process. The instructor can add quiz title with date, time and mark and start adding multiple-choice questions with the options and the system will send it automatically to the learners' mobile units at a specific time and date. In order to run the system at the client side, a mobile phone or PDAs is recommended that supports TCP protocols. The mobile phone should support Java environment. The system we used during the trials was Sony Ericsson G900.

The learners at the client side can receive an SMS, announcement or homework and read it, also, they can solve the quiz and submit their answers to the server for auto marking and get feedback about their grades and also download the correct answers. I want to highlight that the main service in the system is the quiz part which includes a novel idea in the education field that uses the new generation of technologies.

This service provides students with new kind of learning and gives them a good feedback about their own learning capacities. The system help learners to take the knowledge not in traditional way but they can take it anytime and anywhere by just connecting to the server to receive the SMS, announcement or homeworks. In addition they can get the quiz and solve the questions and take their marks directly using available components like cell phones and PDAs.

This thesis should be useful to anyone interested in the M-learning field and its applications. The most important individuals who might be interested in this thesis are teachers, students, and educational organization such as: universities, schools, institutes, or anyone who looks for a proper M-learning that exactly suits his demands.

The developed system has some limitations like connection of learners. Currently students can only reach the system within a close distance. The system interface is in English and thus the users (learners and instructors) should know English.

## **5.2. Recommendation and Future Work**

The system works now with a very high efficiency. One of the future aims is to make this system available not only in the class but also in all university campus to make it more usable and widespread and to make it available for anyone wishes to benefit from the services. This will require from me to supply more services to enrich the database and to furnish the system with new ideas to add more services such as building a blackboard system for the courses and give the students new choice to take the materials in their phones. In addition the services can be updated to be more flexible like sending quiz in a random way to make the exam with more than one sample or version by changing the order of the questions or the questions themselves. One of my main aims was adding other languages to the user interface. Accordingly, the users of the system can customize the interface by choosing any language that suits him/her from the list of available languages in the system.

- The quizzes sent to students should be automatic and selected randomly by the system. e.g. all students will receive same quizzes but the numbering of quizzes will be different.
- The system will be enhanced so that students can send their homework written using the Word package.
- The system will be enhanced so that teachers can send lecture notes prepared using Word, PowerPoint, and flash software packages.
- Currently students within a certain distance can use the system. This should be removed so that there are no distance limitations.

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# **APPENDICES**

## **APPENDIX A**

These appendices are the system's user manual. It contains a full description about all tasks in the system. Firstly, we have to know the main users who are expected to use our system. They will be one of the main users' types:

- Instructors.
- Students.
- Administrator.

This guide will present all the system's forms for the instructor and for the students. Use appendix A from this thesis to see all the screen shots for all the system.

### **1. Instructor**

In the section, the forms that are related to the instructor are described.

#### **1.1. The instructor login screen**

In this window (Figure A.1) the instructor should insert a valid username and password that was given to him/her by the administrator of this system, after that the instructor will move to home page for this system which have the services that the instructor can use which are:

- Change password.
- Student Information.
- Create SMS.
- Create Announcement.
- Quizzes.
- Homeworks.
- Logout.

These services are shown in Figure (A.2), when the instructor wants to use any of these services he/she can just click the button to move to new window and we will explain how to use every one in details as following:

## **1.2. Change password**

To change the password there is one step which is inserting the new password in the “Teacher password text field” and clicking change password button after that the system will give a message “Change password done”, also the instructor can clear the text field and click back to go back to the home page as shows in Figure (A.3).

## **1.3. Student information**

We can see in Figure (A.4) the student information window, in this window the student can add, update or delete student’s information and also he/she can search for an existing student. How to add, update or delete a student will be explained as following:

- **Add student:**

The instructor should fill the first name, surname, student ID, password and student number, after that he/she should click add to add this new information and the system will give a message “Insert done”. After the addition the instructor can click search button to make sure that the student is added successfully.

- **Update student:**

To update any student’s information, the instructor should click the search button to open search screen (Figure A.5) and click any name he/she wants to update it and click ok, in this time the system will fill the information’s in the fields and the instructor can change any information and click update and the system will give a message “Update done”.

- **Delete student:**

Also using search button to select the student and click ok to fill the fields and click delete button to delete it, in this time the system will give alert window “are you sure you want to delete student information” if the user clicks yes, the system give new message “delete done”.

## 1.4. Create SMS

This window as shown in Figure (A.6) is used for sending short messages to students, to send a message there are two ways:

- **Send now:**

This way is used to send a message directly to students. The instructor just needs to write the message text in the text area and choose all to send it to all students or custom to choose which student(s) he/she wants to send the message to, in this time the system will give a message that “SMS send successfully”

- **Save:**

This part is used to send the message later, in his way the instructor should write the message text and insert the sending date and time and click save, and the system will send this message in the required time and date automatically.

## 1.5. Create announcement

To create an announcement, the instructor should go to announcement page (Figure A.7) and write the announcement text and the date and time of the announcement and click send to send it to the students’ mobiles, in this time the system will give a message “send done successfully”.

## 1.6. Quizzes

The main service in this system is to create quiz and send it automatically to students, in Figure (A.8) we can see the create quiz page, this page has two options:

- **Quiz options:**

To start creating the questions of quiz we should first finish the quiz options which are add, update and delete quiz. To add a quiz, the instructor should write the quiz title, date, time and quiz mark then click add to add the quiz information.

To update quiz information just click on “update quiz setting” to move to quiz details window (Figure A.9) and edit the quiz information then click update to go back to create quiz page.

To delete any quiz click on the search button to see the list of existing quizzes (Figure A.10) and select the quiz that you want to delete and click ok and the system will fill the quiz information with all questions and click delete to delete it with questions.

- **Questions options:**

After adding the quiz information, the instructor can add the questions for this quiz. Firstly, the instructor should write the question formula, after that the instructor should insert five options for the question and choose the correct answer for it, then click add next question button in this time the question with five options and the correct answer will shows in the table. The instructor can add many questions and when he/she finishes he/she should click finish button, in addition he/she can update or delete any question by selecting the question form the table and making any needed changes if he/she wants to update the question or delete to remove it and the system will give alert messages for each action.

## **1.7. Homeworks**

To create a homework, the instructor should go to the homework page from the home page (Figure A.11) and write the homework text and the date and time of the homework and click send to send it to the students’ mobile, in this time the system will give a message “sent done successfully”.

## **1.8. Logout**

To logout from our system and go back to login page.

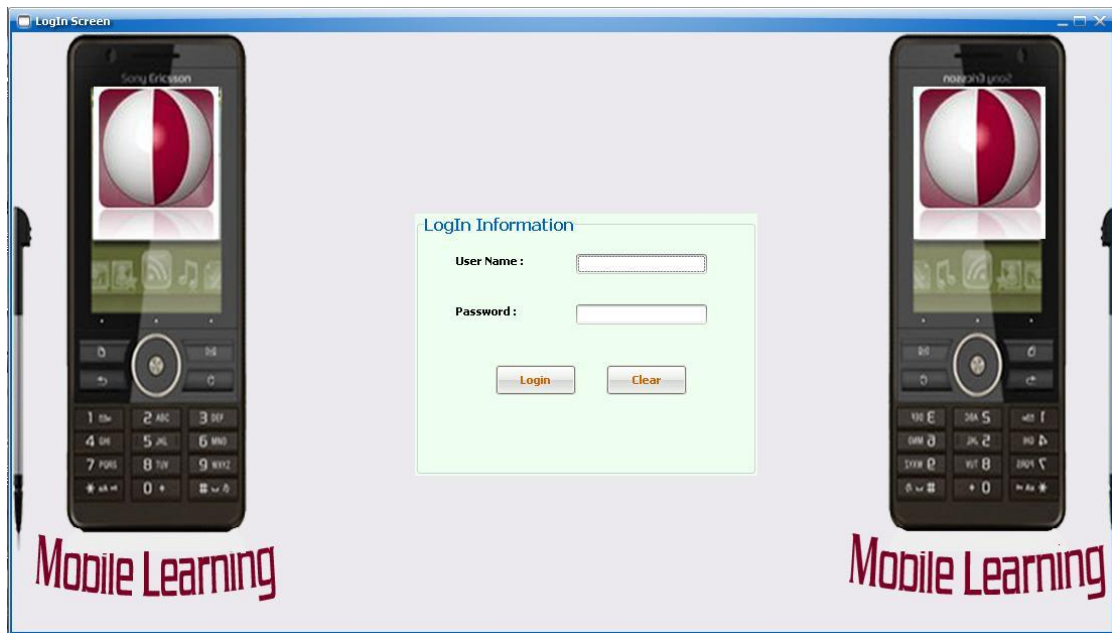


Figure A.1: The instructor login page

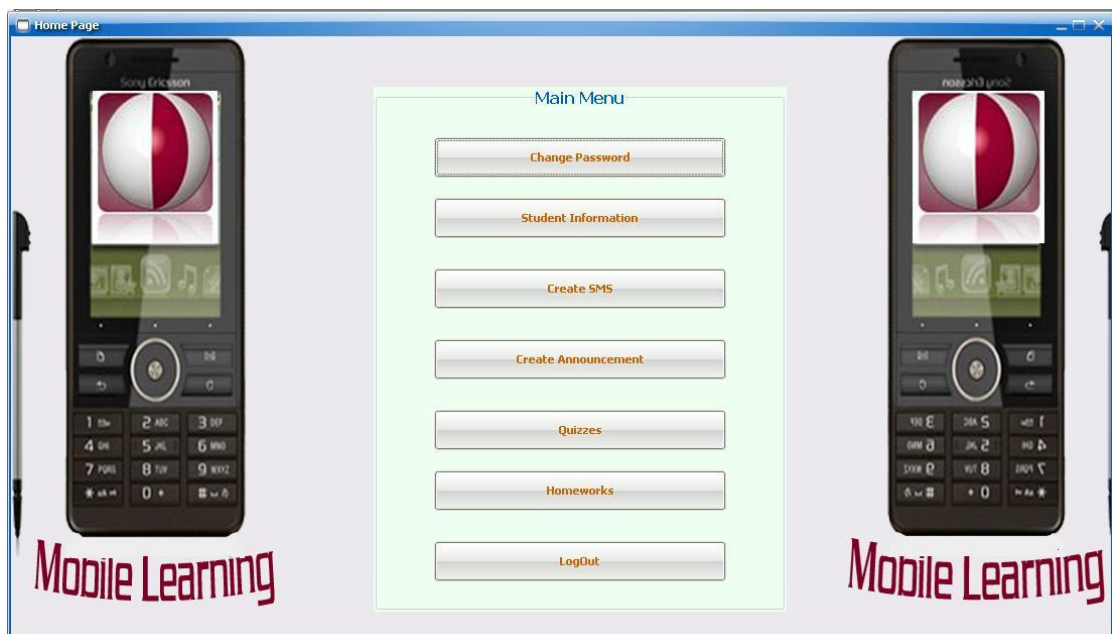


Figure A.2: Instructor home page

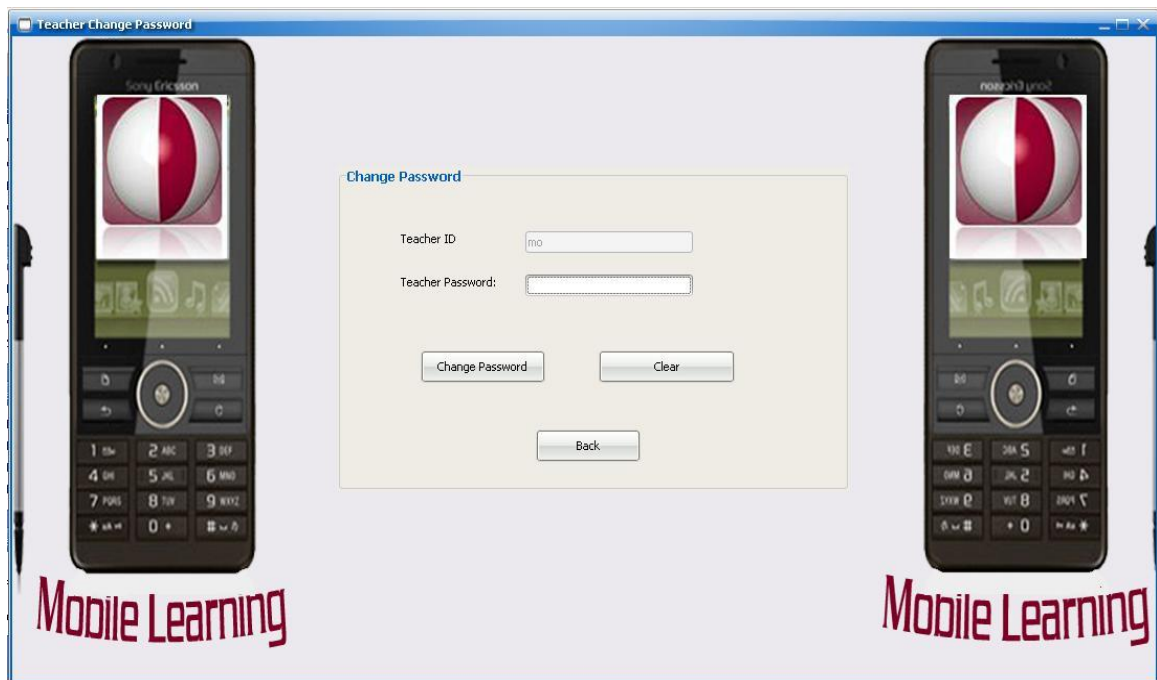


Figure A.3: Change password page



Figure A.4: Student information page



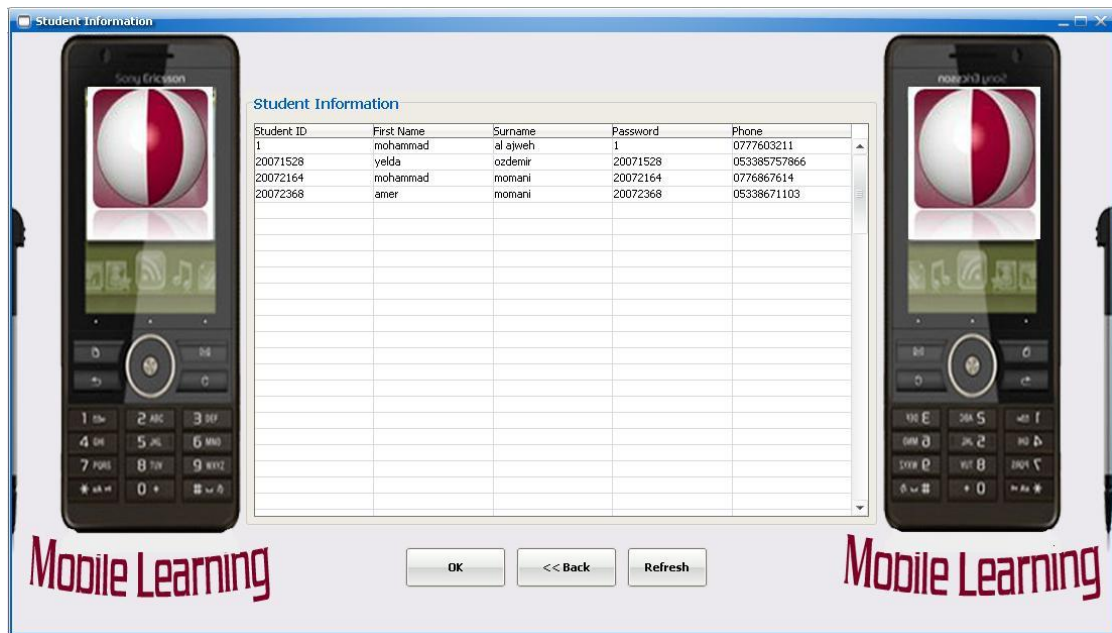
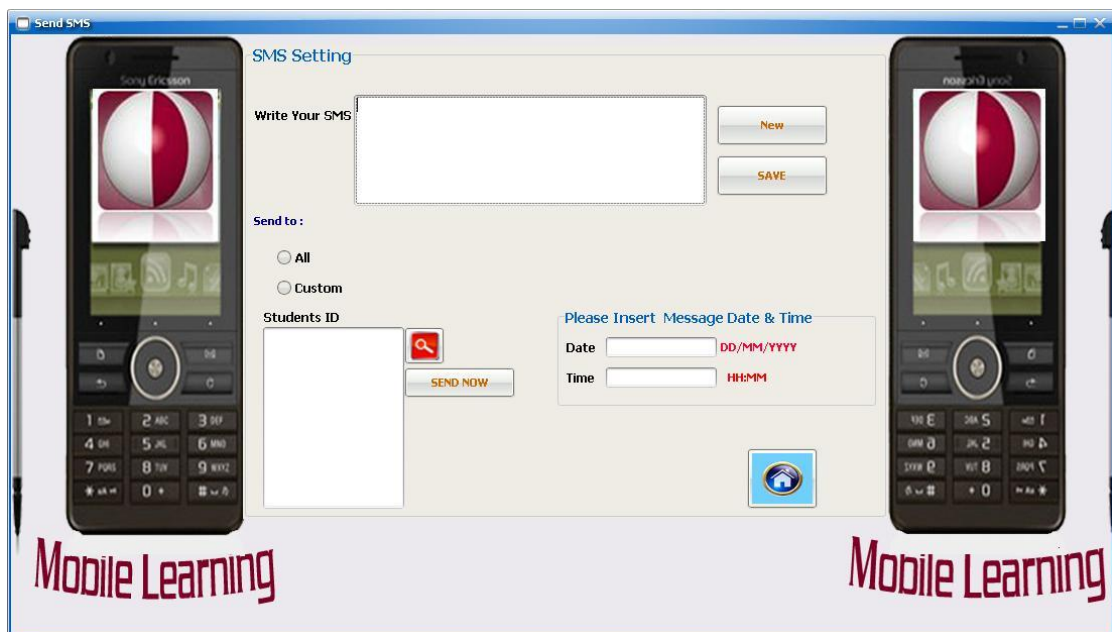


Figure A.5: Search for student information



A.6: SMS page





Figure A.9: Update quiz details page



Figure A.10: Search for quiz

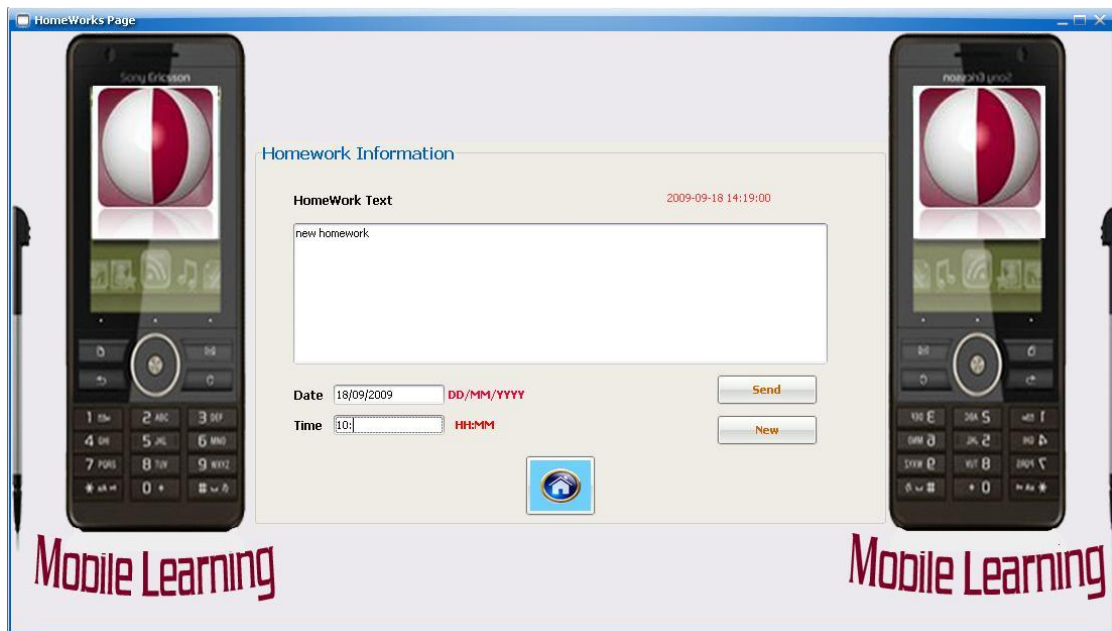


Figure A.11: Homework page

## **APPENDIX B**

### **2. Student**

The students should install the application file in their mobile phones to use our system, after installing the jar file the student will ready to use our system. In the section, the forms that are related to the student are described.

#### **2.1. Student login**

The student should insert a correct username and password in the login page Figure (B.1) to enter to our system, after login the system will give a message to connect to the server, so when he/she click ok the student will see the home page which has the services as following:

- SMS.
- Announcement.
- Homeworks.
- Take quiz.
- Download quiz key,
- Change password
- Logout.

These services are shows in Figure (B.2), when the instructor wants to use any of these services he/she needs only to click the button to move to a new form and we will explain how to use every one in details as following:

#### **2.2. SMS**

When the student clicks the SMS button he/she can read the short messages that were sent by the instructor as shown in Figure (B.3), and after reading it he/she can click back to go back to the home page, also if there is no messages for this student he/she cannot enter to the SMS form.

### **2.3. Announcement**

In Figure (B.4) the student can read the announcement text on the date that was determined by the instructor and after that he/she can click back to go to the homepage.

### **2.4. Homeworks**

In Figure (B.5) the student can read the Homework text on the date that was determined by the instructor and after that he/she can click back to go to the homepage.

### **2.5. Take quiz**

When the student clicks the take quiz button he/she will start the quiz, the questions will be viewed one by one with their five options, the student can choose the answer and click next to go to the next question, also he/she can go back to the previous question if he/she wants to make any changes in the selection, and the system will show a submit button in the last question as shown in Figure (B.6), therefore when the student clicks submit that means he/she has finished his/her quiz and this will send his/her answers to the server for marking, in this time the server will send the mark to the student and give him/her the new option to show the correct answers for the quiz as shown in Figure B.7 and the student can click back to go to the home page.

### **2.6. Download quiz key**

The student can download the quiz that he/she already did with answers by using download quiz key button, then click ok to start downloading the quiz as a text file that can be opened using notepad.

### **2.7. Change password**

Figure (B.8) shows how the student can change his/her password by inserting the old password and the new password and click change.

### **2.8. Logout**

The students can logout from the system when he/she clicks logout button.

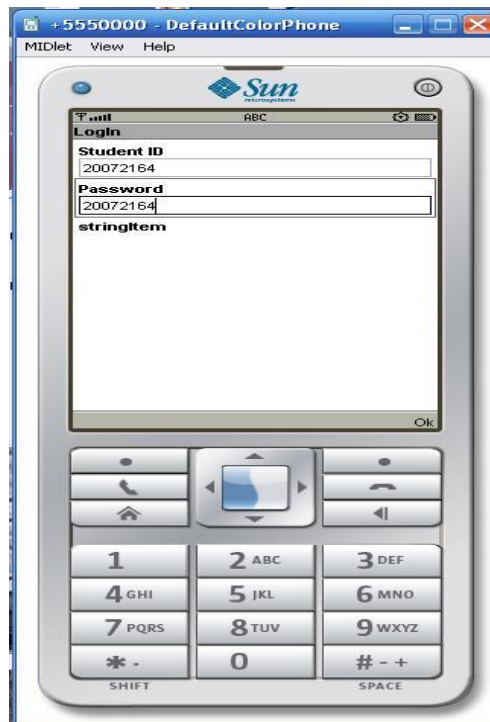


Figure B.1: Student login screen

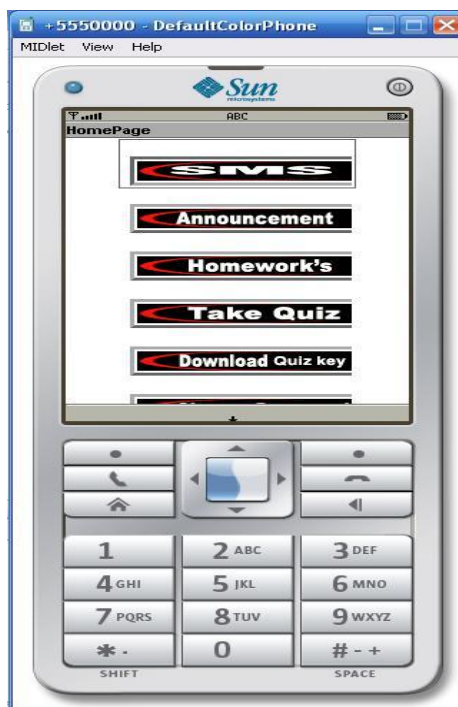


Figure B.2: Student home page



Figure B.3: SMS form

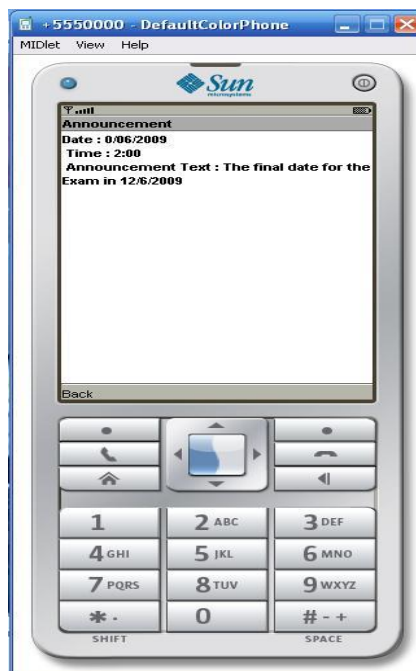


Figure B.4: Announcement form



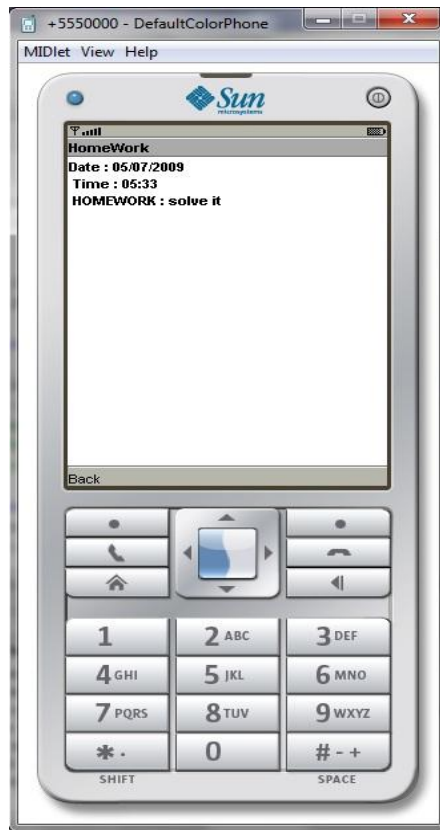
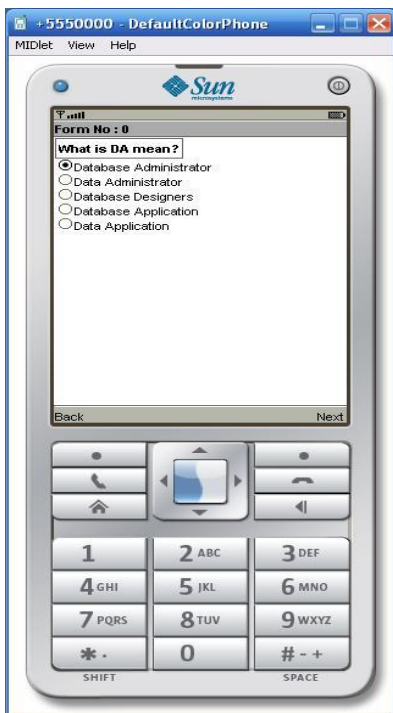
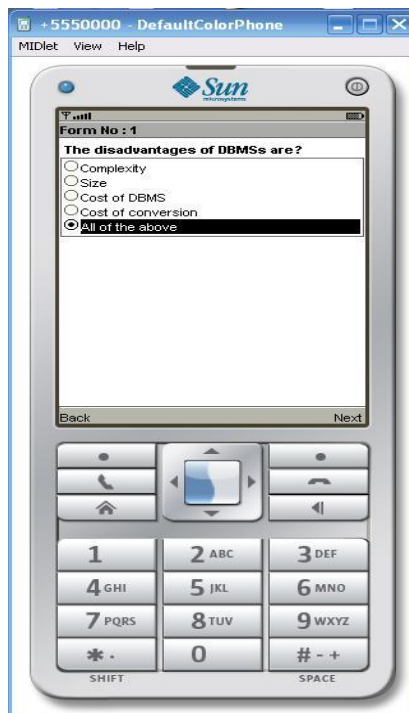


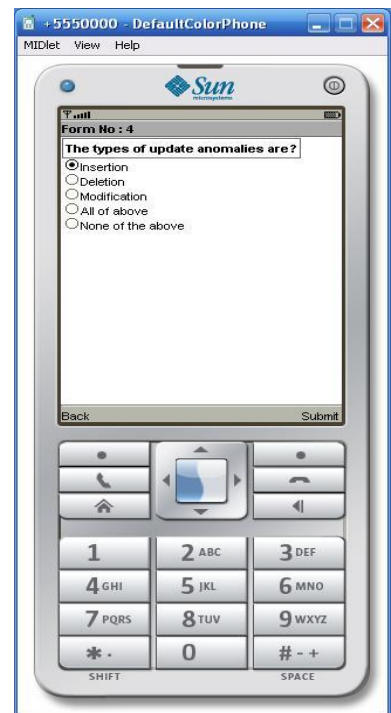
Figure B.5: Homework form



A



B



C

Figure B.6: Questions forms



Quiz mark

Quiz correct answers

Figure B.7: The quiz mark and correct answers



Figure B.8: Change password page

## **APPENDIX C**

### **5.3. Administrator side**

The administrator who can give permission for instructors and other administrators to use our system.

#### **5.3.1 Admin login screen**

In this figure (figure C.1) the administrator should insert his correct username and password to enter to the admin homepage.

#### **5.3.2 Admin homepage**

Figure (C.2) show the admin homepage which have two main option the first one for instructors and the other for administrators, the figure (C.3.a) and (C.3.b) help the admin to add, update and delete instructors or administrators only he/she enter the name and the password for the instructors or the administrators and click add to add them or he /she can choose any names in the table by click in it to fill it in the fields and click update to change the password or click delete to remove it .

#### **5.3.3. Logout**

The Administrator can logout from the system when he/she clicks logout button.

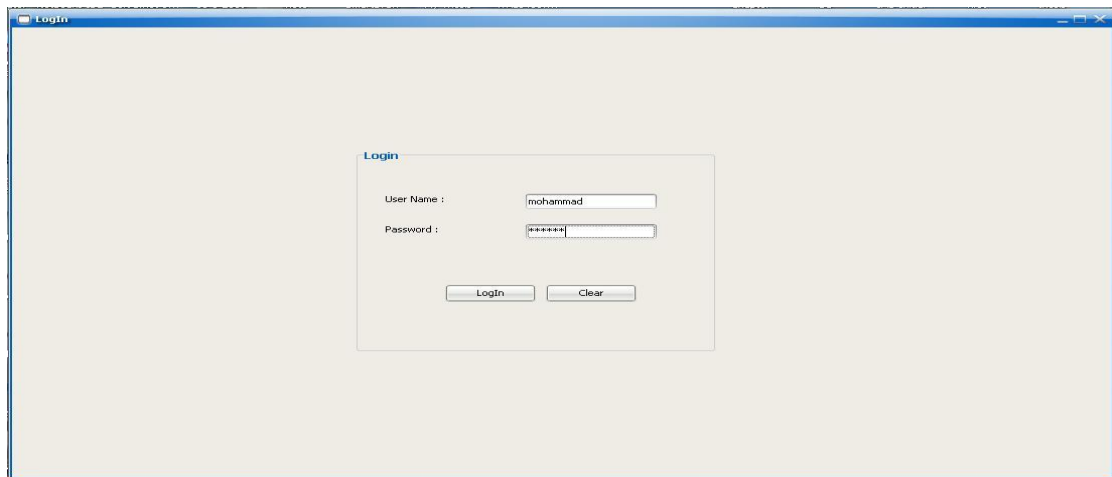


Figure C.1: Administrator login screen

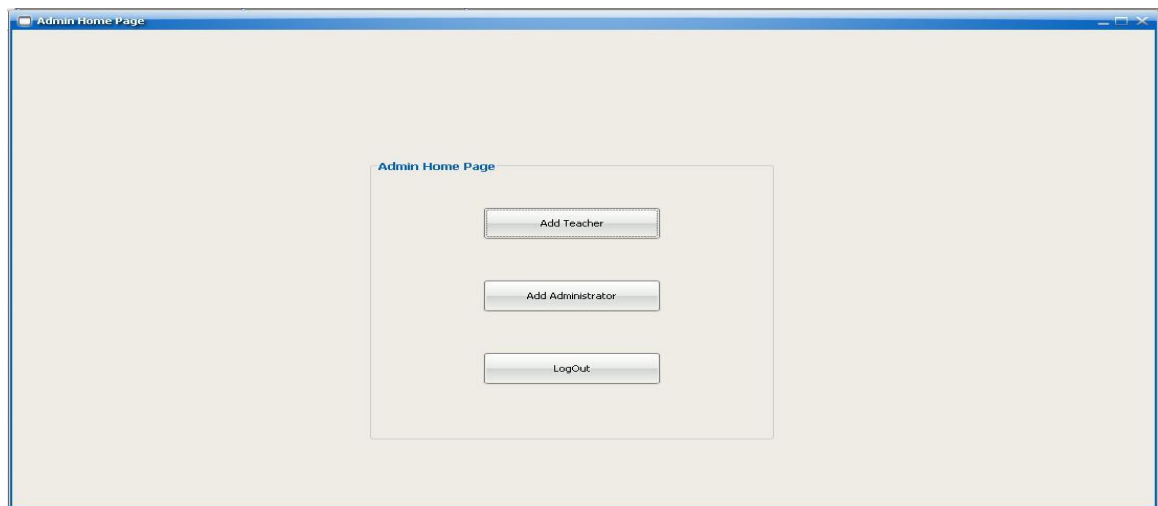


Figure C.2: Administrator homepage

