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Nahrain Mobile Learning System (NMLS)

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Abstract

The work in this paper involves the planning, design and implementation of a mobile learning system called Nahrain Mobile Learning System (NMLS). This system provides complete teaching resources, which can be accessed by the students, instructors and administrators through the mobile phones. It presents a viable alternative to Electronic learning. It focuses on the mobility and flexibility of the learning practice, and emphasizes the interaction between the learner and learning content. System users are categorized into three categories: administrators, instructors and students. Different learning activities can be carried out throughout the system, offering necessary communication tools to allow the users to communicate with each other through forums, SMS and e-mails. NMLS platform is based on 3G mobile phone technology and adopted WAP as a solution for the system platform. The NMLS framework is based on three layers, which are presentation layer, business logic layer and data layer.

Keywords: *Nahrain mobile learning system; short message service; wireless application protocols; multimedia messaging service; mobile learning; personal digital assistant; wireless fidelity; general packet radio service; extensible hypertext markup language; java database connectivity.*

1. Introduction

The rapid development of wireless infrastructure and the advent of mobile devices in everyday life of people push the research to combine those two domains, which results in the emerging of mobile learning [1]. Mobile technologies potentially promote, facilitate, and enhance student collaboration and interaction. Processes that serve as a means for accessing, discovering, discussing, and sharing environmental concerns via Multimedia Messaging Service (MMS), Short Message Service (SMS), Electronic Mail (E-Mail), Wireless Application Protocols (WAP), or chatting. Students can converse with each other, question each other, and share opinions about environmental concerns. Collaboration could also occur outside the classroom, unlimited by geography, space, or time [2].

It is estimated that the total number of mobile phone users worldwide is double the number of Internet users. One of the recent and significant changes in learning environment is the demand of mobility. The mobile phone becomes popular in the society and most of the people can afford the cost [3]. In addition, the exponential growth of wireless and mobile networks has brought vast changes in mobile devices, protocol development, standardization, network implementation, and user acceptance.

Mobile learning (M-Learning), is defined as learning with mobile devices such as Palms, Personal Digital Assistant PDA, Cell phones, and any other handheld devices. Mobile Learning is the integration between mobile computing and E-Learning. Mobile learning (M-Learning), a natural extension of distance education, supported by wireless mobile technologies, is an emerging pedagogical learning model which requires new forms of teaching and learning. Mobile technology can make instructors and students not to be restricted to a place and a time to teach and learn [4].

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Mobile learning through the use of wireless mobile technology allows anyone to access information and learning materials from anywhere and at anytime. As a result, learners have control of when they want to learn and from which location they want to learn [5].

2. Features of Mobile Learning

There are four fundamental elements in mobile learning; learners, instructors, teaching contents and the teaching methods. All of them have the same feature of Mobility. In comparison with the traditional learning methods, mobile learning has the following features [6]:

1- Mobility: As long as within the areas covering the mobile telecommunication network services, the learners can study anytime and anyplace. By the same token, the instructors can give their teaching information anytime and anyplace, and also can revise and renew the teaching resource database anytime and anyplace.
2- Real time: If learners need to get some knowledge, by using some technical methods, the learners can get that knowledge at once.
3- Interactive: By using mobile terminal instruments and the services of mobile communication, both learners and instructors can communicate in real time.
4- Virtualization: The instructors can create the virtual classroom, virtual instructors, and the learners can create the virtual class. The relationship between the instructors and the learners are dynamic and virtual.
5- Individuation: M-Learning can provide individual services according to the learners' needs and the features of the subjects.

3. Technical Support for Mobile Learning

There are many technical and delivery supports to the mobile learning [7]:

1- 3GP for compression and delivery method of audiovisual content associated with mobile learning.
2- Wireless Fidelity (Wi-Fi) gives access to instructors and resources via Internet.
3- General Packet Radio Service (GPRS) is an always-on internet service, mobile data service, which provides a high speed connection and data transfer rates.
4- Bluetooth is a wireless short-range communications technology that can be used to transfer data between Bluetooth-enabled devices.
5- Fourth-generation (4G) mobile telephone technology. Every new generation of mobile handheld devices plays a different role in M-learning and makes change on M-learning business model.

4. NMLS Requirements

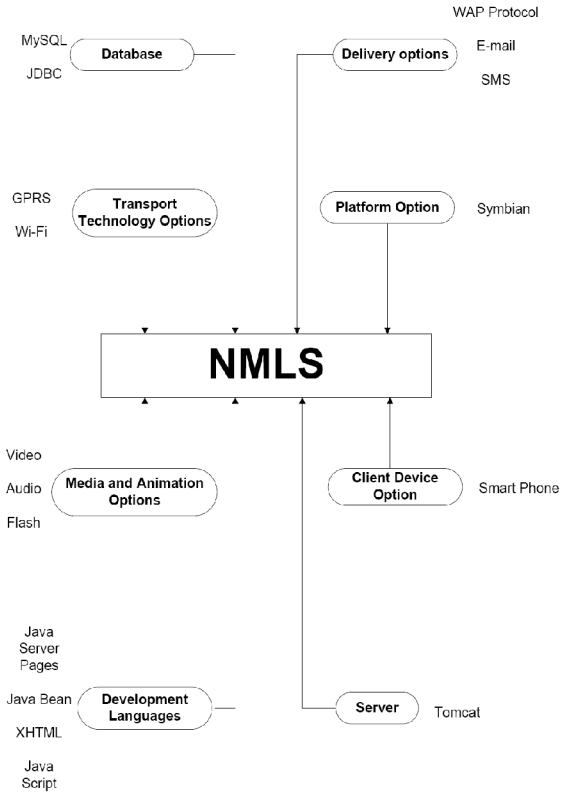


Fig.1. Main Categories of Technology Adopted in NMLS.

The implementation of the *NMLS* involves several development techniques that have been adopted and integrated to achieve a state of the art system. Fig.1 illustrates the broad categories adopted in the design and implementation of the NMLS. The NMLS prerequisite the availability of the following technical requirements:

1) GPRS and Wi-Fi: transport technologies are used to connect the mobile devices to the NMLS website.
2) XHTML and Java Script: programming languages are used to design NMLS website.

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3) Tomcat 6.0 server: a hosting server of NMLS website.
4) Java Server Pages and Java Bean: programming languages are used to develop the NMLS website.
5) MySQL server and JDBC: MySQL server is the program used to develop the database of NMLS and Java Database Connectivity (JDBC) is applied to access a MySQL database.
6) Smart phone is the device that is used to connect, browse and display the NMLS website.
7) WAP 2.0, SMS and E-mail: delivery options to the NMLS website.
8) Smart phone: A device supporting 3GP, MP4 and MP3 streaming and enabling GPRS data transfer. The operating system adopted for mobile device in the system is Symbian.

5. Framework of NMLS

The framework of NMLS is illustrated in Fig.2 The whole mobile learning system has three layers; they are data layer, business logic layer and the presentation layer. The presentation layer is built in the client, while the business logic layer and data layer are built in the server.

A. Data Layer

The data layer is located in the database server; it contains the data processing logic. Its main task is to receive requesting information from the Education Resource Web Server, then complete the function of querying, refreshing and changing data in the database. Thereafter, it returns the results to the Education Resource Web Server (Business Logic Layer).

B. Business Logic Layer

Business logic layer is the main part of the whole NMLS; the services of the mobile learning system are encapsulated in this layer. It has the responsibility to deal with the application requests of the presentation layer and to make logical estimation of the result. If the logical estimation is legal then the data is invoked by the system from database, data is processed and then the results are returned to the presentation layer.

C. Presentation Layer

The presentation layer is an interactive interface between users and the system. Its responsibility is to deal with the dialog between users and system.

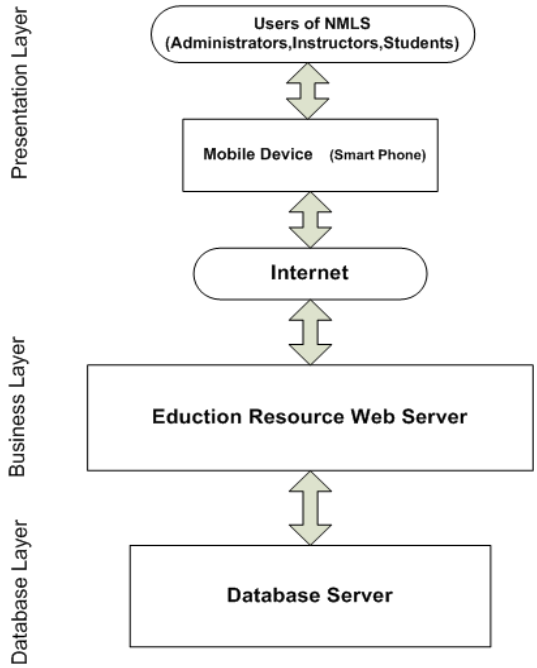


Fig.2. The Framework of the NMLS.

6. NMLS Users and Functionality

The *NMLS* allows three different types of users to interact with the system according to given privileges. They are the administrator, instructor and student. It provides various services for each user. These users can login in the system in related identities, possessing a different operating authority and functions.

6.1. System for Administrator

The administrator subsystem plays an important role in keeping the system management. A huge amount of data must be update at the beginning of each semester. This subsystem provides the administrator with web-based services to manage the information of the *NMLS* and other services provided by the system as instructor information management, student information management, local department administrator information management and college information management.

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6.1.1. Administrate the Instructors

It comprises the following services:

A- View Information of All Instructors subscribed in the Instructor subsystem.
B- Delete Instructors Information (subscription and registration); this could be due to subscription expiration time.
C- View Result of Questioner to Instructors; this is used to calculate a final evaluation for all students in his /her study level.
D- Insert Result of Questioner to Instructors; it is used to insert and calculate the final evaluation based on all students answers in his /her study level, as shown in Fig.3.

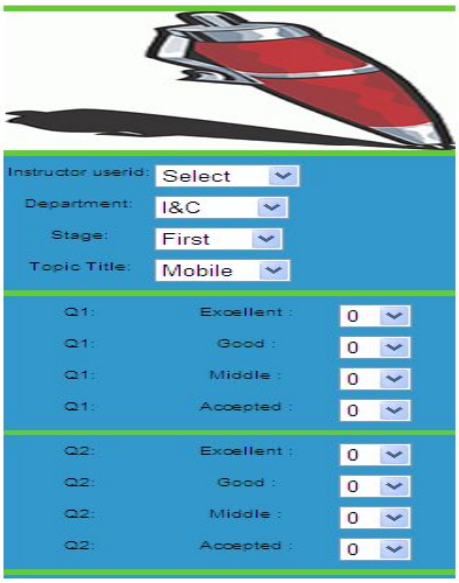


Fig.3. Insert Questioner Results.

6.1.2. Administrate the Students

It comprises the following services:

A- View Information of All Students subscribed in the Student subsystem.
B- Delete Student Information (subscription and registration); this can be due to subscription expiration or that the student has graduated.
C- View Scores of All Students in the online exam. This is useful in calculating the final score of each student, with relation to the student report score.
D- View Scores Reports of Students.
E- Insert Students Result to calculate the final score of each student dependent on the two previous services.

6.1.3. Administrate the Local Departments Administrators

It comprises the following services:

A- View information of all local departments administrators subscribed in the administrator subsystem.
B- Delete information about local departments administrators due to expiration of subscription time.

6.1.4. Administrate Learning Recourses

It comprises the following services:

A- Administrate reports and sheets: This service allows the administrator to organize and integrate the uploading files (Report and Tutorial Sheets) from instructors and students.
B- Administrate Mobile Learning: This service allows the administrator to organize and integrate the uploading files (text, video and audio) from instructors and students.

6.2. System for Instructor

The instructor primary goal in the *NMLS* is to provide a learning course (video, audio, pdf and tutorial sheet), evaluate students, send notes by SMS or e-mail, add questions for the online exams, give students online exams and manage the database of questions. This system provides the instructor with web-based tools to manage the information and learning resources of the *NMLS.* These tools provide the instructor by the following facilities:

6.2.1. Enter Questions to the Online Exams



Fig. 4. Add Questions Service.

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This service allows the instructor to insert questions related to the online exams given to the students, as shown in Fig.4. The instructor can add extra information as answers or mark the correct answer.

6.2.2. Test Report Composition

The service instructor can get students' evaluation to the reports. Additional information can be inserted with this report as student name, department and study level.

6.2.3. Evaluation Students

By this service an instructor can view all answers of students related to the questions of the external knowledge service that he/she input to the students. This can be used to evaluate student according to his/her answer throughout the students evaluation service.

6.2.4. Send Notes and Request to Student

The instructor can send some teaching notices, including exam alerts and test reminding to students. In addition the instructor can send some inquiries and alert messages to the administrators. To send SMS to other NMLS subsystems (administrators and students), the instructor fills the required fields .These fields are User name and Password which are supplied by the SMS gateway,(TO) which indicates the phone number ,(TEXT) which indicates the send message and the (From) that indicates the Mobile Learning system website sender.

6.2.5. Database of Question Management

A- View Previous Questions: This service allows the instructor to review all the previous questions found in the database. The instructor can see other information related to questions as number of question, and probably the answers.
B- Delete Previous Questions: This service allows the instructor to delete previous questions related to online exams from the database.
C- Score of the Exam: The instructor can review all his /her students' score in a specific exam. The information related to the service includes student name, department, study level, date and time of the exam taken by students.

6.2.6. Upload to Mobile Learning

This service allows the instructor to call the following functions:
A- Add to Learning Courses: The instructor can upload the Learning Courses specific to each subject. First these courses are required to upload to the File server. Thereafter the administrator of the instructor's department can organize and link the learning course to the students.
B- Add to Video on Demand: The instructor can upload video within a course. Similarly, an upload to the File server is required. Thereafter the administrator of the instructor's department can organize and link the video to the students.
C- Add to Audio on Demand: The same as in (B) but this concerns uploading audio on demand.

6.3. System for Student

This is the system is originally intended for student. They can view and use the bulk of system services such as downloading the learning course (video, audio, pdf and tutorial sheet) carrying online exams and viewing college information. Other services special to students are used to evaluate the learning operations. The students can inquire the administrator or instructor by email or Question and Answer (Q&A) service. *NMLS* provides many services to the student such as the following:

6.3.1. View General Information College

A- Course List: Student can review the course list in each department in the college and for different study levels.
B- Time Table: The student can review the time curricula table in each department in the college.
C- Examination List: This service allows the student to review the examination lists in each department in the college.

6.3.2. Question and Answer

A- FAQ: The student can review all Frequently Asked Questions put in the NMLS by instructors.
B- Forum: The student can enter his/her inquiry and review other inquires and answers of his/her associate in the department.

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6.3.3. Download Learning Courses

It includes the following services:

A- Learning Courses: This service allows the student to view all Learning Course material provided by *NMLS*. The student can follow the course online or download it into his/her mobile phone for later study at convenient time. Additional information can be viewed .This concerns the topic title, department, study level and course number.

B- Video on Demand: This service allows the student to review all learning videos provided by *NMLS*. The student can follow the course learning videos online or download them into his/her mobile phone for later study at convenient time. Additional information can also be viewed.

C- Audio on Demand: The same as in (B) but this concerns downloading audio on demand.

6.3.4. Evaluate Instructor Learning

This service allows the student to evaluate the instructor level of teaching through the learning resource. The evaluation is carried on through answering questions related to the course, as shown in Fig.5. The student must check the options: Accepted, Middle, Good and Excellent. This service allows each student to fill the form only once .

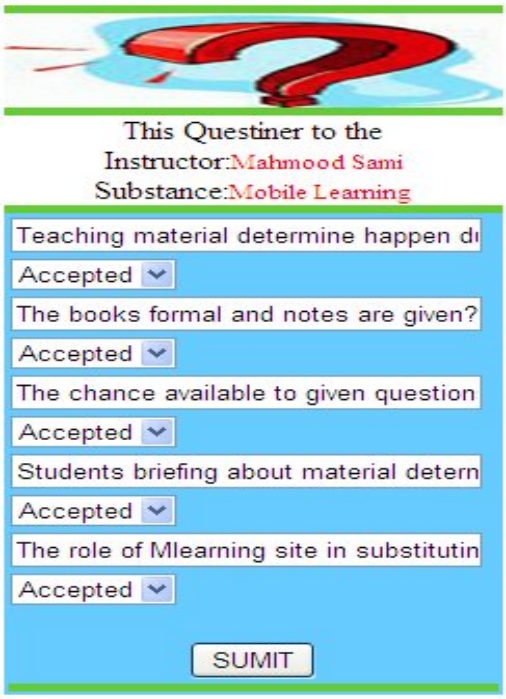


Fig.5. Questioner Form.

6.3.5. Online Exam

After a student login in, he/she can do the exam, within a limited period specified by the instructor, as shown in the Fig.6. The questions supported are of (fill in) and (multiple choices) types.

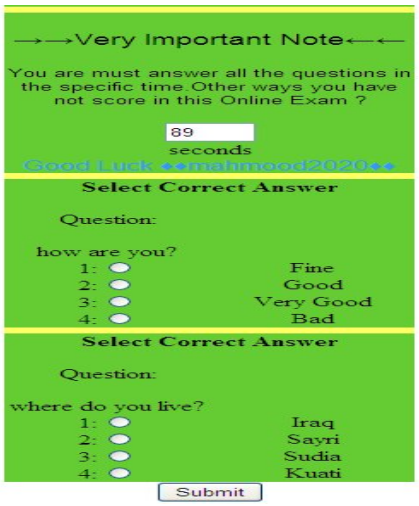


Fig.6. Online Exam Service.

6.3.6. E-mail

The student can send any suggestions or questions concerning the learned topic to the instructor. He can also send any inquiries to the administrator concerning his registration. Thereafter, the student can receive the related answers.

7. Discussion

Nahrain Mobile Learning System (NMLS) compared with other related works has fulfilled certain advantages:

1. It comprises comprehensive learning services, requirements of teaching and management for different categories of users (administrator, instructor and student).
2. The *NMLS* Website has been publisher on the Internet to guarantee that users can access the *NMLS* to reach the learning services and management capability any time, any place. It facilitates the communication with the system platform allowing the exchange and sharing of data with users from existing resources on a server through the Internet. The platform is embedded with the SMS technology on mobile

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phones, so it can exploits the functions of SMS notification and reminding, which increases the flexibility of the system.

3. The NMLS platform does not restrict to a special mobile device, but it allows different smart phones and PDAs devices to access the services and learning resources through the Internet.
4. The NMLS platform does not require the installation and running of special programs in the mobile device to access the services and learning resources. However, all that it required is a mobile device supporting WAP 2.0/XHTL, active mobile Internet services GPRS (GPRS technology has been adapted to the NMLS in the current research, because it is an available technology in Iraq to connect to the Internet by mobile devices) , Wi-Fi, and support of 3GP, MP4 and MP3 to play media content.
5. It does not restrict to the knowledge of specific topics but support versatile topics.

8. Conclusions

1- The NMLS is based on WAP 2.0 as a layer for connecting mobile learning applications with different mobile networks and operating systems without noticing mobility awareness.
2- NMLS platform is augmented with the SMS technology on mobile phones.
3- The main problem encountered the design and implementation of the NMLS is the limited content arrangement in a very small mobile phone display. This problem is solved by dividing the users of the system into three categories (administrator, instructor and student).
4- A problem of the low network bandwidth and cumbersome input of mobile phones is also encountered. Bandwidth limitation has been solved by making the content of each page in the NMLS website to have a minimum number of images. While the cumbersome input has been got through by providing each user of the NMLS website navigators and links.
5- NMLS platform design and implementation has been based on the state of the art of programming environment and technical tools.

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نظام النهرين التعليمي المتنقل (NMLS)

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الخلاصة

العمل في هذا البحث يتضمن تخطيط وتصميم وتطبيق نظام تعليم نقال مهمي بـ ـ (نظ امالنهرين التعليمي المتنقل (NMLS)).زود هذا النظ ام مصادر تعليم كاملة ، التي يمكن أن تستخدم من قبل الطلاب والاساتذة والمدراءمخلال الهواتف الجوالة وهو يقدم فعال إلى التعلم الالكتروني يركز على قابلية حركة ممارسة التَّعلم، ويضيف مرونة و يؤكد التفاعل بين المتعلم ومحتوىالتعليم .مستخدمونظاللام مصنفون إلى ثلاثة أصناف :المدراء والاساتذة والطلاب. نشاطات التعلم المختلفة يمكن أن تنفذ على مدى تعلق النظام باقتفاء تعلم الفصولنفس وتسجيل صوتي وفيديو).يشغلالنظ امكل الممارساتفي عملية التعلم، يزود عمليات متعددة الاستعمالات لادارة التعلم النقال ، يعرض ادوات التصال الضرورياتي تسمح للمستخدمين الاتصال مع بعضهم البعض خلال المنتديات خدمة الرسائل القصيرة ورسائل البريد إلكتروني خطة NMLSمستندعلى تقنية 3G للهاتف الجوال وبروتوكول التطبيق اللاسلكي (WAP) الذي تم اعتماده كأساس لاتصالات النظام . إن هيكلية NMLS مستندعلى ثلاثة طبقات ،وهي طبقةالعرض , طبقة العمل المنطقي وطبقة البيانات.

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