m-Learning Solution for Training English

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Abstract:
The research project described in this paper involves in using of a mobile learning approach to train newly recruited trainees on workplace English, so they can become more effective when communicating in the workplace. Training local human resources in English language skills will prepare them for the global workforce and allow them to communicate more effectively in English so they can become more competitive globally. This project is timely since there is limited research on the use of mobile technology in training and education. The project breaks new ground toward understanding ways in which mobile devices can be used to train employees in the workplace in Qatar. The target beneficiaries for this project are oil and gas employees. Oil and gas employees were picked as a first step where the project shall transfer to other industries and sectors next. This research is a collaborative project between Qatar University, and the Corporate Training Department at Qatar Petroleum-QP. The English content that is delivered via mobile devices trains oil and gas workers on English Grammar, how to listen and interpret different workplace situations, and drill and practice on oil and gas terminologies.

I. Introduction

In recent years, mobile learning has gained in popularity as it provides trainees with learning content wherever they are and at any time they choose. Mobile learning also known as m-Learning is an offshoot of eLearning. People can use mobile learning as an important instrument for lifelong learning thereby utilizing their time more efficiently. Furthermore, mobile learning could bring important benefits to schools by supporting classroom teaching, assisting in the educational process and enabling personal and group learning. This approach to learning could revolutionize the way people learn in the future [1][2].

The major difference between e-learning and m-Learning is that content intended for e-learning is in most cases unsuitable for small handset devices because of their small screens and limited memory. Therefore, course content intended for mobile learning must be packaged in concise and focused learning units. In addition, a learning application that runs on the mobile handsets would have several restrictions including limited processing power and speed, limited memory and storage capacity and a variety in screen sizes and resolution, and a variety of operating system platforms.

For this study, several mobile learning systems have been investigated in the literature. The Blackboard Mobile Learn [3] enables students and faculty members to access and update much of the core content already available on Blackboard. The application can be downloaded into devices with multi platforms including; Android, BlackBerry, and iPhone. This system has many good features such as, it enables the learner to open and join discussion threads, and browse information pertaining to the organization to see recent announcements, and post discussion, or comments.

Another learning application called Mobl21[4] that supports a dynamic, unstructured way of mobile learning. It allows instructors to develop content that learners can access from their mobile devices, allowing them to study at their own pace. Mobl21also enables instructors to track and monitor content access and view test performances. This application is compatible with many devices, including: Android, and iPhone.

The Desire2Learn system has developed an open and extensible Mobile Web platform that enable students and other users to access their learning programs anywhere, right from their mobile device [5]. Students can review what they have read in a history of recently viewed topics, or easily identify unread topics they need to catch up on. In addition, content can be bookmarked for reading later on, and automatically synchs up to other online bookmarks. Students want to be informed and be on-top of what's happening, and stay current with assignment changes. This system divides its applications to three parts. One for Course Design and Delivery which include Instructional Design Wizard ,Course Builder, Class list, Intelligent Agents, User Progress, Auditors/Parents, Content, and News. The second part is for Collaboration and Communication, and this part contains some type of collaboration between the users such us Email, Calendar, Discussions, Synchronous Integration, Instant

Messaging/Pager ,and Blog. The last part is for Measurement and Assessment, that is measure the works of users in quizzes, surveys, self-assessments, drop box ,grade book ,Competencies and Rubrics.

Busuu is a mobile application available on Android and iOS systems to learn English [6][7]. The application covers courses that ranges from beginner, intermediate to advanced levels, each course is consisted of learning units that covers different 150 day-to-day situation that are presented within the mobile device using different types of material through dialogues, audio, vocabulary and key phrases. However this application lacks the ability given to users to review and assess the new gained knowledge.

This research project extends e-learning to mobile handheld devices within the scope of mobile learning. It involves the design and development of a mobile learning platform called m-Learning that allows users at an institution or within a learning situation to participate in electronic learning sessions via mobile devices including smart phones. With m-Learning, users will also be able to share content and interact with each other using synchronous and asynchronous methods for communication. The proposed application will be applied to the professional training corporate of the Qatar Petroleum (QP). It aims to assist their trainees in learning English while at the workplace.

II. Solution Overview and Functional Requirements

For this study, four learning approaches (exposition, exploration, assessment, and communication) were chosen as mobile learning models for the m-Learning platform because they meet the current resource limitations of mobile handsets. Furthermore, they support the computer-aided learning method that was proven to be successful in an e-learning environment. For more detailed information, see (Kerres 2001) [8] and (Meisenberger 2004) [9]. The following sections briefly introduce the four approaches. which are:

Exposition: This approach supports asynchronous learning in the sense that one could download the intended learning objects into a learning device prior to the learning session. It also requires a learning path through which the learning objects are asynchronously presented through a sequence of slides that are concluded with a set of questions. The questions are intended either to check the knowledge of the user or to conclude the newly gained knowledge approach.

The exposition learning objects designed for mobile learning can generally be structured the same way as learning objects for e-learning on a PC. The main difference lies in the presentation and the amount of information they hold. Due to the limitation of the screen size, memory, and other resources of the mobile handsets, much less text should be used. Additionally, different kinds of media should be applied including spoken text, images, videos, and audio.

Exploration: With the exploration approach, the trainee does not need to go over a learning path. He/She can explore on his/her own the available learning content of interests. This approach gives the trainee more motivation and control. Also, due to the lack of a learning path, explorative learning is more suitable for trainees who have already acquired basic knowledge and have the ability to learn on their own.

Communication: The communication learning approach allows trainees and instructors participating in a learning session to communicate via mobile devices. This approach requires the availability of different types of asynchronous and synchronous methods of communication on trainees' mobile devices, such as chat, email, video and audio conferencing, etc.

Assessment: The assessment learning approach is an essential part of learning its meant to test the gained knowledge by the learner, this is done through exercises and practice tests that conclude each learning session. Due to the limitations of mobile devices such as screen size limitations and memory limitation, questions and answers in the assessment part should be designed and structured to guarantee a beneficial assessment. Also, questions should be short and concise such as multiple choice or true or false questions.

A. System Analysis

Three actors interact directly with the m-Learning system:

- Instructor: Initiates the system by uploading learning material on the system and communicate with the trainees to initiate the learning process.
- Trainee: Visits the m-Learning system and download the required learning objects on his mobile device to start learning.
- System administrator: Manages accounts of instructors and trainees.

Each actor has several roles in the system, as shown in the UML use case diagram, shown in Figure 1:

- Instructor: The instructor is responsible of posting newly developed and updated learning objects to the system. The instructor would communicate with all or selected number of trainees via synchronous and asynchronous means of communication.
- Trainee: The trainee is capable of pulling the needed learning objects from the system and can receive notifications about new courses as well as the courses that he is registered in. Moreover, the trainee can communicate with the course's instructor.
- Mobile system: The mobile system acts as the vehicle that carries the m-Learning system and make it available for the instructors and trainees. It manages several operations, such as the posting and pulling of learning objects, sending notifications to trainees, communications between trainees and instructors and sequence of the learning objects provided to trainees.
- System administrator: It manages the creation of accounts for instructors and trainees and the registration of the trainees in different courses.

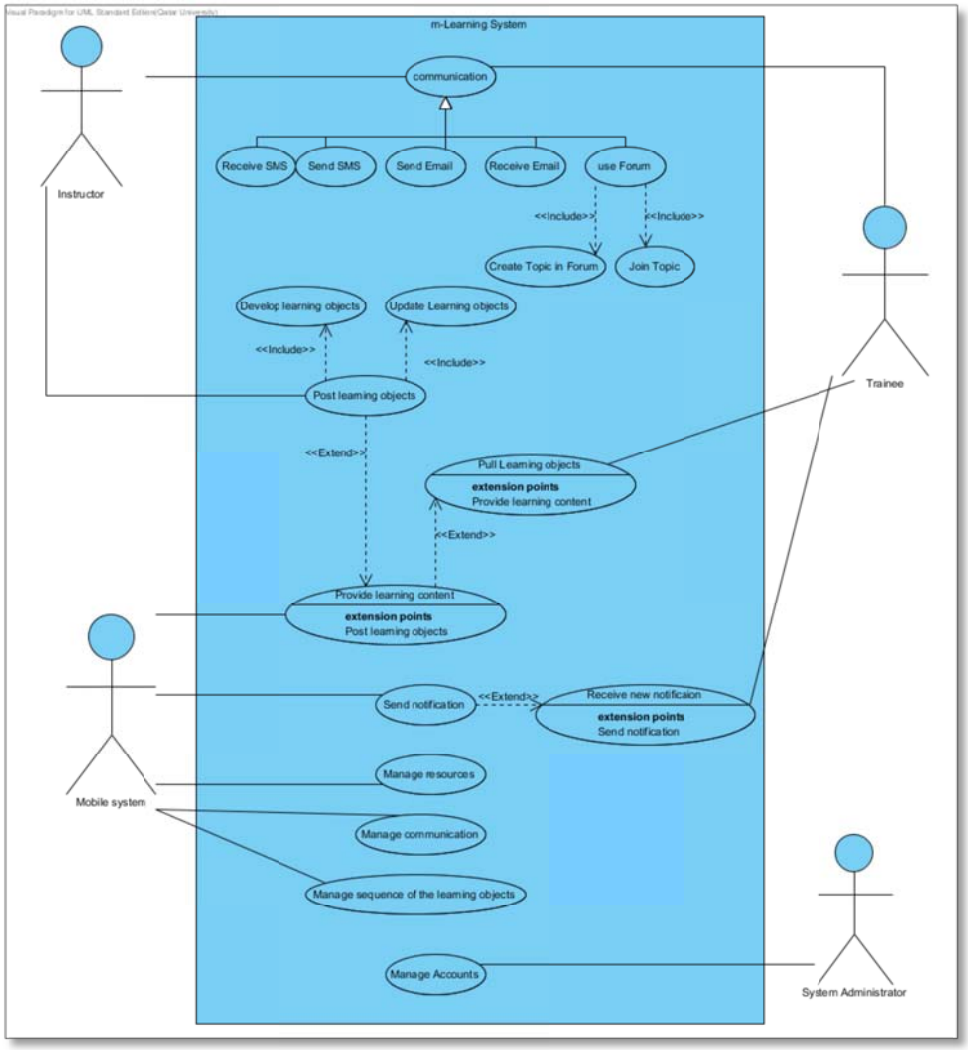

Figure 1: Use case diagram

Sequence diagrams – The sequence diagram in Figure 2 shows the interaction between the users "trainee and instructor", the administrator, and the mobile system. First, the administrator give the instructor account "username and password", after that the instructor can sign in to the system. Then the administrator will check the account if it is correct, it will then accepts the instructor. After that the instructor can select one course to develop and post, or update an existing one in the system. Next the system will send a notification about that to other users "trainees". When the instructor finishes using the system, she/he can sign out. The trainee can also

enter the system through his/her account. Then, the trainee can select the course from the system. That is followed by pulling the learning object. If this happened successfully, then the trainee can read and practice through the whole content of the learning object. After he/she finishes using the system, he/she signs out. The other interaction, which mentions in this diagram, is between the trainee and instructor. They can communication between each other through SMS, email, or through the forum.

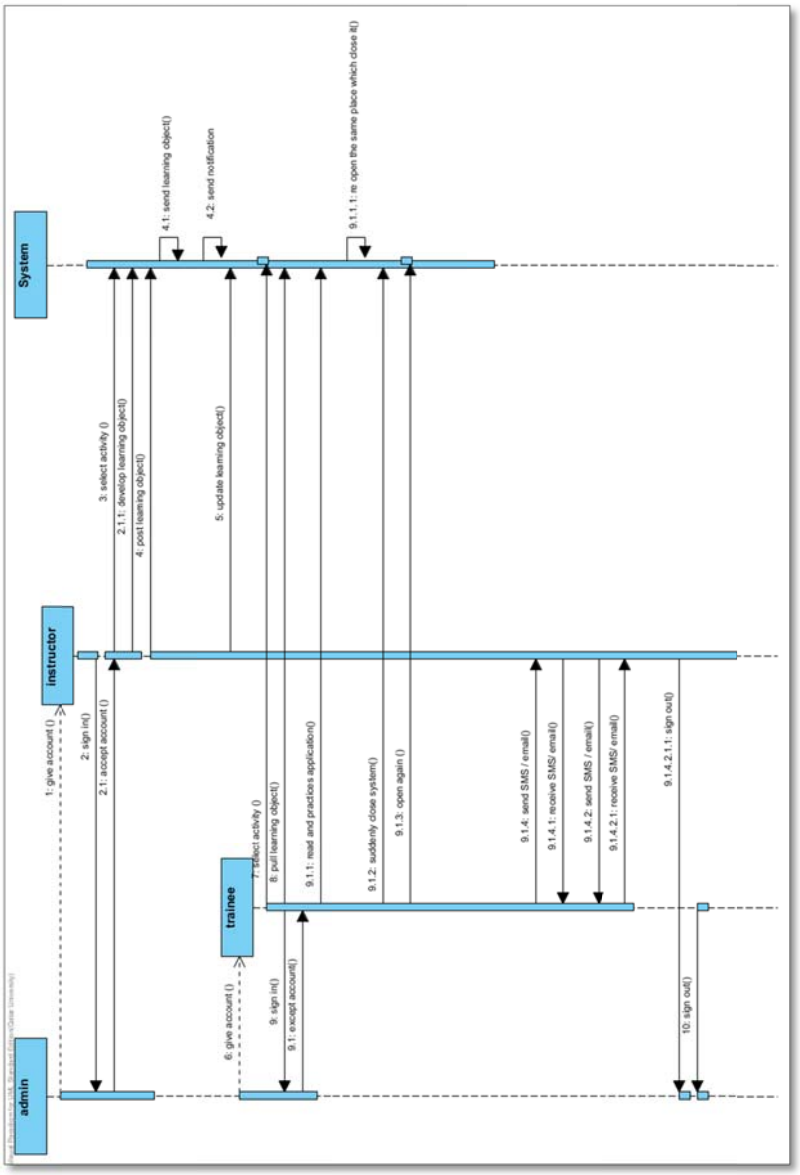

Figure 2: Sequence diagram

B. High level architecture

The architecture of the m-Learning platform proposed in this study uses the Apache web server and SQLite data base platform and XML messaging as shown in Figure 3. It also uses SMS-based delivery methods including Pull, Push, and WAP Push. In addition, the m-Learning architecture offers two options based on the type of transmission content (e.g., text, WAP pages, image, audio, and video) and the type of the end user devices. In the first option, the end users need only basic global system for mobile communications (GSM) mobile devices for sending and receiving text messages on only the SMS platform. This option will be a more practical and convenient solution for the mobile handsets with very basic equipment due to the relatively small volume of exchanged information. The user in this option may not be able to participate in learning sessions that require

rich multimedia content such as videos, because it offers limited data transfer which will make it difficult to send data of a large size.

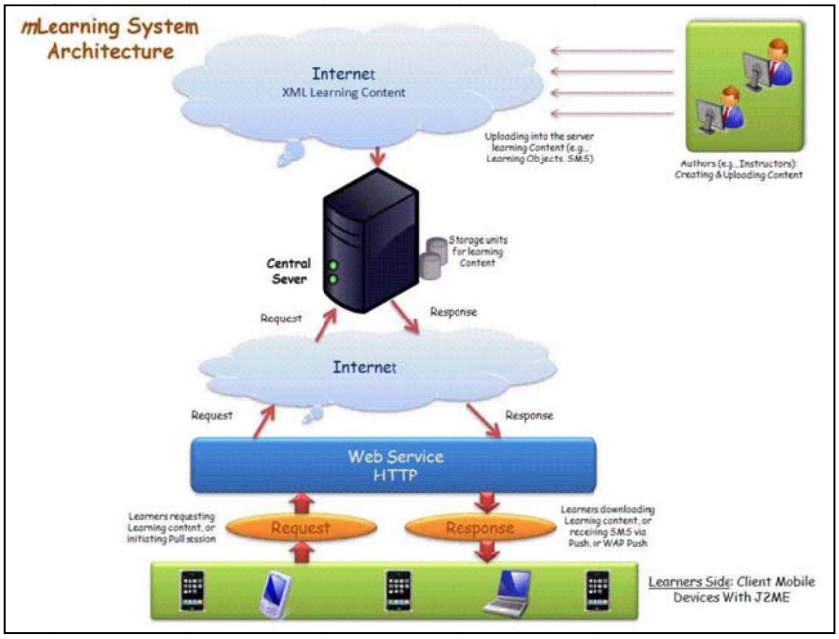

Figure 3: High level architecture of m-Learning system.

On the other hand, the second option offers rich content delivery into mobile devices by incorporating different types of media. It requires the installation of the –Learning application directly on the smart client component in every end user third generation (3G) mobile device that should also be GPRS/3G enabled. In this option the end user mobile device will communicate with the web service directly over a GPRS/3G network for exchanging the actual XML content.

The learning objects for m-Learning (e.g., course content, training material and interactive tests) are written in XML, which is an open and international standard that can be understood by Android platform, which was used as the development platform. With XML, different types of learning content can be implemented and connected to each other. The learning objects are normally stored in a central web server from which the learners can download the learning objects that they need. A web site should also be developed as part of the proposed system architecture. The authorized users (e.g., course instructors) for delivering learning objects and for creating and scheduling new SMS messages would access it through an authenticated web channel.

The m-Learning activity would normally be initiated when the client (trainee) issues a request for a learning object. The client interacts with the server using XML over HTTP. The server side components are primarily Java servlets. The process begins when the mobile client creates a request object that contains information, such as a destination servlet or servlet operations with the associated parameters. Once the request object is populated, then the client sends the request to the HTTP connection manager, which is a web service component, that acts as a client-side proxy for the server by serializing and de-serializing the object requests to and from XML messages, respectively. The HTTP connection manager passes the request to the server as an XML message and listens for a response. At the server side, the XML message would be first received by the dispatcher servlet that takes the message and de-serializes it into a request object. The dispatcher servlet then passes the request object to the appropriate servlet responsible for dealing with the user's content request, generating a response object by accessing the data store via a layer of data access objects, and finally sending the response object back to the client through the HTTP connection manager. The client's HTTP connection manager de-serializes the XML response into an appropriate response object and passes it back to the calling object.

III. Implementation and Deployment

The m-Learning system for this study was built upon the android platform, which has a powerful application framework that makes it easy for developers to create sophisticated add-ons that extend the power of android systems into virtually unlimited directions. The deployment scenario mainly depends on the client/server

architecture of the system, where all system users that are instructors, trainees and administrators are clients, as shown in Figure 4. They all attempt to connect to the system from their client mobile phones using an Internet connection and a client application. The system server validates the identity of the user who is trying to connect to the m-Learning server, then grants the connection, and it starts receiving services requests. The m-Learning server conveys MySQL commands to the database to fetch data or to update the database with new changes. For instance, it receives requests from the trainee to pull learning objects and updates the clients' information table located in the database with the new information. Also, the instructor connects to the server to update or push new learning objects to the systems.

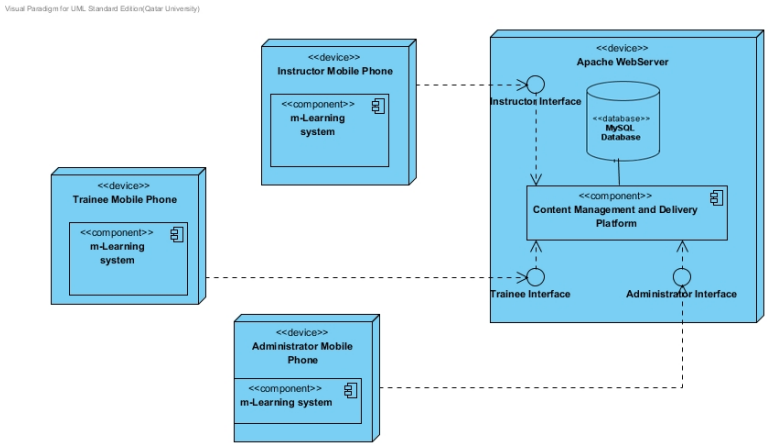

Figure 4: Platform Deployment Diagram

IV. Conclusion and Future Work

For this research project, a pilot model was deployed targeting the oil and gas industry, in which the designed architecture and the m-learning pedagogy developed in this research were tested in the Qatar petroleum corporate training center. The 27 learners who took part in the pilot were trainees from five different oil and gas companies. The testing outcome proved that m-learning approach and the m-learning application used in this study are effective in promoting retention in language learning. As for future work, this m-Learning system can be extended to cover more industrial and educational fields.

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