The Design and Development of Mobile Collaborative Learning Application Using
Ramya Rampelli1 Suvarnasnap Kaveri2 Jambhavdekar3 Shraddha Muley4

Abstract— In 21st century mobile phones brought a huge change in our day to day life. People expect to be able to work, learn, and study wherever and whenever they want. Learning by means of smart phones is becoming a new approach towards education. Mobile Collaborative Learning (MCL) has been getting more importance in educational environment as one type of mobile learning application. This paper introduces the theoretical and technical foundations for designing and developing an effective MCL environment as well as describing a new approach for building a learning application towards mobile technology. Finally the proposed prototype will be designed and constructed using the Android operating system with a suggestive infrastructure for this type of system.

Keywords: Mobile Learning; Mobile Collaborative Learning

I. INTRODUCTION

Mobile technology has entered into the mainstream society, affecting the lives of many in recent years. According to the report “Information and Communications for Development: Maximizing Mobile [1],” which was released on August 16, 2012, there were 101 mobile cellular subscriptions for every 100 people in the Philippines in 2011, a jump from 41 subscriptions for every 100 people in 2005. Worldwide, the number of mobile subscriptions grew from one billion in 2000 to more than six billion in 2011, of which nearly five billion were in developing countries. Mobile phones based on android platform have become an indispensable communication device for many people, particularly in younger segments of the population, such as students. Smart Telecommunications noted a steep rise in the use of the top three Smartphone’s operating systems in its network. Collaborative learning is a group based learning approach in which learners are mutually engaged in a coordinated fashion to achieve a learning goal or complete a learning task (Dillenbourg, Baker, Blaye, & O’Malley, 1996). Thus the demand of collaboration learning over the mobile device has been increasing as a major education element. Major research challenges are raised in developing MCL for educational object such as sharing knowledge, requesting for modified contents, fully accessing to Enterprise Data Warehouse (EDW).

II. BACKGROUND AND RELATED WORK

Students seem to learn better or solve problems correctly when they collaborate with others, especially when the task is conceptual or complex (Gabbert, Johnson, & Johnson, 1986). Furthermore, collaboration among students also seems to have beneficial effects such as improving social relations or increasing motivation (Sharan, 1980).

A. Collaborative Learning Theories

Collaborative learning has a number of benefits when compared to individual learning. It enhances critical thinking in learners (Gokhale, 1995). Critical thinking generally refers to the ability of making reasoned judgements and autonomous thinking (Paul & Binker, 1993) and also having metacognitive awareness and problem-solving abilities (McLoughlin & Luca, 2000). There is also evidence that collaborative thinking encourages learners to take ownership of their own learning (Johnson & Johnson, 1986) and to retain information longer compared to individual learning (Totten, Sills, Digby, & Russ, 1991).

B. Mobile Learning Architecture

Android, an open-source mobile operating system and application framework supported by Google is a recent addition in the mobile application platform. By providing an open development platform, Android offers developers the ability to build extremely rich and innovative applications with a rich set of User Interfaces, support for broad range audio and video file formats. Developers and mobile handset manufacturers around the world has embraced this new platform due its open source and diverse application development and running capabilities with programming language as Java [3].

III. DESIGN ISSUES FOR MCL APPLICATION

One of the highly challenging tasks for designing and developing the prototype of MCL application is to recognize current limitations and understand what users’ requirements are, so that we get to learn how to reflect and satisfy the required functionalities of application and architecture. MCL application is part of mobile learning systems; it may suffer from the same problems as the general e-learning systems have undergone. In this part, we review the existing problems and try to search for design concerns from two prospective: mobile communication and MCL application.

IV. PROPOSED MIDDLEWARE ARCHITECTURE

Learning system should be designed on client-server based infrastructure to avoid running overload on mobile devices. In the client side, mobile devices, notebooks, tablet PCs, PDAs, cell phones, smart phones and other devices can access to content server using wireless technologies. M. Shannugapiya and A. Tamilarashi [4] suggested a mobile learning architecture in their previous paper as seen in Fig. 2 Students learn anywhere outside classroom and they use diverse devices to link the server module that runs on university server through web services middleware architecture in order to attend learning process.

Fig. 1: Mobile learning applications for ubiquitous learning environment
The learning system for this prototype also adapted and modified four layered components of collaborative framework proposed by X. Su and others [6]. The architecture has been optimized and clearly defined with inclusion of new sub components, and each layer has been assigned a different responsibility. Fig. 3 depicts the conceptual and architectural framework for the mobile collaborative learning environment. Thus, for constructing these middleware, the university or organization should need to co-work with a mobile service provider which is able to support e-learning. This approach can be more helpful for the institution to provide online course preparations on the interest of students.

Fig. 2: Conceptual and architectural framework for the mobile collaborative learning environment

A. Content Generation Layer
Content generation layer is the main component of collaborative framework. If clients require contents, they send the request message to the content server for delivering required contents. The request message includes device profile, status of previous network condition and requested URL.

B. Communication Layer
This layer functions as a transport layer. By detecting network status and amount of data, the layer decides whether to store messages or to use additional function such as content fragmentation. In the case of no network connectivity, the layer forward stored messages to recipients.

C. Content Regeneration Layer
This layer performs two types of tasks: first, it forwards contents to display and visualization layer for the next process; second, if clients request to modify the contents in the middle of a process, the layer also starts to work on the demand.

D. Content Display And Visualization Layer
The function of this layer is to display and hand over contents to clients. The layer can obtain contents from several media managers, and then start to display contents in several types of forms, graphs, images, voice and others as clients’ request. Therefore, the main function of this layer is to translate the source program into an object program that is done with the support of parse engine. This proposed middleware architecture can be applied to mobile collaboration activities. It is also easy to allow collaboration via wireless network and mobile devices. In general, types of media content which are commonly transmitted in a collaborative system include graphics, text messages, images, voice, and so on. Within this framework, a multimedia format that can be represented as a single, unified format and transmitted as a messages queue would simply the overall communication mechanism. So it can simplify data stream between client and server, and effectively improve efficiency of collaboration.

V. DESIGN AND IMPLEMENTATION
The System Development Life Cycle (SDLC) is also known as Information Systems Development or Application Development.

Steps involved in the System Development Life Cycle:
Step 1: Software Concept. The first step is to identify a need for the new system.
Step 2: Requirements Analysis Requirements analysis is the process of analyzing the information needs of the end users, the organizational environment, and any system presently being used, developing the functional requirements of a system that can meet the needs of the users.
Step 3: Architectural Design After the requirements have been determined, the necessary specifications for the hardware, software, people, and data resources, and the information products that will satisfy the functional requirements of the proposed system can be determined.
Step 4: Coding and Debugging Coding and debugging is the act of creating the final system. This step is done by software developer.
Step 5: System Testing
The system must be tested to evaluate its actual functionality in relation to expected or intended functionality. Some other issues to consider during this stage would be converting old data into the new system and training employees to use the new system. End users will be key in determining whether the developed system meets the intended requirements, and the extent to which the system is actually used.
Step 6: Maintenance Inevitably the system will need maintenance.

VI. DEVELOPMENT OF MCL APPLICATION
MCL applications will be a stand-alone application that use and terminate services when they are no longer needed. It also should be designed as a client-server model using Windows forms or Web browser application as seen in Fig 4. Android is an open-source mobile operating system and an application framework supported by Google. By providing an open development platform, Android offers developers ability to build extremely rich and innovative application with a rich set of user interfaces. MCL allows users to obtain computer-based information through mobile devices. Using MCL provides various advantages, such as context awareness, portability, connectivity, and social interaction.

Fig. 3: Basic MCL architecture
While factors of a development plan may vary according to organization size and extent of work, the best MCL development should begins with a well-designed
collaboration plan. Fig. 5 shows the MCL running processes on the prototype.

Fig. 4: Collaborative learning processes

Once students have an access into registered class, they receive inquiry on whether participating collaboration learning process depending on class requirements. The prototype for MCL is designed for users to easily make collaboration with a mobile. In general, it requires enterprise database warehouse (EDW) to help students find and search necessary information or contents when logging into a class. Initially, EDW provides standard course information which comprises of textbook information, course name, course ID, course description, discussion topics, etc. In a well-organized collaborative learning environment, it is very important to set suitable group members and build a study forum based on topic. Communication with the forum is necessary to construct a more get-together and affinity group, and also it accommodates easy ways to set a goal and find the same goal.

Generally, the following collaborative activities will be required for the MCL application [5].
- Grouping members
- Monitoring each member
- Displaying member status
- Synchronizing multiple discussion
- Delivering messages

From The Admin End:
A. Authentication Process For Admin
To protect admin profile and system security, MCL requires authentication process.

Fig. 5: Authentication Process for admin

B. Home Page Of Web App
As seen in Fig. 7, when authenticated admin logins this home page will get display.

Fig. 6: Home page of web app

C. Manage Student
As seen in Fig. 7, when admin add student details to manage student this window display on web application.

Fig. 7: Manage student

D. Add Resources
As seen in Fig. 9, when admin wants to add resources this window display on web application.

Fig. 8: Add Resources

E. Manage Message
As seen in Fig. 10. When an admin wants to give message to any department then this window display on web application.

Fig. 9: Add Message

F. Manage Question
As seen in Fig. 11. When admin wants to know answer of question by student then this window display on web application.

E. Manage Events
As seen in Fig. 12. When admin wants to organize new events then this window display on web application.
The Design and Development of Mobile Collaborative Learning Application Using
(IJSRD/Vol. 2/Issue 01/2014/211)

From The Students End:

1) **Authentication Process**
To protect user profile and system security, MCL requires authentication process. Thus, after executing the application, it requests user authentication in order to avoid fault users or lost of priority data, as it can be seen in Fig. 6. Once the process completes, the application should forward to a new page containing the course a student has registered in the quarter or semester.

2) **Home Page Of Android App**
As seen in Fig. 7, when authenticated user logins this home page will get display.

3) **View Notifications**
As seen in Fig. 8, when user clicks on view notification block this window will display. This shows list of notification.

4) **View Events**
As seen in Fig. 9, when user clicks on view events block this window will display. This shows list of events.

5) **E. View Resources**
As seen in Fig. 9, when user clicks on view resources block this window will display. This shows list of resources on clicking particular resource the user can download that file.

6) **Question & Answer Session**
When user clicks on Q & A session block then window shows list of question and answers given to that.

VII. **CONCLUSIONS**
The main contribution of this research is the design and development of a MCL prototype. Collaborative learning seems to be a teaching and learning innovation whose time has come. It will make a student actively engage in building their own minds. Basically, the main objective of MCL is to obtain learning advantages on hand-held devices particularly mobile devices which allow accessing and sharing of learning materials anywhere and anytime.

**REFERENCES**
The Design and Development of Mobile Collaborative Learning Application Using

(IIJRD/Vol. 2/Issue 01/2014/211)


