A Proposed Model for Individualized Learning through Mobile Technologies

Farhan Obisat and Ezz Hattab

Abstract— Mobile Learning (mLearning) describes a new trend of learning that uses innovations like wireless communication, personal digital assistants, digital content from traditional textbooks, and other sources to provide a dynamic learning environment.

With the facility of connecting people and information world-widely, the Internet has a major impact on the traditional education. Currently, students can easily access online courses at anytime anywhere in the globe. Since the Internet has been adopted by students, traditional pedagogical models are no more appropriate models. Consequently, new pedagogical models are required. Such models should be student-centric that based on individual student's learning expectation, styles, interests and abilities. In this paper, first we discuss these four dimensions and then we introduce an individualized learning model that takes these dimensions into account. It discusses 1) student learning styles, 2) student learning interests and 3) student devices, such as personal profiles. The main objective is to help understanding the behaviors of the students and to materialize the concept of personalization**.**

Keywords— e-learning, personalization, profile, device, learning style, and interest.

I. INTRODUCTION

E-learning and Web-based applications are becoming popular in our daily life it would not go a single day without us using them by (Pc, mobile, internet, TV etc…), so there is a need to know more about them.

E-Learning is the currently fashionable term used to describe the diverse use of information and communications technologies to support enhance learning, teaching and assessment – from resource based learning (in which students carry out face-to-face tasks supplemented by a range of online resources) to fully online courses.

E-learning is the use of internet technology for the creation, management, making available, security, selection and use of educational content to store information about those who learn and to monitor those who learn, and to make communication and cooperation possible [1]

As students completed their course, they were requested to access their regular online course materials from a distance using their existing mobile devices and then asked to provide feedback on their experience using the mobile devices for anytime and anywhere access. The course content for delivery on mobile devices was in XML format using the IMS Learning Design specification. This allows the content to be separated from the presentation and identified specific activities and learning objects within each unit of learning. Also, this allowed content to be displayed in many different formats, in a wide range of layouts, and on a variety of devices. Device detection was done at the presentation level, and depending on the device detected, the stylesheet is selected that best matches the device.

M-learning, or Mobile E-learning, is fundamentally E-learning delivered through mobile computational devices (e.g., PDAs, Mobiles, MP players, etc.) [1].

M-learning is much more than simply E-learning through mobile devices. As mobile devices evolve, people discover new ways in which the functionality of these devices can be applied to learning. Mobile E-learning will become increasingly different from conventional E-learning and will create a new learning environment; an environment where learners have access to contents, teachers and other learners anywhere and anytime, where the contents they are accessing are dynamic and dependent on their location in space and time, and finally where learners can record any learning content for later use.

General speaking, Mobile learning incorporates within its scope a wide range of activities that provide learners with convenient or contextualized opportunities to access and engage in learning. However, while many approaches to mobile learning capitalize on the mobility of the learner in

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combination with well-established recording and replay tools, such as books or cassette audio players, this works scope is more narrowly focused on personalization of learning.[2]

The convergence of computer-based learning with 'new learning' pedagogies with stylizes and powerful, portable digital devices has forced considerable interest from the national education sector in digital mobile learning ('m-learning').

There are vast numbers of hardware platforms available for supporting m-learning, which made the scope for divergent configurations and personalization of these platforms. Obviously, it indicates the need for standards and methods for facilitating the development of m-learning resources that make it more interoperable [3].

II. PERSONALIZATION

The concept of personalization as an organizing principle for innovation in higher education, suggests that ultimately the individual learner can and should be the center of everywhere infrastructure of support [124]. Designers of new network-based applications are envisioning a day when the technological infrastructure for personalization is invisible, always available, accessible in many formats and personal devices. Innovators in higher education can now develop and use network-based applications that support personal inquiry, decision-making, action planning, documentation, mentoring and validation of work as well as evidence of learning. A new elearning and web application is designed to facilitate personalization to enable personalization of education while at the same time meet the accountability needs of higher education.

Personalized content access intends to improve an information retrieval process by adding explicit user requests to implicit user preferences. This is likely better meet individual user needs and its overall satisfaction regarding the system outputs. Such request reformulations also disambiguates initial queries [125].

Personalized user interactions can be done according to different steps:

Modeling the user profile.

Acquiring user's data.

Generating personalized services.

Advances in highly interactive computing technology now makes it possible to realize personalized learning. Modern e-learning systems need to continually probe the learner, find out at that instant what he wants to know, and what he can and cannot do. Based on this dynamic gathering of information and taking his pre-defined learning preferences and constraints into considerations, the modern e-learning system must then be able to offer personalized support and learning solutions in real-time. Such an approach combines real-time assessment, learning, and pedagogical considerations into one

seamless learning activity. Unfortunately, although such an approach can address and assist with individual learning problems, few learning solutions of such a nature exist. Sadly, in spite of the tremendous advances of technology and growing economic demands for better trained manpower, our educational systems have not responded at the same pace. The major learning modes remain unchanged. As emphasized in our earlier research papers [1, 2], our current utilization of technology and pedagogical principles are still far from what is needed, for all that plagues our under-performing educational sector. With easy access to the World Wide Web, interactive media technology and facing the challenges of a fast-paced global economy, 21st century students are now demanding more flexibility and control in taking responsibility over their learning. Gone are the days where students follow a full training course and treat lectures or textbooks as their primary course of learning. 'Fragmented learning' or learning-on-demand is becoming the new trend of learning for the 21st century students. In this paper, we identify some major new trends in learning. In doing so, we identify some vital issues which expose the weaknesses in today's e-learning systems. Through this, we are then able to develop a novel learning framework which enables us to address the weaknesses we have identified. Through this framework we can streamline the educational process into one seamless learning activity that integrates personalized assessment with learning. We advocate that such an approach is important to help course and content designers to develop personalized learning systems – an important aspect of distance learning where the availability of personal help from teachers and instructors may be poor.

In the last decade several basic principles of the learning theory have been reevaluated having in view the new facilities of the Information and Communication Technology (ICT) evolution, as well as by some lack of success of the existing elearning systems.

New computational environment are necessary in order to support new framework for education such as integration of working and learning, self direct learning. The fulfillment of individuals of each user –learning personalization needs, the learning personalization need new solutions for a many of aspects as:

Adapting to the profile, goals.

Knowledge formulization.

Learner objective definitions.

Learner knowledge acquired opinion.

The simplest user model is the overlay model, wherein the user's knowledge is a subset of the system's knowledge [4]. In its simplest form the overlay model states if an item of the knowledge base is learned, it is not completely learned or is unknown. By comparing the user's knowledge with the expert's knowledge the system derives the user's lack of knowledge. The critical part of overlay modeling is to find the initial knowledge estimation. One of the main drawbacks of this approach is that it can't model the user's misconceptions

of knowledge concepts, which is an important aspect within learning environments. More elaborated versions of overlay user models can differentiate between more detailed knowledge states.
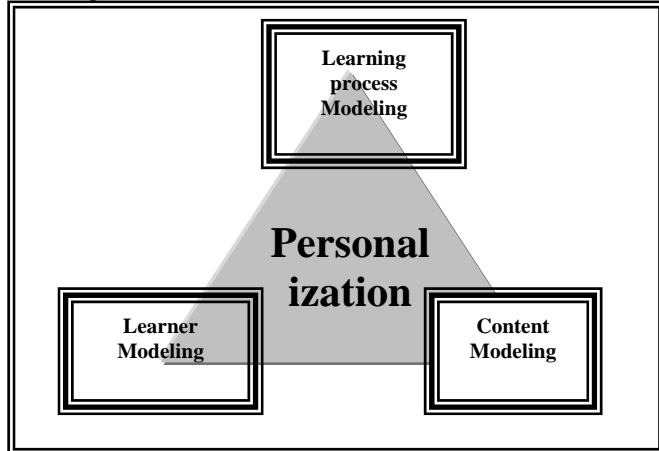

Figure1: learner model

III. LITERATURE REVIEW

Juniu (2002) gives an overview of palmtop hardware and software applications relevant to education in 2002 for the PalmOS® and Microsoft® Windows CE palmtops. Uses include grading and attendance, assessment portfolios, fitness and wellness assessment, lesson planning organization, and quiz-writing used in an exercise room or outside. There are also generic palmtop applications: word-processing, spreadsheet, database, e-books and web browsing [4].

Mohamed Ally(2006) shows that Mobile learning devices can be used to deliver learning materials to students, but the materials must be designed properly to compensate for the small screen size of the devices. Learning materials need to use multimedia strategies that are information-rich rather than textual strategies. As a result, the writing style of course developers has to change from textual writing to a greater use of visuals, photographs, videos and audio [5].

Athanasios D et al (2006). They show that GIS learning object selection problem is an intelligent topology-based GIS learning systems, by proposing a methodology that instead of "forcing" an instructional designer to manual1y define the set of selection rules; produces a decision model that mimics the way the designer decides, based on the observation of the designer's reaction over a small-scale GIS learning object selection problem [6].

M. Baldoni et al (2006). In their work they have shown the integration of a new semantic personalization web service for course planning within the Personal Reader Framework. The goal of personalization is to create sequences of courses that fit the specific context and learning goal of individual students [7].

Mariko Sasakura et al (2007). They proposed a framework for adaptive e-learning systems and shown a prototype system based on the framework. The system consists of two parts, the self-learning part and the authoring part. The prototype system consists of two parts:

• Self-learning part: it is based on the model represented a student uses this part.

• Authoring part: it is for making materials and exercises. This part is used by teachers [8].

Alex Pongpech et al [2007] illustrated a manner that their proposed representation can be utilized for personalized learning functionality such as courses recommendation functionality. Although they used background of each learner to recommend suitable personalized goal, they also have observed that in several instances the minimum number of courses left uncompleted might not be enough to provide a unique solution for each learner. Furthermore, given that there can be more than one possible recommendation for each learner, this mechanism allows learners to specify personal criteria to find a possible unique solution would more superior [9].

Owen Conlan et al (2007) have described the principles behind the combination of personalized content and services may be used to create activity-based personalized distance learning offerings. Through combining the methodologies seen in the domains of service composition and personalized learning a service-oriented approach to personalized learning activities may be realized. They shown the principles of the multi-model, metadata driven approach as appropriate guidelines for achieving successful personalization that engage learners in activity-based distance learning opportunities [10

IV. WEB INTERACTION

E-learning, as we know it today, has been closely attached to the evolution of information and communication technologies (ICT). The inclusion of educational technology at school allowed teachers to enhance learning from different supports besides the spoken word. In that manner, radio, television, movies, photographs, and, more recently, CD-ROMs, DVD-ROM's and Internet have gained a great success during last two decades.

However, current recommendations demonstrate that digitizing learning materials and delivering them to students does not suffice. It is important to conceive those materials from a more public and collaborative perspective, which means creating pedagogical documents that can be used and reused in different contexts. One of the solutions proposed by international organizations are *Learning Objects* (LO).

It is focus on interaction techniques, search reformulation, relevance judgement.

Information seeking: used to describe studies how people react when they experience a need of information in order to

perform a task; involves cognitive, emotional and physical reactions; epoques attempts, clarifying the need, expressing it, selecting among possible sources to satisfy it,

interaction with potential sources, refining the
results of interaction process.
Information searching: user-source interaction,
part of information seeking; may involve persons
interacting with any kind of information system and sources,   including others persons.
Information retrieval: denote interaction between
persons and (computerized) information systems.
Web search process: user behaviour in web search process
Web usability: site level usability, Page level
usability [4].

V. IDENTIFICATION OF M-LEARNING ACTIVITIES

Initially, m-learning activities were explored and identified using a learner-centric activity model. Using this model in conjunction with research into m-learning activities that other educators have tried, and recorded on the internet, a large number of m-learning activities were identified and categorized. This list is comprehensive, but not exhaustive, and will certainly be updated in future as both mobile technology and functionality improve. However, it does provide a sample of the current core applications of m-learning, and is useful as a means of deriving the standards required to support it.

Once these activities were documented, they were tagged according to criteria such as the data files and formats required to support those activities, the aspects of hardware or software they might potentially impact on (such as memory limitations or data weight), and aspects of usability and user access (such as user issues with screen size or data input).

VI. MOBILE CONTENT DEVELOPMENT

Mobile audio

Mobile audio is identified as the most commonly currently utilized medium for delivery of M-learning. Audio is also the most pervasive of all of the media, and can be readily deployed to personal digital media devices.

Mobile video

Digital video generally consists of two major elements: a digital video track, with a synchronized, accompanying digital audio track. These components of the video are known as data streams. Additional or alternate data streams can be present in a video file; the various data streams are multiplexed together to present all of the content in a single file.

Mobile web

Approximately 85% of mobile phones in 2007 had internet connectivity, with basic GPRS being the most commonly available access technology. Standards for content that is intended to be delivered using web browsers installed on mobile devices are comprehensively advised by the activities of the W3C Mobile Web Initiative (MWI), a collaboration of industry and technology experts that is hoped to 'improve web content production and access for mobile users and the greater web' [11].

VII. LEARNER INFORMATION

Learner Information is a collection of information about a learner. The objective of these specifications is to allow the import data into and extraction of data from different systems. They provide data models, including the syntax and the semantics, to describe both the characteristics of a learner and his or her knowledge/abilities [12].

The information is associated with learners and used by Learner Information servers that may exchange data with Learner Delivery systems or with other servers. It is the responsibility of the Learner Information server to allow the owner of the learner information to define the information to be stored and shared.

Basically, information about a learner comes from three different sources:
Personal information.
Preferences.
Academic information.

In the following section we present various contributions to complete some standards and specifications about learner information, especially those related to learner's preferences, because it is in these preferences where specific characteristics of learning through mobile devices are reflected.

Learner profile and device profile

The student model enables the system to provide individualised course contents and study guidance, to suggest optimal learning objectives, to determine students' profiles and the actual knowledge they have acquired, to dynamically assemble courses based on individual training needs and learning styles, and to join teachers able to provide support in terms of guidance and motivation and therefore to help the students with different backgrounds and knowledge levels to achieve their learning goals effectively on the Web.

The software developers face a number of challenges and difficulties when trying to model student profile and activities on real eLearning systems. The process of collecting student modelling data is time-onsuming and requires the development of complex data structures to represent student's personal information, knowledge and behaviour in the learning domain.

Once student data is collected, it must be converted into a format compatible with knowledge representation and reasoning systems to function as the input for the adaptive

systems. Faced with these requirements, student modelling data is often stored in proprietary, hard-to-access formats that don't encourage reuse or distribution. In addition, in most cases the student models can only be used with the learning application, which it was developed for and when the application is changed or replaced they will be useless.

Inside the Learner Profile, a new type of structure, called Device/Devices Profile, will be created. The Device Profile addresses the characteristics of the device used by the learner for learning tasks. More specifically, the Device Profile stores a set of preferences about managing the device related to its particular characteristics. These preferences will be processed as "default preferences", which, if it is possible, will be finally used. To consider those cases in which these preferences can't be satisfied, some ranges of variation about them are defined. Obviously, these ranges must be supported by the considered device [13].

Ultimately, for facilitating the task of fully supporting the experience of learning according to conditions solicited from the learner, a set of values will be included that indicate the maximum capabilities supported by the device related to its characteristics (e.g., related to speed and types of connection, display capacity, etc.), and always carrying out the user's preferences. Furthermore, a learner can be in possession of several devices for use in learning; because of this, the learner must be able to complete his/her learning through all of them. Depending on his/her situation at the moment, he/she can select, from among all his/her devices, the one that is more convenient at that moment to achieve the learning tasks that he/she wants to complete. In such a case there will be not one Device Profile, but as many Device Profiles as the learner has "learning devices" to be used at his/her convenience.

Therefore, three possible forms to implement the above exist:

1. To include all the Device Profiles inside the same Learner Profile, which implies the system must be able to interact with each of the different Device Profiles within a single Learner Profile.

2. To permit only one Device Profile per Learner Profile, this implies the existence of several Learner Profiles (at least one per Device Profile) with which the system must be able to interact.

3. To permit both previous schemas, i.e., to permit several Learner Profiles (or only one), which can include one or more Device Profiles [14].

All of this implies the need for researching a set of services to manage all gathered information related to mobile devices. These services must be complete with a series of behavioral models that define how the data will be managed.

VIII. APPROACH

Current mobile learning systems do not consider mobile limitations and users profile which include learning style, psychological needs of the learner and pedagogical model.

Therefore, we need systems and methods for facilitating the development of m-learning resources those are interoperable between platforms (devices and SW) and configurations, practical, usable, and equitable in terms of access and opportunity.

Our approach tends to follow adaptation according to generated user profile and its features which are relevant to the adaptation, e.g. the user's preferences, knowledge, goals, navigational history that are used to provide personalized adaptations.

We need to understand the learning style of the learner. The learning style represents: "...the characteristic cognitive, affective and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment" [4]. Tailoring instructional content to specific learner needs according to his/her learning style should result in achieving learning objectives more efficiently, admiring individual strengths and preferences.

Organizations must permanently adapt o new technologies in order to obtain a larger market segment or even for staying on the market. In the existing e-learning platform, we can use a didactical strategy, complementary to e-learning which comprises: laptop, PDA/smart phone, cell phones, accessories.

The new digital technologies and recent research in visual design (visual design, screen design, eyetracking etc.) enlarge significantly the sphere of possibilities and foreshadow a future which will definitely leave behind distance learning

IX. METHODOLOGY

We need to design course (lesson) content tailored to individual users, taking into consideration device technical features and specific learning style and subject matter learning motivation and how could learning objects metadata be used for learning object retrieval according to the specific needs of the individual learner.

Analyzing coordination between student's learning style and his motivation for specific teaching material. We give guidelines for preparing learning materials according to different learner's characteristics. Those guidelines are based on learning style strategy and motivation factor with a strong learning style background as shown in
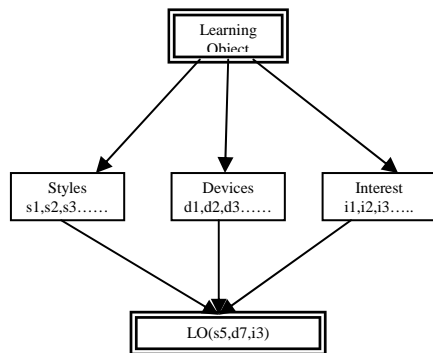
Figure2: learning style background

Learning styles

Students differ in learning styles and prior knowledge. Educational institutions usually select one major teaching and learning strategy and group their students accordingly. There are only few examples of universities that allow students to choose between separate 'tracks', according to differences in learning preferences.

Nowadays, differences between students increase. A growing number of students have work experience. In addition, their average age is also higher. Differences in prior knowledge and abilities are also increasing. Educational institutions feel the pressure to find an adequate answer to these challenges.

Distance learning is suited better than campus universities to deal with personal differences. In the first place, distance learning as such is developed to be used by individual students. In the second place, ICT tools allow to combine standardized learning objects in various ways. For example, students who prefer a deductive approach to learning might be offered theoretical knowledge prior to information of a case. Students with inductive learning preferences like to get acquainted with a case, preliminarily to their inventory of relevant theoretical viewpoints.

There are two major categories of learners, who respond better to what they see are visual learners and those who respond better to what they hear are hearing/speaking learners. People learn by:
- Reading (visual)
- Listening (auditory)
- Seeing (visual)
- Speaking (auditory)
- Doing (tactile)

There are also the learners who learn by doing. But when faced with new information, the majority of people fall back on their main learning style.
- An auditory person would say, "Tell me about it!"
- A visual person would say," Show me how to do it!"
- A tactile learner would say, "Let me do it!"

The concept of „learning styles" has the roots in the classification of sociological types. The theory of „learning styles" is based on researches that show that different individuals differently receive and process the information as a result of heredity, growing and the actual needs of environment.

The evaluation of learning styles must respond to the characteristics selected by students. The evaluations are applied to each student and resume the preferences of environment processes, the emotional, sociologic, physiologic, and global and analytical behavior for learning processes [16].

Learning interest

The learning interest is depend in the learner interest which is mainly is stored in the learner profile, learner interest is which courses/materials the learner like to study online (Java, C++, Math ….etc)

Learning Devices

Today learner can access online courses from anywhere and anytime with his suitable device at high right moment (laptop, PC, mobile device…. Etc)

X. CONCLUSION

over the past ten years mobile learning has grown from a minor research interest to a set of significant projects in schools, workplaces, museums, cities and rural areas around the world.

These projects range from providing revision questions to children by mobile phone through small group learning in classrooms using handheld computers to context-sensitive learning in museums.

Each of these projects has shown how mobile technology can offer new opportunities for learning that extends beyond the traditional teacher-led classroom. As the projects developed, the researchers became aware of significant issues that were not obvious at the outset.

Some are technical problems, such as how to manage technology with short battery life, or how to interact with a mobile device when walking. Some are educational, such as how to coordinate small group learning in the classroom, or to deliver teaching content through a small device. And some are broader issues of society, for example whether it is ethical for software on mobile devices to monitor and control children's learning activities outside the classroom

This paper showed that e-learning personalization is an important issue in the e-learning domain and to reach the goal of learning personalization we have to take into our consideration learning style, learning interest and leaner devices.

Learners can easily access the online course materials at anytime anywhere. Internet also amplifies the complication of the course materials development. As the learning idea is taken by a student in the e-learning environment, traditional learning model is no longer appropriate model. Consequently, student-centered course materials which are prepared based on

individual student's learning expectation, styles, interests and individual academic background become critical. In this paper, we introduce a model for personalized course material generation through

1) Student learning styles.

2) Student learning interests.

3) Student devices, such as personal profiles that help understanding students' behaviors to materialize the concept of personalization.

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