

Development of Platform Independent M-Learning Content

Rushitaa Gupta, Muhammad Rukunuddin Ghalib
School of Computing Science and Engineering, VIT University

Abstract— There has been a lot of advancement in mobile technology. The perception of a mobile as mere communication device underwent significant changes. One such change is M-learning which has taken its roots from e-learning. Mobile learning (M-learning) provides educational opportunities through mobile phones, PDA, digital media players. The best feature about M-learning is that exact information can be grasped anytime, anywhere without many constraints. Though, M-learning requires researcher's attention in developing issues, processing capabilities and small screen displays. The only major problem with M-learning is the difficulty regarding platform dependency due to different operating systems. The paper discusses about mobile learning technologies, platform independent content and challenges for success of M-learning. It is proved that most of the learners in India have mobile phones and m-learning is an upcoming research field that aims at transition of learning tools from digital boards to hand held devices. Developing M-learning content is a Herculean task in today's date as we have different operating systems supporting different formats and to create content valid for all of them is very difficult. During research, content development was carried out to lay the basis for presentation style, file formats and platform independency for mobile phones.

Index Terms—Mobile Learning, E-learning, Mobile Content, Design issues for mobile learning

I. INTRODUCTION

Advances in satellite systems and computer technology, particularly wireless communication, including Bluetooth and infrared beaming have led to the emergence of M-learning from E-learning. Mobile learning can be referred as a subset of e-learning, which also acts as distance education that focuses on learning with mobile devices [1]. Mobile learning is a sort of learning that can be performed at any place and at any time without any constraint. Mobile technology refers to the use of mobile devices with the application for learning aides and materials have become an important source of learning. With the advancement of M-learning the application would enable a student to on the go learning. The student has the access to interact with the smart content of the M-learning application that would enable them to view their lessons and also give a small quiz to review their progress. Further the smart application would also enable a student to store their progress on the database or any available server for their future reference [3][4][7][11]. This paper is organized as follows: Section II deals with SCORM basics, Section III deals with goals of SCORM

standards, and Section IV discusses deals with research work in the area of M-learning content

II. M-LEARNING OPPORTUNITIES AND CHALLENGES

A. Concept

E-learning refers to the use of technology in learning and education. There are several possibilities to describe the intellectual level and technical development of e-learning, which can be categorized into discrete areas [2][9].

- E-learning as an educational approach or tool that supports traditional subjects
- E-learning as a technological medium that assists in the communication of knowledge, and its development.
- E-learning administrative tools such as education management information systems (EMIS).

B. M-Learning

The term m-learning or "mobile learning" refers to a subset of e-learning, educational technology and distance education that focuses on learning across contexts and learning with mobile devices. Mobile learning is any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies. In other words, with the use of mobile devices, learners can learn anywhere and at any time[5][10]. Using mobile application for learning aides and materials has become an important part of informal learning. Another basic challenge for the development of the application interoperability of the content developed. This challenge is amended by using the SCORM standards for the content development that enable easy interoperability. Moreover the content can also be compatible with any Learning Management System (LMS) [13] for the ease of access and lesson development. SCORM [6][8][15] is a set of technical standards for e-learning software products. Accessing the built in Application pose a serious challenge because of varying device features in terms of hardware and software capabilities. For example, streaming video requires a minimum bandwidth of 256Kbps which is not very common when we look at mobile wireless channels in India [23]. Technology challenges include limited connectivity, battery life, small screen size, low memory, local language support, etc. Apart from technological challenges there might

be monetary constraints, educational challenges including access to learning outside classroom, device support which developer must keep in mind before developing any M-learning application[17][19]. Moreover a few challenges found during our research are concluded as follows [12][14]:

- Number of file/asset formats supported by a specific device
- Content security or copyright issue from authoring group
- Multiple standards, multiple screen sizes, multiple operating systems
- Reworking existing E-Learning materials for mobile platforms
- Tracking of results and proper use of this information is not possible
- Restriction on learning timetable
- No just-in-time (J.I.T.) learning
- No feasibility on storage of the Application on Cloud
- Requirement of LMS is compulsory to run the Application
- Re-usability of learning and testing content is not possible

III. DEVELOPING PLATFORM GUIDELINES INDEPENDENT M-LEARNING CONTENT

Firstly, the design used for the development of e-learning content cannot be applied to m-learning as learners in this case use mobile phones which have considerably a smaller screen size when compared to that of the desktop. With the varied features, capabilities and operating systems of the mobile phones available it is of utmost priority to develop content which is interoperable and is not undermined by any of the above mentioned limitations. The following guidelines may be followed for developing of m-learning content.

A. Short and attractive content

The designer must focus on development of short and attractive content for the comfort of the end user. The content needs to be to the point and short as the mobile phones have a very limited memory available. There is no point in developing a heavy application whose capabilities the user cannot avail due to memory constraint. Moreover the content should be attractive as the user can only focus for a limited time on the small screen.

B. Limit high level of graphics

The applications rendering high graphical content may increase processor load and drain battery power. The developed content should have limited Data entry. Navigation to other pages should be provided using hyperlinks or big size buttons to restrain memory usage. Graphics used should be present in HTML Language[18].

C. HTML 5 Supportive

The content should be developed to support HTML, CSS, and JavaScript so that user should not face any issues in packaging the content.

D. Interactive Design

The Graphical user interface should focus on engaging and thus enabling learner interaction. E-learning and flash based interactivities and widgets such as roll over, buttons should be used to make m-learning more interactive and fun based. There should always be simple quizzes that evaluate learners understanding of the subject. Such an application feature not only provides interactivity but also engages learner in education.[16][20][21][22]

IV. EXPERIMENTAL RESULT AND DISCUSSION

Our project is developed as a Mobile Application and is built using Flash Builder following the SCORM standards. It is then converted into HTML content. The Application provides Lessons for the distant learning Users which are informative in order to help them grasping knowledge in required fields such as various Computer Languages. The Users can opt for quizzes provided in the application to test them after completing the learned lessons. Moreover, the application is such that it can be packaged to support any platform making it platform independent. The research found that if we make the basis in HTML , Cascading Style Sheet (CSS) or JavaScript then the application can be easily converted to support any operating System. For iOS applications the output is an IPA file) (iOS Application Archive), for Android applications the output is an APK file) (Android Package), for Window Phone the output is a XAP file (Application Package), etc... These are the same application packaging formats used by "native" applications, and can be distributed through the appropriate ecosystems

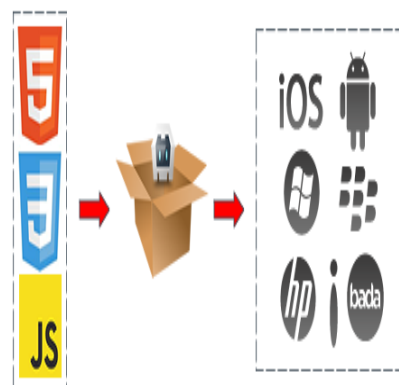


Fig 2: Application Converter

The advantage of such content will be that if it is used in classrooms for teaching on a wide scale there won't be any dependency related to device. The student would have freedom to use his/her smart phone as per his choice. The content developed also supports video based learning which has been provided as navigation to another URL feature

thereby reducing memory usage and enabling e-learning type experience to the user. Moreover the GUI developed is quite interactive and involves learners' complete attention and interaction. The sample content image is shown in Fig 1. Below.

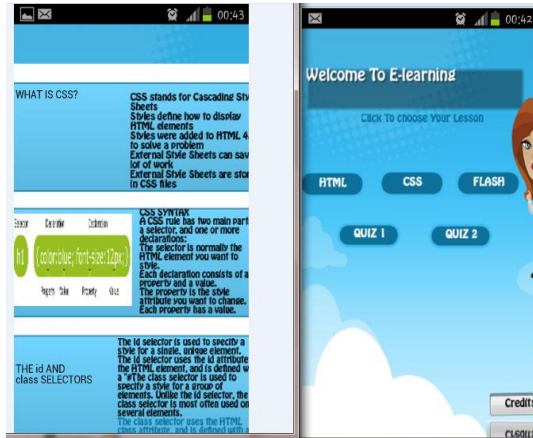


Fig 1: Sample Content in GUI

Although mobile content development guidelines were formulated, guidelines followed for developing content for one subject may not be useful for others. Let us consider HTML programming and soft skills. For HTML focus should be on explaining fundamental concepts with illustrative examples where as for soft skills focus may be on grammar, pronunciation etc.

V. CONCLUSION AND FUTURE SCOPE

The paper discussed about m-learning technology and challenges. Approach for context design was also discussed. The adoption of M-Learning in tertiary settings would appear to be underway, though it is still in its initial stage. The early trials of m-learning in tertiary settings indicate that the adoption of this technology is largely dependent on issues of design and operating systems. With careful planning, we aim to harness learning potential that is platform independent. The feasibility of implementation of m-learning would appear to be strength with the prevalence of WiFi hotspots across campuses and the prevalence of smart phones among the student and teaching body. We wish many revolutions in m-learning and want m-learning to become a powerful tool in the coming century to revolutionize the current learning system. Digital board learning and the traditional moodle quizzes need a break and with this application we would like to lay the foundation for the same. We wish that in future same formats are acceptable in all operating systems with respect to applications.

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AUTHOR'S BIOGRAPHY



Rushitaa Gupta: She is pursuing her final Year B.Tech (CSE) in VIT University, Vellore. Her areas of interest in research are data mining in bioinformatics, soft computing and Micro array analysis. She has co-authored several papers in national and international conferences.



Muhammad Rukunuddin Ghalib: He is an Assistant Professor (Senior) in VIT University, Vellore, India and currently in his final stage of Ph.D degree in CSE from Anna University, Chennai, India. A life member of Computer Society of India (CSI). His areas of interests are data mining, bioinformatics, algorithms and graph theory. He has published several research papers in refereed international journals and conferences.