Converting E-Learning Into M-Learning Application Using MMCD

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ABSTRACT

E-Learning system has dominated the internet-based distance education for the past two decades. With the advance of mobile technology, the use of mobile device as m-learning platform has now becoming a new way of e-learning that deliver knowledge at any time any place. However, the limitation of mobile devices compared to computers give challenges to the developers in developing good m-learning applications. Aspects such as content design, navigation design and mobile HCI are critical and need extra attention during the development phase. MMCD is a set of development framework and methodology designed for multimedia mobile content development using Flash Lite technology. This research will present the MMCD framework and methodology for converting e-learning application into m-learning application to ease and guide the development process.

KEYWORDS: Mobile Learning, Mobile Application Development, Framework, Methodology, Flash Lite, MMCD.
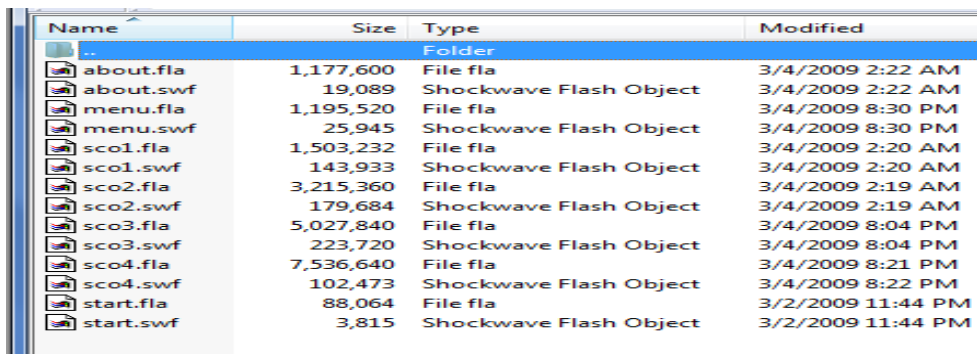
1   INTRODUCTION

With the advance of mobile technology and widely use of mobile devices today, m-learning has the potential to dominate the distance education as what have been achieved by electronic learning (e-learning) for the past two decades [4]. M-learning enables learning via mobile device at any time and any places. Unlike e-learning applications [3], m-learning provide more personalize learning environment to the users. Smart phone, PDA, iPhone, iPad is an example of mobile devices that support this learning style.

For m-learning to dominate the distance education, limitations of mobile devices such as small screen resolution, limited data space and slow processing speed must be considered by the developer during the development of m-learning applications. Therefore, aspects such as content design, navigation design and mobile HCI are critical and need an extra attention during the development phase.

The purpose of this paper is to present the experiments of using Multimedia Mobile Content Development (MMCD) Framework and Methodology to convert existing electronic learning (e-learning) application into mobile learning (m-learning) application. The Electric and Electrical courseware is an online based application developed using Flash.

2   SCREEN BY SCREEN CONVERSION FROM FLASH TO FLASH LITE COMPATIBLE

The common method used by developers to convert a Flash-based e-learning application is by converting the courseware screen by screen into Flash Lite compatible courseware. In our experiments, in average it took a month for a programmer to convert a heavy multimedia learning object into a multimedia mobile learning object. Figure 1 shows some samples of file sizes developed for a learning object consists of 7 screens. It shows that the size of a screen may reach 223Kbytes as shown by sco3.swf. The total size for this mobile learning object is about 694K. If one m-learning object occupy 694K, how much we require to store 60 m-learning objects for one subject? Having this experience encourage us to find a methodology that would expedite the development of multimedia mobile learning application and at the same time optimize the processing and data usage of mobile devices.

Name	Size	Type	Modified
..		Folder	
about.fla	1,177,600	File fla	3/4/2009 2:22 AM
about.swf	19,089	Shockwave Flash Object	3/4/2009 2:22 AM
menu.fla	1,195,520	File fla	3/4/2009 8:30 PM
menu.swf	25,945	Shockwave Flash Object	3/4/2009 8:30 PM
sco1.fla	1,503,232	File fla	3/4/2009 2:20 AM
sco1.swf	143,933	Shockwave Flash Object	3/4/2009 2:20 AM
sco2.fla	3,215,360	File fla	3/4/2009 2:19 AM
sco2.swf	179,684	Shockwave Flash Object	3/4/2009 2:19 AM
sco3.fla	5,027,840	File fla	3/4/2009 8:04 PM
sco3.swf	223,720	Shockwave Flash Object	3/4/2009 8:04 PM
sco4.fla	7,536,640	File fla	3/4/2009 8:21 PM
sco4.swf	102,473	Shockwave Flash Object	3/4/2009 8:22 PM
start.fla	88,064	File fla	3/2/2009 11:44 PM
start.swf	3,815	Shockwave Flash Object	3/2/2009 11:44 PM

Figure 1: Samples of file sizes of one learning object converted from Flash to Flash Lite using screen by screen techniques

3   MMCD FRAMEWORK AND METHODOLOGY

MMCD is a Multimedia Mobile Content Development framework and methodology developed at UTeM as a master research that started on 2008. MMCD is a framework and development methodology for mobile applications. Two main testing which are White Box Testing and Black Box Testing and experimental was conducted during the three years research, included three series of users acceptance testing which given a positive feedback. MMCD generally consists of MMCD Framework and MMCD Methodology. The framework was design based on Flash Lite (FL) technology. Figure 2 shows the MMCD Framework. MMCD component in this framework controls the navigation, content management and application logics which are the database used and quiz setup. This framework design helps the developer to speed up the development activities and also to ensure that the m-learning application is developed as planned.
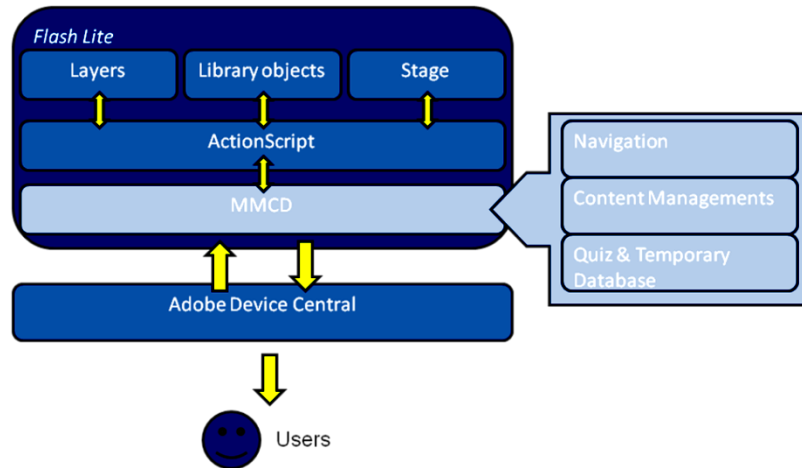
Figure 2: MMCD Framework

The MMCD Methodology is as shown in Figure 3. The methodology consists of five main phases which are 1) application idea creation, 2) structure analysis, 3) process design, 4) main function development, and 5) testing. It is designed to help developers in speeding up the application development process and at the same time optimizing the processing usage and data usage. Content navigation and objects used were identified as the key characteristics of MMCD methodology. This will be explained in further details in the next section.
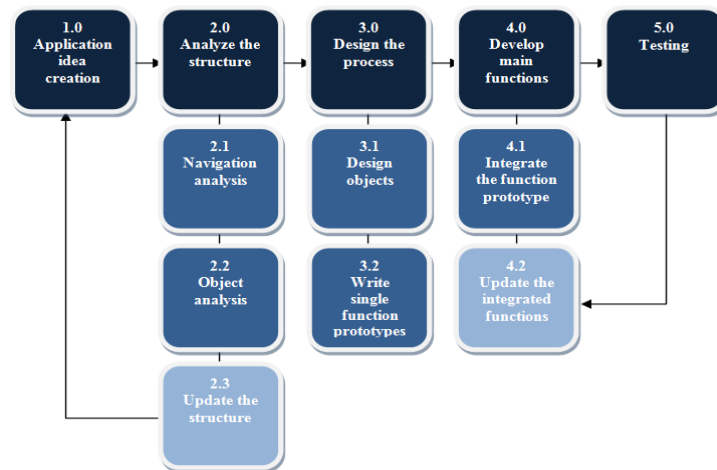
Figure 3: MMCD Methodology

4   USING MMCD IN CONVERTING E-LEARNING APPLICATION

By choosing MMCD Methodology, the development duration were expected to be short period of time and high percentage of working and usable application deliverable as expected. As shown in Figure 3, five main phases were performed.

4.1 Application Idea Creation

The development started by preparing the check list table as show in Table 1. This phase prepared the information needed before the design and development of the application starts. Since in this research, the Mobile Electric and Electrical (MEE) courseware was developed based on an existing application, therefore, the existing e-learning application was analyzed.

Table 1: Application Idea Creation Check List

Item	Note
Type of application	*Mobile Learning*
Target device	*Symbian OS Smart Phone and iPad*
Target users	*General (Kids, teenagers and adults)*
FPS and application settings	• *ActionScript Version: 3.0* • *Flash player: 9* • *FPS: 24* • *Resolution: 240x320px*
GUI	• *Background (intro, main menu, info & credit)*
Images	• Magnets and tools as listed in table 2 (static)
Video	• None
Audio	• *Voice over*
Application synopsis	*MEE is a mobile learning application developed based on existing e-learning application for a web based platform using Flash. MEE teachs users about electric and electrical subject as a complementary learning resource for students that are taking this subject at university level.*

4.2 Structure Analysis

In this phase, two sub components that were analyzed were the navigation and objects used in the application. A content structure check list as shown in Table 2 was produced during this activity, based on the application idea creation and discussions between developers.
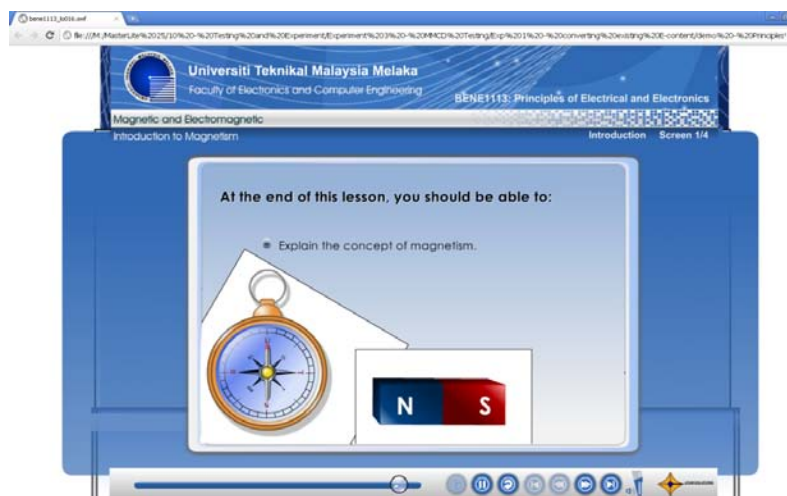

Figure 4: Online Version

Table 2: Content Structure Check List

Item	Note
Layers design	• *Layer 1: ActionScript* • *Layer 2: Softkey Label* • *Layer 3: Button* • *Layer 4:Learning Objects* • *Layer 5: Softkey* • *Layer 6: Title Text* • *Layer 7: UTeM Text* • *Layer 8: logo* • *Layer 9: Title text* • *Layer 10: UTeM Text* • *Layer 11: Logo*
Frame design	• *Frame 1-40: Intro & main menu* • *Frame 45-55: Chapter 1* • *Frame 56-62: Chapter 2* • *Frame 63-70: Chapter 3* • *Frame 71-87: Chapter 4* • *Frame88-96: Quiz*

Menu and navigation	• *Softkey (left & right)*
	 • *Main menu*
	     ○ *Back/Next*
	     ○ *Exit*

Number of main GUI	• *Application logo*
Sub GUI	• *Magnet* • *Screw* • *Pencil* • *Human Posture*
Images	• *Main background images (png)*
Placing audio	*None*
Placing video	*None*
ActionScript Draft	• *Stop(); in each frames* • *Global softkey*
Storyboard	• *As shown in attachment*

4.3   Design the Process

The main objective of this stage is to prepare and designs all the items listed in Table 2. This stage consists of two sub components: design objects and write the single function prototype scripting. The first prototype was completed at the end of this process. It consisted of: 1) graphics and objects designs, 2) object placement on stage, and 3) single scripts that were placed in each frame. The next process was to write the main function scripts to complete the application development and make it functional as planned.

4.4 Develop Main Functions

In this application, the main functions required were the navigation between any selected menu to the information movie clips and the softkey scripting.

4.5 Testing

The application was tested using Adobe Device Central after completing all function scripting required. Once the application was 100% completed, the SWF file was published and uploaded to the online website for distribution and user testing purposes.

Figure 5: Adobe Device Central Testing

5 TESTING AND RESULTS

5.1 Actual Device and User Testing

After installing the application on the actual mobile devices, testing was performed. The data size usage on device is 154kb. Based on the testing results from adobe device central, the processing usage is 368kb.

5.2 User Feedback

The availability of mobile version application enables the users to use this application at any time and any place. Small application data size also part of the factor that encourages users which are students from UTeM to download and install the application into their mobile devices. The development process conducted as planned and no major problems occur with the use of MMCD. As a result, the application development was completed within short duration of time and less problems. Developers involved in this project also acknowledge that by using MMCD, their working activities and task are well planned and easy from the early stages which are application idea creation, the development of content design and scripting writing.
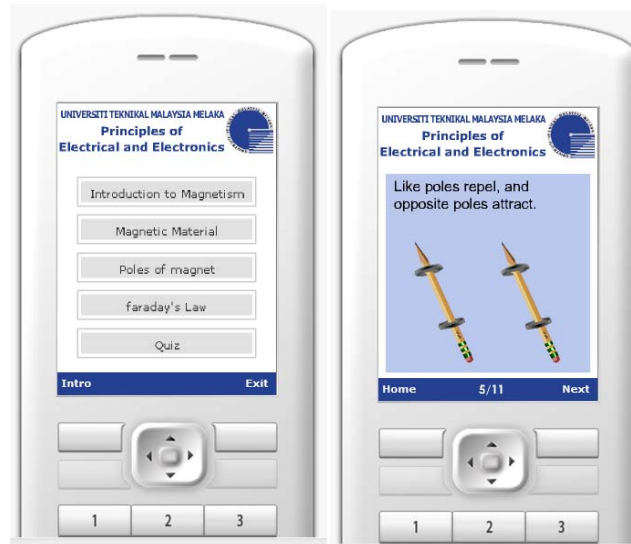
Figure 6: Mobile version Application Interfaces Design

5.3 Results

The application was completed within a day of development which consider as a fast development process. The prototype version of MEE cover up to five main menu or chapter complete with all the animation presentations. Using MMCD, the application data size also reduced as shown in Figure 7 below.

Figure 7: Original e-Learning Version Files and Converted M-Learning Version Files

6 CONCLUSION

MMCD was tested and proven suitable and practical for conversion activities of e-Learning application in to m-Learning application. Save more on the development time duration, the use of MMCD also helps in producing functional application within minima data size and processing usage.

7   ACKNOWLEDGEMENTS

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