MMCD Framework and Methodology for Developing m-Learning Applications

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Abstract

The purpose of this paper is to use MMCD, a Multimedia Mobile Content Development Framework and Methodology for developing an M-Learning application. Mobile devices limitations such as small screen resolution, limited data space and slow processing speed give challenges to the developers in developing good 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. By using Flash Lite (FL) technology that was widely supported by today mobile devices, MMCD are chosen based on the characteristic of an Agile development model and the capabilities of the final output to be used on majorities of the mobile device which definitely encourage the learning activities. Focus on the object or content design and the navigation control are two development aspects that help the development of learning application via mobile device optimized.

Keywords: Mobile Learning, Framework, Methodology, Mobile Application Development.

1. INTRODUCTION

The purpose of this paper is to propose MMCD, a Multimedia Mobile Content Development Framework and Methodology for developing mobile learning (m-learning) application. With the advance of mobile technology and widely used 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]. With the advance of mobile technology and widely used devices, m-learning enables learning via mobile device at any time and any place. Unlike e-learning applications [3], m-learning provide more personalized learning environment to the users. Smart phones, PDA, iPhone, iPad and Tabs are examples of mobile devices that support this learning style.

For m-learning to dominate the distance education, mobile devices limitations 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. Moreover, aspects such as content design, navigation design and mobile Human and Computer Interaction (HCI) are critical and need extra attentions during the development phase.

Based on our experience in developing various m-learning applications and converting e-learning to m-learning applications, we have formulated a framework and methodology for developing multimedia mobile content called MMCD. MMCD has been developed for applications to be developed using Flash Lite.

In this paper, we will present MMCD as a framework and methodology for developing multimedia mobile learning application and describe how MMCD is applied in the development of a prototype called "m-Nations". M-Nations is an m-learning application that teaches and encourages users to learn nation names and its associated flag designs. Users also are provided with general information of the nations and its different features and characteristics.

2. MMCD FRAMEWORK AND METHODOLOGY.

MMCD consists of MMCD Framework and MMCD Methodology. The framework was design based on Flash Lite (FL) technology. Figure 1 shows the MMCD Framework.

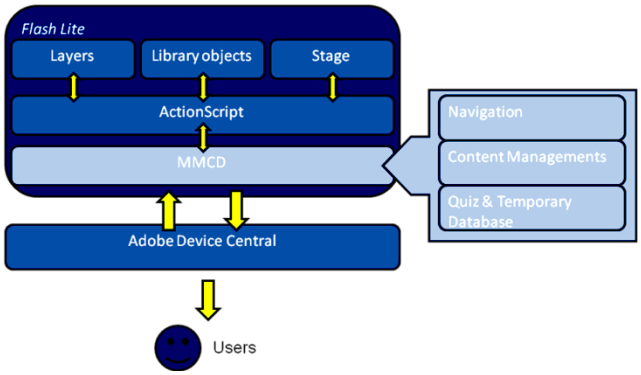

Fig. 1 MMCD Framework

The MMCD component in this framework control the navigation, content managements 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 developed will perform as planned.

The MMCD Methodology that we proposed is as shown in Figure 2. The methodology comprises of five main components: 1) application idea creation stage, 2) structure analysis stage, 3) process design stage, and 4) main function development stages, and 5) testing stage. We have tested and refined the methodology for developing several mobile content including mobile learning applications. The results shows that it helps developers to speed up the application development process and at the same time optimize the mobile processing usage and data usage.

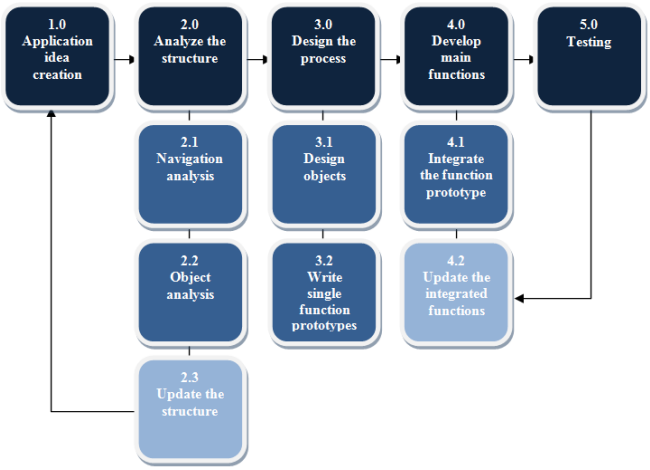

Fig. 2 MMCD Methodology

The beauty of MMCD methodology that focused on the content navigation and objects used were identified as the key characteristic. This will be explained in next section.

3. APPLICATION DEVELOPMENT

M-Nations is a m-learning application that teach and give an information's to the user on the nations names, flag design and general information. This application

was designed targeted for smartphone and iPad users that support FL.
The development is using MMCD Framework, where FL was used as the development tool. MMCD Methodology also practiced in the development process.

3.1 Application Idea Creation

Start by preparing the check list table as show in table 1 below, the application idea creation prepares the information's needed before the design and development of the application start.

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	• Nations flag. (static)
Video	• None
Audio	• *Intro music* • *Nation name VO* • *Clicking audio*
Application synopsis	*M-nation is a mobile learning application where the user will select a nation by name or by flag. Then, the application will display the general information of the selected nation. This prototype version will only cover the 10 south east Asia nations which are Brunei, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam.*

3.2 Analyze the Structure

In this phase, two sub component that were analyze are the navigation and objects used in the application. Content structure check list as show in table 2 below was produced during this activities, based on the application idea creation and discussions between the developers.

Table 2: Content Structure Check List

Item	Note
Layers design	• *Layer 3: ActionScript* • *Layer 2: Content* • *Layer 1: Background images*
Frame design	• *Frame 1: Intro & main menu* • *Frame 2: Nation name list* • *Frame 3: Nation flag list* • *Frame 4: info* • *Frame5: Credit*

Menu and navigation	• *Softkey (left & right)*
	• *Main menu*
	  o *Nation name*
	  o *Nation flag*

Number of main GUI	• *Application logo* • *Nation flags (10 flags)*
Sub GUI	*None*
Images	• *Main background images (png)* • *Info background image (png)*
Placing audio	• *Intro audio (intro.mp3)* • *Nation name VO(nation.mp3)* • *Clicking (clck.mp3)*
Placing video	*None*
ActionScript Draft	• *Stop(); in each frames* • *Global softkey*
Storyboard	• *As shown in attachment*

3.3 Design the Process

The main objective of this stage is to prepare all the items listed on the table 2. This stage consist of two sub components design objects and write the single function prototype scripting. The first prototype was completed at the end of this process. The prototype was complete in terms of the graphics and objects designs, object placing on stage and single scripting that placed in each frames. The next process is to write the main function scripting to complete the application development and make it functional as planned.

3.4 Develop Main Functions

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

3.5 Testing

Application was tested using adobe device central after completed of each function scripting. Once the application was 100% completed, the SWF file was published and uploaded to the online website for distribution and user testing purpose.

4. TESTING AND RESULTS

4.1 Actual Device and User Testing

After installed on actual mobile devices, the application successfully performs as planned.

4.2 Users Feedback

The final application of m-Nations was published on website (www.ftmk.utem.edu.my/wansazli/mnations). Based on the feedback, most of the users are satisfied with the m-nation application and acknowledge that the application helps them in learning more about

nations in South-east Asia. Users also encourage for the full application that will cover all nations around the world and more info provided such as maps and weather info.

4.3 Results

The application was completed within a day of development which consider as a fast development process. The prototype version of M-Nation cover up to 10 nations. In the users point of view, results show that the application did helps them in increasing their general knowledge of the nations worldwide. Not only the users can learn about the national name, general info and flag design, users also able to used this application and learn at any places and at any time.

In the development point of view, the results show that by using MMCD framework and methodology, the development process can be completed in short duration of time and less problems that required the development team to reconstruct or redeveloped the application again. Focus on the navigation and object design at the early stage was identified as the key reason for the successful development application. The processing usage and data space usage also was optimized.

5. CONCLUSION

Results from this research where MMCD were used as the development framework and methodology for m-nation, a m-learning application show positive outcome. The application development not only completed within a short duration of time, but also optimized in terms of processing usage, data space and user acceptance. The development team faced minimum problems during the development activities. For future works, we will develop m-learning application that has more activities such as quiz or test, and the use of video as the learning objects would be necessary.

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