Towards Content Adaptation for Mobile Learning

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Abstract. The study develops content adaptation of m-learning. M-learning content adaptation is quite important, combining mobile technologies and learning together are highly valued by researchers. Content adaptation refers to different kinds of software and coding applications that use for learning. In order to develop mobile content adaptation applications, we should follow some principles for mobile devices features and learning characteristics.
So as to know explore best way for m-learning content adaptation applications, a mobile MMLS demo was carried out with 100 students. The methodologies of the study were consisted of survey and interview. The finding of the study was analysis. Based on the results of survey and interview, that is necessary and tremendous impact to m-learning for touch screen to create a suitable content adaptation.

Keywords: Content adaptation, Navigation Design, Layout, Content Design

1. Introduction

Mobile learning (m-learning) is a field which combines mobile computing and electronic learning (e-learning). In recent years, the rapid development of wireless technology and mobile information technology boosted birth of the brand-new mobile learning (M-learning).

Increasingly, users want to view multimedia content created specifically or customized to meet their needs and preferences at least. Joseph and Maria (2007) realized people watch videos. Maybe they are interested only in content to meet their requirements and expectations. Besides, they are often interested in content. In addition, achieving interoperability across platforms dictates that content either original or modified adheres to certain standards. Although some image tracking techniques create or tailor content by working directly with raw basic and multimedia content, matching the user's content needs and preferences becomes more difficult as the complexity of the user's requirements increases.

Content adaptation is the process of converting the multimedia content available from the content provider into a format which can be consumed by user while also maximizing the user's quality of experience. In m-learning, it also needs efficient solution to enable the use of a content variation of content, under different network conditions and natural environment and primarily realized in the form of text, images, videos, even layout adaptation (Jannach, Leopold, Timmerer &Hellwagner, 2006).

Content adaptation is important in mobile learning. It is a technique to provide the most suitable content presentation according to students' computing context student's computing context that is referred to as devices, network, location, and time, which affect students' mobile access of learning content (Yang, 2006). Our content adaptation technique demonstrates the needs to achieve the aforementioned objectives and in lower reading comprehension due to such content adaptation. The questions addressed what is the appropriate content adaptation for touch mobile devices?

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2. Literature review

2.1. Adoption of Mobile Learning

The educational design of m-learning can be achieved using existing teaching and learning theories. The opportunities presented by m-learning enable a full range of pedagogies to be adopted by educationalists designing m-learning. An understanding of relevant formats, codes and containers used to support learning activities becomes more important as learning activities are developed, and became an important issue for resource developers.

Mobile learning becomes more and more complex which includes graphics, sound, animation, interactivity, narrative and etc; thus, there are many problems of content adaptation include how to solve limited computational capabilities, display sizes and moving environment we need improve.

2.2. Development Principles Targeting Mobile

Development of ubiquitous learning application is dependent of four key factors, affecting effectiveness of usage of applications: Capabilities of communication protocol being used; architecture implementation; learner device capabilities; software tools and technologies used for development. Jastin (2006) mentioned that applications have narrow bandwidths; system resources used; display limitations; power consumption. They are typical for development of mobile applications, which supports ubiquitous learning.

2.3. Demands for Mobile Learning Content Adaptation

Mobile users often encounter a variety of presentation issues. Although handheld devices provide good mobility, they generally have lower computing power, smaller display screens and slow networks. Direct content delivery without layout adjustment often leads to the disorganization of information previously mentioned. It also requires users constantly in the vertical and horizontal scroll bar to see complete information.

2.4. Implement Adaptation for Multimedia Content Methods

Content providers can encode multimedia content with specific parameters, or a media converter can convert it to another format to better fit the delivery context. For example, in a traffic-heavy network, an adaptive system may regenerate content with fewer colours and lower resolutions for reducing trans- mission latency. It can also switch media modality in order to suit the current network bandwidth.

A variety of approaches can be applied to implement adaptations for multimedia content: multiple encoding, trans-coding, layered encoding and rate shaping.

We believe that enabling access to adaptive, personalized, and context-aware information and service are crucial to fully take advantages of the pervasiveness and convenience of mobile devices. But encoding support content adaptation is very hard to getting started designer.

The paper uses them to support the content, not only keep the benefits and drop limitations of these methods, but also explore new technologies and knowledge of content adaption for m-learning analysis.

2.5. Learning Theories

Kristine (2007) mentioned that educators will have to shift from being transmitters of knowledge to facilitators of learning, in order to create new learning pathways that are more situated, personal, collaborative, and long term. To help educators make the transition and offered the following suggestions for adapting mobile learning to some major types of learning, include behaviorism, constructivism, situated learning, collaborative learning, informal/lifelong learning, support or coordination.

For example, quick feedback or reinforcement can be facilitated through mobile devices. Mobile devices enable immersive experiences such as those provided by simulations or games. Learners could take mobile devices into authentic learning environments or "context-aware" environments, such as specially equipped museums. Mobile devices provide a handy additional means of communication and a portable means of electronic information gathering and sharing. Mobile devices accompany users in their everyday experiences and become a convenient source of information or means of communication that assists with learning.

Mobile devices provide just-in-time access to learning resources, news, information, planners, address books, calculators, and so forth.

3. Research Methodology

Our m-learning system is based on MMLS (Multimedia Learning System) but only focuses on mobile devices. In addition, some mobile utility tools are added. For m-learning performed on touch mobile devices system offers a demo.

The research type is experimental. It is based on experimental group. Trough literature view, after creating mobile learning website for MMU (Multimedia University) students, one group will work with this website first. Afterwards, they will be given a feedback. For the control group, all of students will work with the website which focus on mobile devices and compare to original website.

Multimedia Learning System (MMLS) was developed at MMU not only to suit the e-learning system, but also to focus on the needs of the entire educational enterprise. It is an intelligent management system which serves as a platform for the delivery of multimedia rich contents to its learners. Within the technological framework, MMLS is designed as an intelligent, interactive, self-paced, instructor-led, web-based teaching and learning tool. The system is user friendly, platform and database independent, maintaining auto-administration. Furthermore, it is a fully web-based intelligent learner tracking system along with an instructor-led course management. Key features of MMLS are course management by an instructor, intelligent delivery system, questions bank, online self test, short notes, course outline, past year exam papers, lecturer notes, references, e-mail, chat, discussion board, online forum by course for asynchronous interactions, extensive student monitoring and tracking through Short Message Service (SMS)(Reaz, Hussain & Khadem, 2007).

The m-learning demo was designed based on previous experience and research. The purpose of the m-learning system was to follow MMLS of MMU. The mobile MMLS was developed using CSS 3, HTML 5 and JQ touch. The mobile MMLS already uploaded to web server. Students could go to the address anytime.

4. Discussions

Touch screen mobile devices are tidal current in mobile's market. 100% interviewees stated that they would like to use m-learning like mobile MMLS content adaptation learning system or website. The major factors are based on navigation design, layout design, designing of content which are easy to use. 77% and 78% participants approved of "Overall ease of use" and "Attractive appearance" items.

Appropriate content adaptation contains three sections in the study for touch mobile devices. They are "Navigation Design", "Layout" and "Content Design". The details are explained in the following sub-sections.

4.1. Navigation Design

A good navigation design could be due to the satisfactory page, such as links, table of contents. In addition to the frequency of navigation design in survey, 5 items were analyzed.
- Provide overt and easy navigation system
- Provide orientation clues
- Use consistent style and your
- Favorite colour for links
- Table of contents
- Use suitable pages to avoid scrolling

Participants' responses appeared to be at least 71% of them strongly agree or agree with the navigation design details. Many items of navigation design such as overt and easy navigation system, orientation clues, consistent style and colour of links, table of contents and suitable pages to avoid scrolling can be easily read by mobile devices. Some of the participants stated that it also can offer more languages and colours choices,

execute unnecessary links, images, banner and any advert, as so on. The interaction with classmates or teachers can be easily established and information communication quickly and simply.

Based on the participants' answers, it is clear that their navigation design ideas are personality and ease navigation. M-learning system should be a simple, easily, clearly and personality structure. All of the items are suitable condition to design ease navigation for content adaptation of m-learning.

4.2. Layout

In the context of the study, a large number of students felt better about layout of mobile MMLS. There were 6 items in layout. They were "Amount of enough information (tools) on the page" "Provide clean, tidy and consistent page layout", "Use simple and plain background", "Page size fixes the screen size", "Clear buttons" and "Inside images". The top of item is "provide clean, tidy and consistent page layout" (88%). The disputed item is inside image or not. The participant comments "Images can be more attractive, but maybe make it slowly." One of participants suggests "We can do a link, if you want to see image, link to another page." However, they almost strongly agree or agree the layout design of mobile MMLS.

Layout of m-learning should be easy, sample. Users can see a tidy and clear web page by mobile small screen. In view of touch, the system needn't mouse design. The mouse is hand of users. For this reason, the layout design is based users' hands. It was designed the big buttons which suit hand to touch.

4.3. Content Design

Moreover, receiving comments for content design from participants was also considered as quite agree by many students, at least 72%. It indicated that students expected feedback and appreciation from their experiences of mobile MMLS. Most of students suggested that add more tools and functions. Totally, most participants preferred to content design, and would like to use mobile MMLS or m-learning like this.

Overall ease of use and attractive appearance both are content design purposes. On account of touch screen, the content design should be as a clear list, use high contrast colour between background and text, and offer different colour after users touch the item. The system should be offer more interactivity tools that can be used by touch screen.

5. Conclusions

This study has discovered some factors of content adaptation which effected students' usage of m-learning. The analysis and findings have indicated some of the most influential factors such as: navigation design, layout and content design. In addition, designers do need to pay attention to the potential factors and creative more personality and interactivity m-learning systems.

Based the research, author discovered that navigation design ideas were personality and ease navigation for touch screen. M-learning system should be a simple, easily, clearly and personality structure. Users need a tidy and clear layout of mobile small screen. The layout design should be suit users' hands as the mouse for touch screen. Content design should purpose overall ease of use and attractive appearance. Owning to touch screen, the content design possessed clear list, use high contrast colour. The system should be offer more interactivity tools which focus on touch screen.

In conclusion, the findings suggest that lecturers not only need to support content adaptation of m-learning in technologies, but also need to pay attention to participates' needs in learning experiences, provide constructive feedbacks, and ensure the content adaptation is expectation.

Mobile MMLS can be real build and extended to other universities in Malaysia. More and more users can attend study. At that time, it should be more factors waiting for discovering. The future studies are suggested to focus on completed system and long time to discover more factors as well as to solve m-learning limitations, and find better content adaptation for m-learning. The future studies also can be provided friendly and efficient web browsing, content adaptation should be more hommization. In the future, not only users can use the websites which is focus on mobile devices, but also staff and students use interactivity tools for mobile, and build the new websites by model. These approaches proposed adaptation for content transformations.

6. Acknowledgements

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