

Evaluation of WAP Services in a Campus Environment using a Quantitative Approach.

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ABSTRACT

In this paper, we introduce a novel approach to sharing information between students and lecturers in order to enhance the quality of information in a campus environment via Wireless Application Protocol (WAP) technology. We describe a network for distributing campus information among lecturers and students. The concept of developing campus information via WAP technology is to ensure that student can access information at any time, at any locations and ad-hoc basis. WAP Based Students Information System helps the students and lecturers on campus to find and access information based on an *ad-hoc* basis, which is of interest and relevant to students or lecturers; they only need a PDA or a mobile phone.

The second purpose of this study is to evaluate the capabilities of WAP service for retrieving and sending information. In this research, focus groups are being used to develop survey instruments for measuring students' satisfaction with WAP service implementation. Then, the survey instruments will undergo testing and evaluation process for measuring the effectiveness of this WAP service implementation in campus environment. Students mostly agreed this WAP service is possible to utilize some of the campus problems in providing useful information solutions such as students' results, students' courses, announcements, and news. The results and analysis show that based on framework the WAP-based customized information services have successfully performed in campus environment. Therefore, campus institutions can provide and offer information for mobile users (students) as value added services.

(Keywords: WAP, wireless application protocol, PDA, information, students, quantitative, mobile phone)

INTRODUCTION

This study focuses on the development of a mobile browser in a campus environment that supports WAP as well as Web service. The system will help students to check their academic results and related course information, view personal information, check for announcements, and even courses registration. It manages students' information systems in the wireless environment. Students will be provided with more value-added services, which are easy to use directly from a mobile phone to access information at any time, at any location.

The current issues are: i) information cannot be access at any time, at any location (mobility); and ii) registration and results need to be collected at main campus locations. This aim of this study is to improve the convenience of student information retrieval. Deployment of campus information-oriented applications for mobile terminals and the wireless application protocol (WAP) has provided a promising solution. In addition, it is convenient to access online information via mobile devices between students and lecturers. The students and lecturers can immediately access information about the campus and save the time spent in reading large amounts of electronic documents.

The first major effort entails researching and determining a set of criteria to use in evaluating the efficiency of WAP services. The second major effort involves WAP interface and design. WAP services were evaluated related to their features and capabilities using a quantitative approach. Students were asked to comment on the finding of efficiency for WAP services. The quantitative survey method used in this study helped gain a deeper understanding of the features and characteristics WAP services.

RELATED WORKS

Smart terminal equipment such as mobile phones, PDAs etc., developed quickly over the last decade [1]. WAP provides a viable technical solution for wireless data terminal applications. Wireless networks have many characteristics, for example, they can be visited conveniently and fast, and accessed anytime and anywhere. Therefore, we want to focus on the benefits, more specifically on the benefits that are associated with the use of mobile services.

The obvious benefits of mobile services are related to mobility in space. Mobile devices and services offer people the opportunity to move around while maintaining access to relevant services and staying (socially) connected [2]. The nomadic value of mobile services is reflected in concepts like “anytime and anyplace” [3].

Pagani [4] mentions mobility, availability (anytime, anyplace), and personalization as important benefits of (multimedia) mobile services. Some educational communities and organizations have recognized the possibilities of m-Learning. M-Learning may provide tools to respond to the demands of working life and information society [6]. One way to enhance m-Learning is to raise the usability of mobile terminals as good usability is the basis for the meaningful and effective learning [5].

Most handheld devices have already been equipped with a web browser. A mobile browser can become a powerful platform for playing a variety of digital media contents, improving the current situation where service providers need to prepare their own players for many different types of media contents [7, 8, 9, 10, 11, and 12].

Mackulak and Savory [13] carried out a questionnaire survey on the most important simulation software features. The most important features identified include: a consistent and user-friendly interface; database storage capabilities for input data; an interactive debugger for error checking; interaction via mouse; a troubleshooting section in the documentation; storage capabilities for simulation models and results; a library of reusable modules of simulation code; and a graphical display of input and output.

The quantitative methods are experimental design and analysis; case study design and analysis; and survey design and analysis (Figure 1). For

example, evaluation of software development as below [14] [15]:

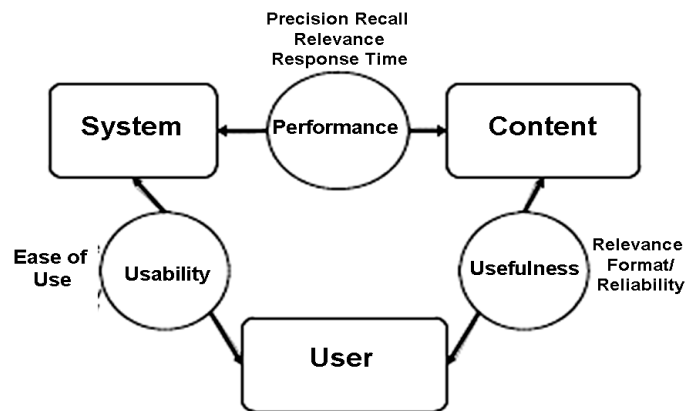


Figure 1: Evaluation Technique for Software Development.

METHODOLOGY AND SYSTEM ARCHITECTURE

Figure 2 shows the overall framework of the WAP services implementation in a campus environment. There are four phases development process:

- i) Web server;
- ii) WAP gateway;
- iii) WAP content/server; and
- iv) Link to existing campus network/Internet/GSM/3G.

The network architecture design of the campus WAP Based Students Information System, consists of two-system architectures:

- i) Existing web server network; and
- ii) New implementation of WAP service.

Students and lecturers can access information via traditional Web service or WAP service (see Figure 3 and Figure 4).

Figure 5 shows WAP services evaluation process using qualitative approach. Students from Malaysian Institutes Information Technology faculty, University of Kuala Lumpur, will select to response the performance of WAP services.

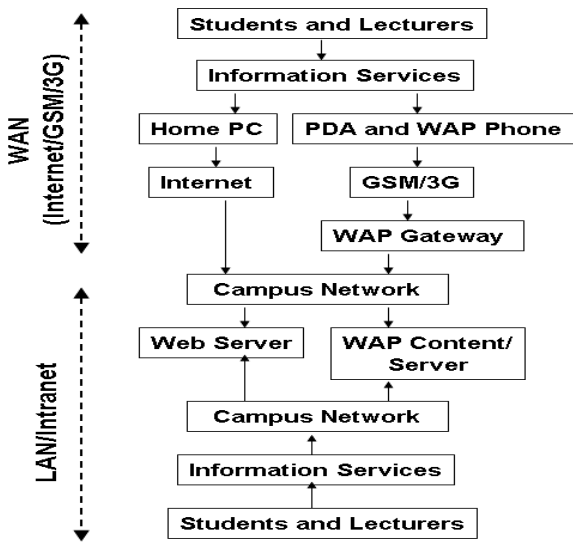


Figure 2: Framework of WAP Service Implementation.

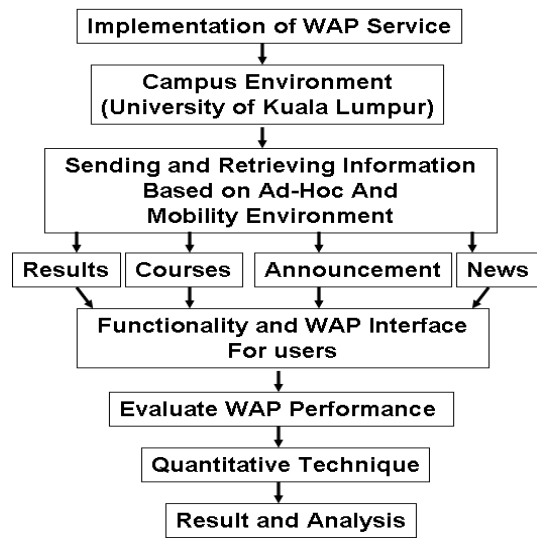


Figure 5: WAP Services Evaluation Technique.

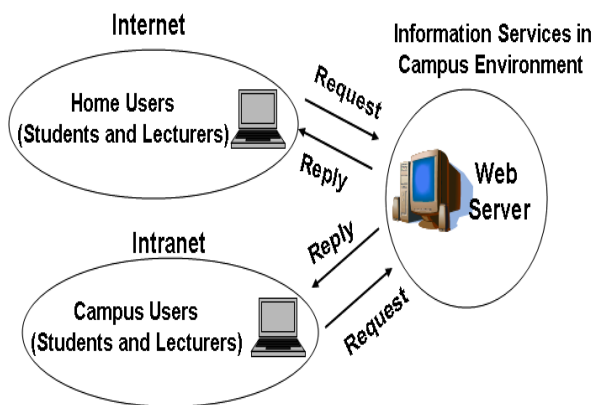


Figure 3: Traditional Web Service Architecture.

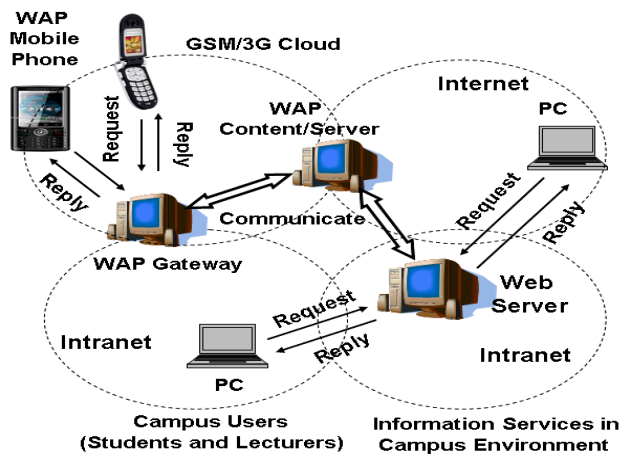


Figure 4: Convergence of WAP and Web Service Architecture.

EVALUATION AND RESULTS OF WAP SERVICES

Results of WAP Services

We have setup a WAP service environment to retrieve information at University of Kuala Lumpur in Malaysia based on mobility approaches. The main objectives of this convergence technique between WAP and Web as follow:

- i) Provide an easier method to access information;
- ii) Provide a WAP based information retrieval system to build an information system that could be available to the students at any location; and
- iii) Provide easy key access and menu-driven interface.

Figure 6 shows the current Web-base Students' Information System. We have converged WAP and Web service to ensure that students are able to access student information system at anytime and at any location.

Figure 7 shows the design of the campus WAP Based Students Information System that consists of three-system modules:

- i) Student;
- ii) Course;
- iii) Personal record information and;
- iv) Announcements.

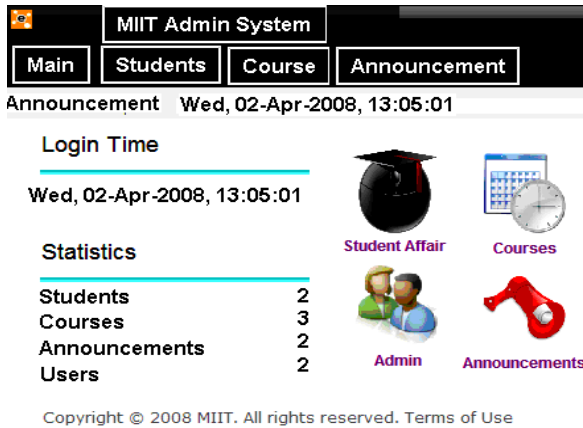


Figure 6: Web-base Students' Information System.

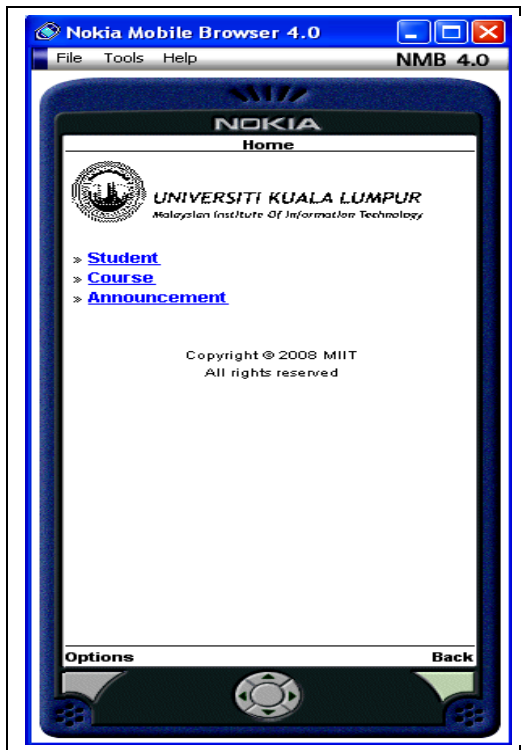


Figure 7: Student Main Menu.

The WAP Based Students Information System is also provided a security system, therefore, students need to key-in their 'ids' and 'password' (see Figure 8). In addition, students are able to display their profile (see Figure 9). Students are also able to register (add, delete, modify) their semester subject through WAP Based Students Information System and access their semester result from everywhere using PDA or mobile phone (Figures 10 and 11). Menu driven interface will apply in the system to minimize text entry by

keypad. The selection menus are well categorized in order to assist the student and navigate the application.

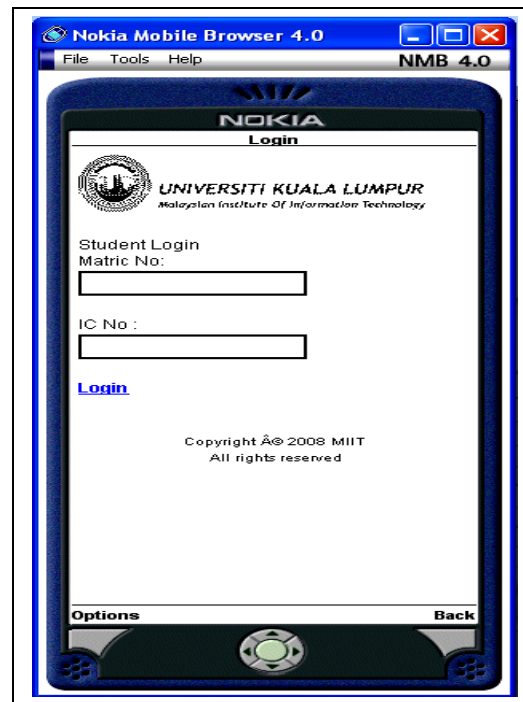


Figure 8: Student Login Page (Security Purpose)

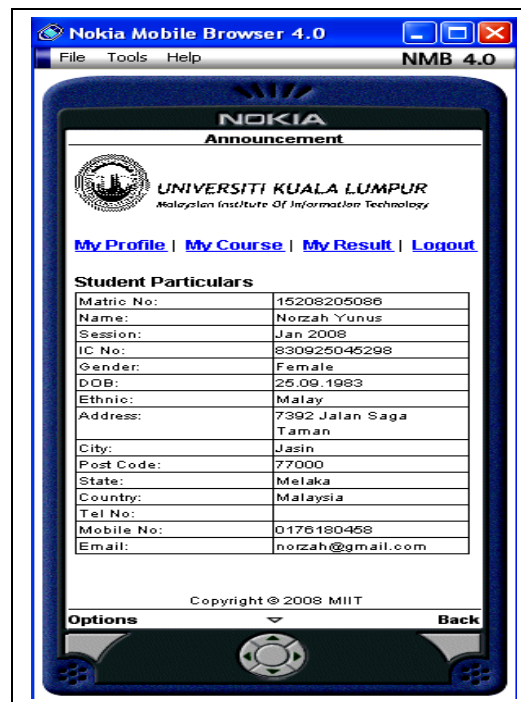


Figure 9: Student Profile Layout.

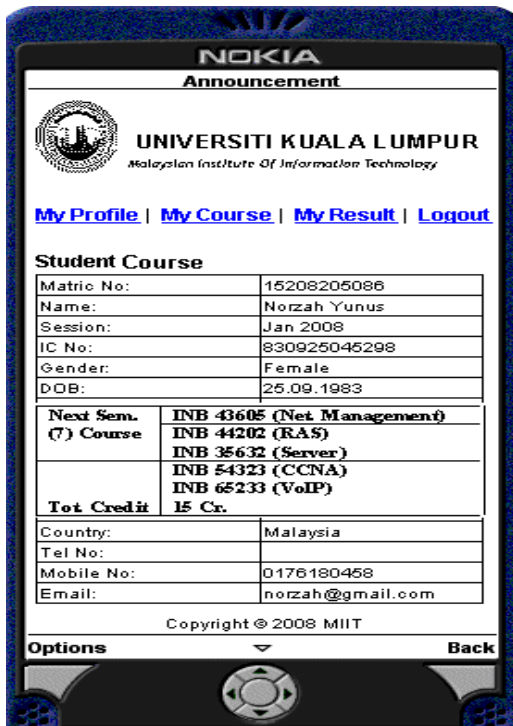


Figure 10: Subject Registration via WAP Service.

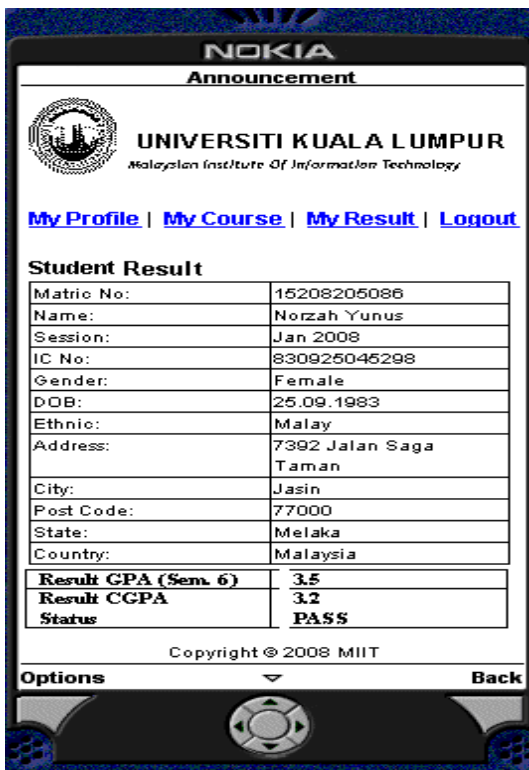


Figure 11: Display Student Result.

Evaluation of WAP Services: Students from MIIT faculty, University Kuala Lumpur were selected to be the evaluators of WAP service implementation in the campus environment. The number of students from each department is 20 students (refer to Table 1). Table 2 shows the criteria categorized and classification of WAP services evaluation.

Table 1: Sample of MIIT Students Evaluation.

Students Response: Faculty of MIIT, University of Kuala Lumpur	
System and Networking Department	20 students
System Engineering Department	20 students
Multimedia Department	20 students

Table 2: Evaluation of WAP Services.

Evaluation of WAP Services Implementation	
Functionality and Interface	Easy of Information Display
	Easy of Information Organization
	Provide help utilities screen
	Format and Position Arrangement
	Error Message Provided
	Able to Navigate Information, News, Events, Results
	Mobility and Ad-Hoc
	Easy to use
	Adequate Information provided

Most of the students agreed and categorize WAP services as moderately satisfactory in information organization (50%), information display (50%), format, and screen arrangement (30%). Other students agreed and categorized information organization and display as 30% satisfied and 20% as very satisfy. More than 60% of student responses were that WAP format and screen arrangement is satisfactory (Figure 12).

Half of the students (50%) moderately agreed the WAP services are able to generate error and alert messages, while half of the students (50%) categorize the WAP services as good for providing error and alert messages. Most students (83%) agreed these WAP services are able to provide output, menu utilities, and are user friendly. While, 16% of students characterize these WAP services as very good for generating output, menu utilities, and are user friendly (Figure 13). Figure 14 shows that 83% of students categorize the WAP services menu as able to help and easy for students to navigate to the relevant information.

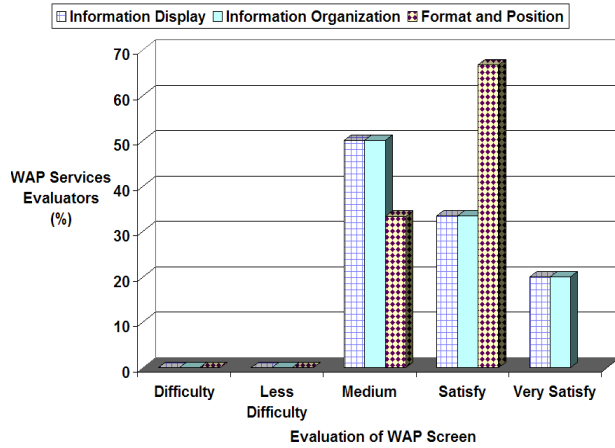


Figure 12: Evaluation of WAP Screen.

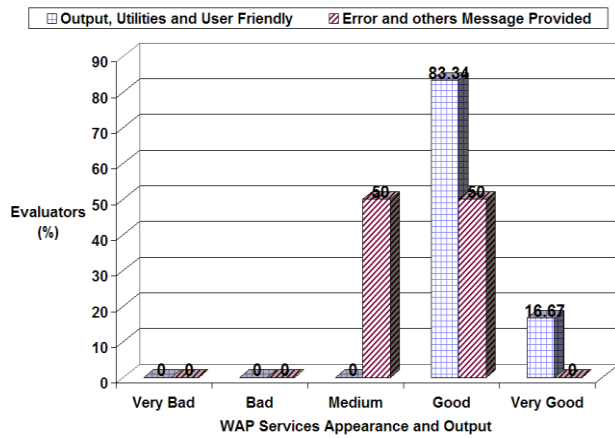


Figure 13: WAP Services Appearance and Output.

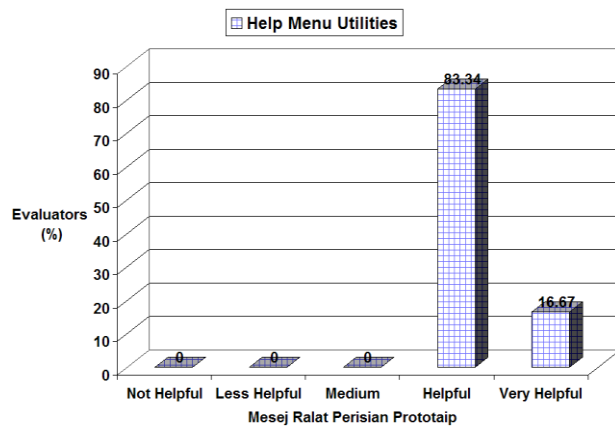


Figure 14: Helpful Menu

A majority of students (83%) agreed these WAP services are able to make course registration. A minority of students (16%) classified WAP services as able to make course registration very excellent (Figure 15). Some of the students (66%) are agreed this WAP services able to view the examination results and others (16%) classified this feature as as moderate and excellent. Some students (67%) agreed that WAP services are able to send and retrieve information based on *ad-hoc* and mobility environment, and others (33%) classified this feature as excellent (Figure 15). Some students (67%) agreed that WAP services were able to navigate information, and 33% students classified as excellent the navigation of information (Figure 16). A majority of students (67%) are moderately agreed the WAP interface is easy to use (Figure 16).

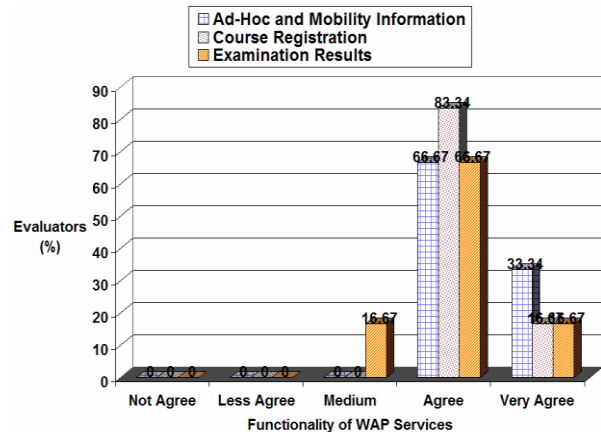


Figure 15: Functionality of WAP Services.

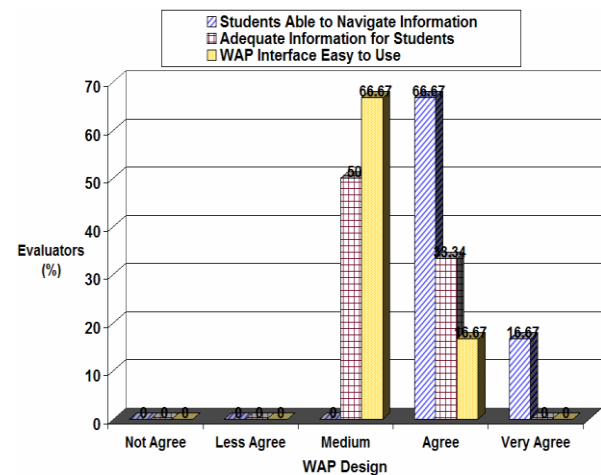


Figure 16: WAP Design.

CONCLUSIONS

In this paper, we presented a WAP-Based Students Information System; a mobile WAP browser for handheld devices. This study focuses on the development of a mobile browser in a campus environment that supports WAP as well as Web services. It is clear that there is a need for development for mobile services and terminals in the campus environment so that students are able to retrieve information at anytime and at any location.

The practical value of mobility in teaching will be greater in the future because mobile terminals are flexible to use and they enable real time and place independence. Our WAP services were evaluated by MIIT students using a quantitative approach. Our WAP services can determine and solve problems for retrieving information. Based on the results, our research shows that WAP-Based Students Information System enabled mobile students to enjoy valuable information and a large number of services over mobile networks.

This WAP application allows students to request academic information using wireless devices. By using this application, students are able to request and retrieve their examination results, view their profiles, check announcements, and register for courses. It can use to retrieve information based on *ad-hoc* and mobility environments. In addition, it is easy to use and provides a user-friendly graphical and text interface.

This study presents a comprehensive list of criteria structured for evaluating WAP service architectures. The results from our study show that evaluators mostly agreed that these WAP services combined with mobility environment are able to generate valuable insights for students to use the requested information anywhere, on and off campus environments.

In general, evaluators perceive these WAP services in a positive manner. Initial quantitative findings from this study will provide a valuable assessment of satisfaction with WAP services as they are implemented. Based on focus group feedback, this WAP service can be significantly enhanced to enable communications with students and lecturers. The system can be further enhanced to become a more powerful and sophisticated system. There are still many aspects for improvement and enhancements of the WAP system can be made in the future to

meet changing needs of the students. There are several enhancements that could be extended to the usability of system developments such as reporting modules, links with other faculties' student information system, and SMS messaging.

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