MOBILE SYSTEM FOR MANAGING AND MITIGATING THE ACCOMMODATION PROBLEMS

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Abstract. Students either local or international experience different adjustment problems while moving one place to another place, and out of those problems, finding suitable accommodation is the most challenging one. However, at Universiti Utara Malaysia (UUM), the accommodation centre for the students is utilizing the traditional method for managing and processing the issues related to the students’ accommodation. Therefore, the current empirical study seeks to exploit the modern technologies, such as mobile devices to increase the communication among the students and management of resident. The present study has three core objectives i.e. identifying the requirements for managing the student accommodation, designing the mobile accommodation system and evaluating the usability of the proposed mobile accommodation system. To evaluate the usability of the system, a usability scale is used and data are collected from 40 students. The results reveal that the users accept and are satisfied with the interface functions, usability, integrity and other facilities for the application. Thus, students and accommodations staff can use the applications successfully.

1. Introduction
Student accommodation plays a significant part in a student’s life. Student learning can be enhanced and made more effective when learning environment is made adequate and appropriate [1-2]. Previous studies show that accommodation plays a vital role in the physiological needs of the students, and that is considered as a condition for student’s quality survival in terms of health, academic performance and learning [3]. Therefore, a favorable environment plays a significant role to maintain the academic performance of the students. In general, all students (local or international) experience different adjustment problems while moving to one place to another place. Duangpracha [4] states that leaving home carries various difficulties; out of them, finding suitable accommodation is the most challenging one. Several studies have been conducted on the accommodation and its effects on the students’ performance in many western countries. However, less studies are conducted in Malaysian Universities.

In Universiti Utara Malaysia (UUM), the accommodation is provided within the campus territory. However, the system to manage and mitigate the accommodation for the students is utilized by the traditional method for managing and processing the issues related to the student’s accommodation. The advancements in wireless and mobile technologies have developed many mobile-based applications in various fields, such as health, agriculture, education and entertainment.
These technologies pave the way for private and public organizations to deliver, can organize and distribute services to the public in a more well-organized and cost-effective manner [5].

Wright [6] states that the ability of online services not mainly focuses on reducing the effort and the time of the users, but also on improving client services and the services validation efficiency. Students’ accommodation should be treated as an issue of great priority. An accommodation problem is considered as one of the daily stressors, affecting the students’ performance [7-8]. These stressors are associated with the depressive disorders among the university students. There are several factors that are considered as the major factors that may lead towards the failure of the students in the final exam, and accommodation problem is found as one the vital factors [9-10]. At UUM, there are many residential halls that are named by different companies, and each of the residential hall has their own office, but the main authority of all the offices is under Student Accommodation Center (SAC). Therefore, the students must come and apply for the accommodation at SAC. Due to large number of students in UUM, usually there is a long queue of students. Moreover, regarding the employee, there are many branches of residential hall under Student Accommodation Center in Universiti Utara Malaysia. Each branch has different number of students depending on the level of education. Therefore, it is difficult for the employee of the student Accommodation Center to deal with the problems of the students. Furthermore, the employees are also facing the difficulties in terms of communicating with the students and determining the proper time for them to address the problem. Therefore, ICT can deal with a substantial number of procedures as suggested by Spotti, Kluzer & Ferrari [11], and it also can enhance the communication among the stakeholders. Indeed, the previous studies also assert that there is a need to utilize the modern technologies to deal with accommodation problems, especially at UUM. Olaniyi [12] affirms that there should be a convenient accommodation system for the students during study times. Therefore, keeping the basis of the facts that previous studies have identified, the present study seeks to explore the modern technologies (such as mobile devices (android or iOS platform), Web 2.0 and cloud-computing to increase the communication among the students and management of the residential halls. The result of the study relates facilitating the students’ accommodation process and easing the accommodation problems.

Therefore, based on these arguments, this study strives to exploit the modern technologies to design a comprehensive system via mobile device (using android) and personal computer (using Web 2.0) to enhance the communication between the student and SAC. Some of the functions benefits the students, and they are hostel application, reporting to complaints, and requesting for services, and other functions that benefit the SAC include room allocation, student feedbacks, and student complaint list. Therefore, this project aims to develop a mobile-based application to facilitate the management of students’ accommodation and mitigate the problem of students’ accommodation. Thus, based on the issues highlighted, this study identifies the requirements for managing the student accommodation, and does analysis and design of the mobile accommodation system, and evaluates the usability of the proposed mobile accommodation system (MAS).

2. Related work
Colleges or universities with residential facilities play a significant role in numerable top universities in the world. It has been believed that student’s educational involvement and outcomes enhance if the student lives in a university-affiliated residence. Campus residence provides a potentially effective environment that encourages openness to diversity as it provides extended opportunities for students to collaborate with peers and staff to implement programs that expose students to multicultural issues [13]. Not surprisingly, earlier studies have found that living on campus is related to increasing tolerance and openness to diversity as compared to commuting from home [14].

College students are the group of people who have more complex problems than how it is used to be over the past 10 years where the difficulties faced are on the demands of a greater academic studies. Kumaraswamy [15] states that stress, nervousness and depression among college students are causes of concern. Apart from that, there is a crucial urgency which demands for the adequate accommodation for the students which emphasizing on the implementation of programmers related to education as well as the welfare of the students in a qualitative way. It is also deemed necessary for any institution to provide the students with the best possible accommodation. Khawaja and Dempsey [16] state that rising discontent with accommodation may serve to increase the psychological strain on internationals students.
The advancements in wireless and mobile technologies have triggered a significant number of applications that had been established in various fields, such as health, agriculture, education, entertainment, among others. Furthermore, these technologies pave the way for private and public organizations to deliver, can organize and dispense services to the public in more efficient and economical manner. The Internet and mobile applications are becoming so common use in our everyday life in the sense that we would not go a single day without using them[6]. Thus, the ability of online services not mainly focuses on reducing the effort and the time of the users, but also improving client services and the services validation efficiency. Therefore, this study explores the development of mobile accommodation system (MAS), which utilizes the mobile computing technology for assisting the accommodation process in UUM.

3- Methodology
Methodology used in the present study comprises of five phases namely, the awareness of the problem through reading and analyzing literature, suggestion phase through the visualization of the interaction between the prototyped used, development phase using Java program, evaluation phase that consists of testing the usability and conclusion phase that summarizes all the phases. The details about the work carried out for every stage is explained below.

| PHASES     | ACTIVITIES                                                                 | OUTPUT                                                                          |
|------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Awareness  | • Read and analysis several materials (articles and books)                    | • Highlight the issues related on the accommodation                            |
|            | • Conducted interviews with employees and students                           | • Explore the requirements used by the stakeholders (student and SAC)         |
| Suggestion | • Visualize the interaction between the tool and prototype functions         | • Design the use case and the sequence Diagrams as well as the class diagram   |
|            | • Exploited the UML diagrams                                                |                                                                                |
| Development| • Using Java programming language                                           | • Design the Mobile-Web prototype for improve the interaction and mitigate the accommodation problems |
|            | • Android Platform                                                          |                                                                                |
| Evaluation | • Develop the mobility and performance survey                               | • Evaluate the final prototype through two aspect: firstly the usability issues, secondly, the performance and functionality purpose |
|            | • Using UCPI progress                                                        |                                                                                |
| Conclusion | • Using the APA style                                                       | • Discuss the final results from the questionnaires and highlight the limitations and future works |
|            | • Harness the results from the survey                                       |                                                                                |

Figure 1: Proposed Methodology

3.1 Awareness Phase
Awareness phase involves requirements of the prototype as requirements identification is an important phase in the prototype. This phase also requires understanding the objectives, the scope, and the problem. Regarding this study, awareness of the current problem is highlighted by the thorough reading of the literature and from real life. As for the literature, the previous studies assert to solve the accommodation problems because the accommodation issues affect the student performance and stress. About real world, the interviews with employees and students are conducted for this purpose, and the results indicates that there is less communication between the Student Accommodation Center (SAC) and the student. Moreover, there is lack of coordination between the staff and students to fix the problems related to accommodation issues.

3.2 Suggestion Phase
After identifying and understanding the needs of users from the first phase of design research method, this study suggests using a mobile device to build MSAS. The output of this phase is quite tentative prototype. The analysis and design of the system constitute the system prototype design using UML relationship composition. In general, the UML diagrams used are those of case diagrams, detailed sequence diagrams (for each use case) and more importantly, the class diagrams. The proposed architecture for the system can be seen in the following:
3.3 Development Phase
The main tools that is used to design the Mobile System for Accommodation of students System (MSAS) is Windows 7, and used as an operating System for a PC or Proto-type for development purposes Eclipse was Used as development tools. Photoshop was used for designing interface required by the system.

3.4 System Design
This section gives detailed explanations to the design mobile system for accommodation of students (MSAS) prototype, depending on Unified Modeling Language (UML) for mobile application. The process of the application is designed in a way that helps its user to understand. UML comprises of diagrams and the flow chart of the system’s architecture, and it is the standard language that helps to specify, visualize, construct and document the artifacts of the software system; the details are mentioned in the analysis and comparison section. It has been clarified in the use case diagram, activity diagram, sequence diagram and state chart diagram sequentially. The specification for every use case and the list of functional requirements and non-functional requirements are also presented.

The illustration of MSAS application requirements is one of the most important stages for the development of useful and accurate mobile application. Besides, the functional requirements are the functions or techniques used in MSAS application while the non-functional requirements of MSAS application explain a methodical and pragmatic approach to application development and the quality measurement for attributes, as example usability, performance, and reliability. To draw necessary diagrams that play a significant role in the developmental stage of mobile application. The following section of the study illustrates the design of the prototype.

3.5 Use Case Diagram
The main functional requirements in MSAS formalized through modeling methods, using case diagram is one of these methods which describe what does a certain application from an external observer’s standpoint. The main goal of using use case diagram is to understand application functions and what it does; an actor is involved in doing application functions [17]. The relationship between student and use case are shown in the form of case diagram which is a three-layered architecture, and it is a tool to present the design and software [18]. The system has following main functions: login, registration, home page, booking, SAC information, complaint’s report, complaint status and instant chatting as shown in the Figure 3.
3.6 Class Diagram

ERD is a kind of graph that is used to visually present the entity in the form of set, attribute, and the relationship between entities in a database. ERD is top-down approach in database design which gets started by identifying the vital data called entities, and associations between the data should be represented in the model. ERD is developed through using the technique of normalization as shown in the Figure 4.
3.7 Application Interface of mobile Application and web server

The MSAS application is connected between SAC Officers, and students.

3.7.1 Direct Connection
The mobile application sends a request to web application to get response. To ensure the privacy, the Secure Socket Layer (SSL) or another encryption type is used. There are three features of connection:

- Direct connection using standard telnet/SSL;
• User verification via simple login/password;
• UI commands converted to server commands.

3.7.2 Server-side application
The mobile application and the server-side application are directly connected. In other words, a software program is run on a remote server. It has a unique feature of connection i.e.: Direct connection to a server-side application.

3.7.3 Web application
The mobile application can communicate with the same web application to get information from it. There are three features of connection:
• Using of a web services via specialized API;
• User verification via simple/secure login/password;
• UI commands converted to API requests.

3.7.4 Cloud Integration
Cloud Infrastructure as a Service with the organization (UUM) receives a private cloud which is pretty like the classic understanding of clouds, but that is used solely for UUM purposes, and it has better security for connecting to cloud by means of its services (API).

3.8 Evaluation Phase
Evaluation phase is the last phase of the methodology of the application. Feature test is an essential part to know if the features developed are easy to use. A usability test is one of the most significant techniques for evaluation because it needs students to use the developed application.

The evaluation process is conducted in determining the level of usefulness as well as the ability in operating the system after the development of the system by the System Usability Scale (SUS) by Bangor et al., [19]. A sample of 40 students from UUM are involved in gathering data to evaluate the perceived usability of a system which gives rich information with respect to the multilingual system.

4 Findings And Discussion
Data is collected using randomly sampling technique. Each of the respondent is given a brief description regarding the use of the MSAS and the user interface other prototype. However, the user has been given ample time to learn and explore the content of MSAS. Once they are done with the exploration, the users are given a questionnaire to evaluate the usability. Statistical package for social science (SPSS) version 23 is used to analyze the data gathered. The results of the analysis are shown in the table 1.

Table 1 Mean and standard deviation of SUS

| Item number                                      | N  | Mean | Std. Deviation |
|--------------------------------------------------|----|------|----------------|
| I think that I would like to use MSAS frequently. | 40 | 3.80 | 0.72           |
| I found the MSAS unnecessarily complex           | 40 | 3.12 | 0.64           |
| I thought the MSAS was easy to use               | 40 | 3.75 | 0.80           |
| I think that I would need the support of a technical person to be able to use MSAS | 40 | 2.82 | 0.87           |
| I found that the various functions in this MSAS were well integrated | 40 | 3.70 | 0.68           |
| I thought that there was too much inconsistency in MSAS | 40 | 2.97 | 0.83           |
| I would imagine that most people would learn to use MSAS very quickly | 40 | 3.57 | 0.90           |
| I found MSAS very difficult to use               | 40 | 3.52 | 0.78           |
| I felt very confident using MSAS                 | 40 | 3.37 | 0.70           |
| I needed to learn a lot of things before I could get going with MSAS | 40 | 2.70 | 0.88           |
The results of the table 1 show that all questions have high mean score which is approximately 3. Besides, the standard deviations are small, less than 1. This explains that all the statements regarding the usability of MSAS are agreed by the subjects with small biasness or influence of other factors. Reliability is addressed for the usability evaluation questionnaire. One of the most widespread reliability measures is Cronbach Alpha Coefficient (Coakes, [20]. Thus, using the Cronbach alpha reliability of the SUS is used to calculate by using SPSS 23 to determine the scale reliability which assesses the degree of internally consistent. Table 2 presents the Cronbach alpha value for System usability scale. If the measures have a Cronbach alpha of greater than 0.7, these measures satisfy the internal reliability criterion [21]. Thus, the scale is said to have a good reliability i.e. it is internally consistent.

| Cronbach’s Alpha | N of Items |
|------------------|------------|
| 0.792            | 10         |

Based on Table 5.8, the reliability is significant and accepted because the Cronbach alpha value is greater than 0.7 which indicates good reliability of the scales. Through the questionnaire analysis, we can observe that the user in general agree that by using mobile facilities, they make online complaint. The MSAS user has accepted and are satisfied with the application interface functions, usability, integrity and other facilities in-side the application. Based on the result, the researcher has concluded that our application has achieved the goals, and it is worth noting down. The users are satisfied by the MSAS utilization, and they claim that it would be easy to be used in the future.

5. Conclusion

In this study, MSAS is conceptualized to provide facility for students as well as the management team of SAC. The present study addresses the existing gap in the literature about the managing and mitigating the accommodation problems among students at Universiti Utara Malaysia (UUM). The findings of the present study can be applicable for administrators to formulate guidelines in terms of management for future development of student accommodation system of UUM. Hence for future development and expansion of this research, the followings are suggested. Since the scope of this research is limited, further developments should be made Thus, to cover other services of the report complaint, ii) informing users about their reserve transaction by SMS or Push mobile technology, not only be email, iii) making integrating between writing report complaint services and SAC officer services via mobile technology are needed.

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