MOBILE SYSTEM FOR MANAGING AND MITIGATING THE ACCOMMODATION PROBLEMS AMONG STUDENTS IN UNIVERSITI UTARA MALAYSIA (UUM)

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Abstrak

Sama ada pelajar tempatan atau antarabangsa sering menghadapi masalah penyesuaian yang berbeza dan bergerak dari satu tempat ke tempat lain demi untuk mencari tempat penginapan yang sesuai, dan hal ini memberikan pengalaman yang paling mencabar kepada pelajar tersebut. Walau bagaimanapun, di Universiti Utara Malaysia (UUM), Pusat Penginapan Pelajar masih menggunakan kaedah tradisional untuk mengurus dan memproses hal yang berkaitan dengan penginapan pelajar. Oleh itu, projek ini bertujuan untuk mengeksploitasi teknologi mudah alih untuk meningkatkan proses penginapan dan meningkatkan komunikasi di kalangan pelajar dan pengurusan penginapan pelajar. Projek ini mempunyai tiga objektif utama: mengenal pasti keperluan, menganalisis dan merekabentuk, dan menilai kebolehgunaan sistem penginapan mudah alih (MAS). Untuk menilai kebolehgunaan MAS, skala kebolehgunaan digunakan dan maklum balas penggunaan dikumpul dari 40 pelajar di seluruh kampus UUM. Keputusan kebolehgunaan mendedahkan bahawa pengguna amat menerima dan berpuas hati dengan fungsi antara muka, kebolehgunaan, integriti dan lain-lain kemudahan yang disediakan oleh aplikasi mudah alih ini. Oleh itu, pelajar dan kakitangan penginapan boleh menggunakan aplikasi ini untuk menguruskan penginapan mereka dengan jayanya.

Kata kunci: Pelajar Asrama, Sistem Penginapan, Pencapaian Pelajar, Sistem Berasaskan Mobile, Perisian Aplikasi

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 center for the students utilizing the traditional method for managing and processing the issues related to the students' accommodation. Therefore, this project seeks to exploit the mobile technologies to enhance the accommodation process and increase the communication among the students and management of the resident. This project has three core objectives: identifying the requirements, analysis and designing, and evaluating the usability of the mobile accommodation system (MAS). To evaluate the usability of the MAS, a usability scale is used and feedbacks were collected from 40 students around the UUM campus. The results have revealed that the users strongly accepted and are satisfied with the interface functions, usability, integrity and other facilities for the application. Thus, students and accommodations staff can use the applications for managing their accommodation with successfully.

Keywords: Student Hostel, Accommodation System, Student Performance, Mobile-based System, Software Application

Acknowledgement

"In The Name of ALLAH the Most Gracious and the Most Merciful"

(1)In the name of Allah, Most Gracious, Most Merciful (2) Praise be to Allah, the Cherisher and Sustainer of the worlds (3) Most Gracious, Most Merciful (4) Master of the Day of Judgment (5) Thee do we worship, and Thine aid we seek (6) Show us the straight way (7) The way of those on whom Thou hast bestowed Thy Grace, those whose (portion) is not wrath, and who go not astray.

"True are the words of God"

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List of Abbreviations

UUM	Universiti Utara Malaysia
SAC	Student Accommodation Centre
ICT	Information and Communication Technology
WISRAS	Web-based Interactive Student registration and Advising System
UML	Unified Modeling Language
SAS	Student Accommodation System

CHAPTER ONE
OVERVIEW

1.1 Introduction

Student accommodation plays a significant part in a student's life. According to Modebelu and Chinyere (2014) student learning can be enhanced and made more effective when learning environment is made adequate and appropriate. 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. Ezeukwu (2009) declared that accommodation is the pivot, around which, all the activities of students revolved. Therefore, a favorable environment plays a significant role to maintain the academic performance of the students.

In general, all students (whether local or international) experience some level of adjustment when relocating to a new environment. However, compared with their local students, the international students often faced higher adjustment hurdles. Duangpracha (2012) stated that, although studying abroad offers benefits to international students, leaving their home country and achieving a degree in another language also carries with it a range of difficulties, including those associated with finding suitable accommodation. Several studies have been conducted on the accommodation and it effects on the student performance in many countries such as Australia and US. For instance, Duangpracha (2012) found that, the international students come to Australia and faced many challenges; one of the challenges is accommodation. In addition, Yue, Lê and Terry (2014) stated that, the educational institution needs to give consideration to security and best options for accommodation to ensure students' lives are in a secure and low-cost environment.

Moreover, Marginson et al. (2010) asserted that many universities in Australia and other English-speaking countries that provide international education have turned away from direct provision of student dormitory accommodation in favour of the

provision of student housing by non-university agents. This is partly due to space shortages as universities are no longer willing to subsidise on-campus housing despite the pastoral and educational benefits and in some cases it is also due to the partnerships with non-university providers of housing provide revenues.

In Universiti Utara Malaysia (UUM), the accommodation is provided within the campus territory. Most students are required to stay in hostel during their study. However, the accommodation system that provides the services to manage and mitigate the accommodation for the students is still behind other universities. This is because, the existing system still utilized the traditional method for managing and processing the issues related to the student's room or accommodation that required it to deliver an accurate and faster information the users, especially for the students.

The advancements in wireless and mobile technologies triggered a significant number of mobile-based applications which have been developed in various fields, such as health, agriculture, education, entertainment, among others. Furthermore, these technologies pave the way for private and public organizations to deliver, manage, organize, and distribute services to the public in a more well-organized and cost-effective manner (Maake & Mzee, 2014). The Internet and mobile applications are becoming so traditional in our everyday life in the sense that we would not go a single day without using them. Wright (2005) 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.

1.2 Problem Statement

Students' accommodation should be treated as an issue of great priority (Pat-Mbano, Alaka and Okeoma 2012). In the similar context, Sohail (2013) has claimed that accommodation problems are considered one of the daily stressors affecting the students' performance. In addition, according to the study by Adewuya, Ola, Aloba, Mapayi and Oginni (2006), it has been identified that problems with accommodation

are among one of the factors which is independently associated with the depressive disorders among the University students and this claim is also supported by Ghalawat, Dhingra and Boora (2015) and Demir, Demir, Bulut and Hisar (2014). Meanwhile, Muda, Hussin, Johari, Sapari and Jamil (2013) had identified several factors which have been deemed as the major factors that may lead to the failure of the students in the final exam and the accommodation problems were included in the factors. Moreover, Olaniyi (2014) affirmed that, there should be a convenient, adequate and suitable accommodation for the students during study times. Therefore, based on the facts, the current empirical study will seek to exploit 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 resident. This will facilitate the students' accommodation process and alleviate the accommodation problems.

The present study conducted an interview with local and international students as well as the employees in Student Accommodation Centre (SAC). The students reported that there are several offices in campus but the authority to provide student's accommodation is under (SAC). Therefore, the students must come and apply for the accommodation at this center, hence normally there is a long queue of students.

In the similar context, sometimes students encounter many problems, such as fan is not working or the glass of the window is broken, and many problem regarding utilities. In consequence, when the students felt uneasy, they tend to leave the lectures. The student also write a complaint for such problems, but most of the complaint statuses are difficult to be traced.

Meanwhile, in reference of the employee, there are many branches of residential hall under SAC, and each branch has a number of students and thus, it will consequently be difficult in dealing with the problems and coordinating with students. Furthermore, the employees are also facing the difficulties in terms of

communicating with the students and to determine the proper time for them to address the problem. In contrast, ICT can deal with a substantial number of procedures as suggested by Spotti, Kluzer & Ferrari (2010) and it also can enhance the communication among the stakeholders (Hosseini, Chileshe, Zou & Baroudi, 2013). Despite the advances in information and communication technology (ICT), less attention was given in the prior literature focusing on the modern technologies as a tool for mitigating the problems faced by the students, in particular relative to accommodation issues. Indeed, the previous studies also asserted that there is a need to utilize the modern technologies to deal with accommodation problems, especially in UUM (such as, Muhsen, 2011; Aboshnaf, 2008).

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 will benefit to the students such as hostel application, report to complaint, and request for services, and other functions will benefit the SAC such as 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.

1.3 Research questions

Based on the arguments discussed in problem statement, this study attempts to answer the following questions:

1. What are the requirements needed to design the mobile accommodation system?
2. How to design the mobile accommodation system?
3. How to evaluate the usability of the mobile accommodation system?

1.4 Research Objectives

To deal with the problem discussed, three key objectives are listed as guidelines to solve the main issues related to this phenomenon.

1. To identify the requirements for managing the student accommodation.
2. To analysis and design the mobile accommodation system.
3. To evaluate the usability of the proposed mobile accommodation system.

1.5 Significance of the Study

There are many significance of this study in general and the system in particular. The comprehensive mobile accommodation system is believed to have the ability in enhancing the efficiency as well as bringing the effectiveness of the functions of SAC to the fullest. Apart from that, it also benefited the users in enabling them to experience the recording and delivery of precise information at the right student anywhere at any possible time when needed. Besides, it also has the ability in providing a stable support, efficiency in terms of content, security and most of all, it also solve the problem of paper-based workloads which is apparently dealing with time and is deemed as inefficient as there might be a possibility to experience damaged or lost of reports. The whole idea of this system is to simplify the interaction process for the employees and the students besides saving time and increasing the performance.

1.6 Scope of the study

The main aims of this study is to design the interactive system among the students and the SAC. SAC is a main office for accommodation in UUM. Which has more than twenty branches (as know Student Hall). For designing this interactive system, the researcher will be use Android platform with Java to develop the mobile application for student, at the same time will utilize Apache server and Java programming to design the web application. Moreover, the questionnaire will be the

main instrument to collect data from participants to evaluate the usability of the system.

1.7 Chapter Summary

Modern technologies provides the workspace for people to actively collaborate, restructure organizations hierarchies, and promote participation of citizens. Therefore, this study sough to harness these modern technologies to enhance the service and the communication between the SAC and the students in UUM. In general, in this chapter, the motivation factors leading to the area of study has been explained. Besides that, the problems encountered, research questions, research objectives and the significance to the situation in a real world are also discovered and illustrated. Basically, the several elements above are the crucial ones in assisting the project implementation.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

Students' health and stress are actually affected by several different factors and among them are safe drinking water, food that is sufficient and the most crucial one is the accommodation as well as good social facilities. According to Kumaraswamy (2013) the accommodation problems are one of many factors that leads towards anxiety and depression among the university students. In turn, Mobile phone technologies have become more accepted, and their use among people has increased. These devices are frequently used to communicate information and perform daily activities. Fling (2009) stated that, there has been a rapid change in the development of mobile phone technology since the presence of an electronic device that is smartphone within these few years. Parallel to that, the studies conducted previously has come to a conclusion that 55% of the students in the university preferred having the ability to have the access to the information of the university using their digital devices particularly the one that gives easy access to them that is smartphones (Mills, 2009). Therefore, this study attempts to exploit these technologies to delivery and communicate between the accommodation center and students.

2.2 Accommodation problems and student performance

To date, college students are the group of people who have more complex problems than how it used to be over the past 10 years where the difficulties faced are on the demands of a greater academic studies, the change experienced in family relationships, the change in social lives and last but not least, the exposure to new individuals' ideas as well as personal temptation. Kumaraswamy (2013) states that stress, nervousness and depression among college students are causes of concern. Furthermore, Ezeukwu (2009) declared that accommodation is the pivot, around all the activities of students and this issue is also mentioned by Amr, El-Gilany, El-

Moafee, Salama, and Jimenez (2011) and Teichler (2012). Apart from that, there is a crucial urgency which demands for the adequate accommodation for the students which emphasizing on the implementation of programmes 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. Li and Kaye (1998) investigate the foreign students' perception of their concerns and their problems relating to their educational experiences. The results of the study highlight that the most significant problems for Asian and students from developing countries are monetary, academic, and those related to accommodation. Their results suggest that students view accommodation and financial problems as equally important. On top of that-, Khawaja and Dempsey (2007) stated that rising discontent with accommodation may serve to increase the psychological strain on internationals students.

In addition, Obeng-Odoom (2012) conducted a research on the international students in Australia. He uncovered that accommodation problems are one of the major challenges faced by international students and without immediate action to remedy the situation, it can undermine the quality of higher education in certain country. This argument has also been stated by Khawaja and Dempsey (2007) where they highlighted that demographic factors such as finances and accommodation affected the international students.

In general, individuals can experience stress when they feel that they are unable to cope with the pressures or demands upon them. Duangpracha (2012) content that, unsuitable accommodation is one of the most important stressors that confront international students. In the similar context, Myburgh, Niehaus and Poggenpoel (2006) and Thomsen (2007) mentioned that living in suitable accommodation helps students to counteract feelings of insecurity and loneliness. Further, living in suitable accommodation is crucial to the wellbeing and academic performance of international students (Altschuler & Kramnick 1999; Scheyvens, Wild & Overton

2003). It is not surprising that living in poor quality accommodation can have a negative outcome on mental health (Evans et al. 2000).

Therefore, based on these arguments aforementioned, it will become more useful to deal with these issues through the use of modern technologies by attempting to mitigate the accommodation problems among the students in University Utara Malaysia. Indeed, there are two studies which used a modern technology (web) in booking the rooms in UUM. The first study was carried out by Aboshnaf (2008). In the study, it focused only on designing a website for the purpose of booking the room in the department of Maybank. This system does not have a communicating channel between the students and the accommodation department. Another study was also conducted in UUM and it was by Muhsen (2011) where it aimed at developing an accommodation which is online-based for the purpose of registration in UUM specifically to manage and organize the facilities for the new students especially the postgraduates. Both systems did not provide any means of interaction between the students and the department of accommodation, and also did not solve the current problems faced by the students.

2.3 Internet in UUM

The most valuable outcome of modern technology is arguably the Internet. Basically, the Internet has appeared to be the most common electronic resource and service used in an academic environment for the purpose of teaching, learning and also for conducting research. Kelly and Eells (2015) stated that the Internet and using modern technology is very essential for the university students. In addition, Omekwu, Eke and Agbo, (2014) referred that students need Internet because of its flexibility and dynamism in information retrieval, storage and processing. Adomi, Omodeko and Otolo, (2004) also pointed out that, Internet is very important to students because they need to have access to timely, accurate and relevant academic information.

Internet is a global network made up of many smaller networks that enable computer users to share information and resources quickly and easily (Ejizu, 2010). The Internet provides several opportunities for the academia. It is a mechanism for information dissemination and a medium for collaborative interaction between individuals and their computers without regard for geographic limitation of space (Singh, 2002).

In addition, according to Selwyn (2008) the internet can play a key role in the higher education. It is considered as a channel to access university's services. Therefore, Universiti Utara Malaysia recently sought to devote efforts to provide high-speed internet connectivity in classrooms, library, students' accommodation and other public campuses with 24-hours wireless internet facility. Figure 2.1 shows the Wi-Fi coverage map in UUM.

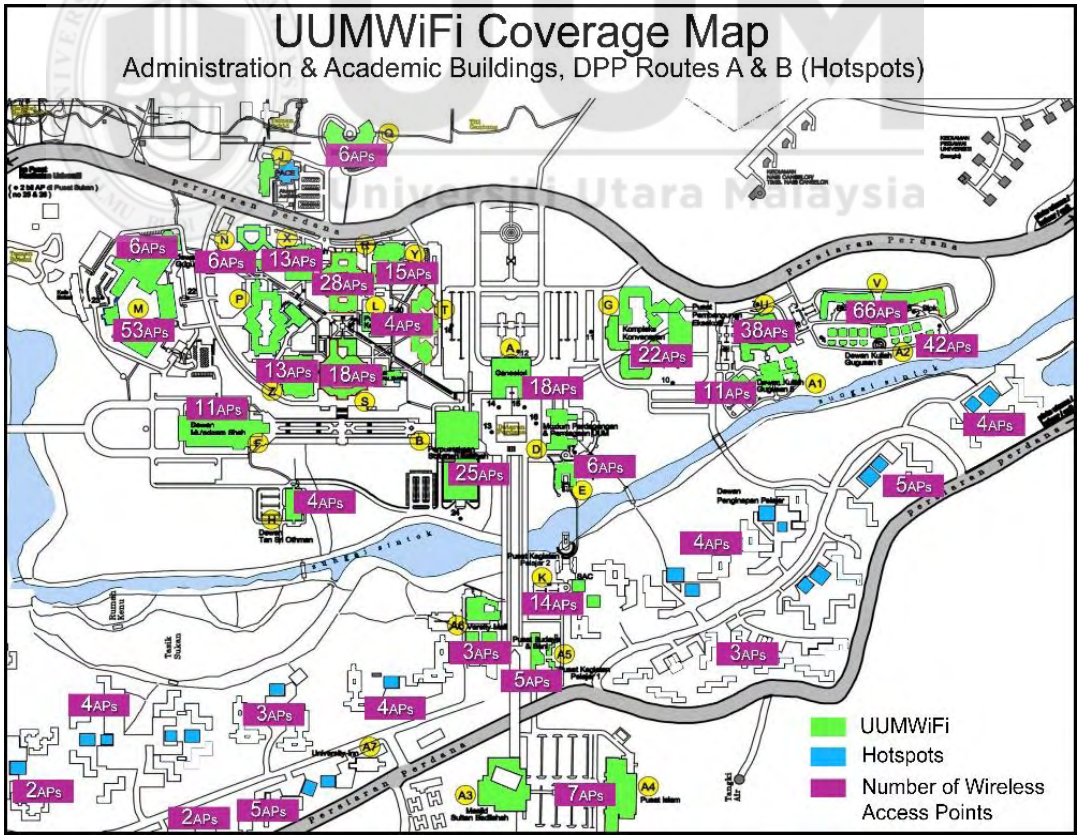


Figure 2.1: UUM WiFi Coverage Map (UUMIT, 2015).

The Internet is basically utilized in UUM by the students and bridges the communication with other people such as their peers, family, lecturers in and outside the campus for different kinds of purposes which apparently ranges right from the academic reasons up to socio-economic ones and most of it are done via the use of electronic messages. With the access to the Internet, the students will have the access reading different reading materials that are available online varying from for leisure purposes and also educational purposes. The access to the Internet is believed to be a great facility for the students for their leisure after a serious environment they encountered when attending classes and educational meetings around the campus all day long.

According to Alasa and Kalechukwu (1999), the Internet is considered as a developmental tool which has the power in enhancing people's lives. Therefore, it is considered as an effective medium fast communication (Koçak, 2010). According to Islam and Hossain (2012), students and faculties especially must take advantage of the Internet in multi-functional ways. This study seeks to take advantage of the access of Internet in UUM to enhance the communicative interactions between the students and the student accommodation center in UUM through a designated electronic interaction accommodation system. It is undoubtful that the Internet has brought lots of changes in the educational sector as its utilization is essential for the access and the delivery of information and services.

2.4 Mobile Technology

Iyawa and Coleman (2015) stated that mobile phones have become a part of people's everyday lives, and consequently, it has become an essential item for every individual. Moreover, Dailey, Loseff, & Meyers suggested that the speed at which communication between participants takes place is crucial to the success of the carpooling model. In addition, the rapid growth of the Internet and the increasing speed at which information exchange is happening has allowed service providers to be more innovative and efficient and offer consumers a wider range of choices in

many aspects of everyday life, such as shopping, leisure, personal services, and travel (Feldman, 2002).

Table 3.1: Significant technological milestones leading to the widespread adoption of ICTs

Year	Event	Significance
1974	Motorola pageboy created	First commercial pager introduced, by 1980 there were 3.2 million pager users.
1982	TCP/IP protocol standardized	Technical standard and technology used by the Internet to send and receive data established.
1985	Motorola DynaTAC 8000x	First commercial mobile phone.
1993	US Air Force launches 24th Navstar satellite	Global positioning system (GPS) network completed, enabled location tracking.
1993	Commercial deployment of SMS	Text-messaging for mobile phones possible, both phone-to-phone and phone-to-computer. As of 2008, 4.1 trillion text messages were sent.
1993	Mosaic, first web browser	Computer users could browse the Internet using a graphical interface.
1996	Hotmail.com founded	First commercially successful web-based email service.
1999	Nokia 7110 released	First mobile phone with a web browser.
2000	President Bill Clinton orders unscrambling of GPS signal	Allows general public to receive same pinpoint location as military.
2001	First 3G network developed	Faster data-transfers for mobile phones.
2002	Java mobile specification released	Java's mobile specification released, developers could build Java applications for mobile devices.
2002	BlackBerry smartphone released	Commercially successfully smartphone supporting push-email, web browsing, Internet-faxing, and more.
2007	First generation Apple iPhone	The iPhone's software development kit encouraged developer to build application for mobile platforms.

The penetration rate of mobile services in Malaysia has increased from year to year. The number of mobile service subscribers has increased ten-fold within a decade of just 2.7 million subscribers in 1999 to 26.1 million subscribers in 2009 (Kahar, Sulaiman, Prabuwono, Amran & Marjudi, 2011). Furthermore, based on the last statistic generated in 2012 reported students 32.5% students from the total mobile service subscribers (Malaysian Communications and Multimedia Commission, 2012).

2.5 Android Platform

According to Zilpe and Chatur (2012), the applications available on Androids are being developed with the use of Java and specifically, it can be ported in a possible easiest way to a brand new platform. Among the features in Android that are available are the 3D graphics engine, database support powered by SQLite and last but not least the integrated web browser (Jerome, 2008). In general, the Adroid's architecture where the third-party applications are executed with the same system priority as demonstrated in Figure 2.2 is among the most appealing features available on Androids. That is why this system is seen as the one which has the best features if to be compared to other systems featured before where greater execution priority is seen in embedded system applications in comparison to the availability of the thread priority to the applications which are developed by the third-party developers. Besides, in reference to Butler (2011), each of the applications is run within its own thread accompanied with the use of a very lightweight virtual machine.

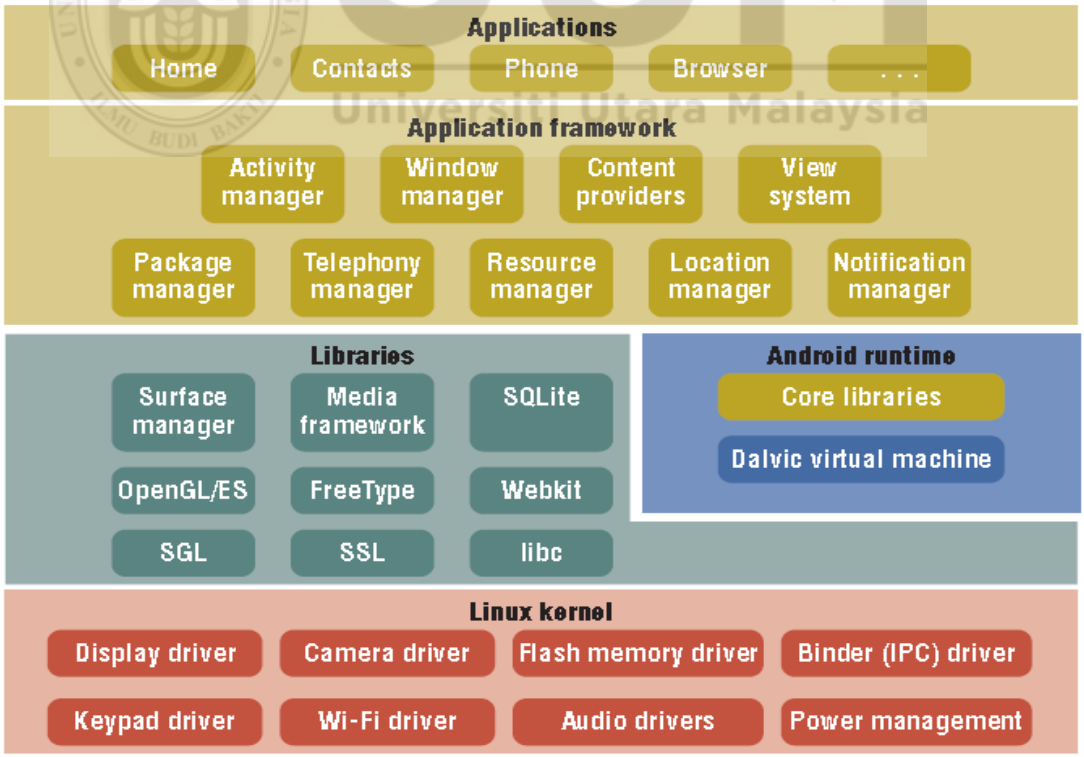


Figure 3.2: Android system architecture (Jerome, 2008).

Android provides an open development platform, which allows developers to build extremely rich and innovative applications with a rich set of User Interfaces, support for broad range audio, and video file formats. This new platform has been embraced by developers and mobile handset manufacturers all over the world because of its features with open-source besides having a diverse development in terms of its application and running capabilities with programming language as Java (Lee, 2012).

2.6 Applications for Student System

Different studies have been addressed and reported the importance of online services for deploying other facilities. Olsen and Malizia (2005) addresses the importance of integrating information technology services into the development of an advance online booking system for rooms. This study has demonstrated the effectiveness of these services towards performing a number of managing activities such as searching, browsing, and booking. However, the difficulties that most of the customers faced towards the traditional system, justified the complexity of interfaces that are offered today which expect detailed and specific data that are considered to be inflexible (Olsen & Malizia, 2005). Figure 2.3 presents the online booking system based services which relies on the customer, intermediate, and the booking system in terms of determining experience and the customer needs.

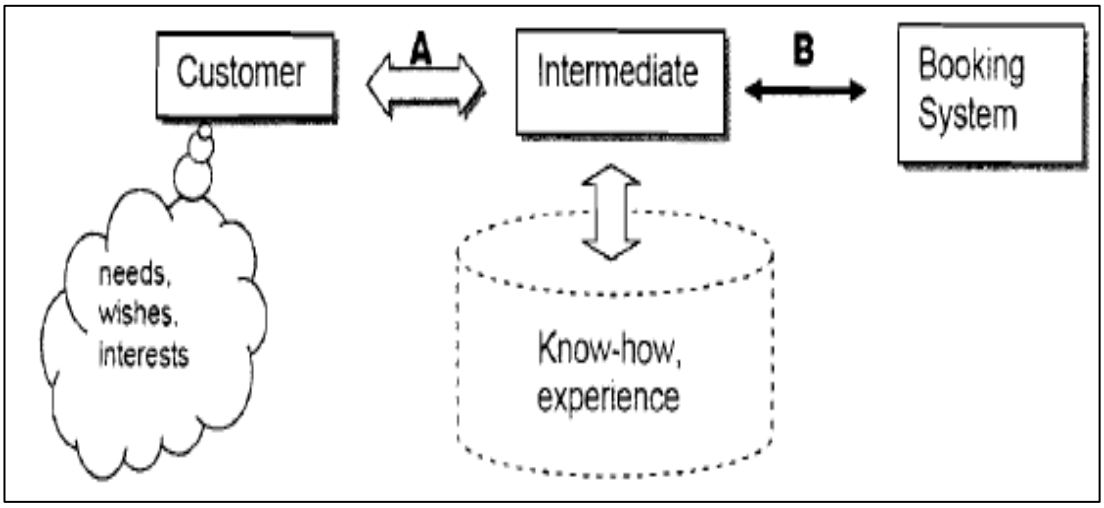


Figure 2.3: Booking accommodation system (Olsen & Malizia, 2005).

Another technique adopted in university of Cambridge developed based on the combination of web reservation tools for accommodation. This service provides the new researchers to check and book their accommodation through online reservation form. Figure 2.4 presents the system, which classified into different sections to generalize the complete student details for certain accommodation (Accommodation Service, 2016).

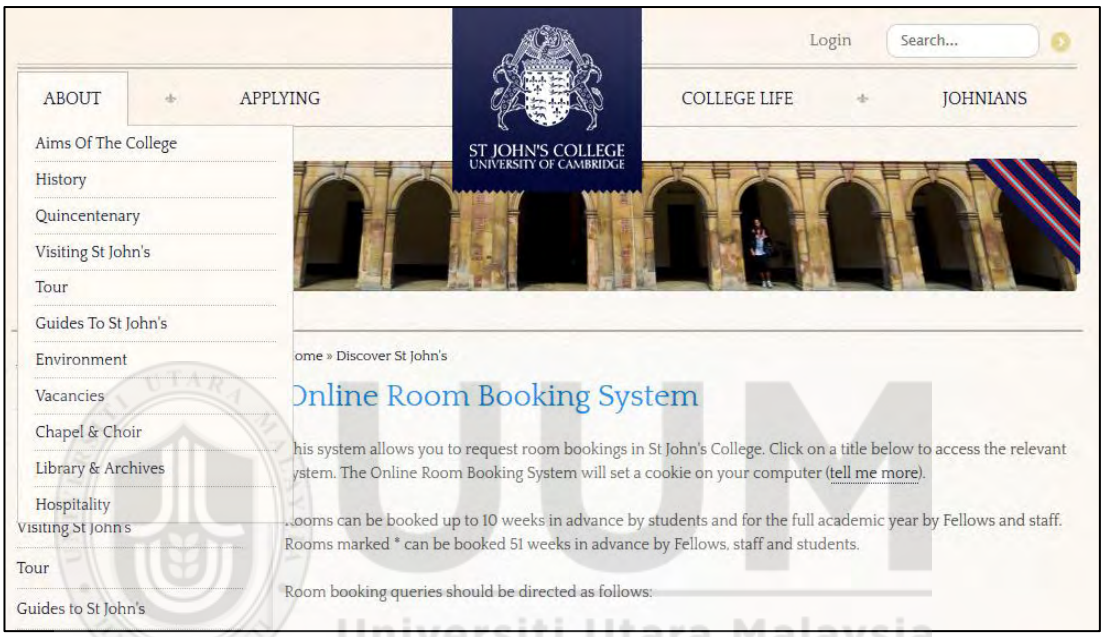


Figure 2.4: Cambridge online booking system (Glasgow, 2016).

In addition, Glasgow university also provide for students to reserve the available rooms through online application form that integrate the require functionalities for checking and processing student application based on content management system (Glasgow, 2016).

It has been indicated by Naini, Sadasivam and Tanik (2008) that the Web-based Interactive Student registration and Advising System (WISRAS) is apparently contributing towards the simplification of the process of registering the students where it particularly provides them with a system that is interactive to be used and most of all, is reachable by the students through their electronic devices. Undergoing this process, the students are required to actually fill up the course plan page on the

website of the department through an online submission and later on, a confirmation e-mail of the course plan submission will be generated specifically to both parties – the students and the advisory board. Then, the advisor will check the course plan submitted by the student and approved it in an electronical manner which will then resulted in the generation of a conformation e-mail of approval to two parties – the student and the department involved.

In addition, Louise and Venter (2011) developed an online-based system to justify the main issues that most students faced while applying for accommodation at the University of the Western Cape. The developed system was intended to facilitate the process of managing student accommodation availability for the university campuses. They reported the current process of managing the accommodations for student for the purpose of observations, carrying out interviews and a questionnaire distributed to the stakeholders. Figure 2.5 presents the main comparison between the previous and the developed system.

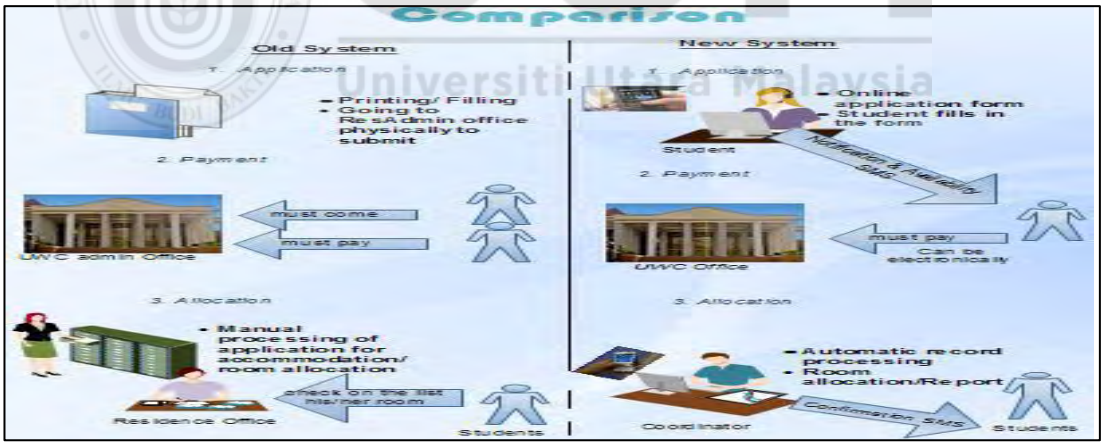


Figure 2.5: Comparison of old system and new system

The proposed system was developed based on the utilization of UML, PHP, MySQL, APACHE and JavaScript. During the process of testing the system specifically in determining the influence from the use of concurrent ones, Diesel Test was used. The prime functionalities were developed in order to provide new students with the

information such as the confirmation of the division of rooms, via email or text messaging. Figure 2.6 presents the system functionalities among new students

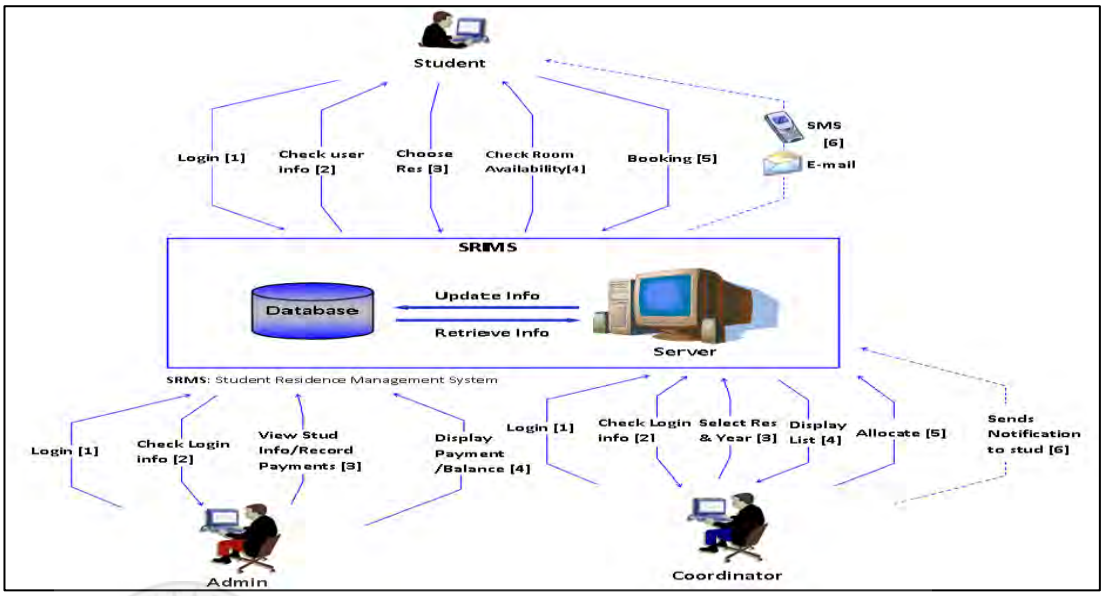


Figure 2.6: System Functionalities

The Figure 2.6 presents the relationship among the student, coordinator, and admin for managing and processing the student's accommodations requests. The process involved the communication between the coordinator and the admin to confirm the student accommodation.

2.7 Chapter Summary

The literature review is important for clarifying the problem statement and also to understand the elements related to phenomena. Therefore, this chapter focused on the several topics related to the current study. In the first section discussed the accommodation problems pertaining to the student's performance and stress. Then, highlighted on the internet as utilized by students as a medium of communication with peoples its coverage in in Universiti Utara Malaysia. After that, we are discussed the modern technologies such as mobile technology and Android. The last section discussed the related work on the online environment to deliver the services of the students.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The research methods deal with the researcher's techniques in carrying out the study i.e. the method used in the data collection and the approaches decided in processing the data as well as the instruments for the research. (Frijat and Al-Msiedeen, 2010). Moreover, Kothari (2004) stated that research methodology is a systematic way of solving a research problem. This chapter will discuss the method that will be adopted to achieve the objectives of this research. The objectives are:

1. To determine the functional requirements according to students' and employees' standpoint.
2. To design and test the electronic interaction accommodation system.
3. To exploit the self-administration questionnaire for evaluating the electronic interaction accommodation system.

3.2 Research Design

The researcher adopted Vaishnavi and Kuechler methodology for the reason that it contains the rational phases which will be used to solve the problem and develop the prototype. In addition, Vaishnavi and Kuechler (2008; 2015) methodology can be implemented flexibly. Many researchers have also adopted Vaishnavi and Kuechler (2008) methodology to enhance the result of their research (such as, Morton & Redmond, 2015 and Hassan, Elbreiki, Firdhous & Habbal, 2015). Vaishnavi and Koehler (2008; 2015) Methodology is made up five steps, namely, the awareness of the problem, suggestion, development, evaluation, and conclusion. The details about the work carried out for every stage is explained below.

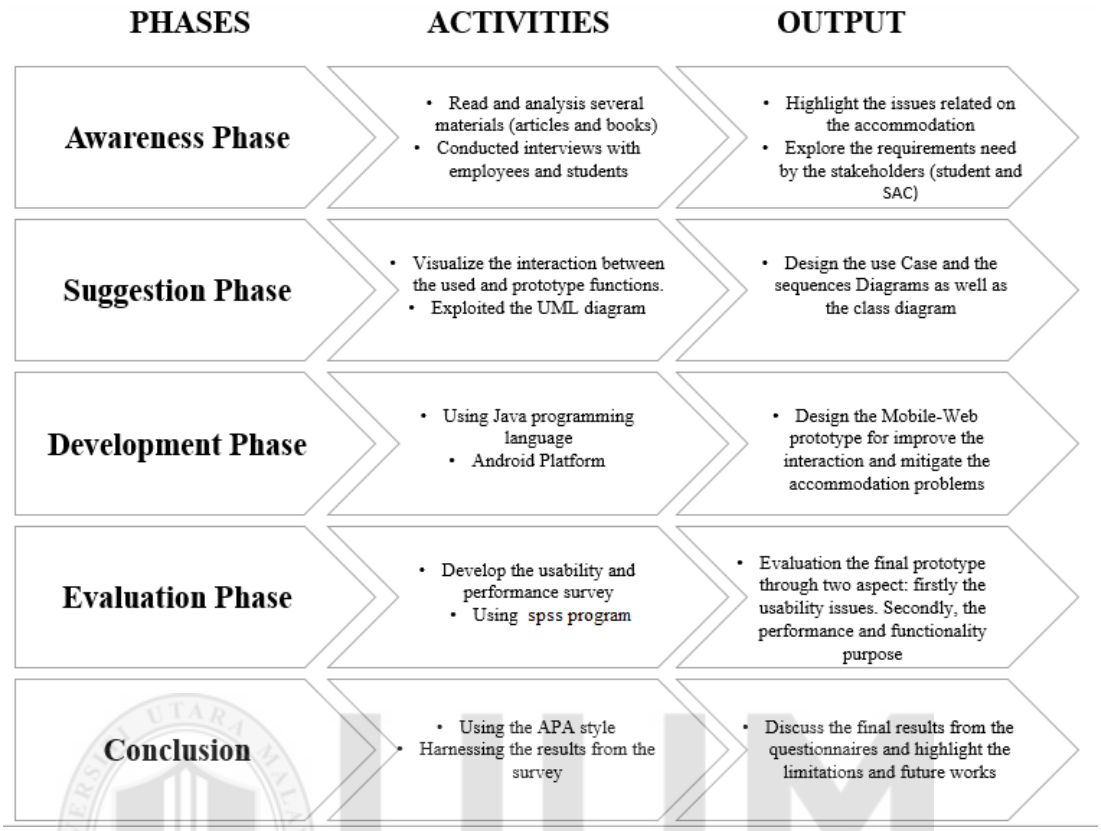


Figure 3.1: The general methodology of the design science research (Vaishnavi & Kuechler, 2008; 2015).

3.2.1 Awareness Phase

The major entity in the general methodology is that the researcher should be identify the requirements of the prototype. Requirements identification is an important phase in the prototype. This stage also requires understanding the objectives, the scope, and the problem. Vaishnavi and Kuechler (2008) explained that about the problem as it comes from various sources: new developments in the industry or in a reference discipline. In the case of this study, awareness of the current problem is highlighted by the thorough reading of the literature and also from real life. As for the literature, the previous studies assert to solve the accommodation problems because the accommodation issues effect on the student performance and stress. With regard to real world, the interviews with particular employees and students are conducted for

this purpose, and the results indicates that, there is a less communicate between the SAC and the student. Moreover, there is lack of coordination between the staff and students to fix the problems related to accommodation issues.

3.2.2 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 Mobile Accommodation System. The output of this phase is quite tentative prototype. The analysis and design of the system will 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 not to forget, the class diagrams. The proposed architecture for the system can be shown as follows:

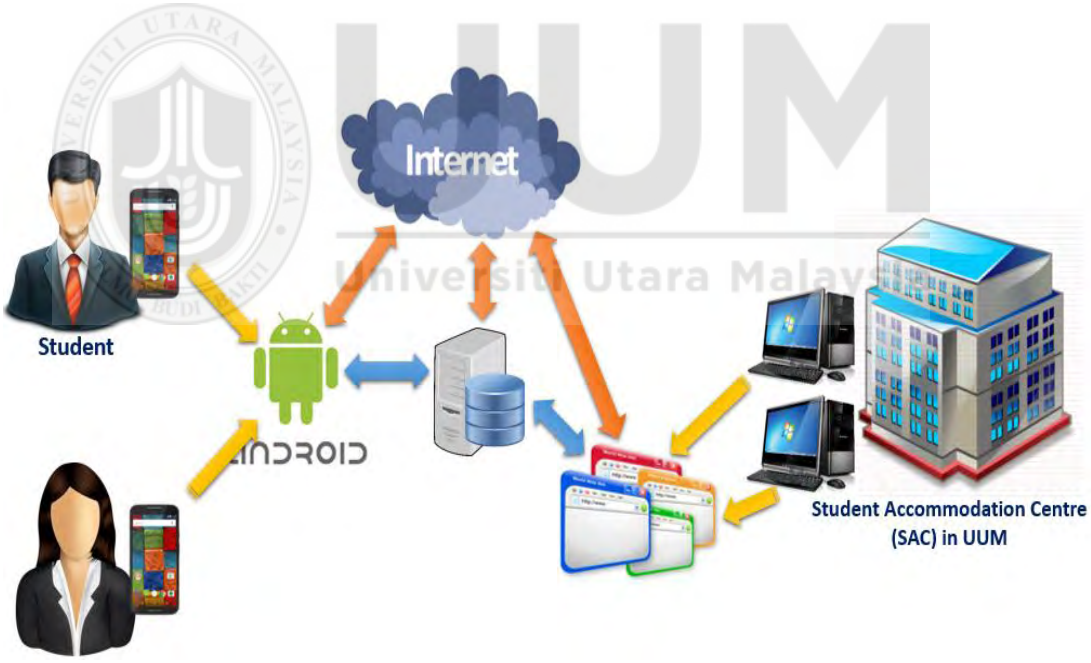


Figure 3.2: Illustration of the architecture of the system (Vaishnavi and Kuechler, 2015).

Based on this architecture, the proposed system will be suggest several functions of the system, such as:

1. Registration for hostel.
2. Complain for any accommodation issues.
3. Manage the hostel rooms
4. Tracking the documents process
5. Create direct communication channel between the students and the SAC staff.
6. Digitize the document and retrieve it in the right time.

3.2.3 Development Phase

The main tools that will be used to design the Mobile Recruiting System (MRS) are:

- **Windows 7**
  Used as an operating System for a PC or Prototype for development purposes.
- **Eclipse**
  Used as development tools.
- **Photoshop**
  Used for designing interface required by the system.
- **SPSS program**
  Used for this study for evaluation purpose.

3.2.4 Evaluation Phase

Evaluation represents the last phase in the methodology. The evaluation process will be conducted in determining the level of usefulness as well as the ability in operating the system after the development of the system where in this stage, the system will be examined using the questionnaire administered to the respondents. The evaluation phase undergoes the utilization of the System Usability Scale (SUS) as suggested by Bangor, Kortum and Miller (2008). The prototype will be evaluated after the development of the system through the employees in SAC and student who would use it on line. The aim of this evaluation is to observe the satisfaction level as well as other aspects such as the ease of use of the system and the ability to operate the prototype system.

3.3 Conclusion

This study attempts to design a prototype that will improve the communication and delivery the services and the information between SAC and students by establishing electronic interaction accommodation system. Digital services allow students to have access to center information, programs, and services by using Information and Communication Technologies, and eventually help reduce the stress and misunderstanding between the staffs and students, at the same time delivery good quality services for the student at the appropriate times. This chapter is made up of four phases:

1. Awareness Phase: ideas, information, issues and problems related to this study.
2. Suggestion Phase: requirements analysis, the output of this phase is the temporary design.
3. Development Phase: determine the programming language which is Eclipse program with Android platform.
4. Evaluation Phase: test the application and find out if it provides the required services.

CHAPTER FOUR
STUDENT ACCOMMODATION SYSTEM DEVELOPMENT

4.1 Introduction

This chapter will cover two (2) main tasks, which are system analysis and design, and system implementation. The system implementation is based on prototype of the mobile system for managing the whole process of student accommodation.

4.2 System Analyses Design

System analysis and design for Student Accommodation System (SAS) has been carried out in order to understand the requirements of the system, and how the SAS will be implemented, especially in mobile environment. The requirements have been gathered through discussion with the Hostel Accommodation Officer, and also the student. Then, the collected requirements been analyzed and identified an appropriate function, data to be captured and the process flow of the system.

4.3 Lists of Requirements

The requirement has been gathered from the users such as students, and SAC staff by using interview method. Then, the requirement has been analyzed to identify the classification of the functional and non-functional requirements.

4.3.1 Functional Requirements

Functional requirement is considered as a main stage to develop any system, through this phase we can know user requirement. In the other words in this phase the staff can develop themselves to understand the student requirements (Zhigang. 2009).

The use case must have some functional requirements for managing the mobile system in accordance to the objective of the use case. In order to mitigate the

students accommodation problems following functional and non-functional requirement listed below have been used in the mobile application in the Table 4.1.

(M) Mandatory requirements (it must be done in the system)

(D) Desirable requirements (it prefers to be done in the system)

(O) Optional requirements (it might be done in the system)

Table 4.1 Functional requirements for SAS

#	Requirement ID	Requirement Description	Priority
Functional Requirements for student:			
	MSAS_1	**Sign up**	M
1	MSAS _1_1	Student can sign up for registration by clicking on sign up button	M
2	MSAS _1_2	New page will be open where the system will show the students information such as Full name, Matric number, School, Semester, Session and Password to be filled in order to get registered.	M
3	MSAS _1_3	The student will click sign up after filling the required attributes.	M
4	MSAS _1_4	The system will show the message “thank you for registration”	M
	MSAS _2	**Log in**	M
5	MSAS _2_1	The student can log in the system by clicking on the Log in button.	M
6	MSAS _2_2	Student will be directed to user log in page where he will fill in the username and password	M
	MSAS _3	**View profile**	M
7	MSAS _3_1	Student can see all his details such as Full	M

		name, Matric number, School, Semester, Session and Password.	
	MSAS_4	**Update profile**	M
8	MSAS_4_1	The student can update its profile regarding its personal information (name, address), its academic details (current semester) and educational background.	M
	MSAS_5	**Complaints**	M
9	MSAS_5_1	When the student will click the "complaint" button it will redirects him to another page.	M
10	MSAS_5_2	"Complaint" page is further divided into three functions i.e. report complaint, view complaint status and main.	M
	MSAS_6	**Report complaints**	M
11	MSAS_6_1	When the student will click on the "complaint" button it will redirects him to a new page. The complaint page is divided into two parts. The first part is the "subject" where the student will highlight the title of the problem. Whereas the second part is "details" where the student will write the details of the problem he wants to report and he will click the "submit" button to proceed his complaint to admin. If the student wants to go back to the previous main complaint function he can click on the "back" button.	D
	MSAS_7	**View complaint status**	M
12	MSAS_7_1	If the student wants to view the complaint	M

		that he made he can do so by clicking on the button “view complaint status” there the student can find the details of the complaint that he reported.	
	MSAS_7_2	**Main**	M
13	MSAS_7_3	The last function of the “complaint” is “main” this function will redirects him towards “main menu”.	D
	MSAS_8	**Booking**	M
14	MSAS_8_1	Student can book a room online by clicking on the “booking” button. When the student clicks on it will redirects him to a new page. Where the student has to fill in his personal information such as Full name, Matric No, Gender, IC/ Passport NO, Marital status, Contact No, Religion, Date of birth, Nationality, Home Tel and permanent home address. After filling the required fields the student will click on the “book” button. In case of mistake the student can reset the information by clicking on the “reset” button.	D

- The other function requirements are described in detail in Appendix (A).

4.3.2 Non-Functional Requirements

Table 4.2 Non-Functional Requirements

#	**Requirement ID**	**Requirement Description**	**Priority**
1	Usability	A software can be used by specified consumers	M

		to achieve quantified objectives with effectiveness, efficiency, and satisfaction in a quantified context of use.	
2	Quality	System should be user friendly and efficiently	M
3	Speed	MSAS is a stand-alone application its implementation is speed	M
4	Security	MSAS ensure the security as it doesn't allow to change its contents by users.	M
5	Reliability	The rate of failure occurring in the application are very low	M

4.4 Software Requirements

In order to build a system software and hardware are required. The present study will use the following software are listed below in the table 4.3.

Table 4.3 List of Software Requirements

#	Requirement ID	Requirement	Requirement Description	Priority
1	MSAS_1	JDK 1.8	Java and JSP complier	M
2	MSAS_2	JCreater	IDE for JAVA and JSP	M
3	MSAS_3	MySQL Database	Database	M
4	MSAS_4	Navicat	GUI tool for managing database	M
5	MSAS_5	FrontPage	2003 HTML design	M
6	MSAS_6	Android	Studio IDE for Android	M

4.5 System Design

This section gives detailed explanations to the design mobile system for accommodation of students (MSAS) prototype, depending on UML (Unified Modeling Language) 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. In order 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.

4.5.1 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 (AbdulWahid, 2015; Banire, Jomhari, & Ahmad, 2015). 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 (Rysavy & Bures, 2004). 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 4.4

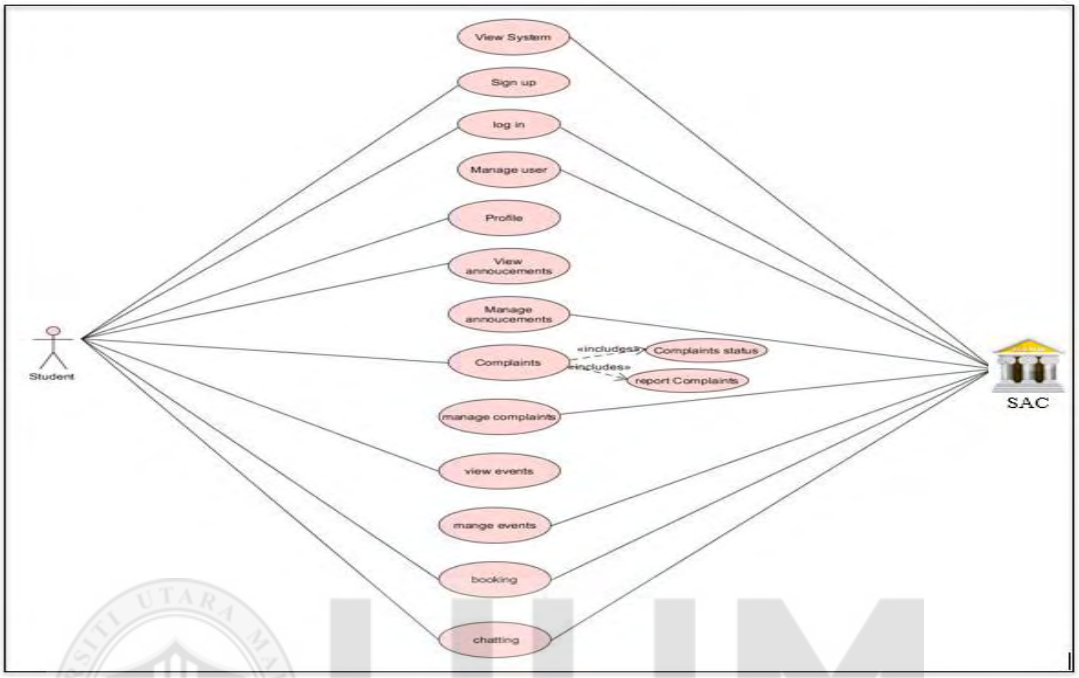


Figure 4.4 Use-Case Diagram

4.5.2 Use case specification

In general, the use case specification deals with the requirement of usage of the system in the viewpoint of the users. The relationship between the student and the use case is actually demonstrated in three different layers of architecture which play a role in representing the design as well as the software which have the ability in enabling it to abstract the specifications at a high level with a description that is stated in detailed regarding the system's behavior basically at a low level of the static structure. The main highlight of this structure is the stimulation of the users who are mainly possible in using the system as well as the dynamic views that are corresponding in describing the abstract behavior whenever the system is treated separately simply by addition of extra information which specify the participants which apparently do not have the accessibility in using the case hierarchy as a whole (Rysavy & Bures, 2004).

4.5.2.1 Use case for complaints by Student (MSAS_ 01)

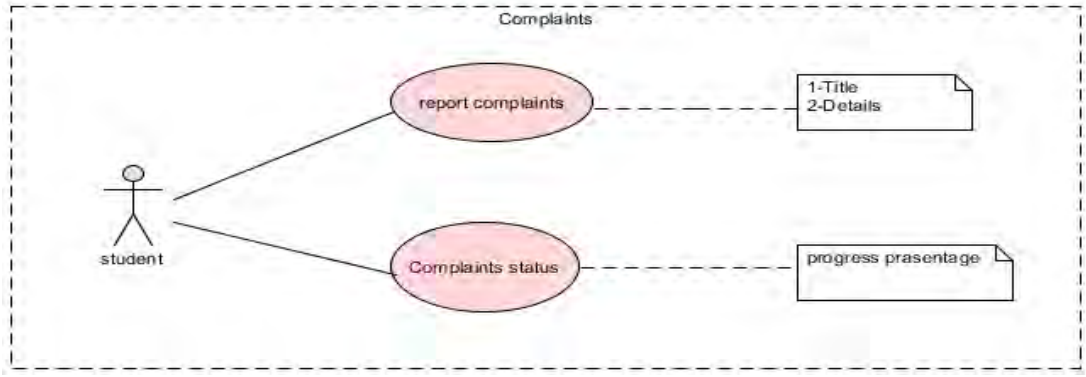


Figure 4.5 Use case for: complaints by Student (MSAS _01)

1) Brief Description

This use case is initiated by the student. In this function the student can report a problem to SAC office through online report complaining service. Moreover, the student can also view the progress of its complaint reported through the progress percentage of the complaint.

2) Pre-Conditions

- The student must enter into report complaint in order to report the problem.
- The student will enter system by clicking into the complaint status to check the status of its report.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begin when the student enter to the system
- Student can view all the functions that is provided in the application regarding accommodation center.
- When the student press the button of report complaint he can report the problem he in facing in terms of accommodation.

- In order to check the status of their complaint reported the students will click on the complaint status button and he can also check the status of its complaint

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

The student must write repot complaints and see his status.

7) Constraint

No Constraints.

4.5.2.2 Use case for booking by student (MSAS_ 02)

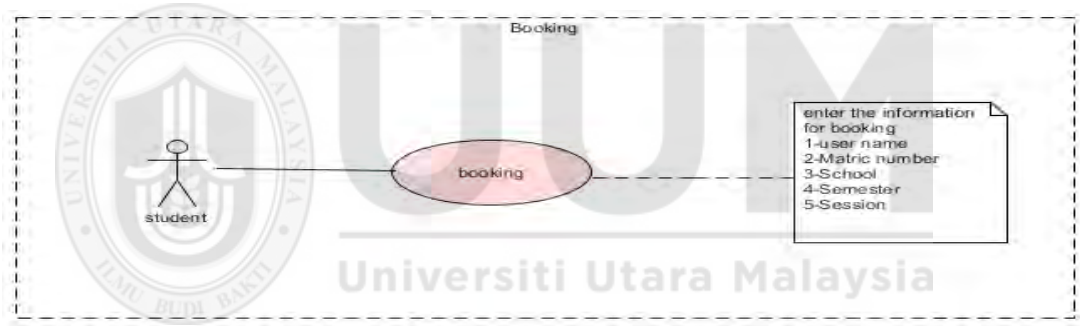


Figure 4.6 Use case for: booking by student (MSAS _02)

1) Brief Description

This use case is initiated by the student. In case the student can view all the information about accommodation such as online booking system, information regarding SAC, complaint's reported, the status of the complaint's and instant chatting service.

2) Pre-Conditions

Student must enter booking page.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begin when the student enter to the system
- Student can enter his information for booking online.
- Student must press “submit” button.
- When the student click on the submit the information .it will be send to SAC.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

The student must write do not leave any filed empty that have been done.

7) Constraint

Entered information.

4.5.2.3 Use case for manage complaints by Admin (MSAS_ 3)

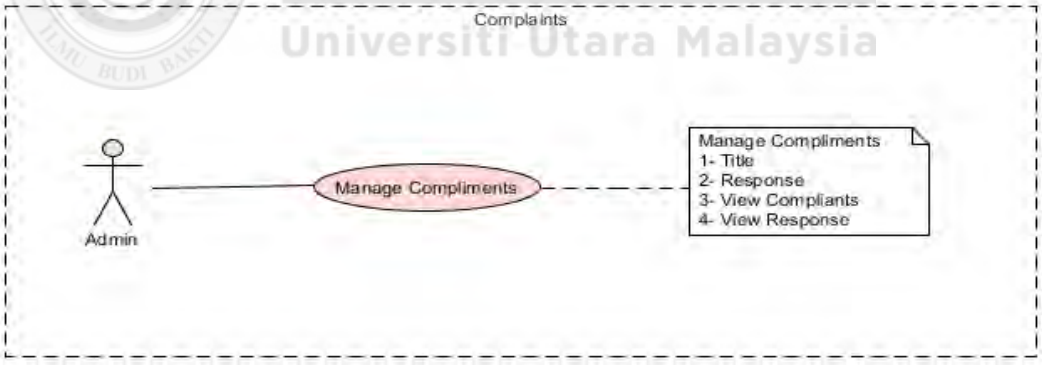


Figure 4.4 Use case for: manage complaints by Admin (MSAS _3)

1) Brief Description

This use case is initiated by the admin. In this case the admin can manage the complaints that are been reported by the students. The admin can give the

complaint a progress percentage between 10-100 based on the successful completion of the progress of complaint.

2) **Pre-Conditions**
    - The admin must log into the system
    - The admin must enter to manage complaints page
3) **Characteristic of activation**

    Execution depends on the student demand.
4) **Flow of event**

✓ **Basic Flow**

- The use case will begin when the admin enter to the system
- Admin can manage the complaints
- Admin will look into the complaint reported and based on its complexity will give a time range in terms of percentage to show the time that will be required by the management to take action for the successful completion of the report.

✓ **Exceptional flow**

N/A

5) **Post-conditions**

    Return to the home page.
6) **Rule**

    No Rule
7) **Constraint**

    No Constraints.

4.5.2.4 Use case for booking for Admin (MSAS_ 4)

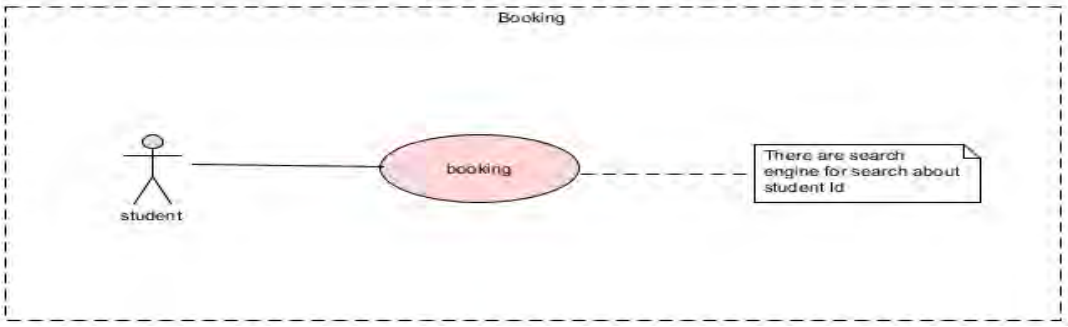


Figure 4.5 Use case for: booking for Admin (MSAS_ 4)

1) Brief Description

This use case is initiated by the admin. In this case the student can book an accommodation for the students. Admin will search for the vacant accommodation in the accommodation center based on the requirement of the student.

2) Pre-Conditions

- The admin must log in to the system.
- The admin must click on the booking page.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case will begin when the admin will enter to the system.
- Admin will click on the booking page.
- Admin will see the requested been made by the student for accommodation.
- Admin will search the available accommodation for the student as per requirement.
- The admin will book online the accommodation for the student.

✓ **Exceptional flow**

N/A

5) **Post-conditions**

Return to the home page.

6) **Rule**

No Rule

7) **Constraint**

No Constraints.

- **The other Use cases are described in detail in Appendix (A).**

4.6 Sequence Diagram

The sequence diagram plays the role in describing the concurrent or sequential control between the processes sequence either its applying good Tanique in capturing the functional specification within the system used (Omar, Brahim. & Taoufiq. 2012). In general, the sequence diagram provide an illustration of the intermittent designing of the control system software by giving the analysis and evaluation of the active methods in the drawing of sequence diagram where a good sequence diagram actually indicates a control software that is very outstanding (Chen & Wang , 2009).

4.6.1 Sequence Diagram for Complaint's by student (MSAS_01)

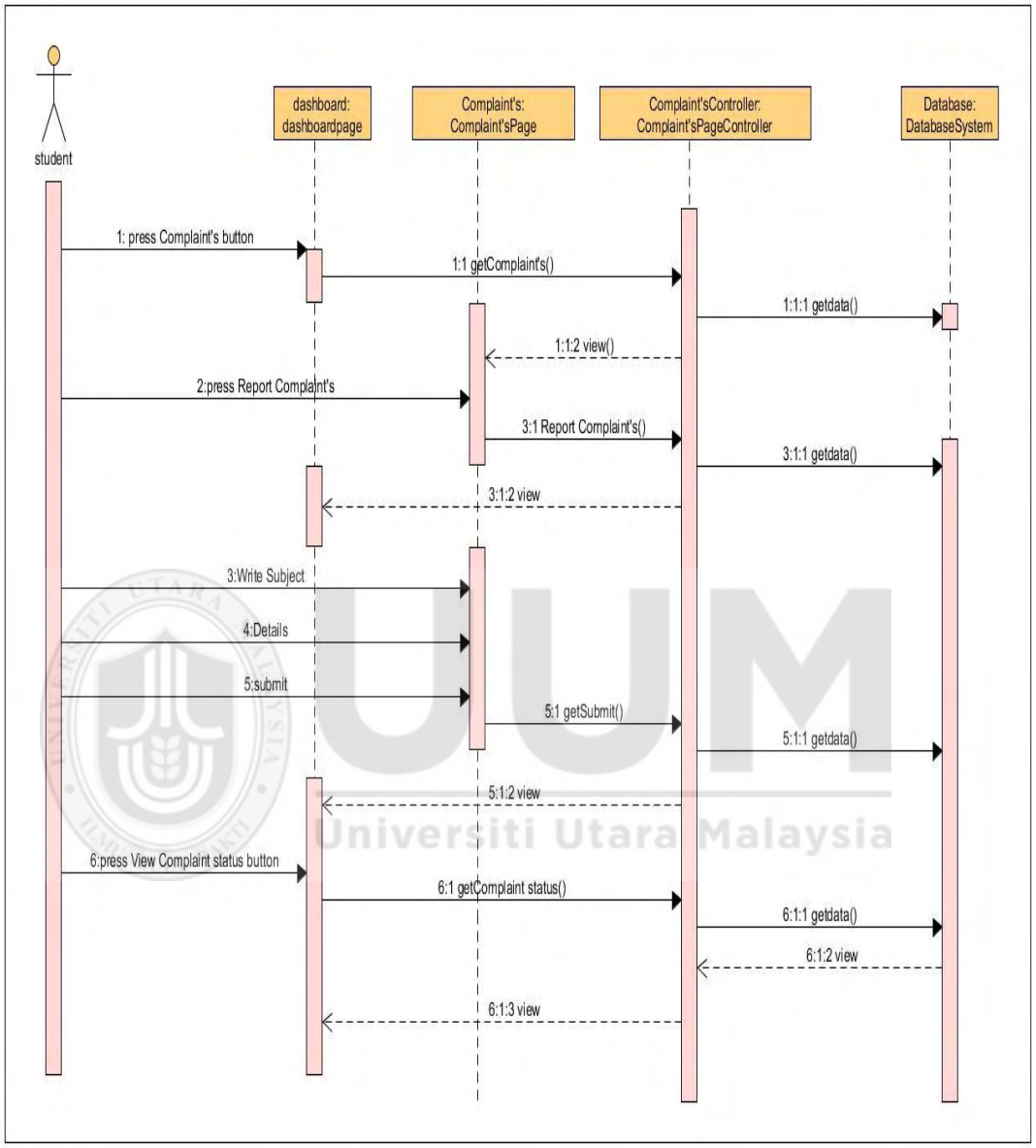


Figure 4.6 Sequence Diagram for: Complaint's by student (MSAS_01)

4.6.2 Sequence Diagram for manage Complaint's by Admin (MSAS_02)

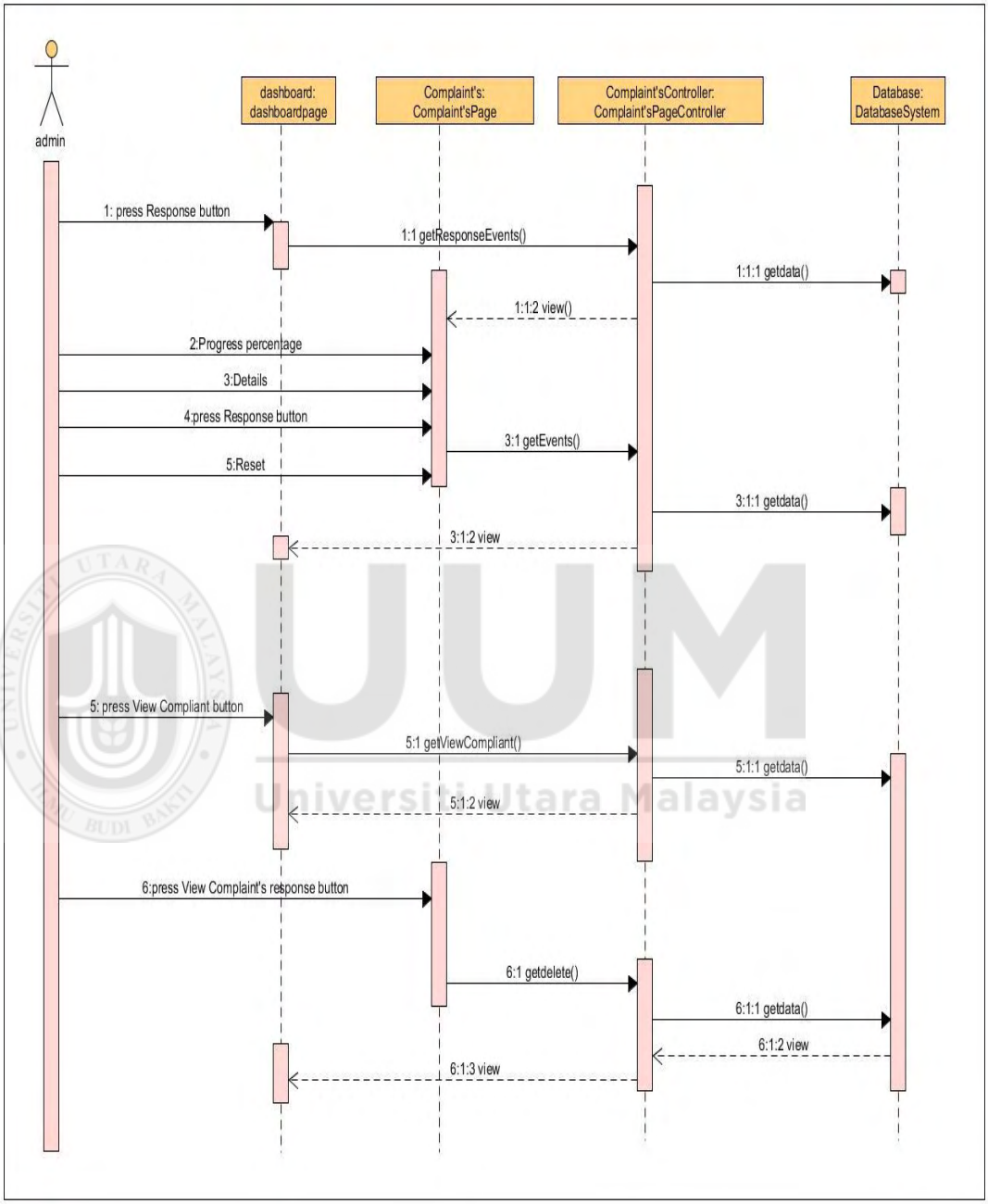


Figure 4.7 Sequence Diagram for: Complaint's by Admin (MSAS_02)

4.6.3 Sequence Diagram for booking by Admin (MSAS_3)

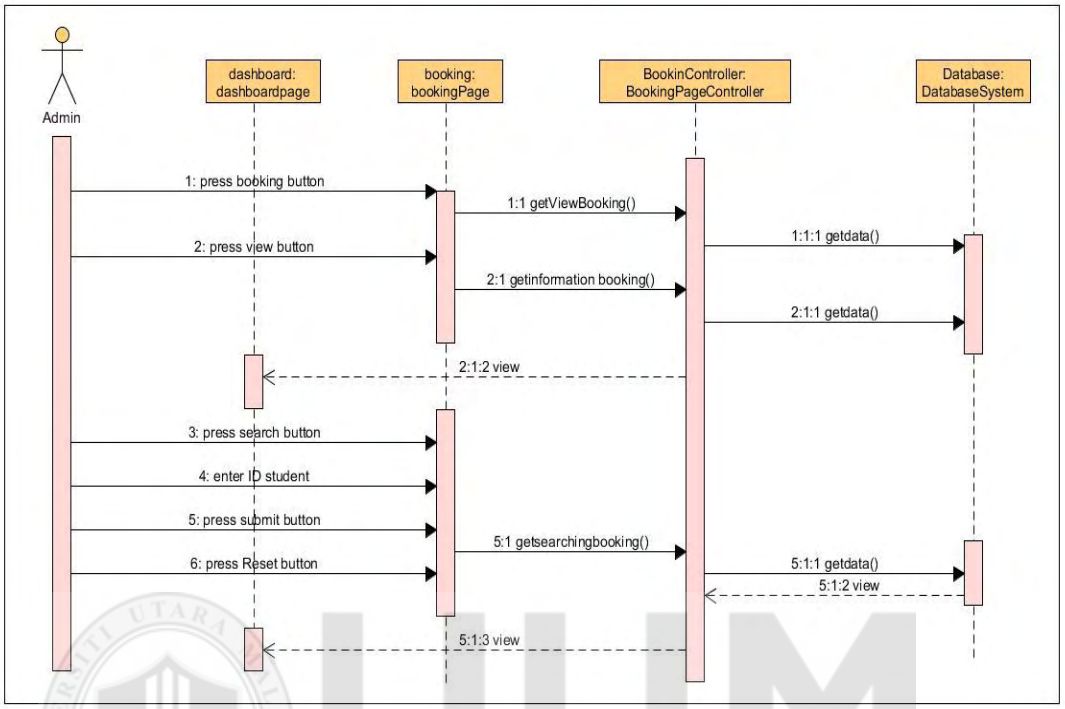


Figure 4.8 Sequence Diagram for: booking by Admin (MSAS_3)

4.6.4 Sequence Diagram for booking (MSAS_4)

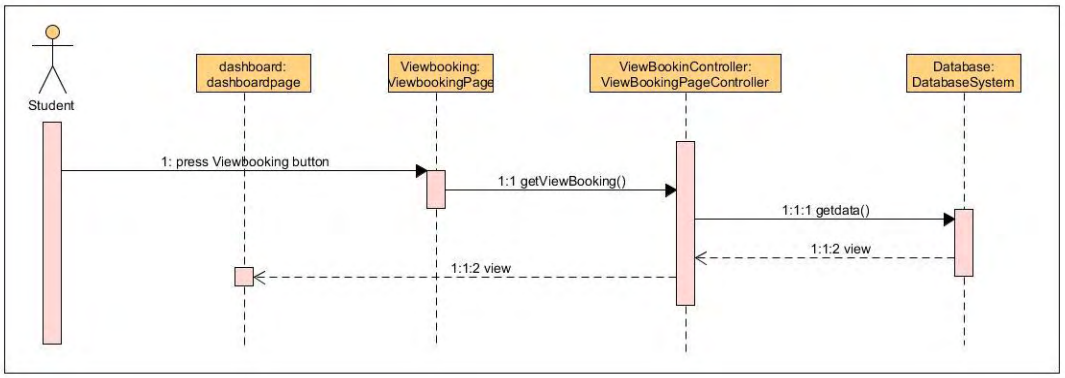


Figure 4.9 Sequence Diagram for: booking (MSAS_4)

- **The other Sequence Diagrams are described in detail in Appendix (A).**

4.7 Activity Diagram

The appropriateness of the activity diagram is not doubted especially for the similar modelling as well as the coexisting ones. Apart from that, it is important to test the software before it is being used. The sub activity particularly in the activity diagram is allotted into two different types of diagram i.e. autonomic activity diagram and compound activity diagram where these diagram act as the constructor of the entire activity diagram in terms of hierarchy (Mahali & Acharya, 2013). Activity diagrams (AD) will be basically redesigned in each model by which the syntax changes the major disparity as it switches from the machine based semantics to the token flow semantics as claimed by (Vitolins & Kalnins, 2005).

4.7.1 Active Diagram for manage Complaints by Admin (MSAS_01)

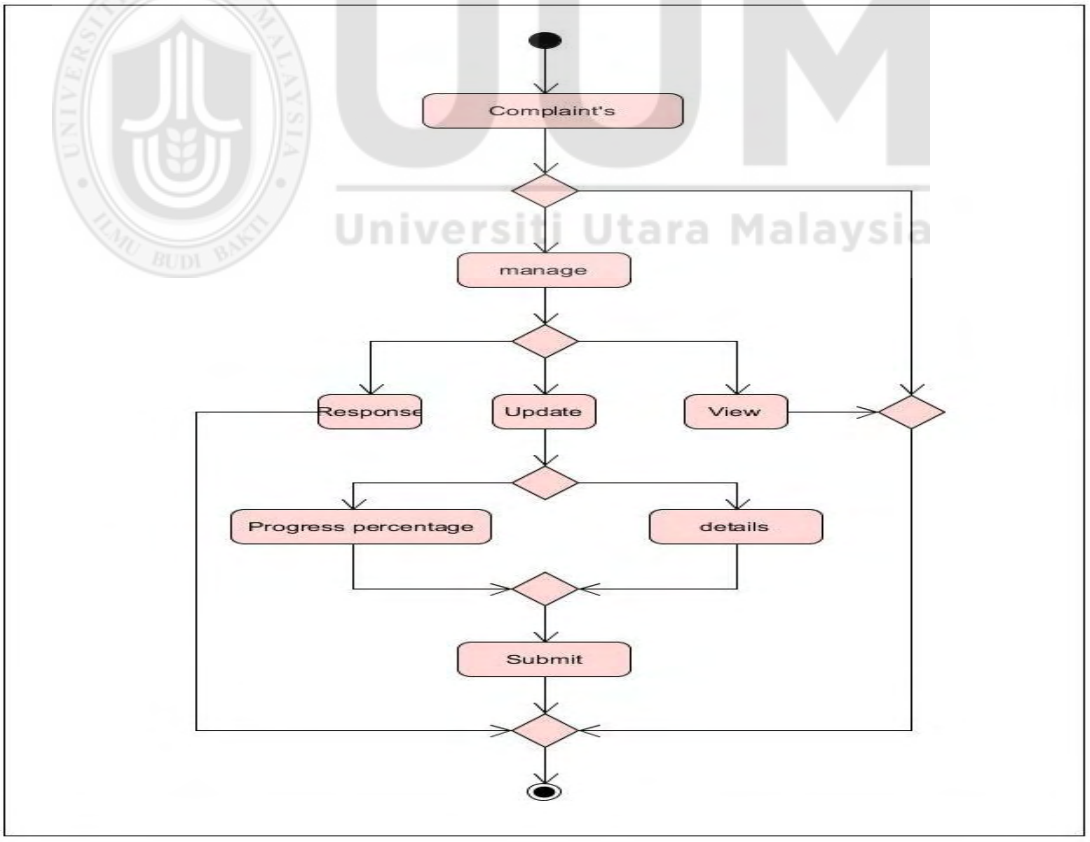


Figure 4.10 Active Diagram for: Complaints by Admin (MSAS_01)

4.7.2 Active Diagram for Booking by Admin (MSAS_02)

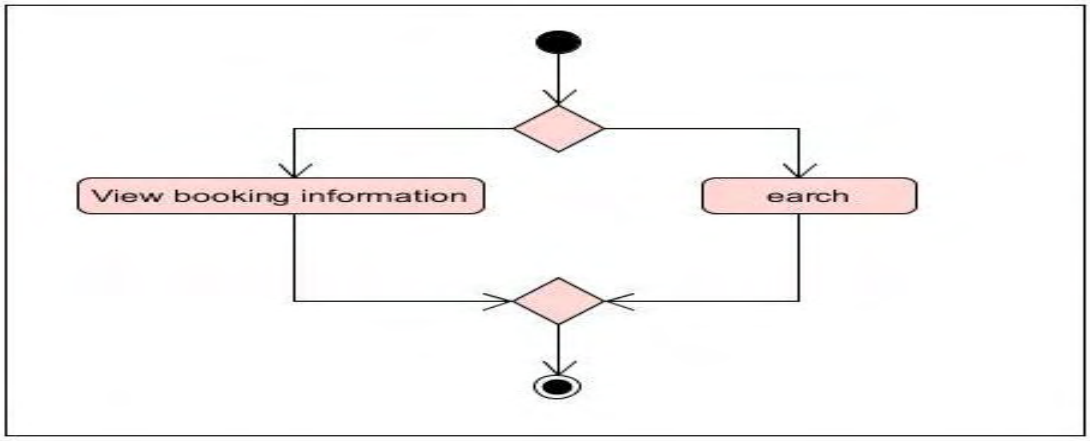


Figure 4.11 Active Diagram for: Booking by Admin (MSAS_02)

4.7.3 Active Diagram for Complaints Report by student (MSAS_03)

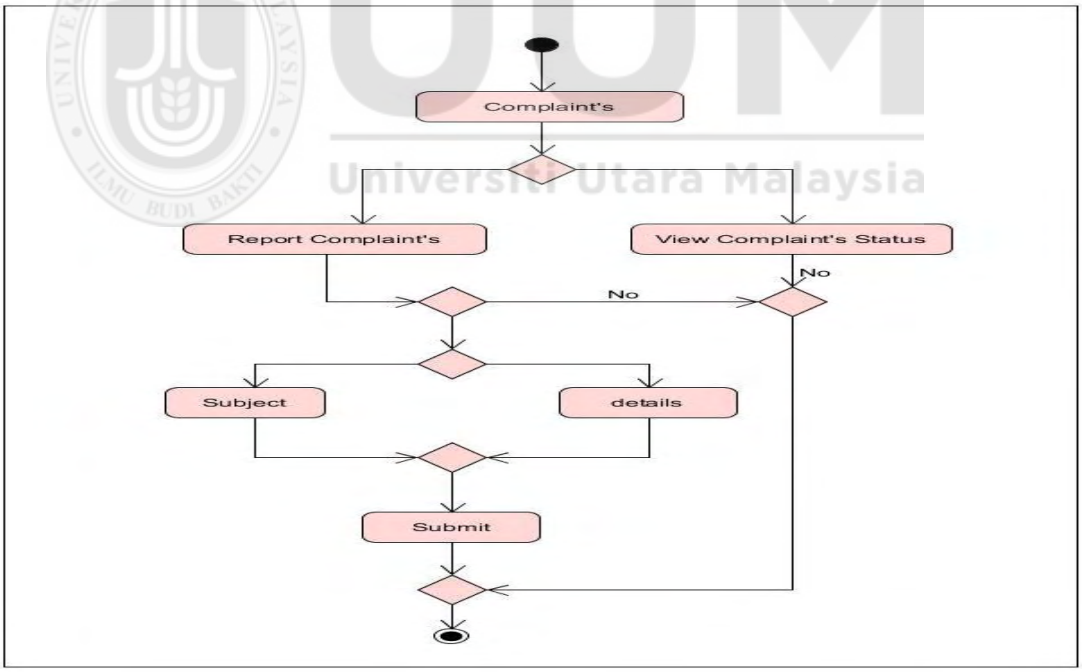


Figure 4.12 Active Diagram for: Complaints Reported by student (MSAS_03)

- **The other Active Diagram are described in detail in Appendix (A).**

4.8 Database Design

The main advantage of utilizing the database is that; it has the ability in retrieving, manipulating and storing large amounts of data in a very organized design where there are many phases of development of the database which actually occurred for the past 25 years (Yannakakis, 1995) In this particular system, the tools of the local database derived with the XML database where every each of the elaborations which utilized the tools of database is required in exporting and importing the data either locally or at the central database. This tool of database also requires the users to enter the data into the certification database and some of them need to report a challenge for database that is flexible enough for the users to perform update, or supplementing and amending certain elements without having to produce the floor system (Detter, Mooney, & Fatig, 2004).

4.8.1 Conceptual Database Design

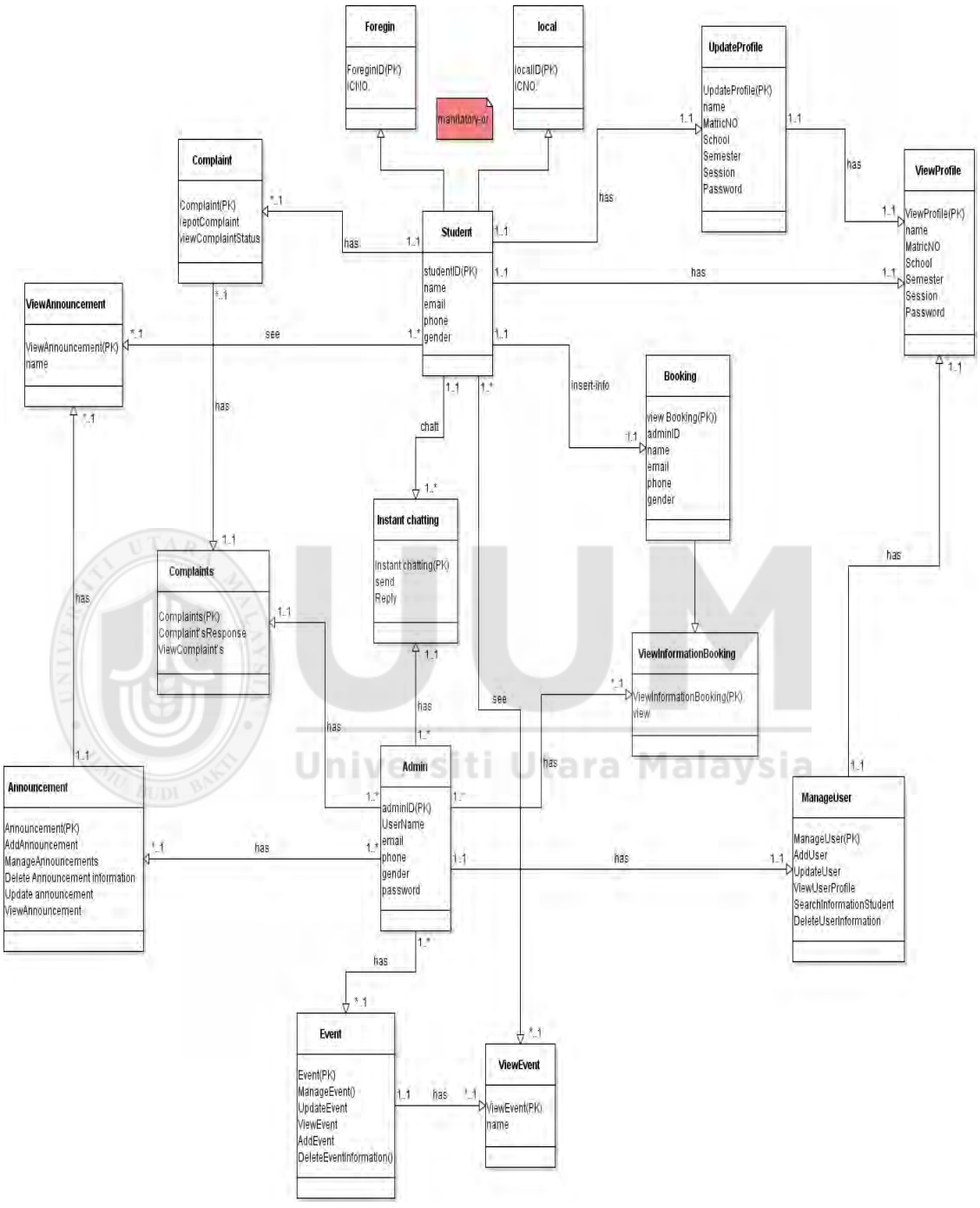


Figure 4.13 Conceptual Database Design

4.8.2 Logical Database Design

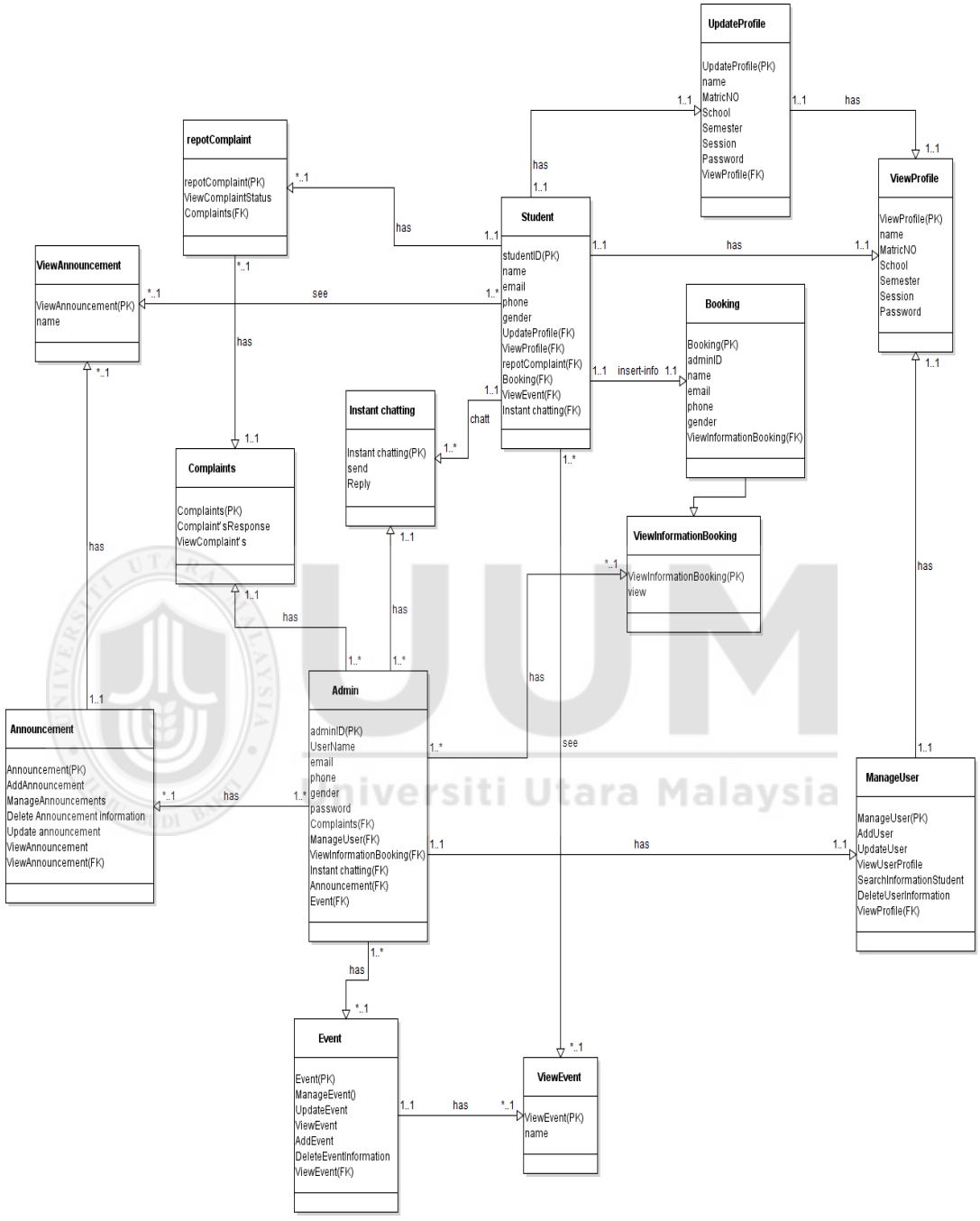


Figure 4.14 Logical Database Design

4.9 Architecture mobile Application and web server

There are ways to connect to the MSAS application that can be divided into two (2) types: SAC Officer, and Student.

Figure 4.40 Architecture mobile Application and web server

4.9.1 Direct Connection

The mobile application sends a request to web application in order 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.

4.9.2 Server-side application

The mobile application as well as the server-side application is actually interrelated. This means that a remote server is used in running the software program and the unique feature that it possesses is that; it is directly connected to a server-side application.

- Direct connection to a server-side application.

4.9.3 Web application

In general, the mobile application has the ability in communicating with the same web application in getting the information from it. There are three definite features of this particular connection and they are stated as follow;

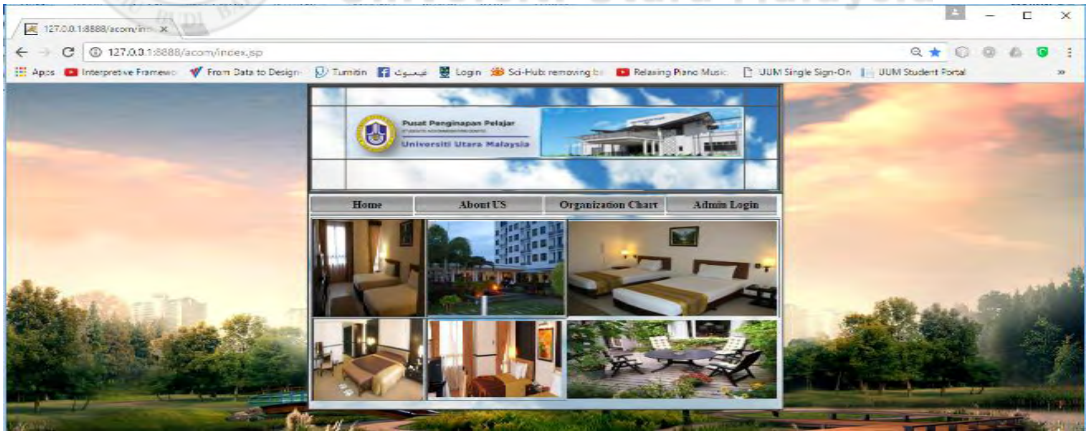
- Using the web services via the specialized API;
- Having user verification via a simple and secure login or password; and
- The UI commands are basically converted to API requests.

4.9.4 Cloud Integration

The cloud infrastructure which is a service used in UUM actually received a private cloud that is slightly the same with the classic understanding of clouds but actually it is specifically used only for UUM purposes as it possess a feature that is highly secured in terms of connecting to cloud through API.

4.10 Prototype design of web service

This is the main page for MSAS. This can be access by This application can be



accessed via http://127.0.0.1:8888/acom/index.jsp

Figure 4.41 Interface: View system

i. The admin will enter the system by entering his username and password, then he will click on log in button to proceed

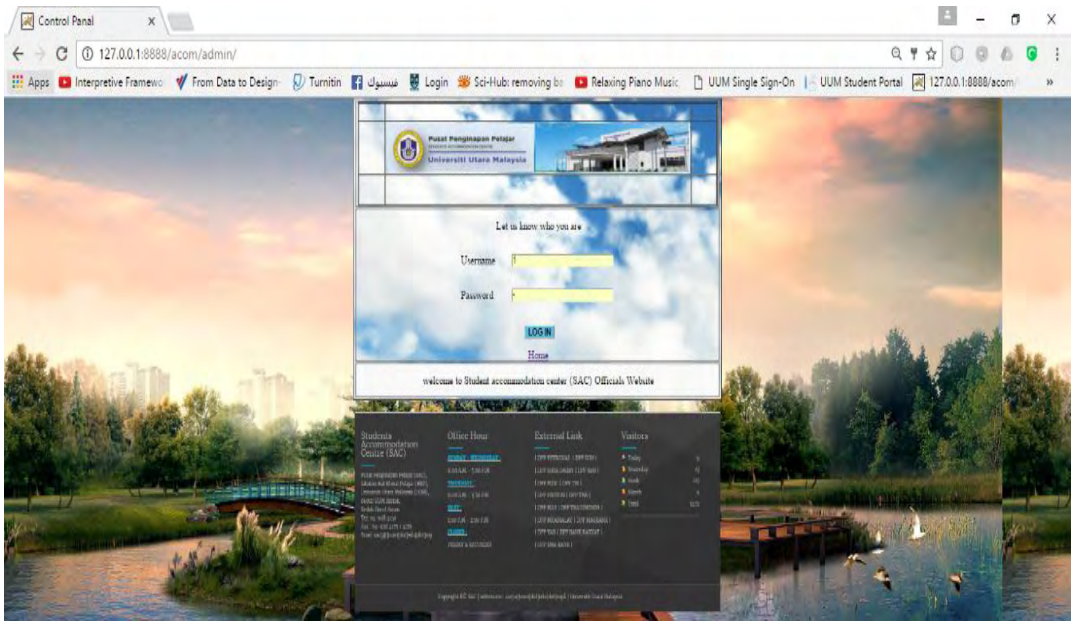


Figure 4.42 Interface: Login

ii. Admin can add important announcement by filling in the title and details of the announcement.

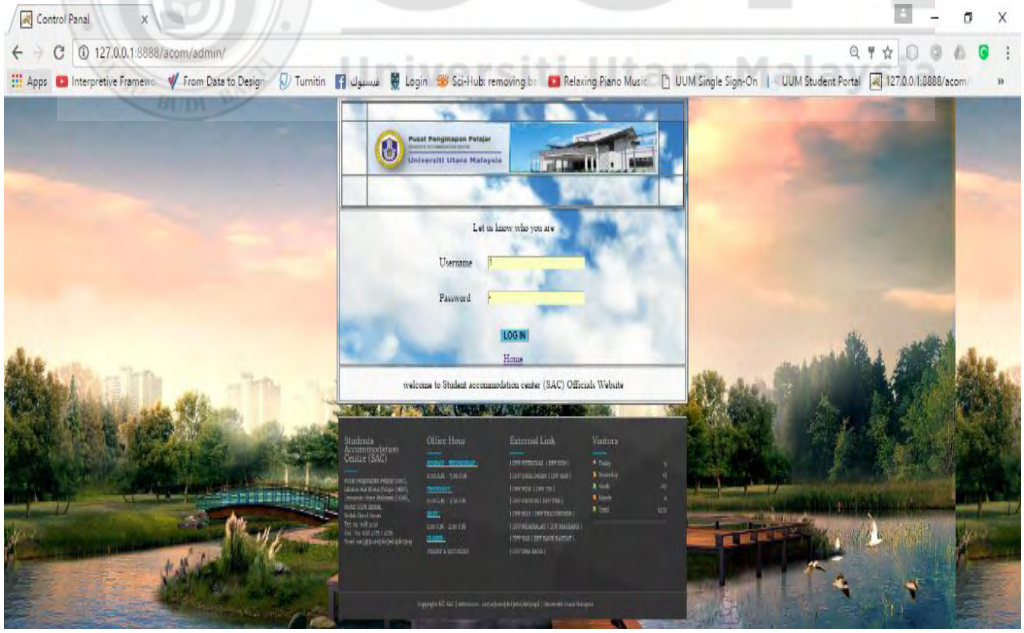


Figure 4.43 Interface: Add announcement

iii. Admin can also manage the announcements through update, delete and view functions.

Figure 4.44 Interface: manage announcement

iv. In case if the admin wants to make changes in the announcement made he can do so by using this function.

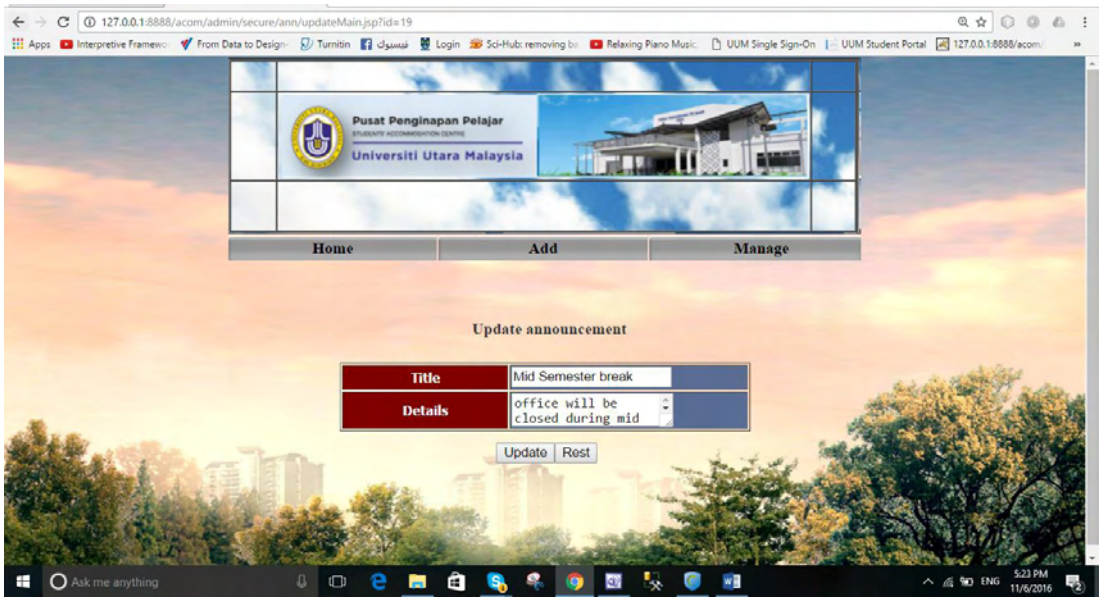


Figure 4.45 Interface: update announcement

v. Admin can also delete the information of the announcement from the system.

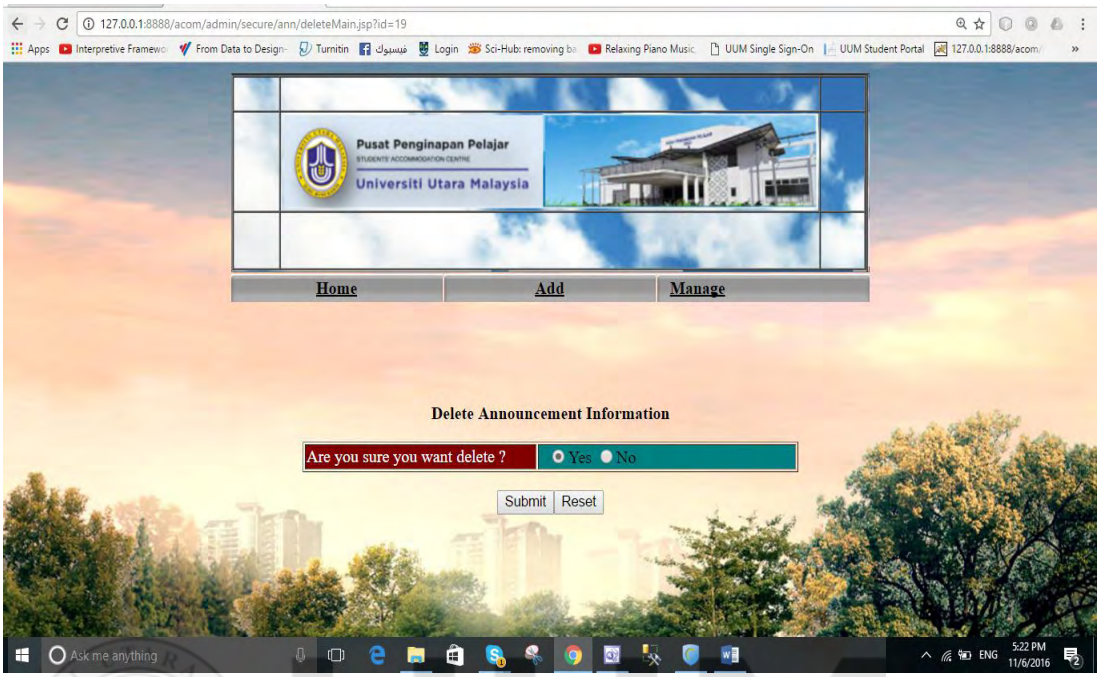


Figure 4.46 Interface: Delete Announcement information

vi. After adding the important announcement, the admin can review it in this function.

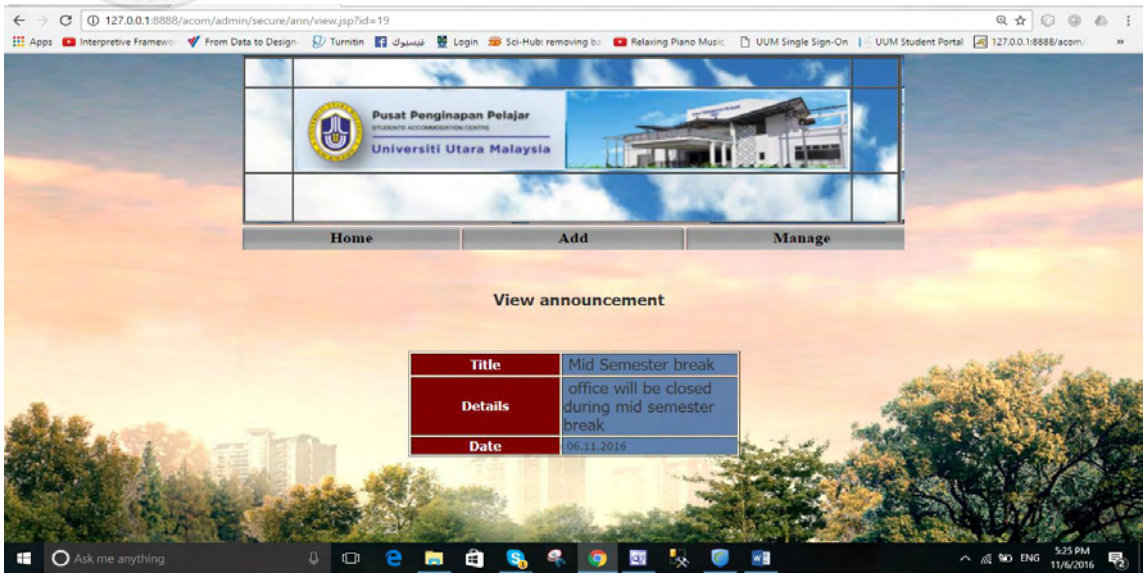


Figure 4.47 Interface: View Announcement

vii. Any important event that will be arranged by the accommodation system will be added in this function. The admin will click on the event button the following screen will be displayed.

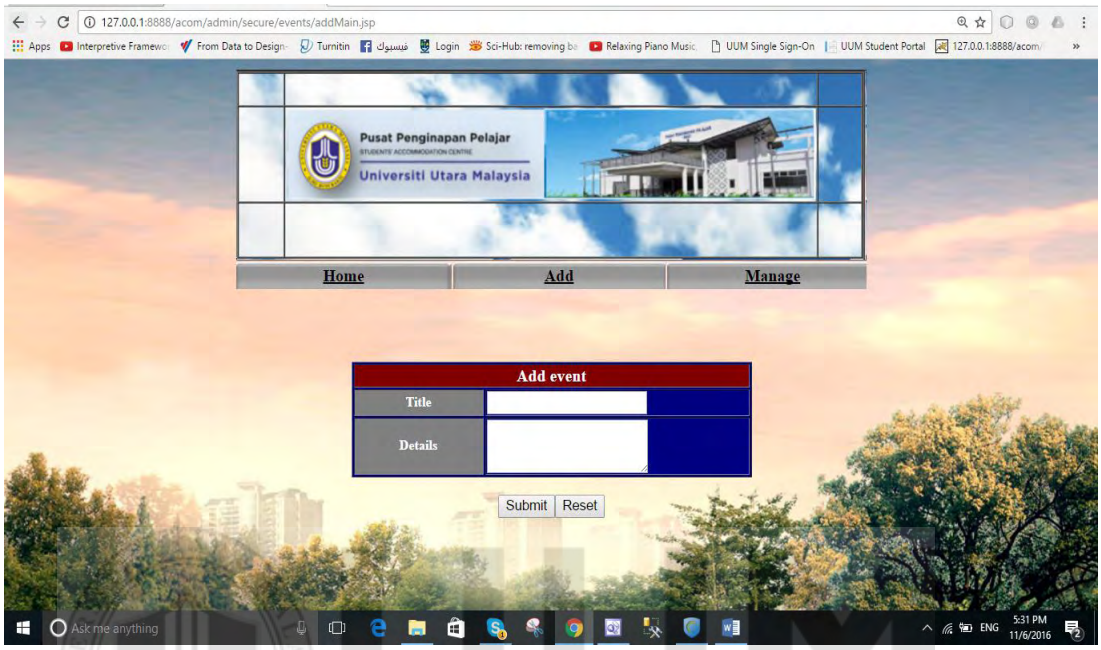


Figure 4.48 Interface: Add event

viii. Events that are announced can be managed.

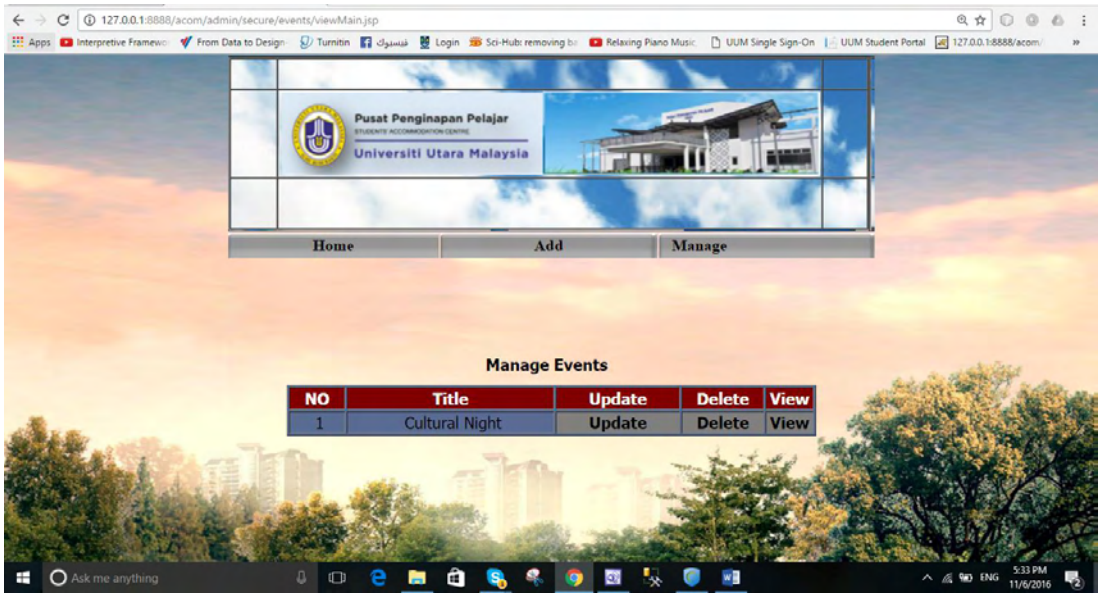


Figure 4.49 Interface: Manage events

ix. The following screen will be displayed. Admin can update the events by filling in the title and details of the event. After that click on the update button.

Figure 4.50 Interface: Update event

x. To remove the event been made click on the delete button and then select Yes and click on submit button.

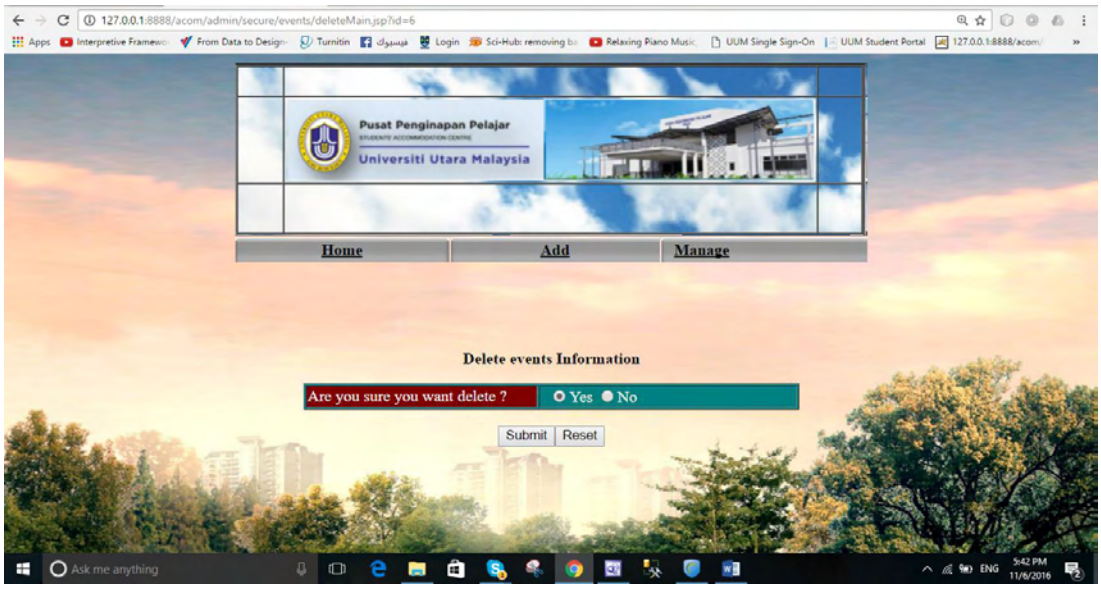


Figure 4.51 Interface Delete event

xi. The following screen will be displayed after filling in all the information relevant to the event

Figure 4.52 Interface: view event

xii. Add new user by filling in the required field and then click on the Submit button as shown below.

Figure 4.53 Interface: Add user

xiii. The following screen will be displayed if the admin wants to manage user information

Figure 4.54 Interface: Manage user by Admin

xiv. If the user forgets the password or username the admin can update his information by filling in the required fields as shown below.

Figure 4.55 Interface: Update user

xv. To delete the user information, click on the Delete button.

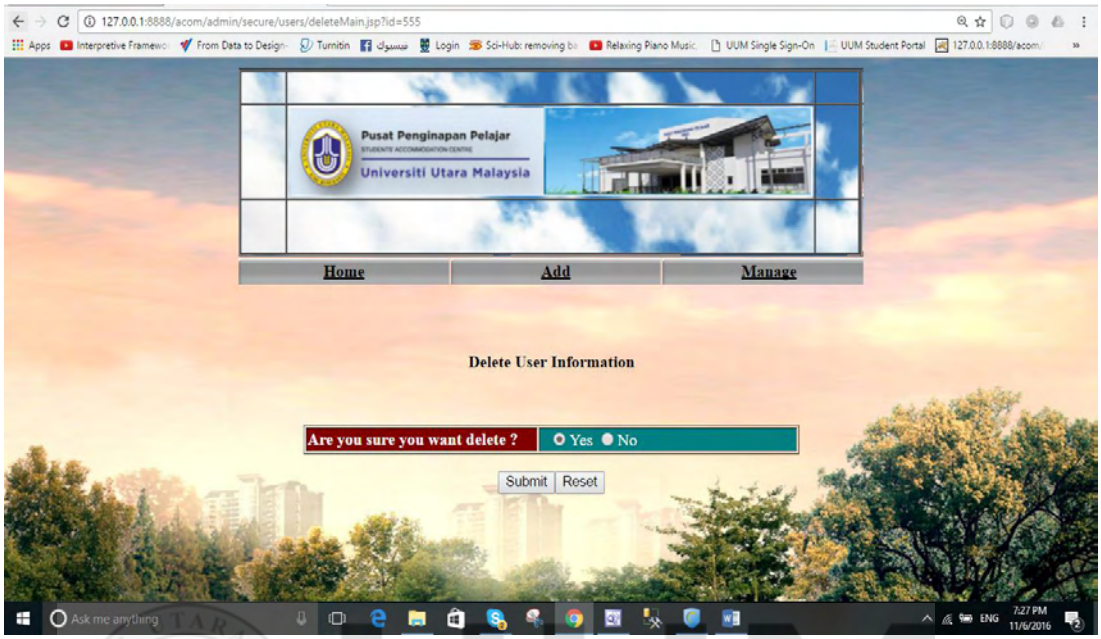


Figure 4.56 Interface: Delete user information

xvi. Click on the View button to View user profile.

Figure 4.57 Interface: View user profile

xvii. The Search button will help the admin to search for the user and the following screen will appear.

Figure 4.58 Interface: Search for user

xviii. Admin can manage the complaints by clicking on the Complaints from the home screen and the following page will be displayed as follows.

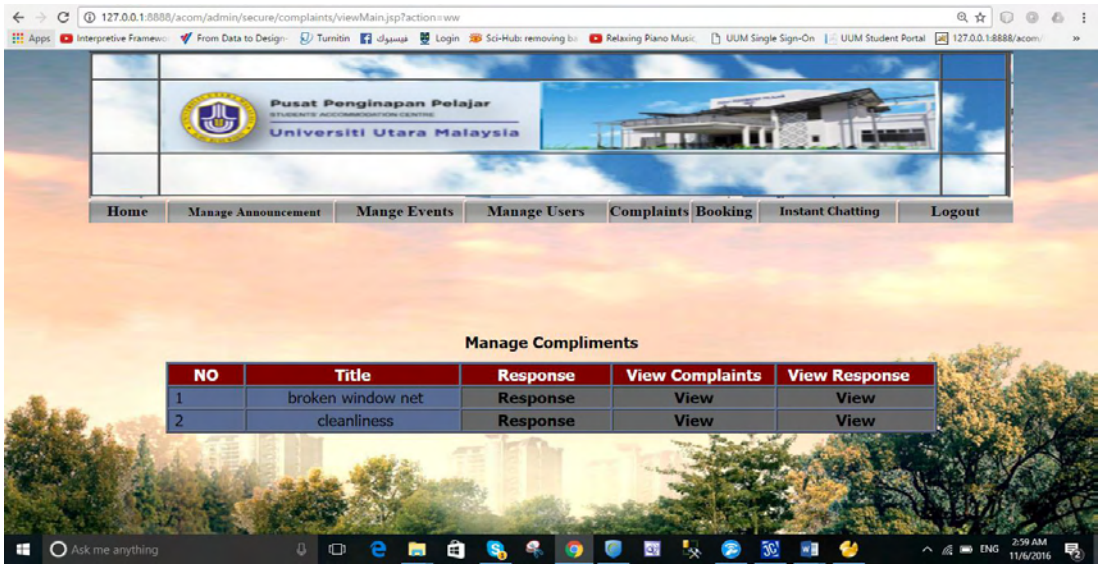


Figure 4.59 Interface: manage complaints

xix. In order to respond to the complaint's, the admin will click on the Response button.

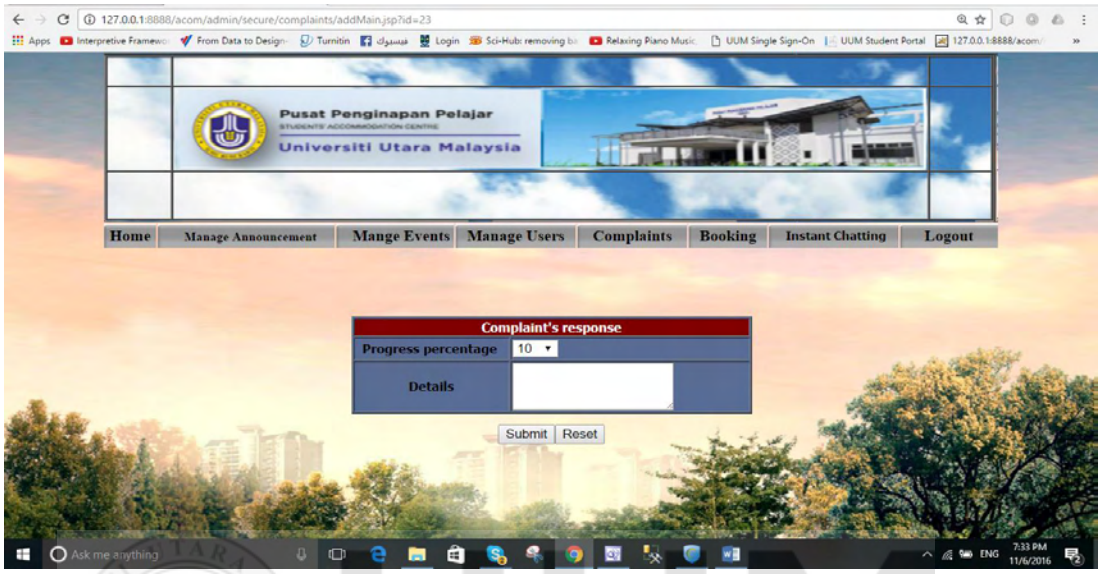


Figure 4.60 Interface: Complaint's response

xx. Admin can view the complaints been report by clicking on the View Complaints button.

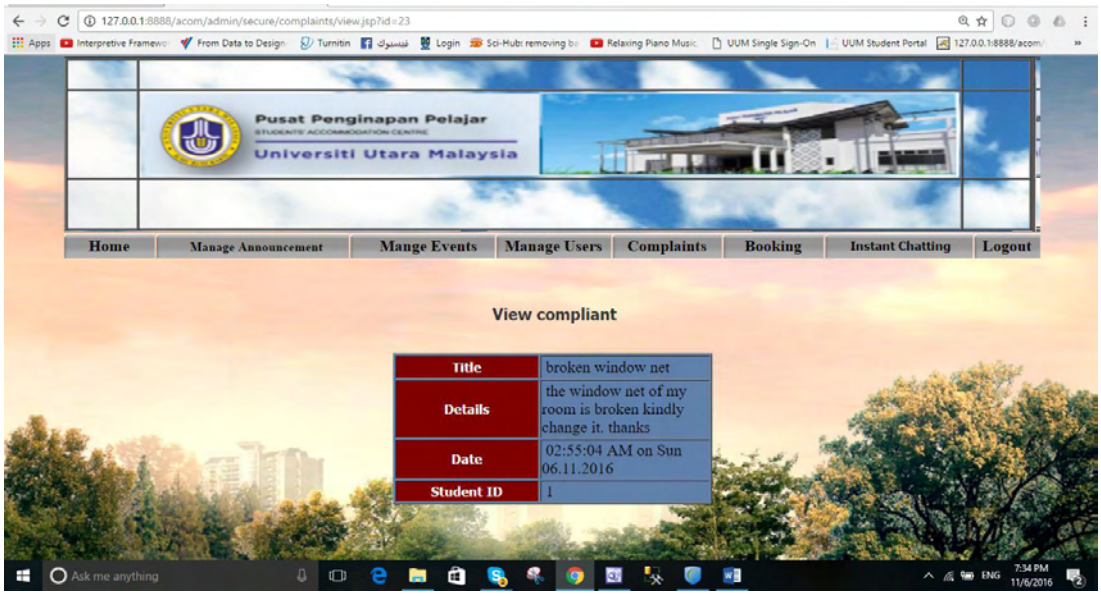


Figure 4.61 Interface: View compliant

xxi. To respond to the complaints the admin will click on the Respons button.

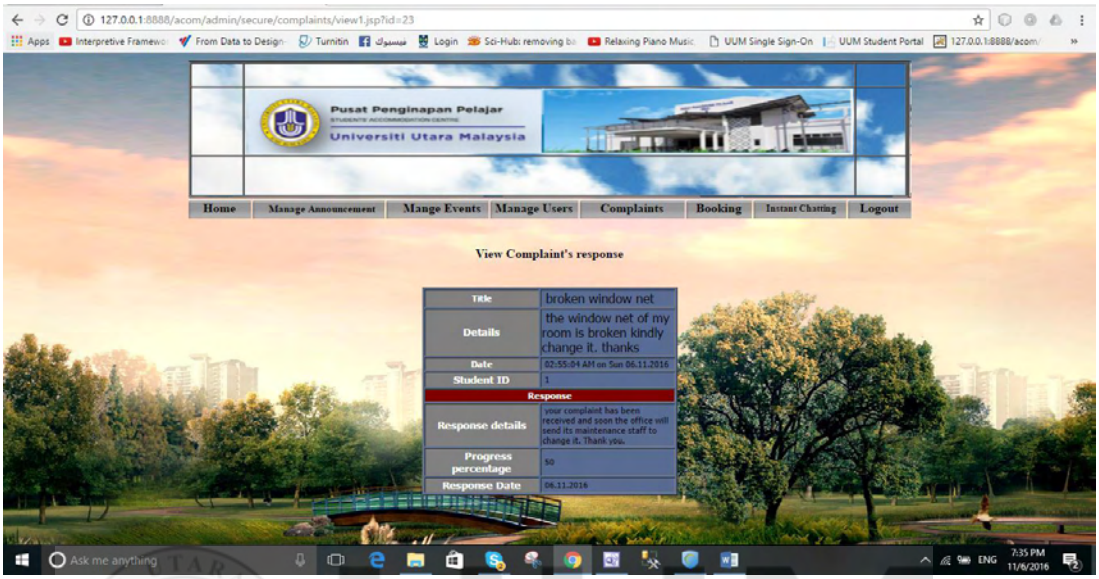


Figure 4.62 Interface: View complaint's response

xxii. To check the online booking information admin will click on Booking button and the following screen will be displayed.

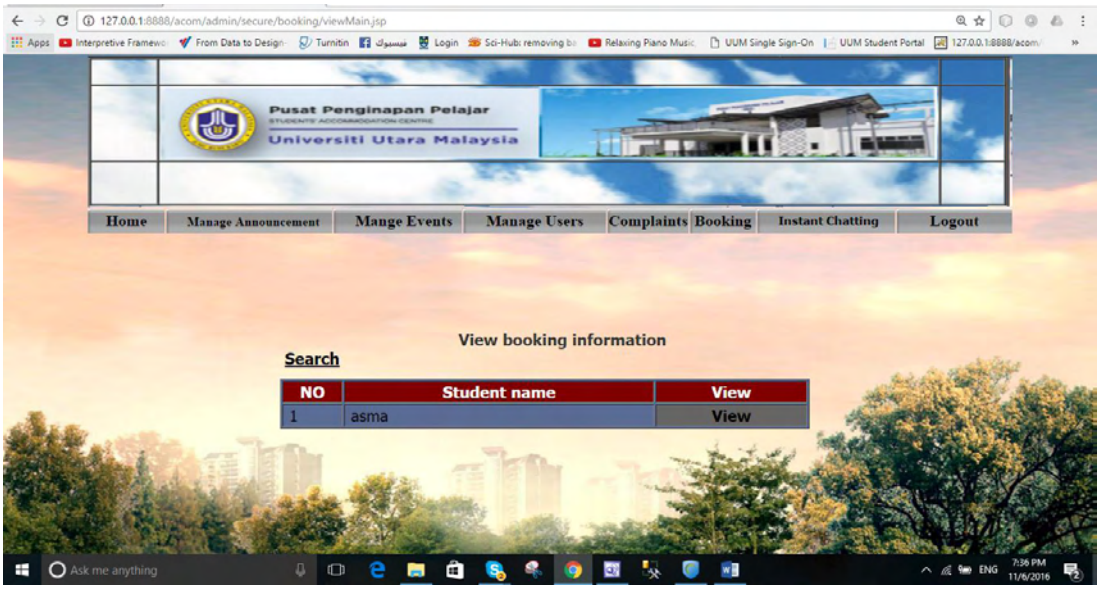


Figure 4.63 Interface: view booking information

xxiii. To view information of the student the admin will click on the View button.

Figure 4.64 Interface: search information student

xxiv. To view user inquiries about accommodation system the admin will click on the Instant Chatting by Admin button.

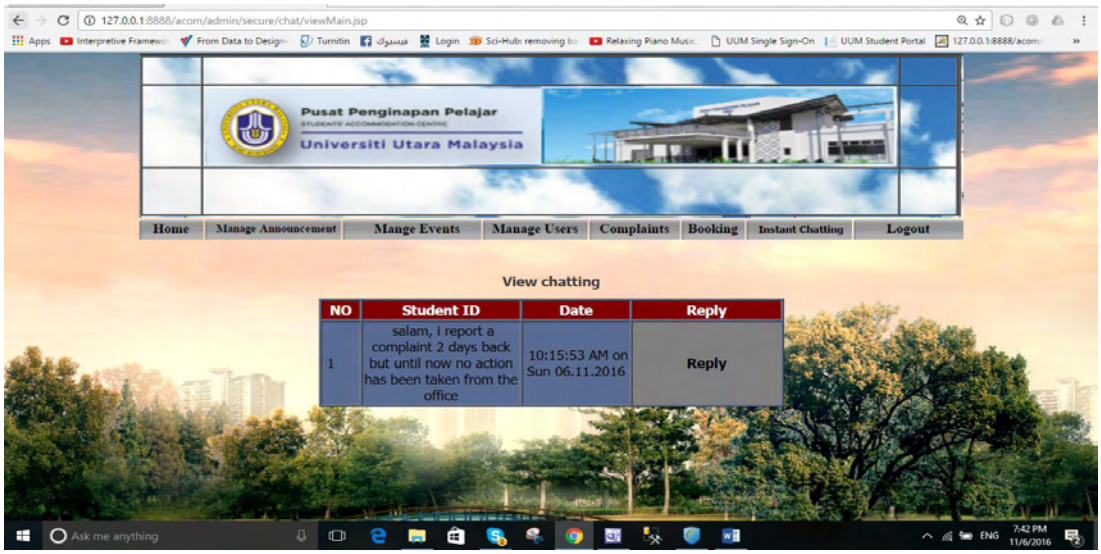


Figure 4.65 Interface: Instant chatting by Admin

xxv. When the admin wants to reply to the massages sent by the user, he will click on the Reply button and the following screen will be displayed.

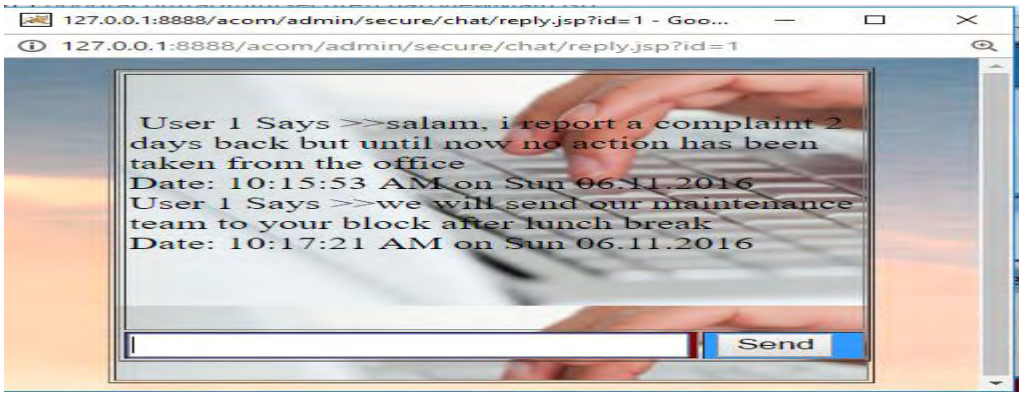


Figure 4.66 Interface: Reply massage

4.11 Application for Student

The application have become very important and will service for a large number of student. The smartphone is a mobile phone built on a mobile operating system with more advanced computing capability and connectivity (Ketmaneechairat, 2014). The present study will explain about mobile application MSAS below.

i. Students will enter to the system by clicking on the MSAS application.

Figure 4.67 Interface: View mobile system

ii. After that the student will Sign up to the application and the following screen will appear where the student will register providing its particulars.

Figure 4.68 Interface: Sign up

iii. Student will then enter its matric number as ID and password and then will click on Log in button to continue.

Figure 4.69 Interface: User log in

iv. After logging in to the system the Main menu will be displayed

Figure 4.70 Interface: Main menu

v. When the students want to report complaints about the accommodation system they will click on the Complaints button.

Figure 4.71 Interface: Report complaints

vi. The complaints reported can be viewed when the student will click on the View complaints

Figure 4.72 Interface: View complaints

vii. Students can click on View complaints to view response by admin on the complaint been reported as shown below

Figure 4.73 Interface: View complaints response

viii. Students can book accomodation online by clicking on the Booking function and the following page will be displayed.

Figure 4.74 Interface: Booking

ix. User can send their queries to the admin by clicking on the Instant Chatting

Figure 4.75 Interface: Instant chatting

x. If the user wants to view his profile and update his profile he can click on the Other button.

Figure 4.76 Interface: View and update profile

xi. Student can view events that are arranged by SAC by clicking on the Other button.

Figure 4.77 Interface: View Events

xii. Student can view the latest important announcement SAC by clicking on the Other button and then view announcements.

Figure 4.78 Interface: View announcement

4.12 Summary

This chapter basically clarifies the analyses of the prototype of the Mobile system accommodation for student (MSAS). It also included a list of requirements either functional or non-functional which are basically considered as the base in building the prototype. It also introduced the major function supported through the system simply by taking few snapshots of the selected prototype.

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CHAPTER FIVE
EVALUATION

5.1 Introduction

This chapter focuses on the evaluation of the MSAS in order to answer the questions as defined in chapter 1. SPSS version 23 was used to perform the analysis on the data that was gathered to test the usability of the mobile based application. Results for the analysis are discussed in the following section.

5.2 Method for Evaluation

The purpose of evalution is to ensure the implementation of the MSAS is satisfy by the users: SAS Officer and Student. The satisfaction was determined by the system usability scale that measures the overall usability of any system. The usability value is captured by using questionnaire that record feedbacks from the users.

5.3 Data Collection from Questionnaire

User feedbacks was collected using a questionnaire that is divided into two sections. The first section contains questions regarding general information to collect users' demographic data and mobile applications experience. The second section contains items that are intended to measure the User Evaluation regarding the MSAS prototype usability aspects.

5.3.1 Respondent for General Information

In the general information section, the researcher understands about the user's demographics. The general information has list and clarify the distribution of the sample given. Items for the participant's general information were; Gender, Age, Educational background, own a mobile device, duration for using mobile

applications. The data were analyzed using descriptive statistical analysis in SPSS, and the results is shown in table 5.1.

Table 5.1: SUS Questionnaires

Sr. No	Statements
1	I think that I would like to use MSAS frequently.
2	I found the MSAS unnecessarily complex
3	I thought the MSAS was easy to use
4	I think that I would need the support of a technical person to be able to use MSAS
5	I found that the various functions in this MSAS were well integrated
6	I thought that there was too much inconsistency in MSAS.
7	I would imagine that most people would learn to use MSAS very quickly
8	I found MSAS very difficult to use
9	I felt very confident using MSAS
10	I needed to learn a lot of things before I could get going with MSAS

5.3.2 System Usability Scale (SUS)

The usability scale is used in accessing the MSAS usability and the scale was basically developed as a toll in evaluating the measurement of the subjective usability of several systems evaluation in the industry. Various evaluations include the SUS i.e. voicemail system, virtual keyboard, paper ballots, mobile phone, and website (Ng, Lo & Chan, 2011). Based on the results obtained, SUS apparently provides robust and valid measurement for the practitioners in measuring the SUS as it can be utilized in a wide range of technologies available nowadays. In general, the individual statements of SUS are not specifically meaningful but it is applicable regardless of different technologies being used (Bangor, Kortum & Miller (2009).

The development of SUS has been initialized by John Brooke in assessing the usability of a system (Sauro & Lewis, 2011). 10 items are used in gathering

subjective opinions from the users as illustrated in Table 5.1. It has been found that SUS can also be utilized in assessing two sub factors learn and usability of a system (Sauro & Lewis, 2011). In this particular project, the SUS was used in assessing the MSAS usability. Every each of the items is presented to the participants with 5-point scale being used which all ranging from the statement "strongly disagree" (scale = 1) to "strongly agree" (scale = 5) as stated in Table 5.2.The SUS uses the following response format:

Table 5.2 the System Usability Scale (SUS)

5.3.3 Scoring SUS

The scoring was done with the use of scoring key which has been provided by the developer of the scale mentioned. In conducting the calculation of the SUS score, firstly, the score contributions from each item need to be sum up. Each of the item's score contribution basically will be of a range between 0 to 4. For items 1,3,5,7 and also 9, the score contribution is the scale position minus by 1. Meanwhile, when it comes to items 2,4,6,8 and 10, the contribution can be said to be 5 minus the scale position. Hence, several items i.e. items 2,4,6,8 and 10 were reversed coded in this study.

5.4 Procedure

It is crucial to note that the procedure in gathering the data is specifically a central stage of SUS. The data was collected using the survey method by which the participants were selected randomly in participating to the survey. Every each of them was given a brief explanation in terms of the usage and also the interface of

other prototypes. They were also given an allocated sample time in learning and exploring the prototype contents. Once they were done with it, they were given sets of questionnaire for them to answer as what has been included in Appendix B. The process of administering and also collecting the questionnaire were then done by the researcher. The respondents then received a brief explanation regarding the purpose of the research and also its significance. They also were affirmed that their responses as well as their answers will certainly be kept as confidential and this will promote honesty and accuracy in answering the survey. They were also given an example on the procedures in answering the questions and it is important for them to clarify any miscellaneous they encountered and 10-15 minutes were allocated for them to answer the questionnaire.

5.5 The Sample

SUS is able to get a measure of the perceived usability of a system with a small sample of 40 students (Lewis & Sauro ,2009). The participants that took part in the user usability evaluation included 15 male and 25 females with different education level from degree to PhD. All participants were UUM students the demographic details have been shown in table 5.

5.6 Data analysis

Descriptive statistics such as mean and standard deviations of the various factors and demographic data were tabulated. Psychometric properties (Reliabilities) of the scales were computed using SPSS version 23. Moreover, descriptive analysis was performed to assess the distribution of data across the pre-defined demographic characteristics of respondents.

5.7 Results

Two Strategies were involved in performing the data analysis: (i) Descriptive analysis (ii) Reliability of scales. The results of which are shown below.

5.7.1 Demographic Distribution of the sample

The frequency and percentage of the demographic distribution of the sample is discussed below:

5.7.1.1 Gender

The tabular and graphic presentation of results reveals the following results.

Table 5.3 Showing frequency and percentage of Gender

Gender	Frequency	Percentage
Male	15	37.5
Female	25	62.5
Total	40	100.0

The results Gender shown in figure 5.1 and table 5.1 illustrated of gender of all the respondents, result was 15 (37.5%) male and 37 (62.5%) females.

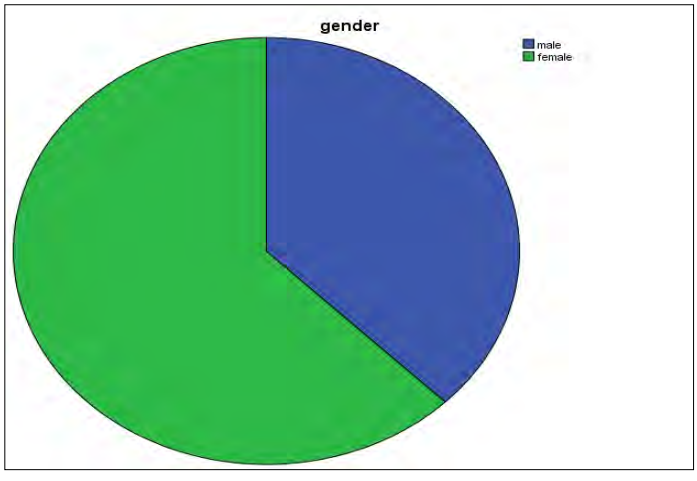

Figure 5.1: Gender

5.7.1.2 Age

The results of respondents have been shown below:

Table 5.4 showing frequencies and percentages of age of participants

Age	Frequency	Percent
20.00	3	7.5
21.00	5	12.5
22.00	4	10.0
23.00	5	12.5
24.00	2	5.0
25.00	8	20.0
26.00	5	12.5
32.00	3	7.5
33.00	2	5.0
37.00	1	2.5
47.00	1	2.5
Total	40	100.0

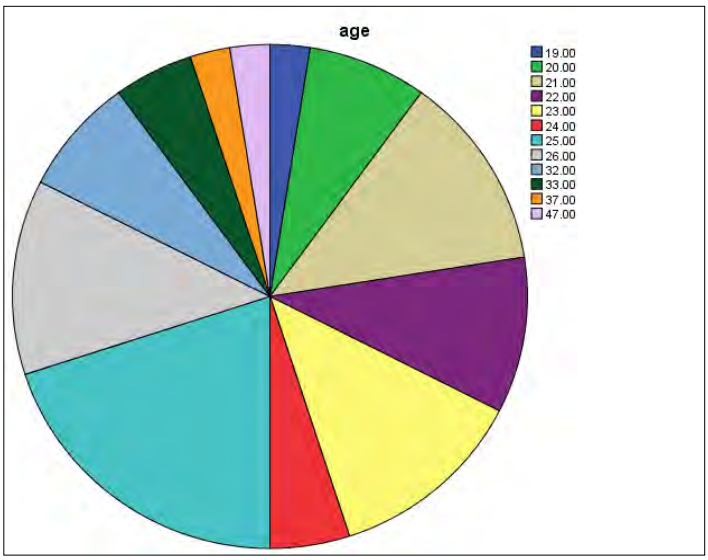

Figure 5.2 Age

Figure 5.2 and table 5.4shown, most of the respondents were less than 48 years old. Among 40 participants, 8 participants were 25years old that is the percentage is 20% whereas, the minimum age recorded was 20 years old 18 participants i.e. (8%) of the total respondents.

5.7.1.3 Education Background

The educational background reveals the following results:-

	Frequency	Percent	Valid Percent	Cumulative Percent
degree	19	47.5	47.5	47.5
masters	12	30.0	30.0	77.5
PhD	9	22.5	22.5	100.0
Total	40	100.0	100.0	

Table 5.5 Education Background

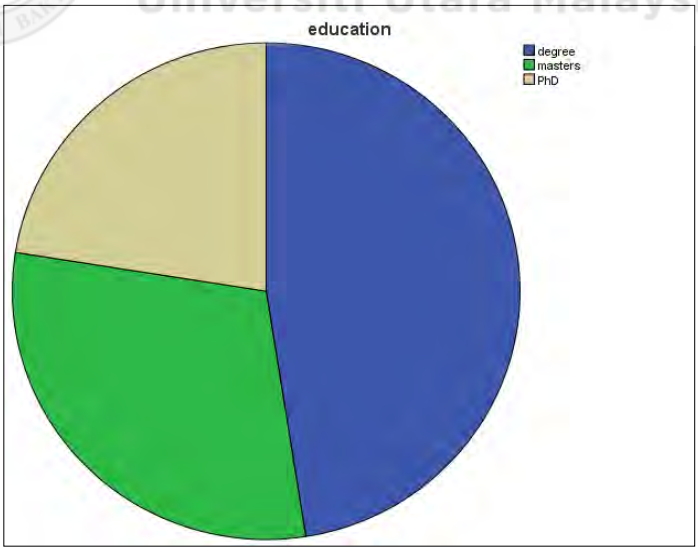

*Figure 5.**3** Education Background*

Figure 5.3 and table 5.5 shown the analysis shows that from the total 40 participants. The frequency of degree students was very high that is 19 contributing towards 47 % of the total participants. The least number of participants belong to PhD i.e. 9 (22%) and the number of master students were 12 (30%).

5.7.1.4 Do you have a mobile device

Table 5.6 Do you have a mobile device

Response options	Frequency	Percent
YES	39	97.5
NO	1	2.5
Total	40	100.0

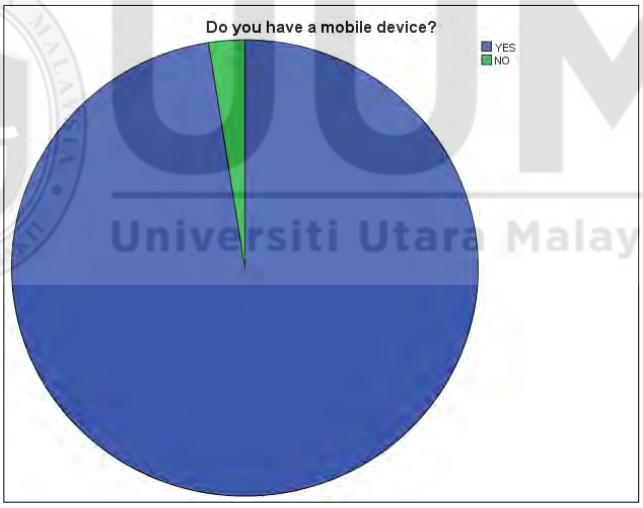

Figure 5.4 Do you have a mobile device

It has been revealed based in the results that the participants possessed their own mobile device. This had also indicated that mobile devices are important in any individual's life and it also stated that there is an increase in the percentage of people who possessed mobile device and meanwhile, 97% indicates good results which specifically indicate that mobile application will be the major option in taking the services.

5.7.1.5 How long you have been using mobile application

Table 5.7 how long you have been using mobile application

Frequency	Percent
1	2.5
2	5.0
3	7.5
9	22.5
3	7.5
2	5.0
5	12.5
2	5.0
8	20.0
1	2.5
1	2.5
2	5.0
1	2.5

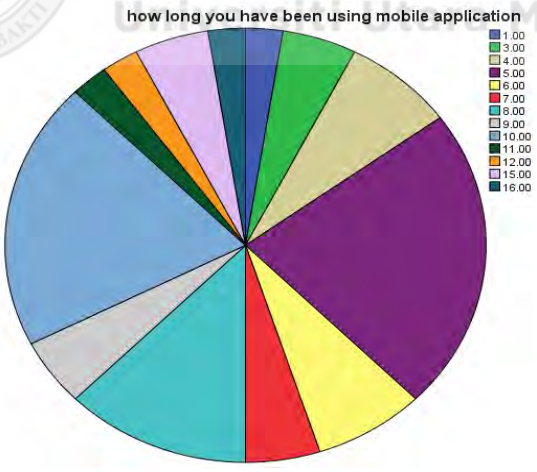

Figure 5.5 how long you have been using mobile application

Mobile Application Experience Based on the figure 5.5 and table 5.5 illustrated that 23% of the total participants have less than 10 years mobile application experience,

and only 4 participants has less than 5% experience. However, there was not any participant that does not have experience with mobile application (0%) that will increase the usability of our application.

5.8 Reliability

The reliability is important in addressing the usability of the questionnaire and acts as an evaluation to it. The most popular reliability test used in studies is the Cronbach Alpha Coefficient (Coakes, 2005). The value of Cronbach Alpha Coefficient was basically calculated by the utilization of SPSS 23 software in determining the scale reliability which is closely related in finding out the internal consistency. Table 5.6 demonstrates the value of Cronbach Alpha for the system usability scale. It has been stated that if the value is higher than 0.7, the internal reliability is believed to be consistent (Andrew, Pedersen, & McEvoy, 2011). Thus, the scale is having a good reliability i.e. it is internally consistent.

Table 5.8 Reliability Statistics

Cronbach's Alpha	N of Items
.792	10

Based on Table 5.8, the reliability is significant accepted because the Cronbach alpha value is greater than 0.7 which indicated good reliability of the scales.

5.9 System usability scale

The response in frequency and percentage on each item of the system usability scale has been discussed below:-

5.9.1 Item no 1

Table 5.9 showing the frequency and percentage of item no 1 "I think that I would like to use MSAS frequently".

Response format	Frequency	Percentage
Strongly disagree	1	2.5
Disagree	0	0.0
Neutral	9	22.5
Agree	26	65.0
Strongly agree	4	10.0
Total	40	100.0

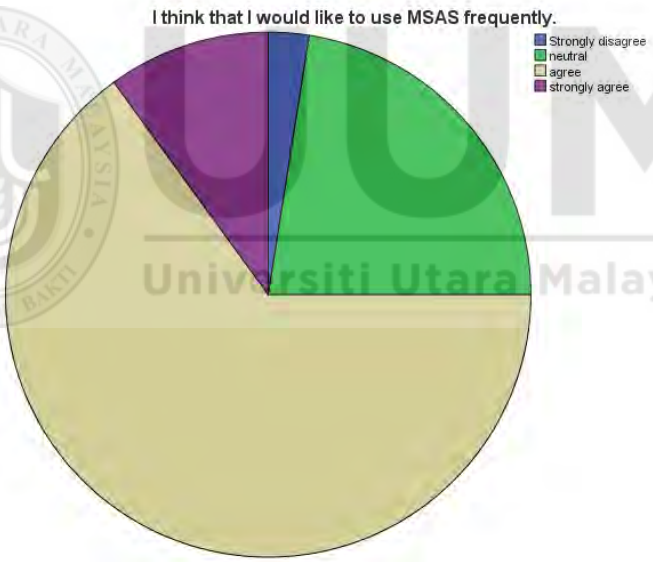

Figure 5.6 I think that I would like to use MSAS frequently

The results of item 1 revealed that 65% of the people shows agreement about frequently using MSAS having the mean= 3.80 and SD=.72. Based on this the researcher concludes that the users are satisfied with using mobile application.

5.9.2 Item no 2

That showing the frequency and percentage of item “I found the MSAS unnecessarily complex”

Table 5.10 showing frequency and percentage of item no 2

Response format	Frequency	Percentage
Strongly disagree	6	15.0
Disagree	11	27.5
Neutral	23	57.5
Agree	6	0.0
Strongly agree	0	0.90
Total	40	100.0

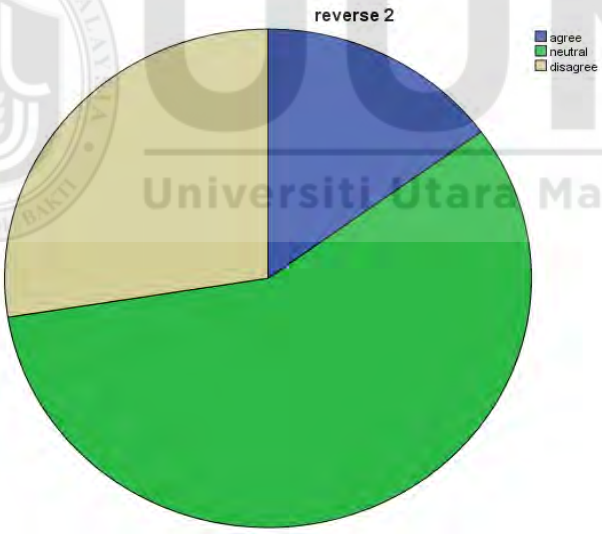

Figure 5.7 I found the MSAS unnecessarily complex

Based on the results from the table 5.10 about the complexity of operate MSAS would be easy for the users, the result was quite good with 27% disagree and 15% strongly disagree and the mean value of response was 3.12 and the SD=. 64 with the

complexity. This question reflects the importance of usage of MSAS that it is easy for the users to operate and they didn't face any difficulty to use the application.

5.9.3 Item no 3

The item number 3 measures the ease of using application i.e "I thought the MSAS was easy to use". The results of the analysis are presented in table 5.11

Table 5.11 showing frequency and percentage of item no 3

3. I thought the MSAS was easy to use Mean =.3.75 SD =.80		
Response format	Frequency	Percentage
Strongly disagree	1	2.5
Disagree	2	5.0
Neutral	7	17.5
Agree	26	65.0
Strongly agree	4	10.0
Total	40	100.0

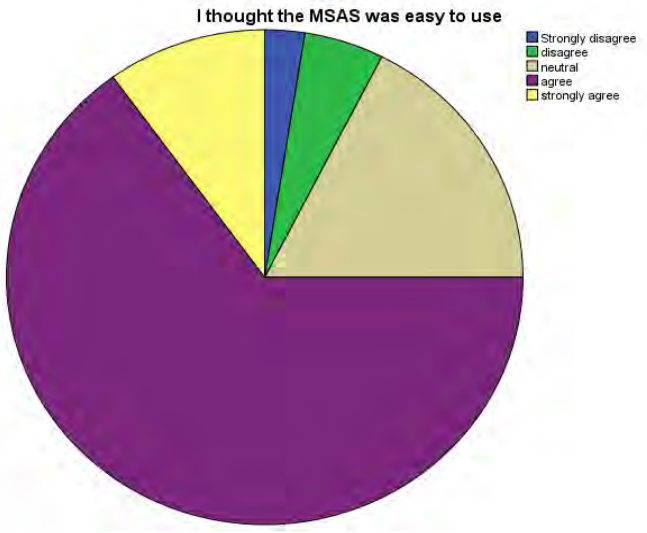

Figure 5.8 I thought the MSAS was easy to use

Based on the results from the table about the ease to operate MSAS, the results were quite satisfactory that is 65% of the people agrees that the MSAS is easy to operate and 10 % strongly agrees. This question reflects the important purpose of the study that is it's easy to be learned by the users. That led towards the supposition that the users will not face any difficulty in the use of the application.

5.9.4 Item no 4

The item number 4 measures the need of a technician for using the MSAS i.e "I think that I would need the support of a technical person to be able to use MSAS". The results of the analysis are presented in table 5.12 .

Table 5.12 showing frequency and percentage of item number 4 "Need the support of a technical person to use MSAS ".

Need the support of a technical person to use MSAS		Mean =. 2.8 SD =.87
Response format	Frequency	Percentage
Strongly agree	1	2.5
Agree	15	37.5
Neutral	15	37.5
Disagree	8	20.0
Strongly disagree	1	2.5
Total	40	100.0

Based on the results from the table illustrates that the percentage of the users whom agreed that the application is easy enough to be operated by own and that there is no need of a technical person where the mean is .28 and standard deviation is .87. This question reflects the main purpose of the study that the design of the application is simple and users can easily make reservations and complaints regarding accommodation system using mobile application more than make by normal method. The percentage of people disagree with the need of technical person was 20 % and

the people who strongly agree with the need to have a technical person to teach them the use of application were 2%.

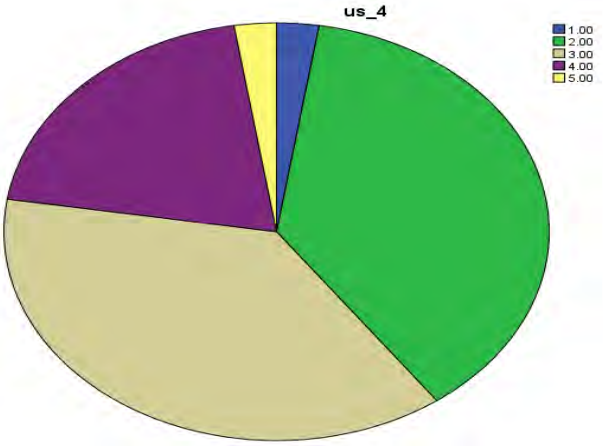

Figure 5.9 us_4

5.9.5 Item no 5

The item number 5 measures the integration of various functions of application the results of which as shown below

Table 5. 12 I found that the various functions in this MSAS were well integrated

I found various functions in this MSAS were well integrated	Mean =2.97	SD =0.83
Response format	Frquency	Percentage
Strongly disagree	0	0.0
Disagree	2	5.0
Neutral	11	27.5
Agree	24	60.0
Strongly agree	3	7.5
Total	40	100.0

The percentage of users who show agreement how MSAS is very well integrated in terms of its functions that makes the user easy to understand its functions and

accomplish the task efficiently. The mean of the items was 3.70 and 0.68 was the standard deviation. The results showed that 60% people agree with the integration of the mobile application and 0 % strongly disagree that it was not integrated very well.

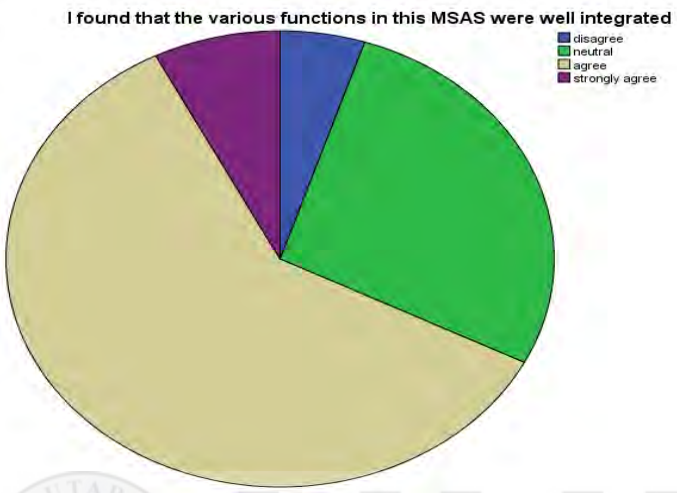

Figure 5.10 I found that the various functions in this MSAS were well integrated

5.9.6 Item no 6

Item number 6 measure the inconsistency in the application. The results are illustrated below:

Table 5.13 showing the results of item 6

I thought that there was too much inconsistency in MSAS. Mean =2.97 SD =0.68		
Response format	Frequency	Percentage
Strongly agree	3	7.5
Agree	5	12.5
Neutral	22	55.0
Disagree	10	25.0
Strongly disagree	0	0.0
Total	40	100.0

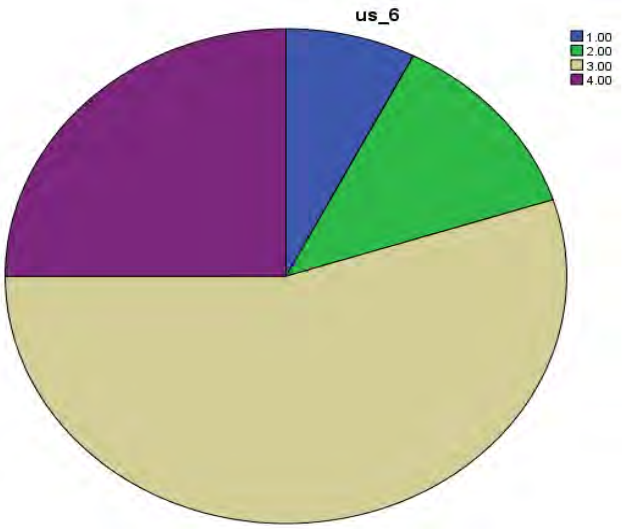

Figure 5.11 I found that the various functions in this MSAS were well integrated

The results found that the mean of responses was 2.97 whereas .83 was the standard deviation. The results further illustrated that 25% respondents disagree with the application integration.

5.9.7 Item no 7

Item number 7 illustrates the ease to learn quickly the results are presented below:

Table 5.14 I would imagine that most people would learn to use MSAS very quickly

Most people would learn to use MSAS very quickly	Mean =3.57	SD =0.90
Response format	Frequency	Percentage
Strongly disagree	0	0.0
Disagree	6	15.0
Neutral	10	25.0
Agree	19	47.5
strongly agree	5	12.5
Total	40	100.0

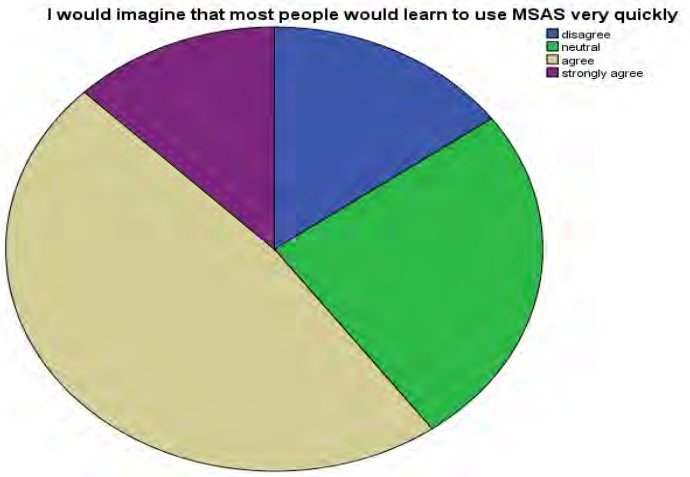

Figure 5.12 I would imagine that most people would learn to use MSAS very quickly

The results demonstrated that out of 40 respondents 48% users agrees that they can learn quickly to use the application which depicts the simplicity in the format for the user to use the application however, the results further revealed that 5% strongly agree with the ease of learning the MSAS very quickly. The overall mean was 3.57 and standard deviation was 0.90.

5.9.8 Item no 8

The results of item 8 i.e. "I found MSAS very difficult to use" shows:

Table 5.15 us_8

Most people would learn to use MSAS very quickly	Mean =3.57	SD =0.90
Response format	Frequency	Percentage
Strongly disagree	0	0.0
Disagree	4	10.0
Neutral	14	35.0
Agree	19	47.5
Strongly agree	3	7.5
Total	40	100.0

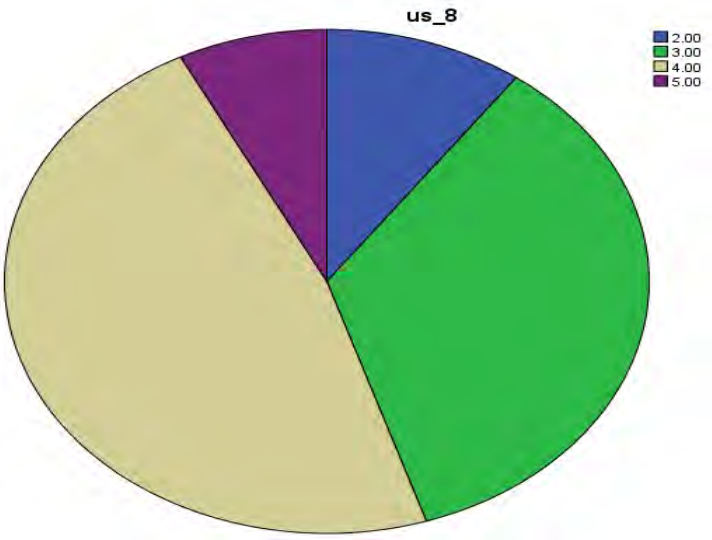

Figure 5.13 us_8

The results revealed that 48 % people agreed that most of the people would learn to use MSAS very quickly. The mean and standard deviation of item was recorded Mean =3.57 and SD= .78.

5.9.9 Item 9

The results of item 9 has been listed below:

Table 5.16 I felt very confident using MSAS

Most people would learn to use MSAS quickly		Mean =3.37 SD =0.70
Response format	Frequency	Percentage
Strongly disagree	0	0.0
Disagree	5	12.5
Neutral	15	37.5
Agree	20	50.0
Strongly agree	0	0.0
Total	40	100.0

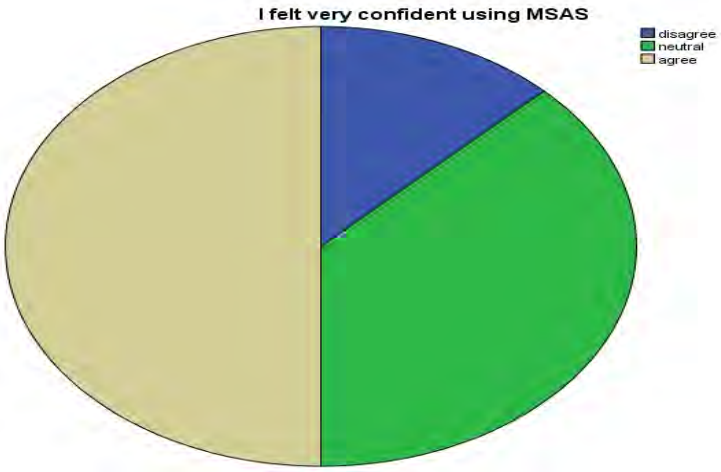

Figure 5.14 I felt very confident using MSAS

Table 5.16 illustrated the percentage and frequency of the users who feel very confident using MSAS. It was observed that the interface of MSAS is compatible and accepted by the users which make them feel confident using it the mean score of the respondents was 3.37 whereas the standard deviation was .70. however, 50% of the participants agree with this statement.

5.9.10 Item no 10

The results of the item 10 has been demonstrated in the table below

Table 5.17 I needed to learn a lot of things before I could get going with MSAS

I needed to learn a lot of things before using MSAS	Mean =2.70 SD =0.88	
Response format	Frequency	Percentage
Strongly disagree	3	7.5
Disagree	14	35.0
Neutral	15	37.5
Agree	8	20.0
Strongly agree	0	0.0
Total	40	100.0

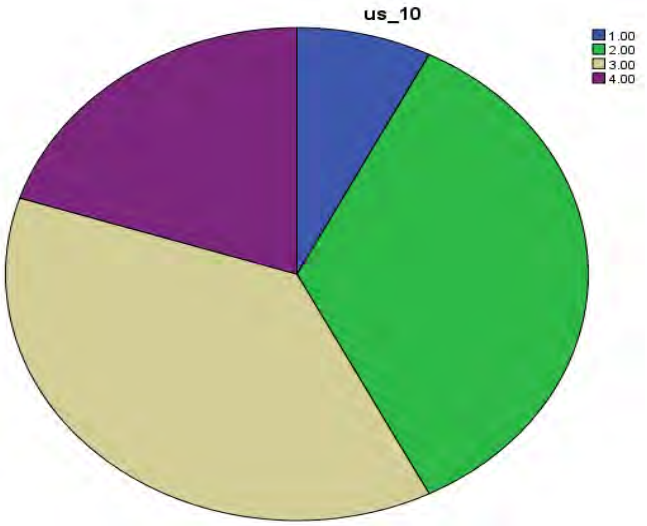

Figure 5.14 us_10

The results of the data analysis revealed mean of the response was 2.70 and SD was 0.88. Total participants were 40 out of which 14 disagree that the need to seek learning before using MSAS that highlighted the fact that the design was easy for its user to easily get through it.

5.10 Discussion

A survey script was given to a sample of 40 respondents and the result was analyzed by user's opinion. Through the questionnaire analysis, we can observe the user in general is agreement through using mobile facilities to make online complaint. The MSAS user has accepted and satisfied the application interface functions, usability, integrity and other facilities inside our application. Based on the result, we can noted that our application has achieved the goals. The users have satisfy the MSAS utilization and claimed it easy to be used in the future.

5.11 Future Works

Hence for future development and expansion of this research, the followings are suggested:

- The scope of this research is limited as it just has focused on reporting the complaints; however, other services have not been focused much. Therefore, the scope of the study can be extended only in terms of functions.
- The present study has focused just on the accommodation system of UUM. Future studies can take different university sample in order to improve their accommodation facilities.

5.12 Summary

This chapter studied the usability of MSAS by using the System usability scale to test the prototype. The procedure to conduct the evaluation was discussed in detail along with the statistical test to measure its use. This chapter discusses user's opinions about the benefit of having such system for reporting complaint and this part also discusses the usability of this system by using the chosen sample to state their opinions on the simplicity, clearly and efficacy of this system.

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Appendix A

#	Requirement ID	Requirement Description	Priority
	MSAS_9	Instant chatting	M
15	MSAS_9_1	When the student has any query regarding the accommodation problem he can ask the administration by clicking on the "instant chatting" button. After writing about his problem the student will click the "send" button.	M
	MSAS_10	Log out	M
16	MSAS_10_1	If the student wants to leave the system, he can click on the "log out" button.	M
	MSAS_11	View announcements	M
18	MSAS_11_1	The students are able to see the latest announcements from SAC	D
	MSAS_12	View events	M
19	MSAS_12_1	The students are able to see the latest events and updates by clicking on the "view events" button.	D
Function Requirements for admin:			
	MSAS_1	View system	M
1	MSAS_1_1	Admin can explore the system by selecting about us, organization chart and log in.	M
	MSAS_1_1_2	About us	M
2	MSAS_1_1_3	When the admin will click the "about us" button the system will open a new page where the welcome message from Director of SAC is present.	D
	MSAS_1_3	Organizational chart	M

3	MSAS_1_3_1	When the admin will click on the "organizational chart" it will give a detailed view of all the organization that how all the members of administration are divided into different units.	D
	MSAS_1_2	Log in	M
4	MSAS_1_2_1	Admin must enter his valid username and password.	M
5	MSAS_1_2_2	User must press the "Enter".	M
6	MSAS_1_2_3	The system will check the username and password entered.	M
7	MSAS_1_2_4	When the user is trying to log in but the username of password is incorrect the system will give an error message.	M
8	MSAS_1_2_5	While trying to logging into the system by putting incorrect password or username several times the system will give the "reset" option.	M
9	MSAS_1_2_6	In case of correct username and password system will successfully log in.	M
10	MSAS_1_2_7	System will show a new page that is the main page consisting of home, manage announcements, and manage events, complaints, booking, instant chatting and logout.	M
	MSAS_1_3	Manage announcements	M
11	MSAS_1_3_1	Admin can select "manage announcements" from main page.	D
12	MSAS_1_3_2	When admin click the button manage announcements the system will open a new	D

		page that is further divided into three sub-functions (home, add and manage)	
	MSAS_1_4	Home	M
13	MSAS_1_4_1	If the admin will click the “home” button the system will redirects to main page.	D
	MSAS_1_5	Add	M
14	MSAS_1_5_1	If the admin wants to add an announcement he can click on “add” button. The system will open a new page where the title of the announcement and the details of the announcements has to be mentioned after filling in the information he will click the “submit” button which will allow the data to be saved in the system.	M
15	MSAS_1_5_2	If there is any mistake in the detail or title of the announcement the admin can edit it by clicking on the reset button.	M
	MSAS_1_6	Manage	M
16	MSAS_1_6_1	If the admin wants to manage the announcement he can manage by clicking on the “manage” button. It will redirect him to a new page which is manage announcements	M
	MSAS_1_7	Manage announcements	M
17	MSAS_1_7_1	This function is sub-divided into three functions that are update, view and delete announcement.	M
	MSAS_1_8	Update announcement.	M
18	MSAS_1_8_1	The last sub-function of manage announcements is update announcements in which an admin can update, delete and view	M

		announcements in correspondence to the title of announcement.	
19	MSAS_1_8_2	If the admin clicks on the “update” it will redirect to a new page that consists of two options Title and Details.	M
20	MSAS_1_8_3	When the admin can update the announcement by putting new title in the “title” section and “details” of the announcement in the details section.	M
21	MSAS_1_8_4	After adding the announcement, the admin will click on the “submit” button and the data will be saved in the system. If case of mistake the admin can reset the announcement.	M
	MSAS_1_9	Delete announcement.	M
22	MSAS_1_9_1	Admin can also delete the announcement by clicking on the “delete announcement” button.	M
23	MSAS_1_9_2	After clicking the “delete” button the admin new be directed to another page i.e. “delete announcement information”.	M
24	MSAS_1_9_3	In this page the system will ask the admin regarding confirmation of deleting the information as “Are you sure you want to delete?”	M
25	MSAS_1_9_4	When the admin will click the button “submit” the information will be removed from the system and the system will show the message “data deleted successfully”.	M
	MSAS_1_10	View announcement.	M
26	MSAS_1_10_1	Admin can view the announcement being made by clicking on the “view” button.	M

27	MSAS_1_10_2	The admin will be redirected in a new page i.e. view announcement. In this page the admin can view the title, details and the date of the announcement.	M
	MSAS_11	Manage events	M
28	MSAS_11_1	When admin click the button manage event it will take him to a new page that is further divided into three sub-functions that are home, add and manage	M
	MSAS_12	Home	M
29	MSAS_12_1	If the admin wants to go back to the main page, he will click the home button.	M
	MSAS_13	Add	M
30	MSAS_13_1	If the admin wants to add an event, he will click on the "add" button.	M
31	MSAS_13_2	The admin will be redirected to a new page that is for adding an event or the activities that are arranged by accommodation center by putting the title of the event in the "title" section and the details of the events in details section.	M
32	MSAS_13_3	After adding the event the admin will click on the "submit" button.	M
33	MSAS_13_4	On adding the information by clicking the submit button the system will give the message "data saved successfully".	M
34	MSAS_13_5	In case of wrong information, the admin can add the information by clicking on the "reset" button that will remove the previously filled data and blank page will appear.	M

	MSAS_14	Manage	M
35	MSAS_14_1	If the admin wants to manage the events he can manage by clicking on the “manage” button. It will redirect him to a new page which is manage events	D
	MSAS_15	Manage users	
44	MSAS_15_1_1	Admin can manage user by clicking on the “manage users” button.	M
45	MSAS_15_1_2	When the admin will click on the “manage users” button it will redirects him to another page. This page is further divided into four functions i.e. Home, Add, Manage and Search.	M
	MSAS_15_2	Home	M
46	MSAS_15_2_3	When the admin will click on the “home” button it will redirects him back to main page.	M
	MSAS_15_3	Add	M
48	MSAS_15_3_1	When the admin will click on the “add” button it will redirects him to another page. Here the admin will add user manually by filling the requirement such as Name, Matric number, School, Semester, Session and Password. When the admin will click on the submit button the data will be saved in the system and if the admin made any mistake in filling up the requirements of the users he can click on the reset button to fill in the information again.	
	MSAS_15_4	Manage	M
49	MSAS_15_4_1	When the admin will click on the “manage” button it will redirects him to another page manage user information where he can update,	M

		delete and view the user information.	
	MSAS_15_5	Update User	M
50	MSAS_15_5_1	If the admin wants to update user information he can do by clicking on the “update” function in manage user information. The admin will fill up the latest information to update the information. if the user for example forgets his password the admin can reset using update function	M
	MSAS_15_6	Delete user information	M
51	MSAS_15_6_1	If the admin wants to remove old graduate students from the system he can delete from system using “delete” function. The system will give the admin a confirmation message like are you sure you want to delete? And two options such as Yes or No. If the admin, choose the Yes button and then click the submit button the information will be successfully delete from the system.	M
	MSAS_15_7	View User Profile	M
52	MSAS_15_7_1	If the admin wants to view the details of the student he will click on the view user profile button and see all the information such as name, matric no, school, semester, session and password.	M
	MSAS_15_8	Search	M
53	MSAS_15_8_1	If the admin wants to search for user he will click on the search button and my typing the matric number of the student he can search the desired student.	M

	MSAS_15_9	View events	M
54	MSAS_15_9_1	Admin can view the announcement being made by clicking on the “view” button.	M
55	MSAS_15_9_2	The admin will be redirected in a new page i.e. view announcement. In this page the admin can view the title, details and the date of the announcement.	M
	MSAS_16	Complaints	M
56	MSAS_16_1	When the admin will click on the complaints it will redirects him to another page “manage complaints”. This function is further divided into three functions that are response, view complaints and view response.	D
	MSAS_16_2	Response	M
57	MSAS_16_3	When the admin will click the “response” button it will redirects him to another page. Complaint’s response is further divided two functions.	M
	MSAS_17	Complaint’s response	M
58	MSAS_17_1	In order to respond to the user complaints, the admin will give the complaint a progress percentage based on the successfully progress of complaint. The range of progress percentage is between 10-100. Admin will also mention the details of the response towards the complaint.	D
59	MSAS_17_2	After adding the details, the admin will click on the “submit” button and the data will be saved in the system. If case of mistake the admin can reset the events.	M

	MSAS_18	View response	M
60	MSAS_18_1	In order to see the response to the complaints of the students the admin will click on the "view response" button.	D
61	MSAS_18_2	Clicking the "view response" will directs the admin to another page that is View complaint's response. Response to all the students can be seen on this page. The response is shown in the form of a table. The first part of the table shows the complaint reported by the student. The title, details, date of the complaint, students ID. The second portion of the table consists of admin response along with the details, progress percentage and the date on which the admin respond to the complaint.	D
	MSAS_19	Booking	M
62	MSAS_19_1	Admin can book accommodation for the students online by clicking on the "booking" from main page.	M
63	MSAS_19_2	When the admin will click on the button "booking" the system will open a new page that is View booking information.	M
	MSAS_20	View booking information	M
64	MSAS_20_1	In his page the admin can search for booking that the students had made and he can also view the booking information.	D
65	MSAS_20_2	When the admin clicks on "search" button it will redirects him to a new page that is search for booking. This can help the admin to search for the booking that have been made by the	M

		students. The admin will enter the student ID and then click the button "submit". The system will look for the request made by the student ID.	
66	MSAS_20_3	When the admin clicks on the "view" button correspondence to the student name it will redirects him to a new page where he can view all of the information of the booking such as student full name, matric no, gender, passport number, contact no, religion, date of birth, nationality, home Tel, address and booking date.	M
	MSAS_21	Instant Chatting	M
67	MSAS_21_1	When the students have queries they can report it to an online forum provided by the accommodation center i.e. instant chatting.	D
68	MSAS_21_2	When the admin will click on the "instant chatting" button it will redirects him to a new page "view chatting". Admin can view the student ID, date when the query was sent and he can reply to them.	M
69	-MSAS_21_3	When the admin will click on the "reply" button it will redirects him to a new page where he can see the problem reported by the student. The admin can reply to the questions asked by the student and that the admin will click on the "send" button.	M
	MSAS_22	Logout	M
70	MSAS_22_1	If the admin wants to exit from the system, he will click on the "log out" button and the admin will successfully log out of the system.	M

Function requirements students and admin:			
1	MSAS_1	Complaints	M
2	MSAS_1_1	When student click the complainants. It will take him to a new page that is further divided into three sub-functions.	M
3	MSAS_1_2	The admin will see three functions such as response, view complaints and view response.	M
4	MSAS_1_3	Whereas the students are able to see two functions such as complains and status complaints	M
5	MSAS_1_4	The student will click on a complaint report to report a complaint and will write the title of the complaints and then mention the problems that he faces in details.	M
6	MSAS_1_5	The admin will click on view complaints and he can view the complaints reported by the students.	M
7	MSAS_1_5	In order to respond to the complaint of the student the admin will click on response button. He will respond to it give the problem a percentage in order to show the status of the problem ranging from 0-100. This percentage will show that how much percent the problem has been solved and click on button “submit”.	M
8	MSAS_1_6	The student will click on response button to see that his/her problem. The students can see his progress percentage by looking at the percentage and will be able to know that how much time will be required by the management to solve the problem.	M

i. Use case for: View System by student (MSAS 05)

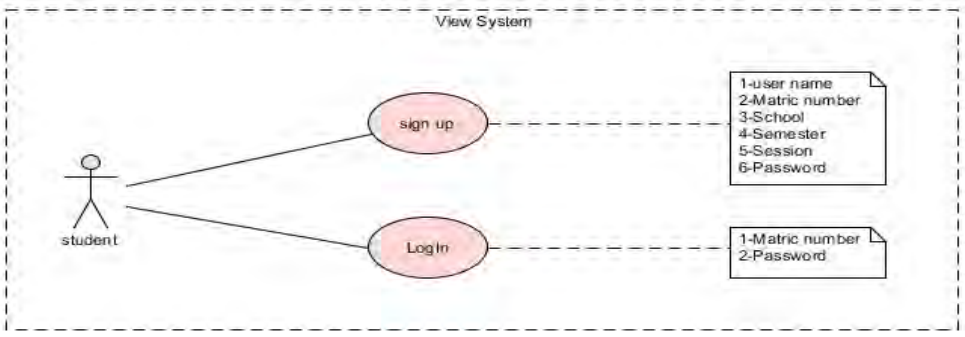

Figure 4.13 Use case for: View System Mobile Application (MSAS 05)

1) Brief Description

Sign Up is the first step for all the students to get registered on the mobile system accommodation for students (MSAS). When a student get registered he provides his personal information in order to register with the mobile application after registering he can log in to the system.

2) Pre-Conditions

- The student must register in order to get authorized access to log in to the system.
- the student will enter system by entering the authorized username and password

3) Characteristic of activation

Event student on the view system (sign up, log in).

4) Flow of event

✓ **Basic Flow**

- When the students enter into the mobile application the sign-up use case will be initiated.
- Students must click on sign up button that will direct the students towards Students registration page.
- For online registration, it is mandatory to fill in the required information.
- Student must press “Sign up” button

- after registering he can log in to the system by putting his matric number and password

✓ **Exceptional flow**

N/A

5) Post-conditions

If the student entered the wrong username or password three times, the account will be retained.

6) Rule

There is no empty filed and any information have been inserted.

7) Constraint

- Enter information to the system.

ii. Use case for: view profile by student (MSAS 06)

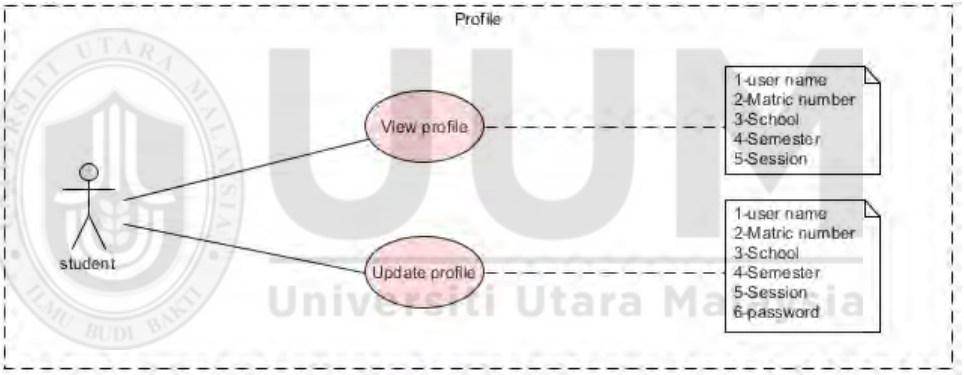

Figure 4.14 Use case for: profile by student (MSAS 06)

1) Brief Description

- This use case will be initiated by the student where he can view the information that he inserted his personal information at the time of registration such as name, Matric number, School, Semester, Session and password.
- This use case is initiated by the student. In case the student can view all the information that he entered at the time of registration and he can modify the information that the saved in the system regarding his name, Matric number, School, Semester, Session and password.

2) Pre-Conditions

There is no session open.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begin when the student enter to the system.
- Student will click on the view profile button.
- This will take him into must press “Home” button.
- The system will view the profile student , then system have to open a new page content the result based on the student home .
- The system should open a new page display the profile student information such as Name, Matric No, Faculty, Semester No, Quick links.
- The use case begins when the student enter to the system by entering his username and password.
- Students can see his profile by clicking on the profile button.
- If the student wants to makes amendments in his profile or he want to update his personal information he can do so by clicking on the update profile button.
- This will take him to a new page where the necessary changes can be made and then he can save his updated information in the system.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

No Rule

7) Constraint

No Constraints.

iii. Use case for View Announcements and Events by student (MSAS_ 07)

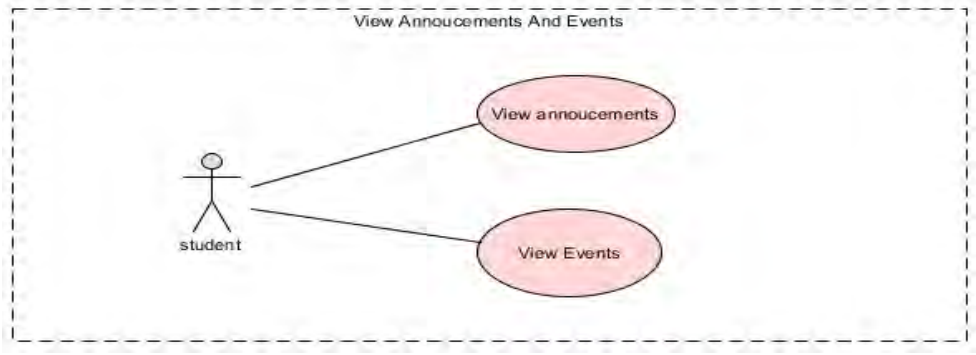

Figure 4.15 Use case for: View Announcements and Events by student (MSAS_ 07)

1) Brief Description

This use case is initiated by the student. In this function the student can:-

- View announcements such as the closing of SAC as due to any public holiday.
- View events like SAC arrange an event in order to welcome new students.

2) Pre-Conditions

The student must enter in order to get authorized access to announcements and events to the system. Execution

3) Characteristic of activation

Depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begins when the student enter to the system.
- After successfully log in to the system the student can view the latest announcements from Accommodation center.
- The student can keep himself update by looking into this section about accommodation.
- The students must enter to the view event page.
- When the student will click on the view event page it will redirects him to a new page.

- This page consists of information regarding the events that are been arranged by SAC.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

Student must see the events and announcements.

7) Constraint

No Constraints.

iv. Use case for instant chatting by student (MSAS_ 08)

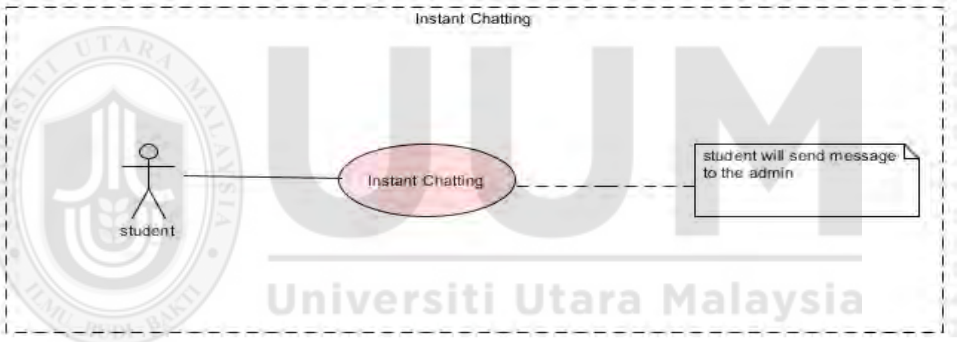

Figure 4.16 Use case for: instant chatting by student (MSAS _08)

1) Brief Description

This use case is initiated by the student. In case the student can report his query to admin by using instant chatting service.

2) Pre-Conditions

The student must enter to instant chatting.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begin when the student enter to the system

- Student can use instant chatting function, and can send massage to SAC.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

No Rule

7) Constraint

No constraint

v. Use case for View System by Admin- (MSAS_09)

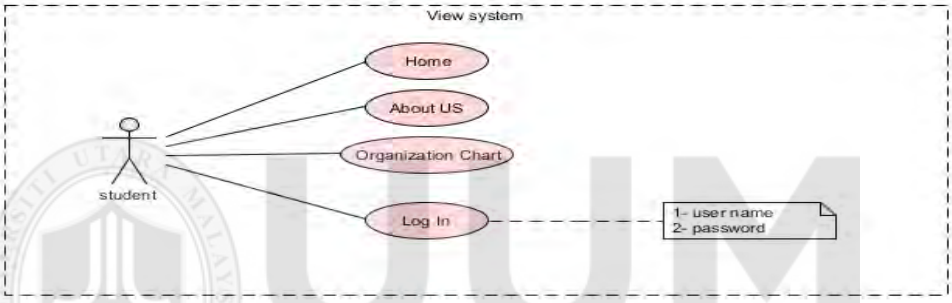

Figure 4.17 Use case for: View System by Admin- (MSAS _09)

1) Brief Description

This use case is initialized by admin. In the use case there are three functions i.e. about us, organizational chart and admin log in to the system.

2) Pre-Conditions

The admin must view the system.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begin when the student enter to the system.
- Students will sign in using their user name and password.
- After that should click on the "log in" button.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

No Rule

7) Constraint

No Constraints.

vi. Use case for: manage announcements by Admin (MSAS_10)

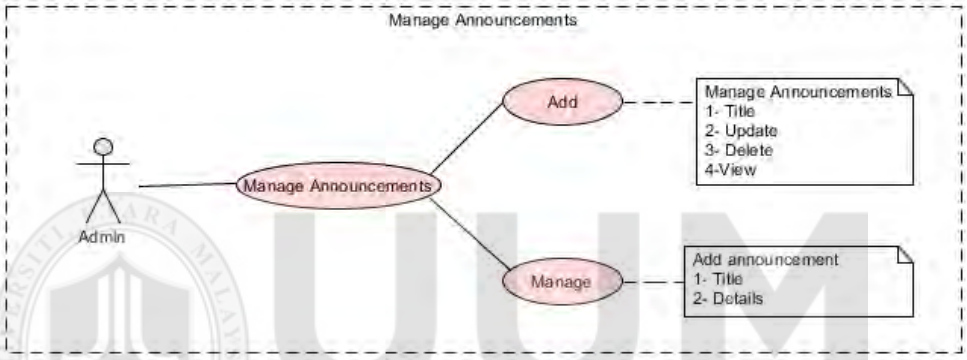

Figure 4.18 Use case for: manage announcements by admin (MSAS _10)

1) Brief Description

This use case is initiated by the admin as he logs into the system. The case consists of three sub-functions that are home, add and manage Admin can also update announcement, delete and view the announcements. The last sub-function of mange announcement is view whereby the admin can view the finalized outlook of the announcement consisting of title and its details.

2) Pre-Conditions

The admin must log in to the system and click announcement manage.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begins when the admin enter to the system
- Admin can add the latest announcement in this function by clicking on manage announcement whereby putting title and details an announcement can be added.
- In case of mistake or error the admin can overcome by using the reset function.
- The last step of announcement comprises of update, delete and view, where a final overview of the announcement can be previewed.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

No Rule

7) Constraint

No Constraints.

vii. Use case for manage user by Admin (MSAS_ 11)

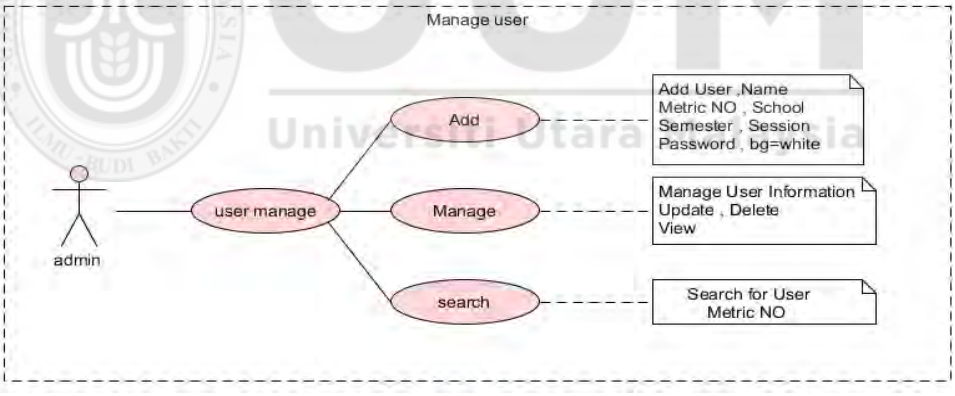

Figure 4.19 Use case for: manage user by Admin (MSAS_ 11)

1) Brief Description

This use case is initiated by the admin. In this function the admin can:-

- Add user manually by filling the requirement such as Name, Matric number, School, Semester, Session and Password.
- Manage user information where he can update, delete and view the user information.

- Search the desired student by typing the matric number of the student.

2) Pre-Conditions

Admin must enter to the system. Admin must open the Manage page.

3) Characteristic of activation

Depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begins when the admin will enter to the system.
- After successfully log in to the system the admin can manage the users.
- Admin can add, manage and can search the user information.
- When the admin will click on the add button it will redirects him to a new page where he can add the new students manually.
- When the admin will click on the manage button it will allow the admin to update the information of the students i.e, in case if a student forgets his password the admin can update his password.
- Admin can also search the students by putting in the matric number
- If the admin wants to return back to the main page he will click on the home button.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

No Rule

7) Constraint

No Constraints.

viii. Use case for manage events by Admin (MSAS_ 12)

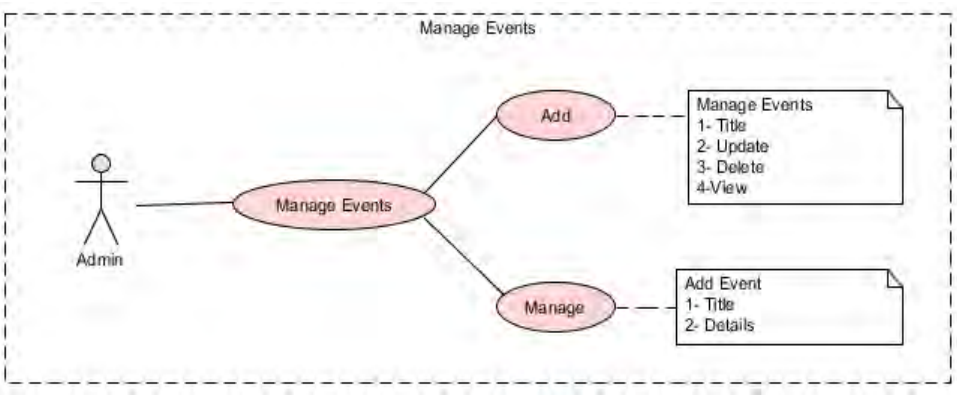

Figure 4.20 Use case for manage events by Admin (MSAS _12)

1) Brief Description

This use case is initiated by the admin. In this case the admin can manage the latest events by getting log into manage events. As it will add and manage the events organized by SAC.

2) Pre-Conditions

The admin must log in to the system and click events manage.

3) Characteristic of activation

Execution depends on the student demand.

4) Flow of event

✓ **Basic Flow**

- The use case begin when the Admin enter to the system
- When the admin clicks on the manage button it will redirects him to a new page. This page consists of three sub-functions that are home, add and manage. .
- Admin can add the latest announcements by using add function and then he will click the button submit which will allow the data to be saved in the system.
- Admin can also update announcement, delete and view the announcements.

✓ **Exceptional flow**

N/A

5) **Post-conditions**

Return to the home page.

6) **Rule**

No Rule

7) **Constraint**

No constraint

ix. Use case for instant chatting for Admin (MSAS_ 13)

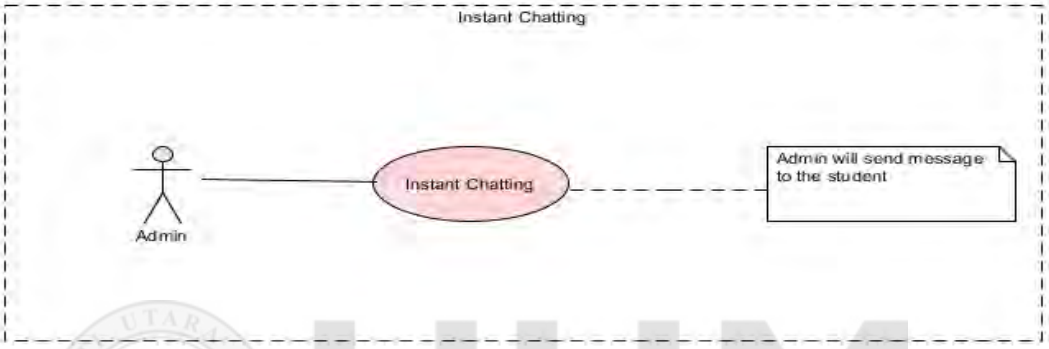

Figure 4.21 Use case for: chatting for Admin (MSAP_ 13)

1) **Brief Description**

This use case is initiated by the admin. In this case if the student has any query regarding the accommodation center he can use the instant chatting service. Admin can respond the queries that have been reported by the student.

2) **Pre-Conditions**

- The admin must log in to the system.
- The admin must click on the instant chatting page.

3) **Characteristic of activation**

Execution depends on the student demand.

4) **Flow of event**

✓ **Basic Flow**

- The use case will begin when the admin will enter into the system.
- The admin will click on the instant chatting page.
- The admin can respond to the student's questions regarding accommodation center.

✓ **Exceptional flow**

N/A

5) Post-conditions

Return to the home page.

6) Rule

No Rule

7) Constraint

x. Sequence Diagram for Sign up by Student (MSAS_05)

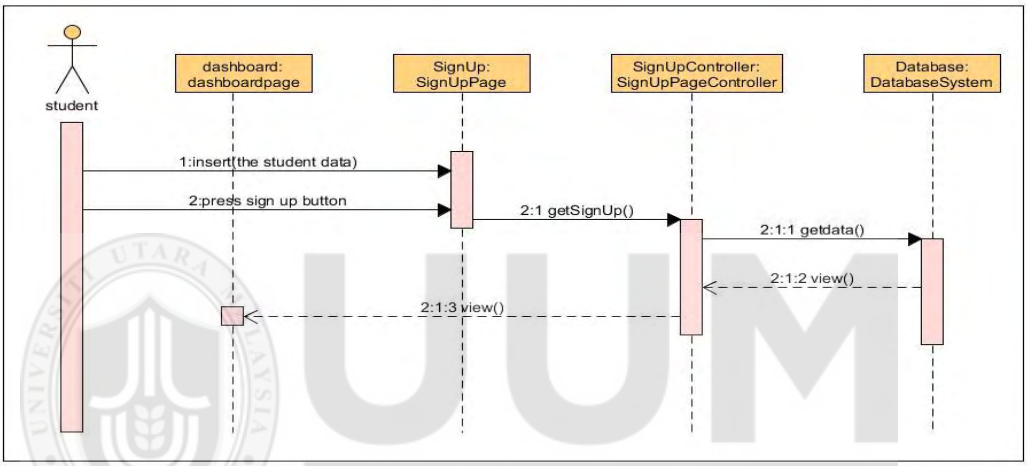

Figure 4.22 Sequence Diagram for: Sign up by Student (MSAS_05)

***xi.* Sequence Diagram for Log In by Student (MSAS_ 06)**

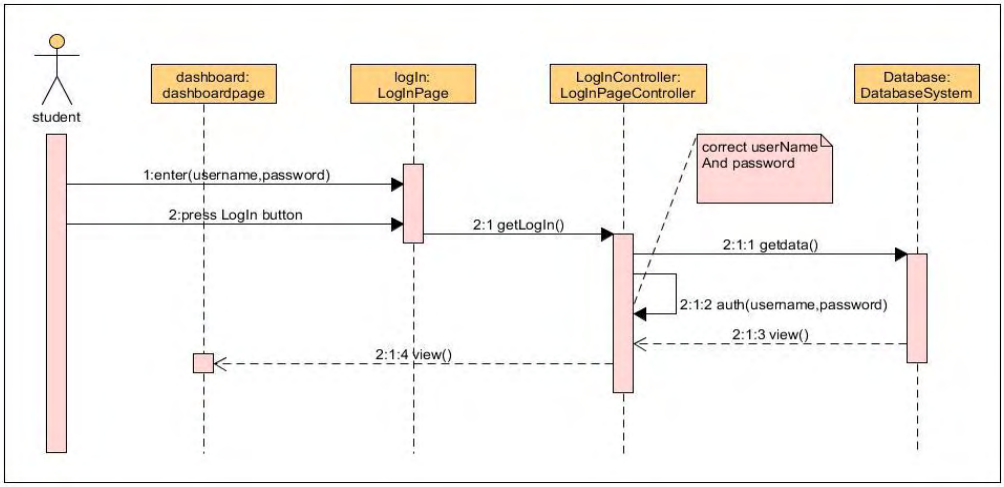

Figure 4.23 Sequence Diagram for: Log In by Student (MSAS_ 06)

xii. Sequence Diagram for View Profile by student (MSAS_ 07)

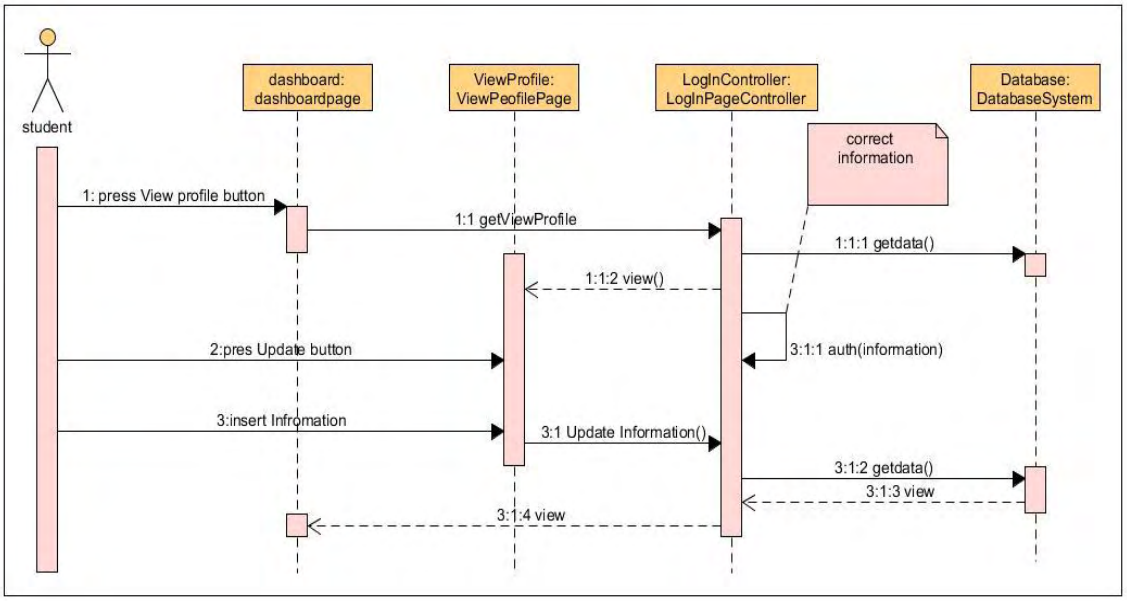

Figure 4.24 Sequence Diagram for View Profile (MSAS_ 07)

xiii. Sequence Diagram for update profile by student (MSAS_08)

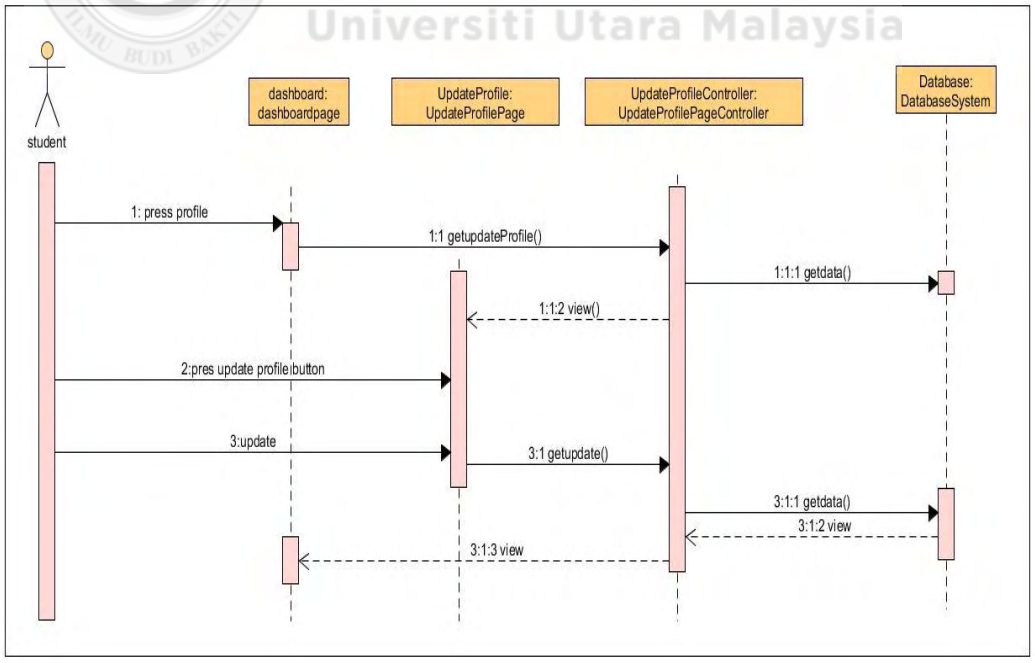

Figure 4.25 Sequence Diagram for: update profile by student (MSAS_08)

xiv. Sequence Diagram for View Announcements by student (MSAS_09)

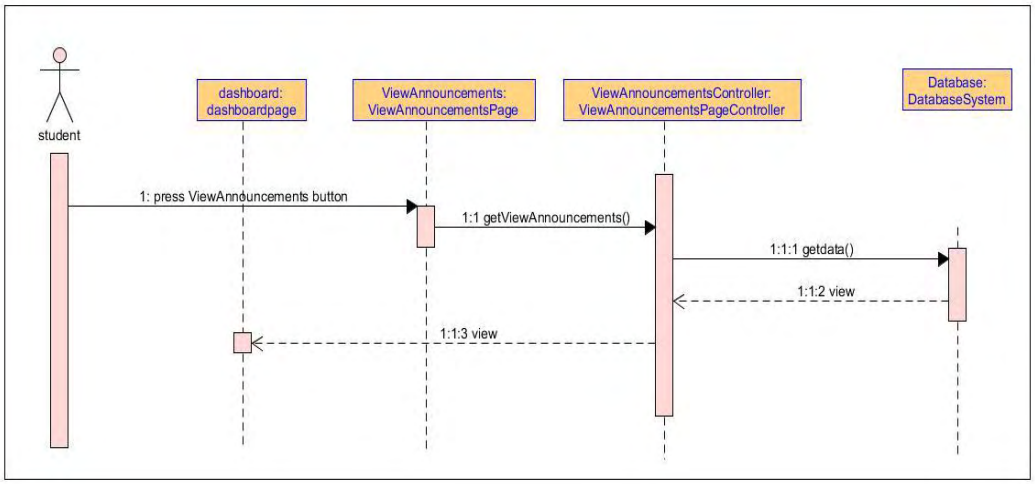

Figure 4.26 Sequence Diagram for: View Announcements by student

xv. Sequence Diagram for View Event by Student (MSAS_10)

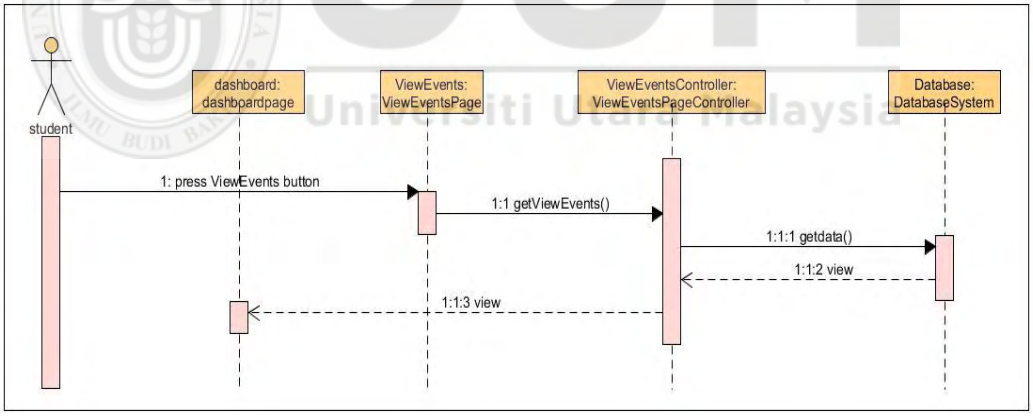

Figure 4.27 Sequence Diagram for: View by Event Student (MSAS_10)

xvi. Sequence Diagram for Manage Announcements by Admin (MSAS_11)

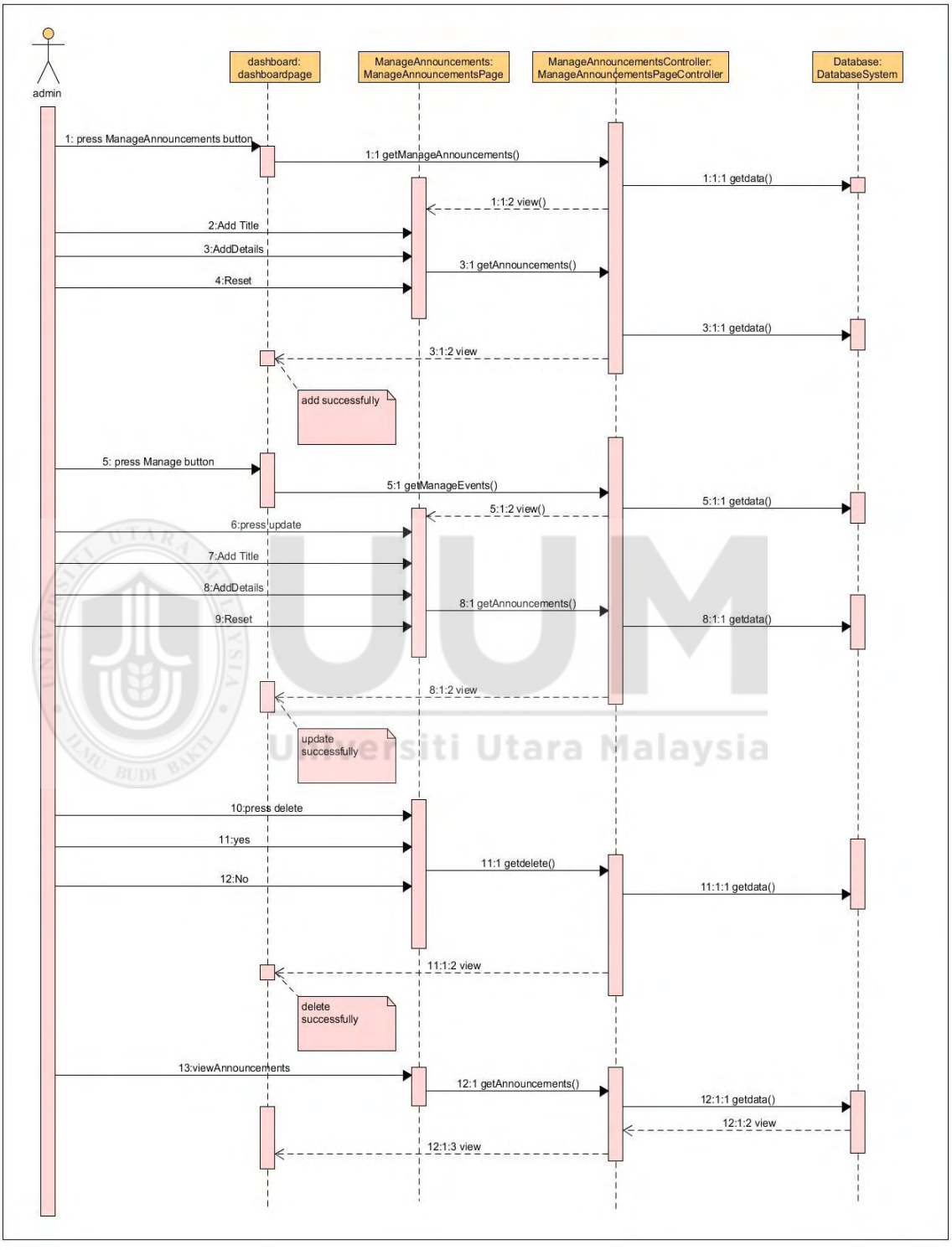

Figure 4.28 Sequence Diagram for: Manage Announcements by Admin (MSAS_11)

xvii. Sequence Diagram for Manage Events by Admin (MSAS_12)

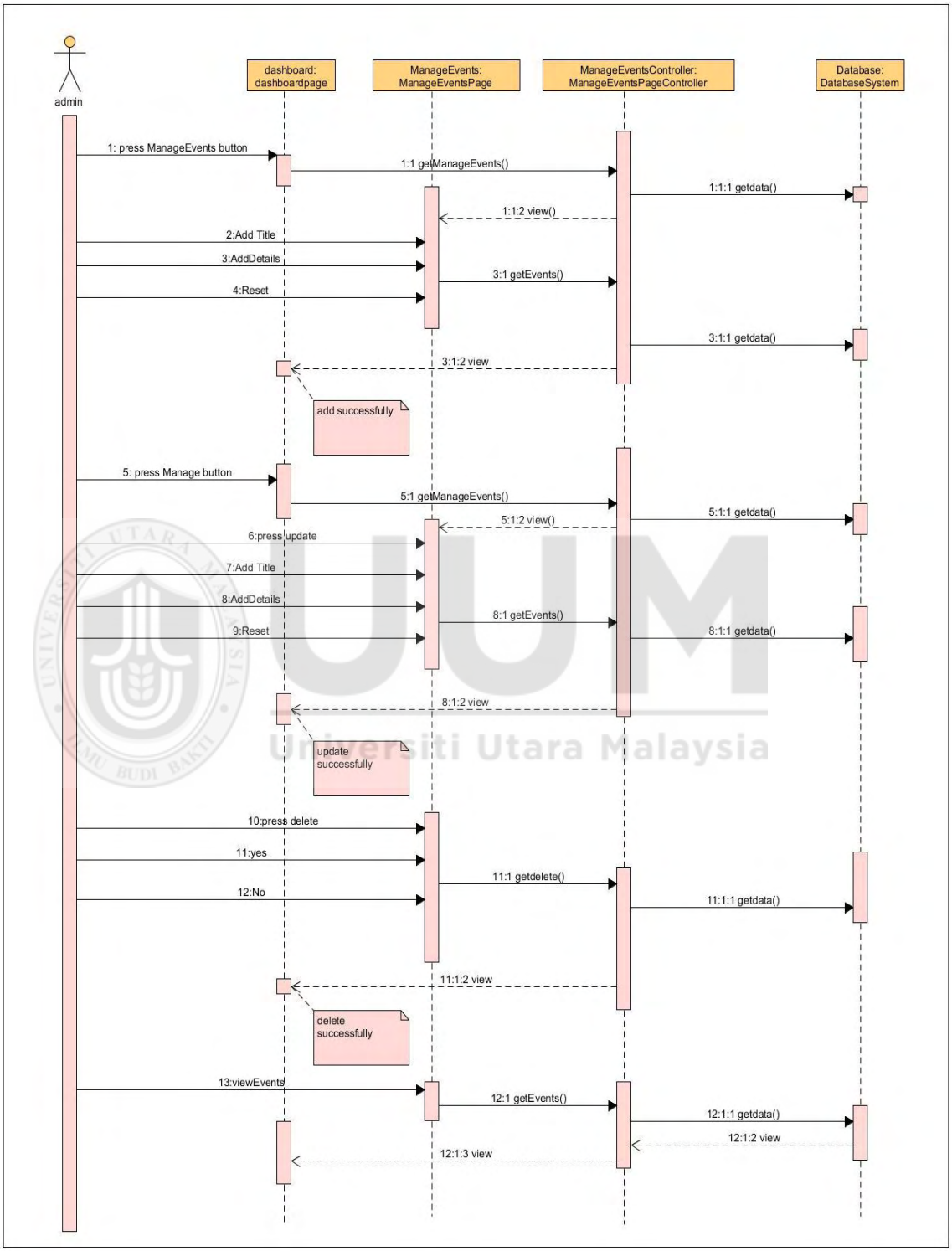

Figure 4.29 Sequence Diagram for: Manage Events by Admin (MSAS_12)

xviii. Sequence Diagram for manage user by student (MSAS_13)

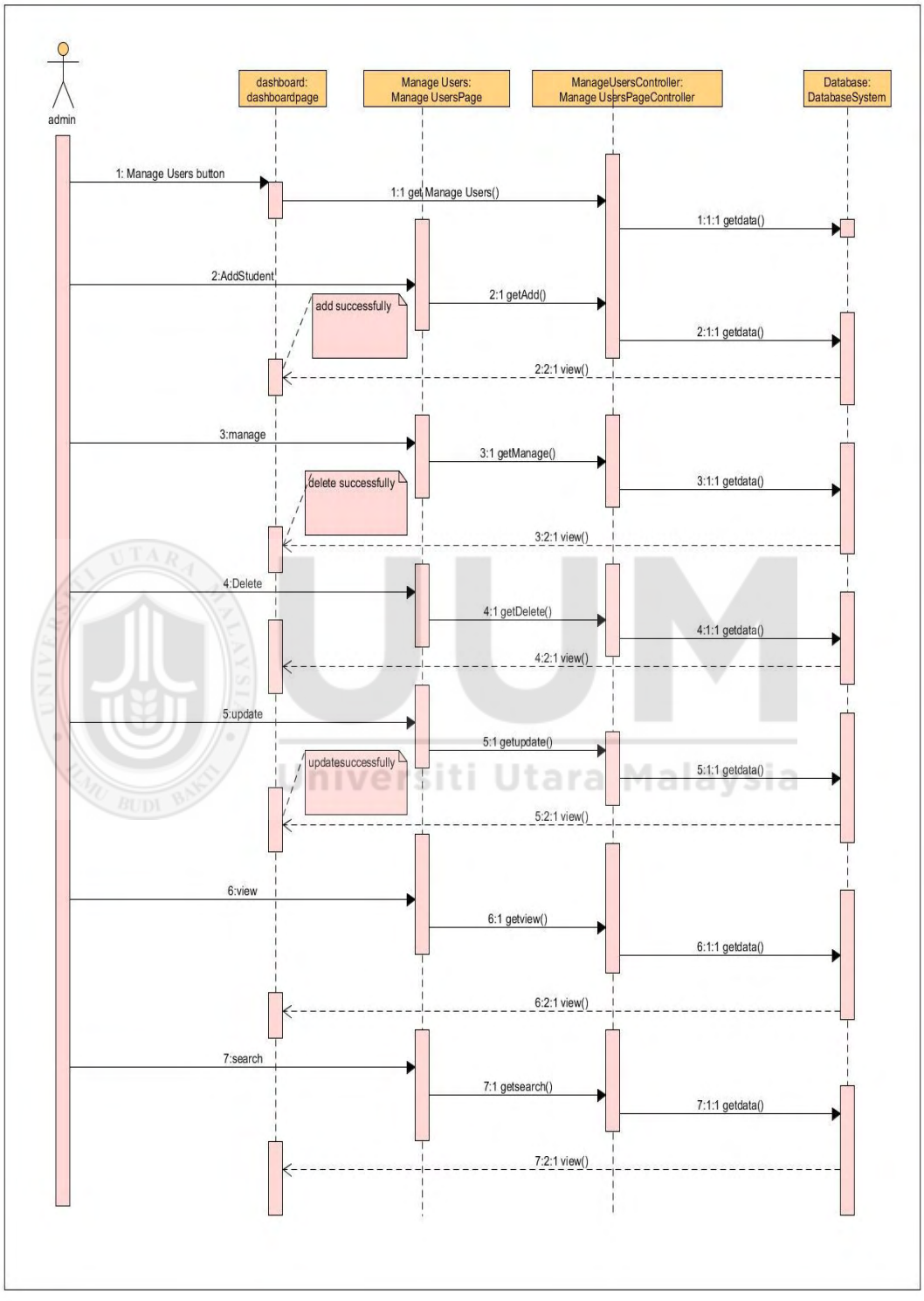

Figure 4.30 Sequence Diagram for manage user by student (MSAS_13)

xix. Sequence Diagram for chatting by student (MSAS_14)

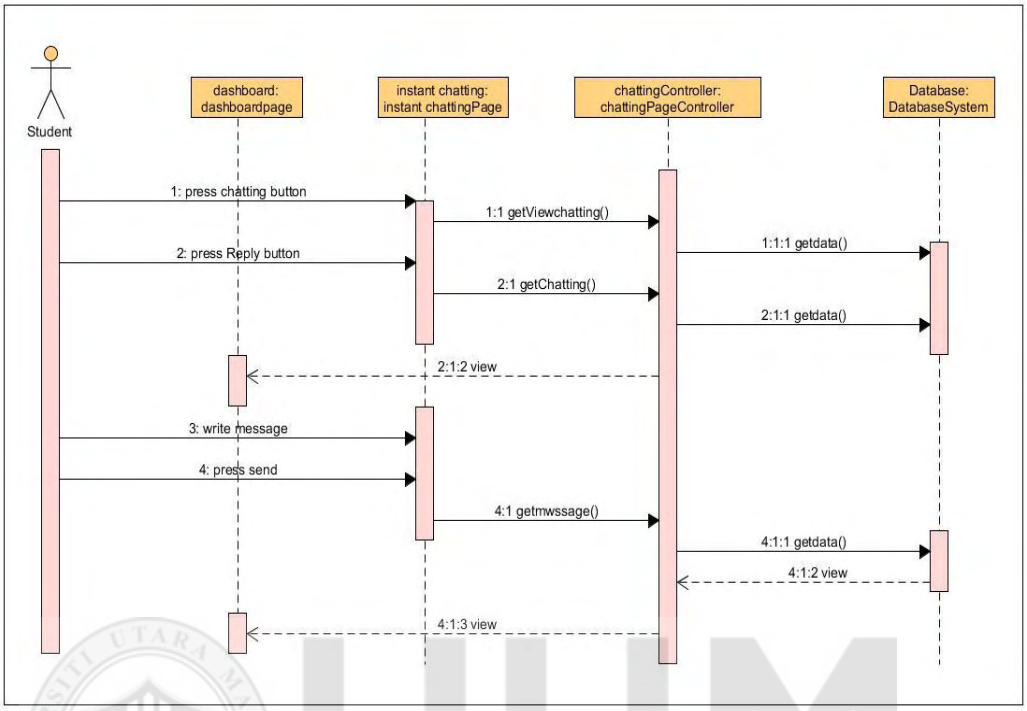

Figure 4.31 Sequence Diagram for: chatting by student (MSAS_14)

xx. Sequence Diagram for chatting by Admin (MSAS_15)

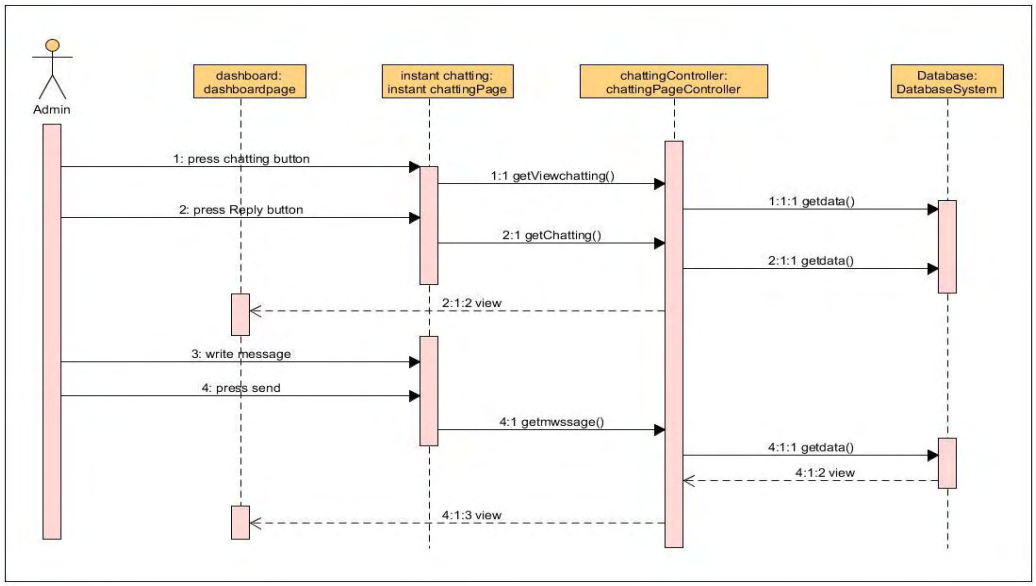

Figure 4.32 Sequence Diagram for: chatting by Admin (MSAS_15)

xxi. Active Diagram for Sign up And Log In by student *(MSAS_04)*

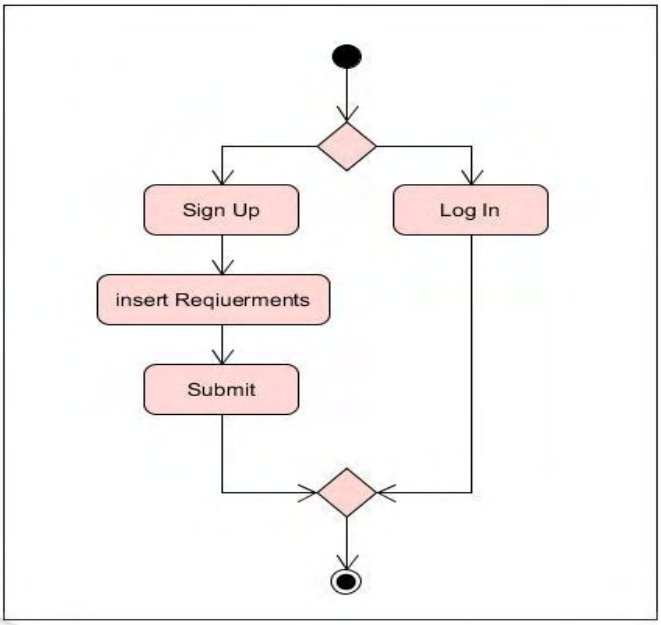

Figure 4.33 Active Diagram for: Sign up And Log In student (MSAS_04)

xxii. Active Diagram for View And update profile student *(MSAS_05)*

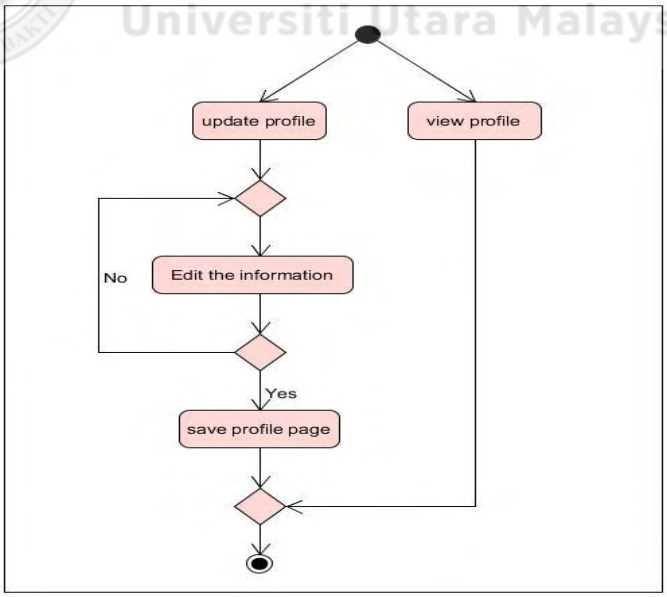

Figure 4.34 Active Diagram for: View profile and update profile student (MSAS_05)

xxiii. Active Diagram for View Announcements and Events by Admin *(MSAS_05)*

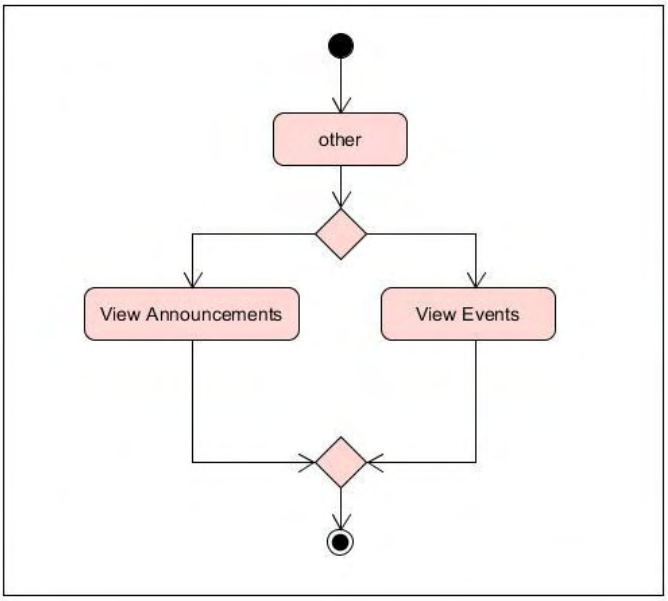

Figure 4.35 Active Diagram for: View Announcements and Events by Admin (MSAS_05)

xxiv. Active Diagram for manage user by Admin *(MSAS_06)*

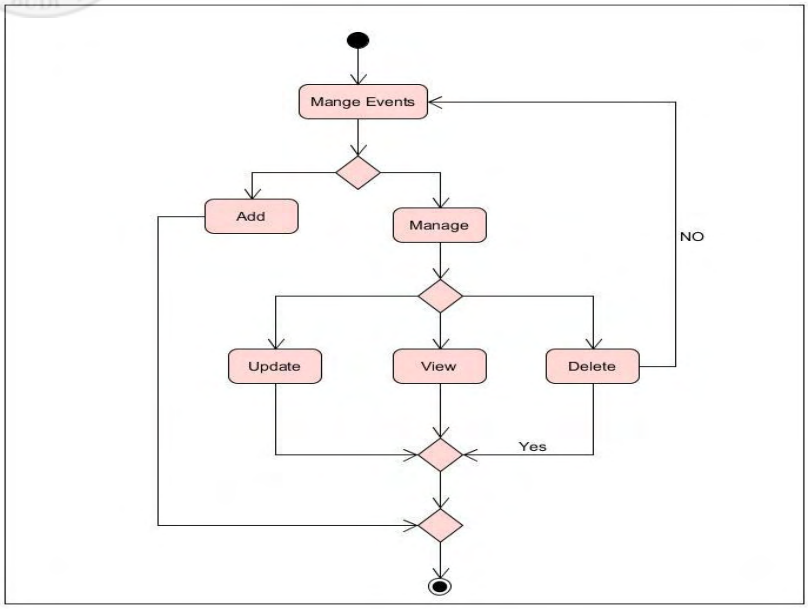

Figure 4.36 Active Diagram for manage user by Admin (MSAS_04)

xxv. Active Diagram for Manage Announcements by Admin *(MSAS_07)*

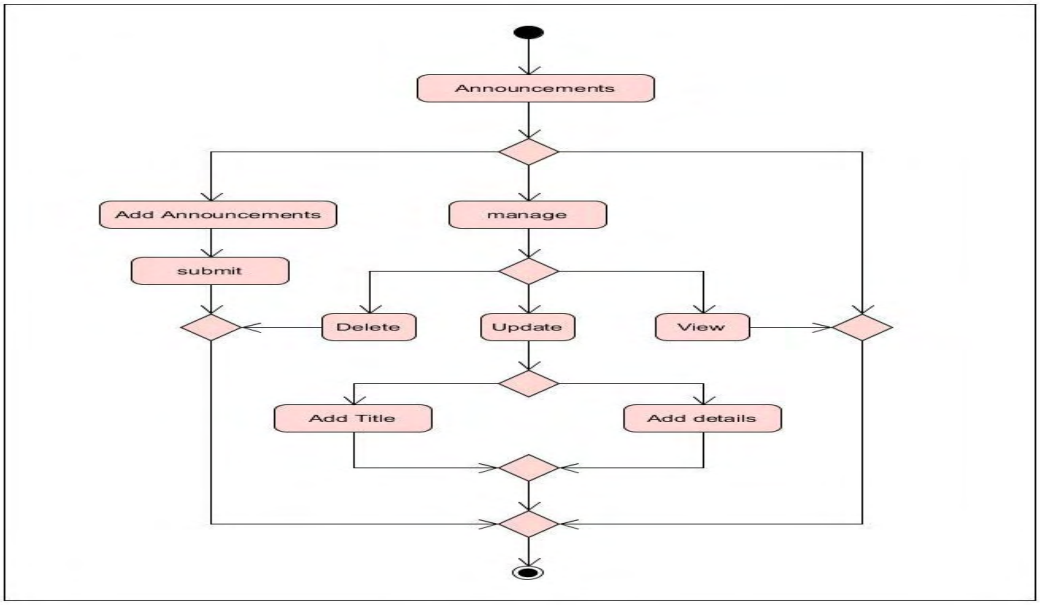

Figure 4.37 Active Diagram for: Manage Announcements by Admin (MSAS_07)

xxvi. Active Diagram for Manage Events by Admin *(MSAS_08)*

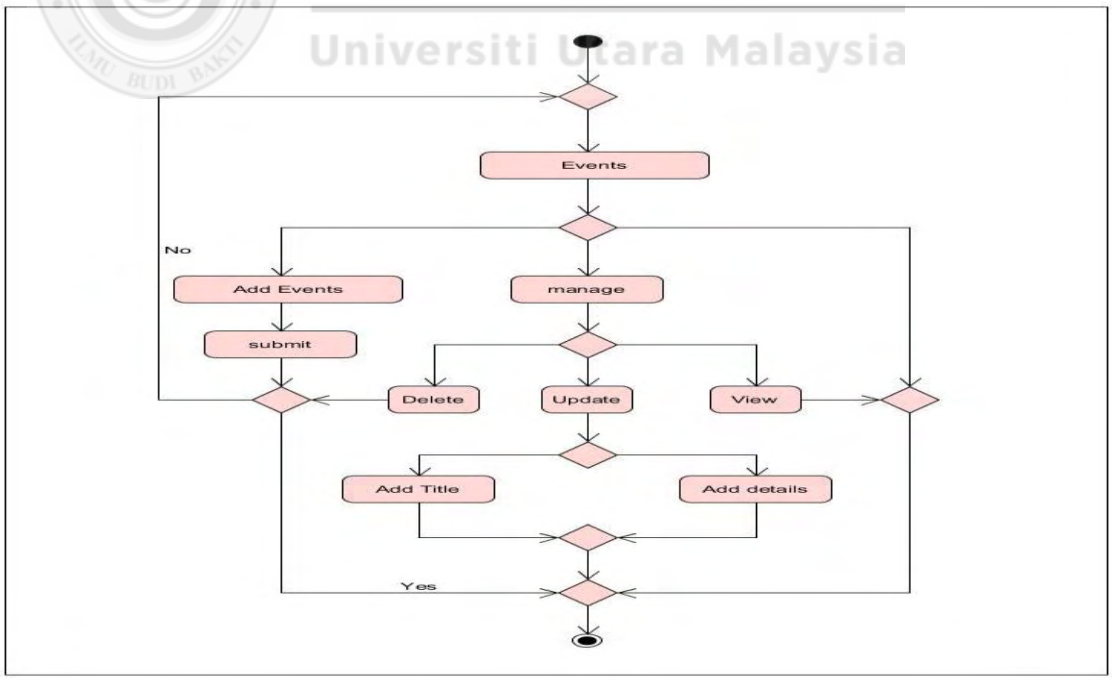

Figure 4.38 Active Diagram for: Manage Events by Admin (MSAS_08)

xxvii. Active Diagram for Chatting by Admin and student *(MSAS_09)*

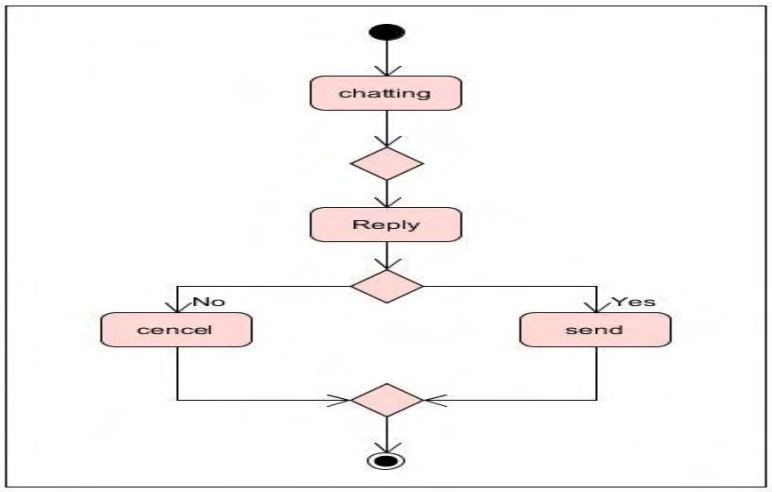

Figure 4.39 Active Diagram for: instant chatting by Admin and student (MSAS_09)

Appendix B

Instrument of Measurement

MOBILE SYSTEM FOR MANAGING AND MITIGATING THE ACCOMMODATION PROBLEMS AMONG STUDENTS IN UNIVERSITI UTARA MALAYSIA (UUM)

I am a M.Sc. (Information Technology) student at University Utara Malaysia (UUM). Thank you for your participation in my research about MOBILE SYSTEM FOR MANAGING AND MITIGATING THE ACCOMMODATION PROBLEMS AMONG STUDENTS IN UNIVERSITI UTARA MALAYSIA (MSAS). This questionnaire aims to understand general information about users who use the MSAS system as well.

The data collected from this questionnaire are strictly ANONYMOUS and CONFIDENTIAL and will be used for research purposes only filling out the questionnaire will take you less than 10-15 minutes. If you have any questions

regarding this study you may address them to me at mmurtaja88@gmail.com or to my supervisors Dr. Azman Tan'a at azman@uum.edu.my.

This questionnaire is divided into two (2) sections (section A and B), which Section A addressing respondent general information and Section B prepared to measure Performance and satisfaction of the propose prototype system. The respondent is required to answer all the questions in order to complete the session.

A. Respondent General Information

This segment is about your background information. Please fill up the blanks and marks (√) where appropriate.

1. Gender:
   [ ] Male [ ] Female
2. Age: _____ Years
3. Education background:
   [ ] Degree [ ] Master [ ] PhD
4. Do you have a mobile Devices?
   Yes [ ] No [ ]
5. How long you have been using mobile applications? _____ Years.

B. This section is to evaluate performance and satisfaction of the propose prototype system.

Please read the following statements below carefully and tick (√) only one of your most applicable answer.

1 – Strongly Disagree 2 – Disagree 3 – Neutral 4 – Agree 5- Strongly Agree

Sr. No	**Statements**	**1**	**2**	**3**	**4**	**5**
1	I think that I would like to use MSAS frequently.					
2	I found the MSAS unnecessarily complex					
3	I thought the MSAS was easy to use					

4	I think that I would need the support of a technical person to be able to use MSAP					
5	I found that the various functions in this MSAS were well integrated					
6	I thought that there was too much inconsistency in MSAS.					
7	I would imagine that most people would learn to use MSAS very quickly					
8	I found MSAS very difficult to use					
9	I felt very confident using MSAS					
10	I needed to learn a lot of things before I could get going with MSAS					

Thank you for your valuable time and cooperation to complete this survey and make it achievable and possible Information provided will be held strictly confident Thank you for your time and cooperation to complete this survey. Information provided will be held in strictest confidence.