International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 11 Issue 4 ǁ April 2023 ǁ PP. 337-346

Design and Development of Web-Based System: Visitor Management System

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Abstract
Visitor Management System (VMS) is a system that keeps track of visitors' actions in an organization. It can quickly offer users the required output and information and track arriving and outgoing visitors. VMS is capable of providing basic information to the organization as well as visitors. This system is about designing and developing the SOC Visitor Management System (SOCVMS) for the School of Computing (SOC) at Universiti Utara Malaysia (UUM). The idea of the SOCVMS is to replace the manual process for visitors at SOC. Currently, collecting visitor information is done through a logbook. This process may cause the data to be lost, unorganized, and paper and pen wasted. The development of SOCVMS involves six (6) phases: requirements, design, development, testing, delivery, and feedback. There are advantages of using SOCVMS to the top management, staff administration, and visitors. Visitors can easily apply to the system anytime and anywhere with an internet connection. Moreover, the administrator can view, analyze data, and produce reports of the visitor before they approve the application. The system has been evaluated by 13 respondents from the public, top management, and SOC admin staff. SOCVMS was successfully delivered, and the results show that the respondents were satisfied with the features of the overall design.
Keywords: *visitor management system, web-based system, implementation*

Date of Submission: 02-04-2023 Date of acceptance: 14-04-2023

I. INTRODUCTION

Information technology (IT) is significant in all real-time systems in today's computer technology environment. Various management systems are in place to help the company organization achieve profit, standards, and future commercial growth. The VMS is a solution to automate visitor management using technology to monitor, track and record visitor information. However, policies may differ depending on the organization, industry, and facility type. The visitors can be clients, interviewees, couriers, consultants, or contractors. Collecting the visitor's name is enough for some organizations, but the company with stricter requirements needs legal documents, badges, or others. At SOC, visitors are currently required to fill out a logbook. However, due to the presence of Covid-19, Universiti Utara Malaysia (UUM) coordinated contact tracing. So, all visitors have to scan MySejahtera. MySejahtera was introduced on the 10th of April 2020 by the Malaysian Government; it was a smartphone application developed to track and trace the infection for the Ministry of Health (MOH) to confine and isolate the infected individual [1]. It also helps track the COVID-19 outbreak in the country by allowing users to analyze their health risks against COVID-19. This application also provides the Ministry of Health with the information to plan for early and effective countermeasures. Therefore, the implementation of SOCVMS can help UUM trace the institution's visitors.

II. BACKGROUND AND RELATED STUDIES

This section describes the background of the visitor management system. A visitor is a general term for someone who comes to see someone or spends time in a place for social, business, or professional purposes or sightseeing. Visitor management is any procedure that assists an organization in keeping track of the people who visit their place. In general, many organizations or schools still use the traditional paper log or guest book to record visitor access such as their name, address, mobile phone, and e-mail. The logbook is inefficient because of messy hand-written visitor badges and illegible paper logbooks. When the number of visitors exceeds the maximum, this manual technique takes longer. Furthermore, increasing visitors indicates that security concerns should be addressed in the organization or institution [2]. Figure 1 shows an example of a visitors' logbook and its content.



Visitor Log Book

Date	Visitor's Name	Reason for Visit	Time In	Time Out	Sign / Initial

Figure 1: Example of visitors' logbook and content of visitors' logbook

Therefore, many studies on visitor management systems have been conducted. These systems offer various features to offer their customers at different price ranges. In 2021, a mobile-based application called VMS Support was developed to integrate with a Computerized Visitor Management System (CVMS). The application receives visitor notifications, responds to CVMS, and updates the current whereabouts [3]. Besides that, COVID-19 Visitor Management System was developed by Kartik Gautam, Praveen Kumar, Sharma, and Mishra in the year 2021. This system is designed to handle visitor entry into homes or businesses automatically. It keeps track of visitors and their physical condition as they enter the premises [4]. A Visitor Management System was developed at Universiti Malaysia Pahang (UMP) by Oktaviandri and Foong in 2019. This system employed a MyKad reader to register new visitors and give them a badge [5]. The study's further research included the adoption of biometric verification methods such as fingerprint and face recognition, as well as a notification system to notify the visiting person of the arrival of the visitors.

III. METHODOLOGY

Agile Model is used for the methodology of the project development. The agile process is based on the software development life cycle [6]. The main reason to use the Agile Model is that it reduces development risks. As the system is delivered to customers after each development cycle and customer feedback is collected, it alerts developers to potential problems that may arise later in the development process. It also helps in the quick detection of errors. This methodology consists of six (6) phases that are iteration which are requirements, design, development, testing, delivery, and feedback, as illustrated in Figure 2.

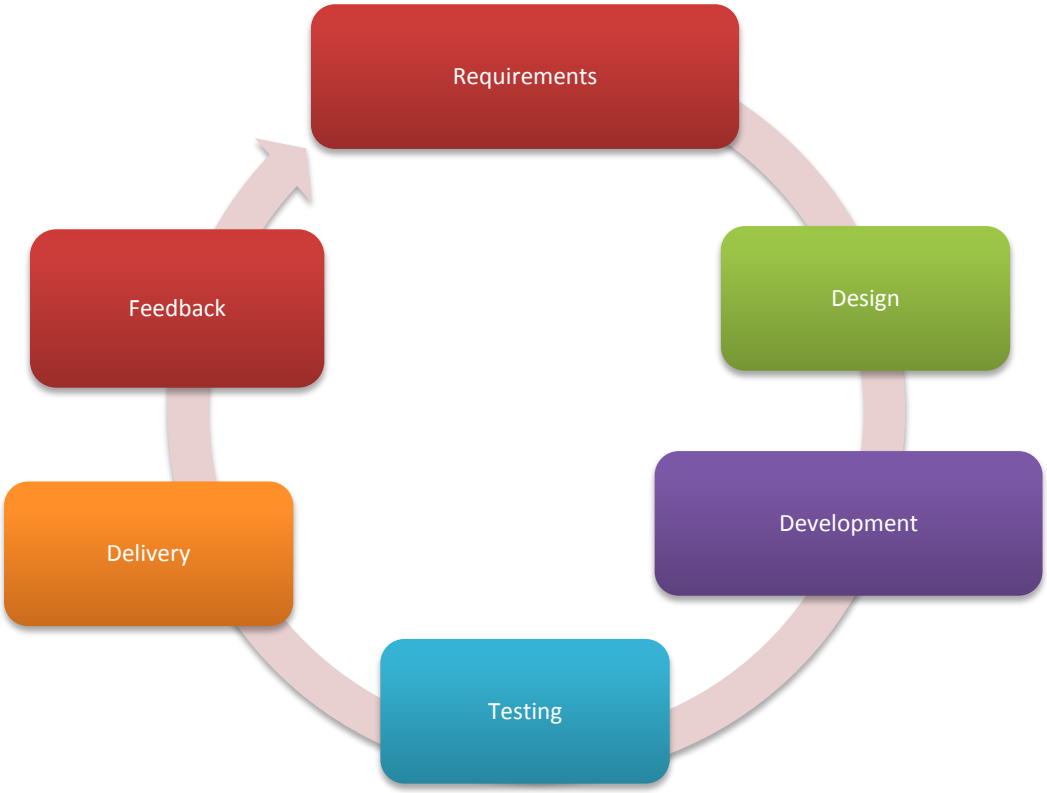


Figure 2: The Phase of the Agile Model

The development of SOCVMS starts with the **Requirements Phase** – The information was collected from the interview with the administration staff and top management at SOC. Then, an analysis was conducted by finding similar works with the proposed system. Then, the list of system requirements was produced to develop the system. The second phase is the **Design Phase -** Preliminary design will be produced after the requirements have been established. It only covers the most important elements of the system and is not a detailed design. A low-fidelity prototype will be implemented. The result of the design is to create a low-fidelity prototype for SOC. The third phase is **Development Phase –** The development process will be started based on the design phase. Detail of the requirement list, design, and development of SOCVMS can be viewed in Section IV: Design and Development. The fourth phase is **the TESTING Phase -** Software and user testing were part of the project to identify syntax and logic errors. The error will be fixed, and the system will be rebuilt till it is stable. The client can then evaluate the system's usability, functionality, performance, and satisfaction. Detail of the testing for SOCVMS can be viewed in Section VI: Result and Discussion. The fifth phase is the **DELIVERY Phase –** The system will deliver to the client. The result of the phase is a ready system. Lastly, the **FEEDBACK Phase -** Detail of the feedback of the system can be viewed in Section VI: Result and Discussion.

IV. DESIGN AND DEVELOPMENT

The development of SOCVMS starts with requirements analysis, design, and development. Table 1 shows the requirement list for SOCVMS.

Table 1: Requirement List of SOCVMS

No.	Requirements Description	Priority
1	**REGISTER**	
1.1	A new user must create an account by providing: • Username • E-mail • Password.	Mandatory
1.2	The system will display an error message if the user does not put @ in the e-mail column.	Mandatory
2	**LOGIN**	
2.1	Staff administration, top management, and the user should log in to the system by key in a username and password.	Mandatory
2.2	The system will display an error message "Login Failed." if the user or system administration keys in the wrong password.	Optional
2.3	The system must verify the username and password.	Mandatory
2.4	The system shall display the main page on the screen based on the roles of users.	Mandatory
3	**VISITOR APPLICATION FORM**	
3.1	The system must display the Profile section for users to enter their personal information.	Mandatory
3.2	User must fill in the personal information for the first-time user: - Profile picture - Full name - Company name - Address - Phone no.	Mandatory
3.3	Users can update their personal information.	Optional
3.4	The system will display an error message whenever users click another section without entering their profile information.	Mandatory
3.5	The system should allow the user to add an application in the menu where the application form will provide.	Mandatory
3.6	The system must display a page of the application form.	Mandatory
3.7	User must fill in the data that has been given in an application form. - Person to meet - Date to visit - Time - Reason to visit	Mandatory
3.8	The system will display a reminder message when the user forgets to fill in the blanks in the application form.	Mandatory
4	**VISITOR APPLICATION VERIFICATION**	
4.1	The application must be verified by the top management.	Mandatory
4.2	The system should display the two sections in the system, Pending and Completed.	Mandatory
4.3	Top management must verify the application by clicking Approve/ Reject button.	Mandatory
4.4	If the top management clicks Reject, the top management must enter the reject reason.	Mandatory
4.5	The system will generate an e-mail to the visitor after the top management has verified the application.	Mandatory
4.6	The top management can view the application that has been verified.	Mandatory
4.7	The system should be visible and recorded by SOC Visitor Management System.	Mandatory
5	**VISITOR APPLICATION STATUS**	

5.1	The system should display the status of the application: Pending, Approve or Reject.	Mandatory
6	**MANAGE APPLICATION REPORT**	
6.1	The staff administration can monitor and view the application.	Mandatory
6.2	The staff administration can view the number of the total visits.	M
6.3	The staff administration can add a new application for the visitor that visit the SOC on the spot.	Mandatory
6.4	The staff admin can search the visitor's name.	Desirable
6.5	The staff administration can delete the application.	Mandatory
6.6	The staff admin can export the data to Microsoft Excel.	Optional

The following stage uses the proper modeling method and tools to illustrate and model the requirements for the web-based system. In this study, the requirements were modeled and visualized using the Unified Modeling Language (UML). The models used in this work include two behavioral diagrams, a use case, and a class diagram that shows the system's structural components. The use case diagram and the actor for a web-based system that can be utilized to manage visitors at SOC are shown in Figure 3.

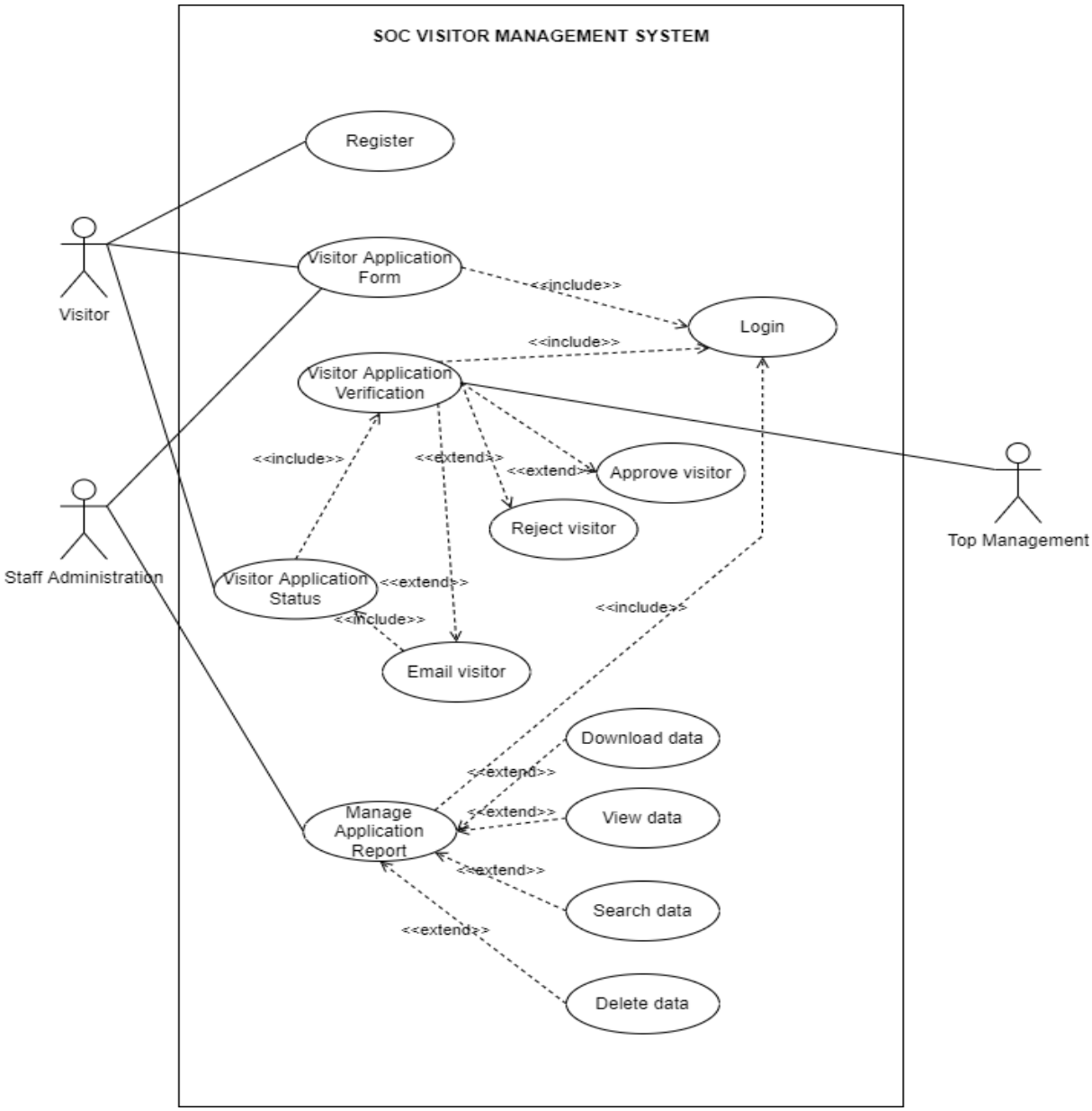


Figure 3: The use case diagram of the SOCVMS

Figure 4 depicts a class diagram of the structural components of a web-based system for visitor management. The class diagram in Figure 4 illustrates the web-based system's attributes and operations.

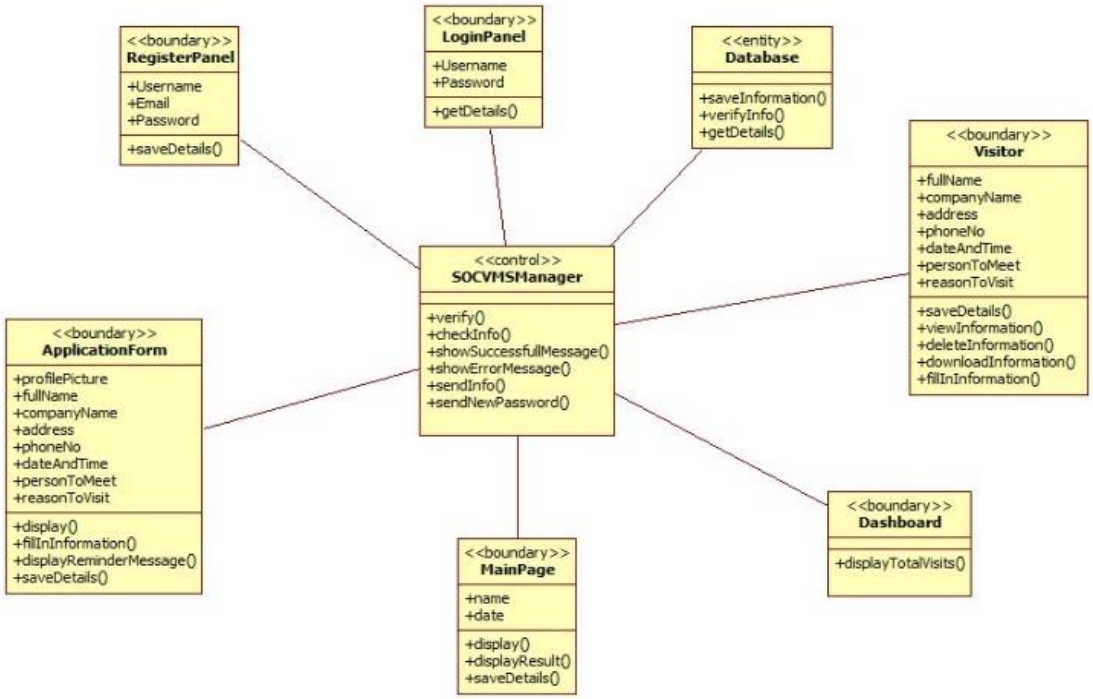


Figure 4: The class diagram of SOCVMS

V. PROTOTYPE DEVELOPMENT

This section describes the development of SOCVMS. A common technique for presenting software requirements is through software prototyping, which allows users to provide further feedback and suggestions based on their interactions with the prototype. The platform for writing code for this project was Visual Studio Code. The web server was hosted online, and the phpMyAdmin database. The print screen in Figures 5 – 10 shows the selected interface of SOCVMS.



Figure 5: Main Page of SOCVMS



Figure 6: Registration Page of SOCVMS



Figure 7: The Visitor Profile

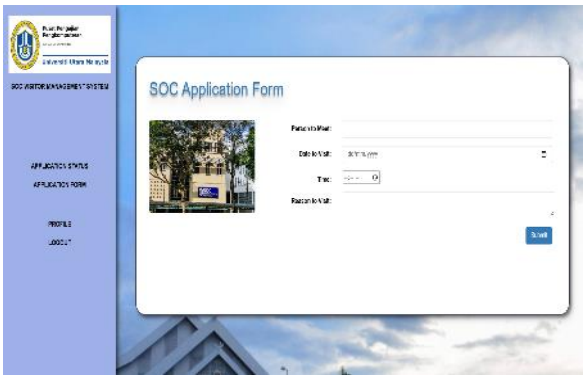


Figure 8: The Visitor Application Form

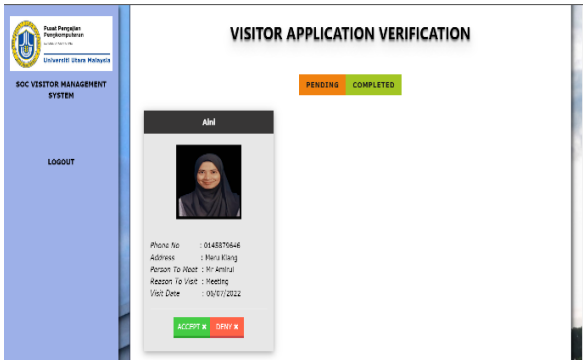


Figure 9: The Visitor Application Verification Page (Status: Pending)

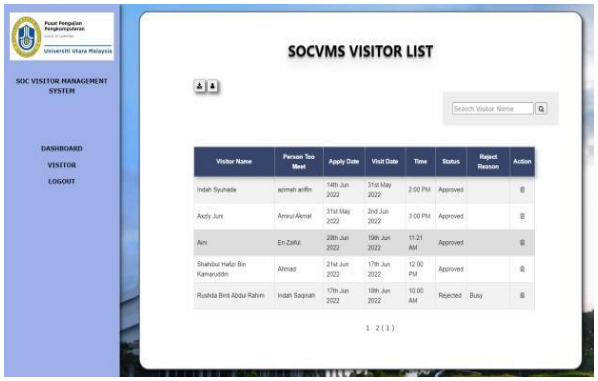


Figure 10: List of SOCVMS Visitor (can be viewed by Admin only)

VI. RESULT AND DISCUSSION

A usability evaluation was conducted on 13 respondents, consisting of the public, top management, and SOC administrator staff. For the public, some of the evaluation was conducted online using Google Meet, some were conducted through WhatsApp, and the survey process was explained in WhatsApp. Meanwhile, the physical testing was conducted with the SOC administration staff and top management at SOC Office. The SOCVMS web-based system and a post-task questionnaire were included in the evaluation. The post-task questionnaire was adopted from [7]. The questionnaire for SOCVMS web-based system is a five-point Likert scale where one represents strongly disagree, to five means strongly agree. The respondents performed the following step-by-step procedure for the evaluation: (1) read the user manual, (2) interacted with SOCVMS web-based system, and (3) answered the post-task questionnaire. The post-task questionnaire responses were analyzed.

Figure 11 shows the results of the usefulness of the SOCVMS. The measurement of usefulness indicates the extent to which a user of SOCVMS meets their goals in a particular context of use.

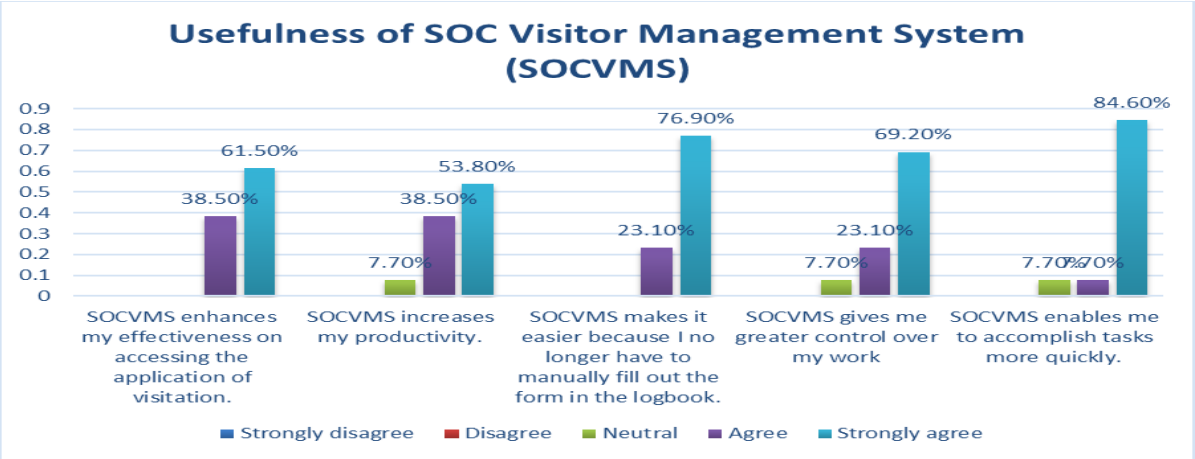


Figure 11: The usefulness of SOCVMS

Respondents agreed that SOCVMS help them to accomplish task quickly (84.60%), and SOCVMS also help them to replace manual task (76.90%) and help them to do their work easily (69.20%). This could be the reason for respondents to use SOCVMS.

Figure 12 shows the results of the ease of use for SOCVMS. The items measure the basic concept that describes how easily users can use a system.

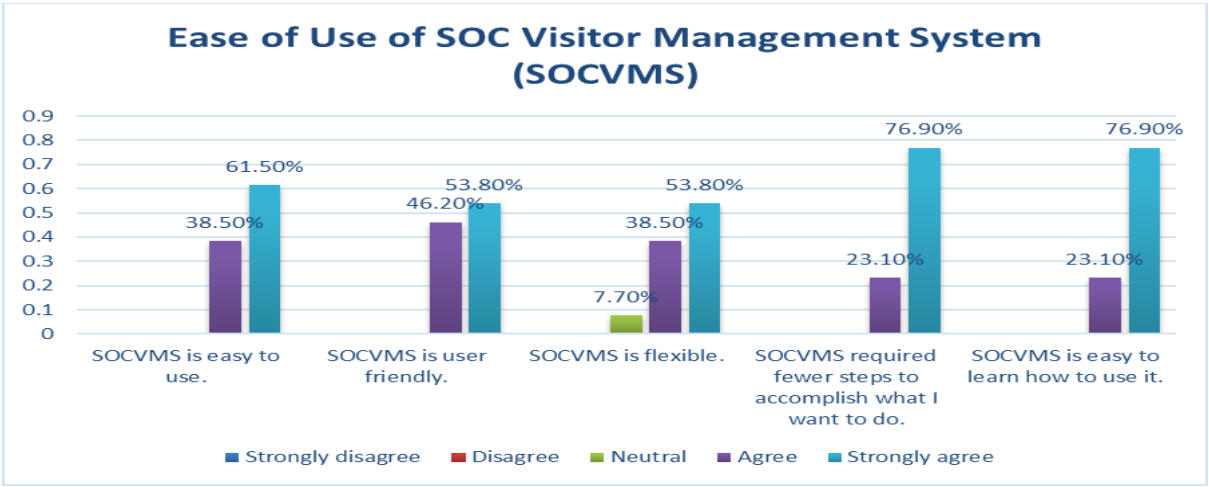


Figure 12: The ease of use of SOCVMS

Respondents agreed that SOCVMS is easy to learn (76.90%) and only requires a few steps to accomplish the task (76.90%). Overall, the respondents were satisfied with the SOCVMS; it helps them do the task and is user-friendly and friendly. This could be the reason for respondents to use SOCVMS.

Figure 13 shows the results of the overall view by respondents for SOCVMS. The items measure the satisfaction of the respondents' amount of time to complete the task. Overall, the respondents are satisfied with completing the task of SOCVMS and the time it took 61.50% strongly agree, while 38.50% agree.

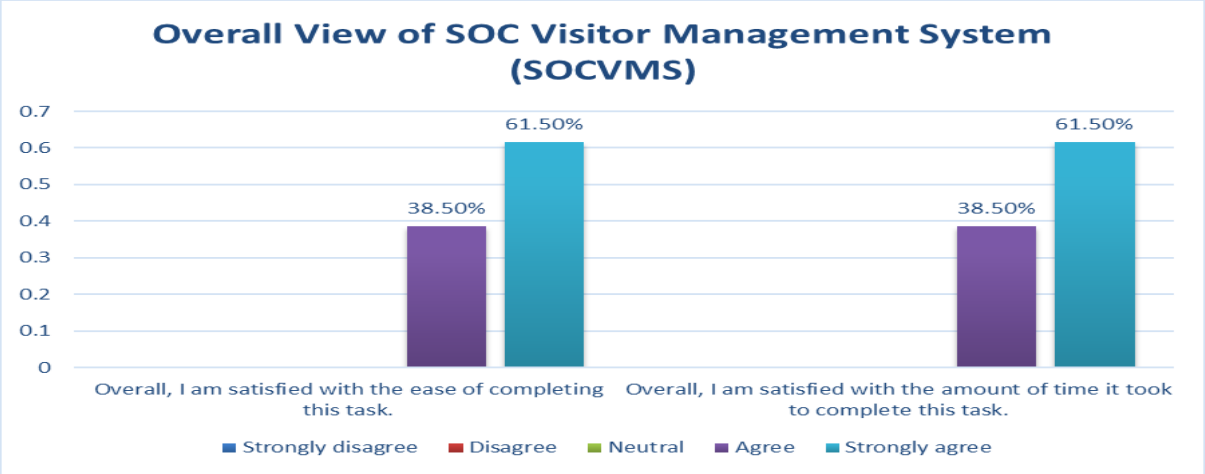


Figure 13: Overall view of SOCVMS

VII. CONCLUSION

The project describes the design and development of a web-based visitor management system. SOCVMS has been successfully developed and tested by respondents with good feedback. In addition, SOCVMS can provide records for reference. For future work, SOCVMS can be improved using mobile apps, and the system can notify the application status through SMS. Hopefully, the implementation of SOCVMS can help the institution go paperless, more modern, and more efficient.

ACKNOWLEDGMENT

The authors thank all Universiti Utara Malaysia School of Computing members and the general public who participated in this study. This project was carried out as part of an Undergraduate Final Year Project.

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