CONTRACTOR AND VISITOR MANAGEMENT SYSTEM USING BIOMETRIC RECOGNITION (VIZIKA SYSTEM)

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for the award of the degree of
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ABSTRAK

Projek ini dibina untuk membantu organisasi di KANEKA Malaysia menjejaki pelawat masuk dan keluar dari premis mereka. Sistem ini biasanya termasuk proses pendaftaran, di mana pelawat memberikan maklumat peribadi dan hubungan mereka, serta proses daftar masuk. Sistem Pengurusan Pelawat turut menyertakan ciri seperti penjadualan janji temu, pemberitahuan automatik dan analitis untuk membantu organisasi meningkatkan pengalaman pelawat dan mengurus kemudahan mereka dengan lebih cekap. Secara keseluruhannya, Sistem Pengurusan Pelawat ialah alat yang bertujuan untuk menyelaraskan proses daftar masuk untuk pelawat, meningkatkan keselamatan dan memberikan cerapan berharga untuk organisasi.

ABSTRACT

This project was built to help organizations in KANEKA Malaysia to track visitors entering and exiting their premises. These systems typically include a registration process, where visitors provide their personal and contact information, as well as a check-in process. Visitor Management Systems also include features such as appointment scheduling, automatic notifications and analytics to help organizations improve the visitor experience and manage their facilities more efficiently. Overall, a Visitor Management System is a tool that aims to streamline the check-in process for visitors, improve security and provide valuable insights for organizations.

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LIST OF ABBREVIATIONS

CVMS	Contractor and Visitor Management System
ER	Entity Relationship
GUI	Graphical User Interface
ID	Identification
MySQL	My Structured Query Language
PHP	Hypertext Preprocessor
RAD	Rapid Application Development
SDLC	Software Development Life Cycle
SHEQ	Safety Health Environment and Quality
SSL	Secure Sockets Layer
SQL	Structured Query Language
UAT	User Acceptance Testing
VMS	Visitor Management System

CHAPTER 1

INTRODUCTION

1.1 Introduction

Contractor and Visitor Management System (CVMS) is a software or hardware-based system that is used to track and manage the movement of contractors and visitors in and out of organization's premises. The contractor is a person who have a contract with a company to provide the services at the company for a certain timeframe. The visitor can be a client, delivery, interviewee, consultant, or everyone who is not a full-time employee at the company (*What Is Visitor Management System and Why Do You Need One?*, n.d.) Usually, CVMS is used in residential areas, hospitals, companies, schools, universities, and tourism before entering the premises by filling in their information details manually or automatically. The purpose of the CVMS is for the management or the guards to keep an eye on the visitors as we do not know who is entering our area, whether they are good or bad people.

The main function of a CVMS is to record and track the details of visitors, such as their name, contact information, purpose of visit, and the person they are visiting. Some CVMS systems also have additional features, such as badge printing, security clearance checks, and integration with other security systems.

Implementing CVMS in the residential area prevents suspicious people from entering the residence to reduce the risk of theft or robbery. Visitors commonly need to fill in their information details by writing in the logbook provided at the guardhouse. After that, they will get the visitor card that needs to be shown in the car. Besides, for the manufacturing plant, the management wants to know the purpose of the visit as they consistently receive many visitors daily, whether for delivery purposes or personal meetings. The company in a chemical plantation has strict rules to follow for safety purposes. Visitors must go through a quick check at the guardhouse to ensure they have made an appointment for the day and somehow are unable to bring phones to enter the premises.

Nevertheless, some companies provide the fingerprint process for regular visitors for the visitor check-in process. The fingerprint is one of the biometric techniques based on uniqueness, meaning there is no similarity of features for every person in the world (Ali et al., 2017). It can make the process more efficient and avoid the visitor's impersonation.

Implementing the CVMS can improve the process's flexibility as the management can track the visitors entering and leaving the premises for security purposes. For example, suppose there is a fire in a building. In that case, the management has the current visitors' information data to contact and inform about the situation, so they are not left behind. They can quickly find visitor information without flipping page by page in the logbook, which requires lots of time.

Other than that, the privacy of visitor data is not easily exposed to other people because it always happens that other people take the personal information of other visitors without consent. Furthermore, CVMS makes the system systematic to generate reports with accurate data for audit purposes. When the number of visitors exceeds the limit, this method can take longer to verify and lead to inaccurate information (al Ghaithi & Eaganathan, n.d.) as everyone has different handwriting. The handwritten may be quite hard to read. In addition, the privacy of other visitor information can easily be exposed by every visitor as they can view the information through the logbook (Karimah et al., n.d.)

1.2 Problem Statement

The problem with the current visitor management system is that it relies on a manual process for tracking and managing visitors. The screening and authentication process in manufacturing plants is often done manually, thus resulting in a comprehensive, biased, and time-consuming security control process. In addition, information acquired through a written form from the manual approach results in difficulty in real-time monitoring and a complicated and tedious process for auditing and reporting purposes. This system has several drawbacks:

- Inefficiency: The manual process of tracking visitors is time-consuming and labor-intensive, and it can lead to delays and bottlenecks in the visitor check-in process.

- Lack of accuracy: The manual process is prone to errors and inaccuracies, which can lead to incorrect visitor information being recorded and accessed (*What Are the 7 Disadvantages to a Manual System? | LinkedIn*, n.d.).

- Security risks: The manual process of tracking visitors does not provide a secure and reliable way to verify the identity of visitors, which can pose security risks to the organization.

- Limited scalability: The manual process is not scalable, as it becomes more and more difficult to manage and track visitors as the number of visitors increases.

The goal of a visitor management system is to automate and streamline the process of tracking and managing visitors, in order to improve efficiency, accuracy, security, and scalability. This will require the development of a system that is able to accurately and securely track and manage visitor information, and that can be easily scaled as the number of visitors increases.

1.3 Objective

The objective shows the purpose of the project to accomplish of this Vizika System which are:-

i. To study and understand the current practice and procedure on Visitor Management on manufacturing site
ii. To design and develop the Vizika System, a security system that helps to authenticate visitors and suitable for manufacturing site
iii. To test and evaluate the functionality of the developed Vizika System

1.4 Scope

- User Scope
  i. Contractors that have a contract with manufacturing site near Gebeng
  ii. Visitors that want to make a visit at Kaneka Malaysia Company
  iii. SHEQ Guard that in charge in register the visitor's biometric recognition for the Vizika System at Kaneka Malaysia Company
  iv. SHEQ Officer that in charge in controlling the system
  v. Staff of the Kaneka that wants to make a visit with visitor

- Cover Area Scope
  i. For KANEKA Malaysia Company at Gebeng, Kuantan used only
  ii. For Visitor and Contractor who are involved with the KANEKA Malaysia

- System Scope
  i. Covered the authentication process
  ii. Covered the appointment process with real time data

- Development Scope
  i. Using PHP Language as programming language
  ii. Using Laravel as PHP Framework
  iii. Using MySQL as the database
  iv. Using Figma as prototype system

1.5 Project Organization

This thesis consists of five chapters. Chapter 1 will explain the introduction to the project which included a background study that briefly describes the project and related issues. The problem statement shows what is the problem that we want to overcome. Besides, the aim and objectives are aimed to reflect its long-term outcomes while the objectives indicate the short-term targets. Moreover, the scope of the project defines the boundaries of the project and users and what tools are chosen for developing the system.

Apart from that, Chapter 2 discusses the comparison of three existing projects, a critical review of the comparison of the existing systems, and a relevance analysis with the proposed system.

Moreover, Chapter 3 describes the methodology, project requirements, functional, non-functional, user requirements, constraints, limitations, and system proposed design that includes a flowchart of the system, context diagram, use case diagram, use case description, activity diagram and storyboard. Then, the ER diagram and data dictionary in data design, planning and implementation have user acceptance testing. A Gantt chart will also be shown in this chapter.

On the other hand, Chapter 4 will clarify the system implementation process, input and output design, database implementation and coding implementation. The user manual also will be explained in this chapter and consists for all users.

The last chapter in Chapter 5 will summarize the project and will discuss the recommendations that are needed to improve the system.

.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review will describe three existing Visitor Management Systems. Those existing systems will be analysed to find the best system as a benchmark to develop the proposed system. The first existing is Vizito System in subsection 2.1.1. Vizito system is used globally for industries, hospitals and universities to record visitor details (*Visitor Management System - Visitor Sign In - Vizito*, n.d.). Next, CloudApper System in subsection 2.1.2. I chose it. CloudApper is a no-code software creation platform to enhance the employee productivity in the company (CloudApper | No-Code Platform For Enterprise Mobile Apps Development, n.d.). Next, The Receptionist in subsection 2.1.3. The Receptionist System helps the front-desk staff to manage the visitor with contactless sign-in (*The Receptionist for IPad | the Original Visitor Management System*, n.d.).

All of the systems have the same purposes which is to manage the visitor for each company and free-trial web-based systems. The systems are only given two (2) weeks to use the free-trial versions. If the users are interested to use, they can purchase the system with a certain amount. They also provide the live chat agent and always keep in touch through email asking if there are any inquiries and can request a live demo with the admin that is in charge of the system for each.

After that, in subsection 2.2, the comparison of the existing system will be discussed for three existing systems that are mentioned in subsection 2.1.1. Next, a relevant comparison between those existing systems and the proposed system which is the Vizika system will be described in subsection 2.3.

2.2 Existing System/Works

2.2.1 Vizito

Vizito is a flexible VMS to track the visitor during the visiting process at the company (*Vizito - Dashboard*, n.d.). The Vizito is integrated into an iPad as a second device for the visitor to sign in a form before meeting with the hosts. The main dashboard of the system looks minimalist and user-friendly shown in Figure 2.1. It displays the summary records of the visitor which are the number of today visitors in, number of today visitors current, date and time, today visitors out, monthly visitor counts and monthly SMS counts. Besides, the dashboard has a line chart that displays the monthly number of daily visitors and shows the visitors' latest activities.

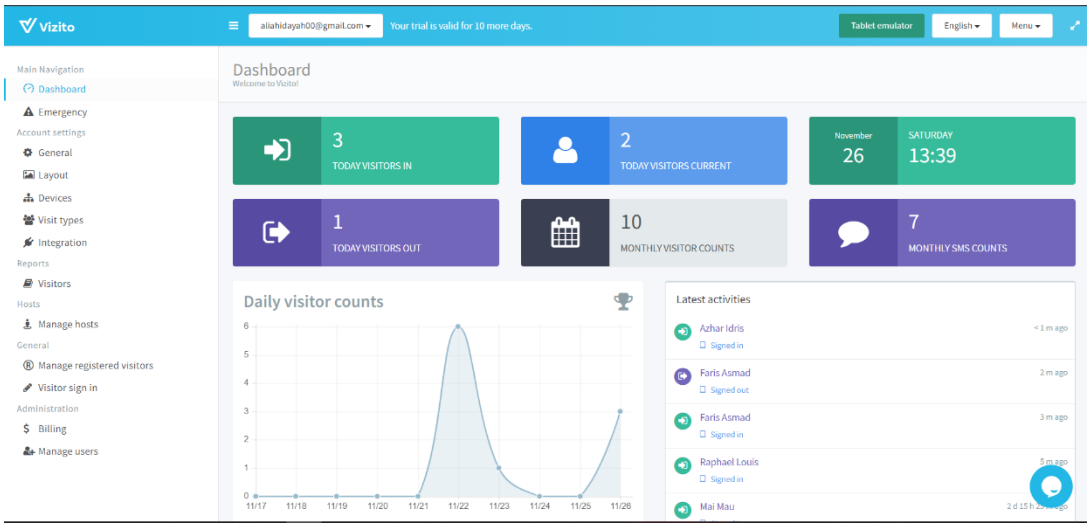


Figure 2.1 Main dashboard of Vizito

At first, in Figure 2.2, the visitor who came to the company must sign in the form digitally using an iPad provided. The visitor must enter the basic information such as visitor name and visitor company and choose the host they want to meet on that day. They can optionally take a photo as evidence of their visiting. Then, they need to sign the Non-Disclosure Agreement on the iPad. The reset button has provided for the visitor to re-sign the agreement. After that, they need to click the "Sign In" button to submit the sign. Next, click the "Sign in" button to submit the request meeting with the hosts. Next, the visitor will receive the host's phone number, and the host will receive an SMS notification that the visitor has arrived.

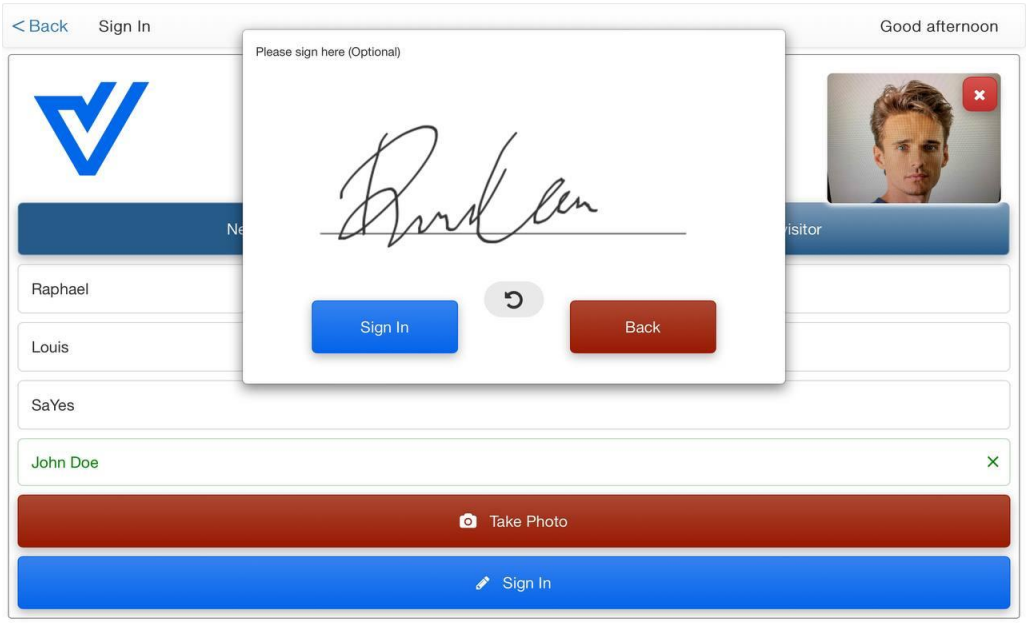


Figure 2.2 The sign-in page on the iPad for Vizito

Besides, the visitor can make an appointment before they come to visit. The staff in charge of the system needs to add the details of the visitor, such as visitor first name and last name, visitor company, here to see who, email and the date the visitor wants to visit, as shown in Figure 2.3. After that, click the 'Save' button to save the appointment. 'Close' button to cancel the appointment details and 'Invite' button to invite the hosts if the client wants to see the hosts.

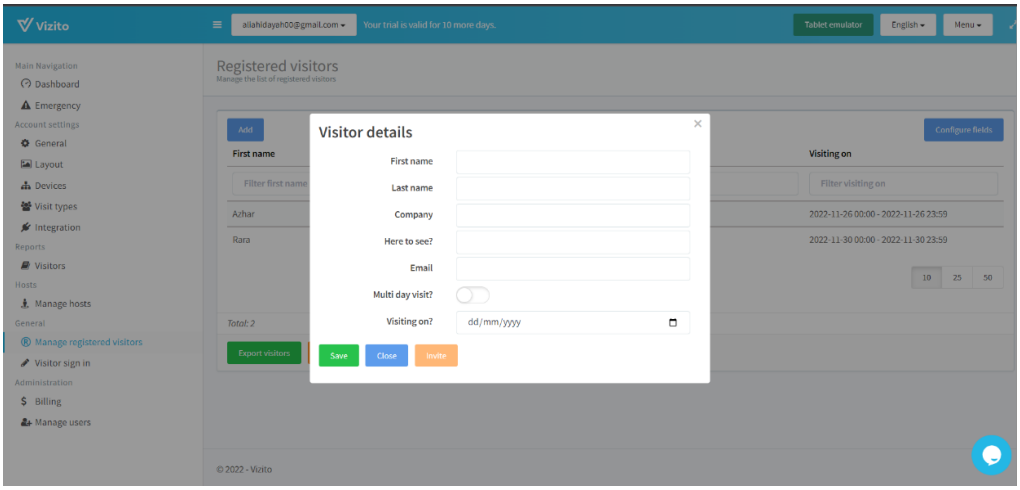


Figure 2.3 The visitor details of Vizito

Then, on the day they want to visit, they need to find their name on the list. If their name is not listed, they cannot enter the premises. The receptionist can view the visitor log displayed in Figure 2.4. The receptionists have three views of managing the visitation, where they can view visitor activities based on the list of visitors in, visitors out and also visitors current meaning those who are still in the premise.

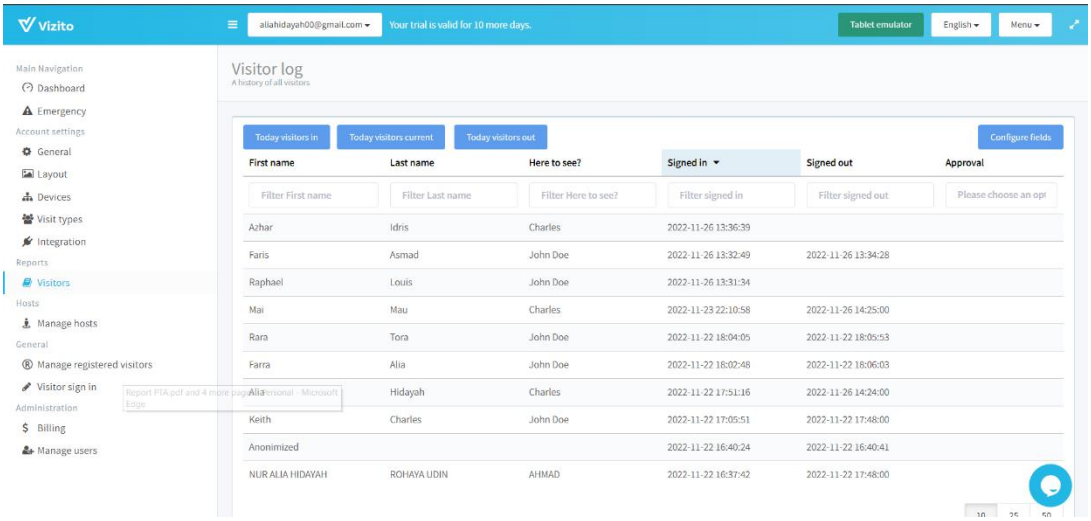


Figure 2.4 The visitor log of Vizito

The system have an pro which is to alert the current visitors if any emergency case happens such as fire alert to let the current visitors alert about the hazard. It is one of the best features as it has a potential to reduce the impact of crises in terms of injuries and losses to life and property from existing hazards (Niebla et al., 2012).

However, the system still has a drawback which is the system is unable to edit the details of the appointment once we save the details to the database, it is one of the bad drawbacks as if the visitor wants to change the visit, they are unable unless they have to create a new one. It will cause many memory storages used in the database as it shows the system is unsystematic. The system also has not integrated biometric recognition. Hence, the system's security is not high as any people can visit the premises with a fake identity.

2.2.2 CloudApper Visitor Management System

CloudApper is also one of the free trial versions of VMS. It is a customized enterprise application that can be customized based on the company needs without coding. CloudApper VMS is one of the systems that exists that can be tailor-made based on what features to have. CloudApper does not have integrated with any devices, such as iPad (*CloudApper*, n.d.) for contactless sign-in. In Figure 2.5, the main dashboard of the system displays the summary records of the visitor in charts. The dashboard displays the number of visits on that day, visitors on watchlist which is the number of watchlist visitors that will come on that day. Then, display the type of visitor and visit by purpose in pie charts.

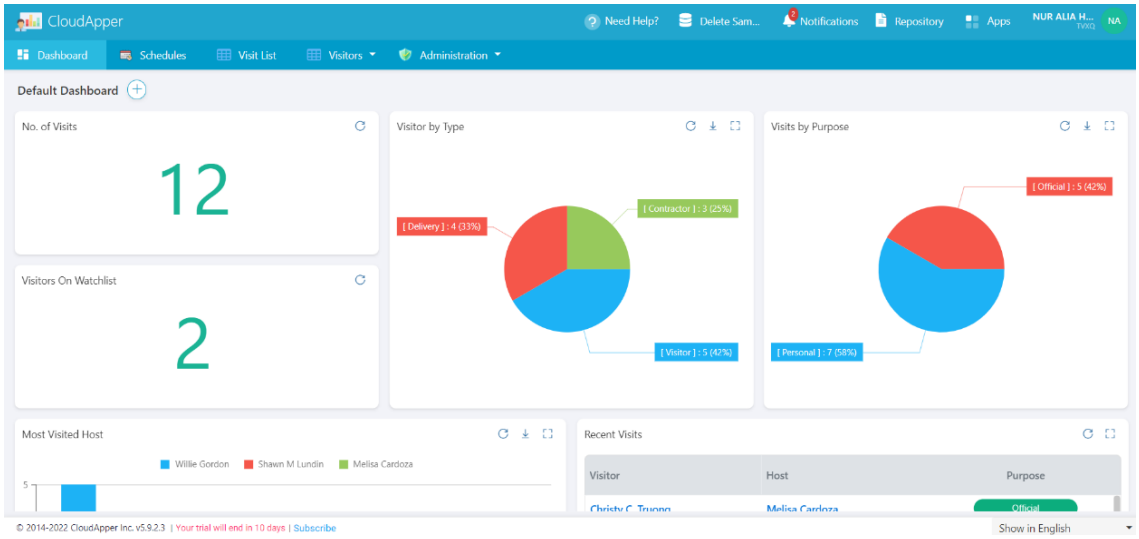


Figure 2.5 The main dashboard of CloudApper system

Next, In Figure 2.6, if the first-timer user wants to make a visit, the visitor must register their information at the front-desk staff. The system has provided fingerprint recognition which means visitors must scan the fingerprint and enter the essential information such as full name, email, mobile number, company, title and ID number. If the user does not scan their fingerprint, they cannot register, as it is compulsory. Then, click the 'Save' button to store the data into the database. If the user wants to cancel the add visitor process, they can click 'Cancel' button.

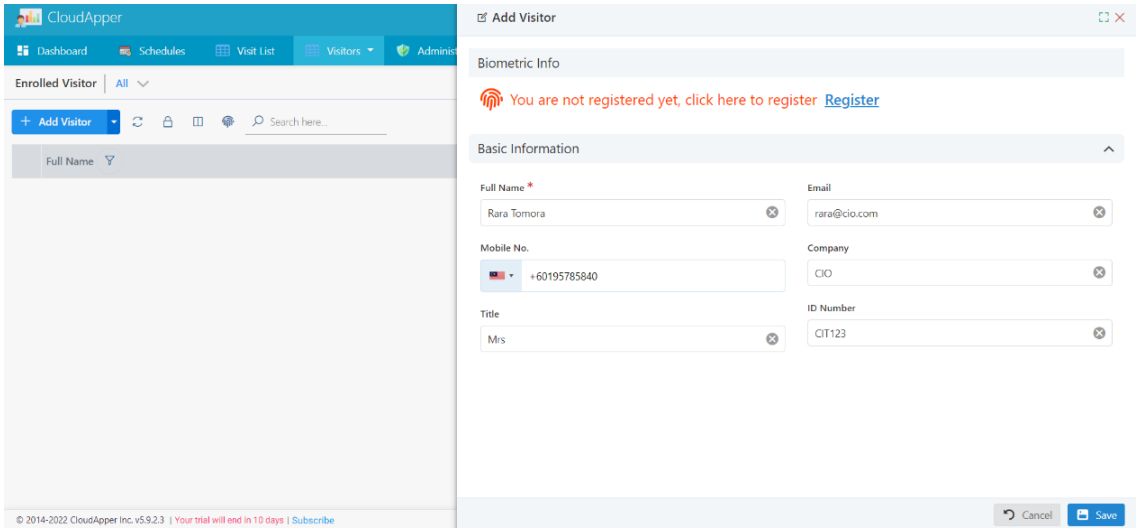


Figure 2.6 The add visitor details page of CloudApper

Meanwhile, in Figure 2.7, for the existing visitor who wants to visit the hosts, the visitor needs to sign in at the receptionist by scanning the fingerprint to authorize the visitor information, then enter the visit information such as host, visitor type and purpose. They can also optionally add the identification document information and notes to the hosts, then click the ‘Save’ button to save the data to the database. Users can click the ‘Cancel’ button if they do not want to continue the add visit process. The system can edit the visitor appointment record.

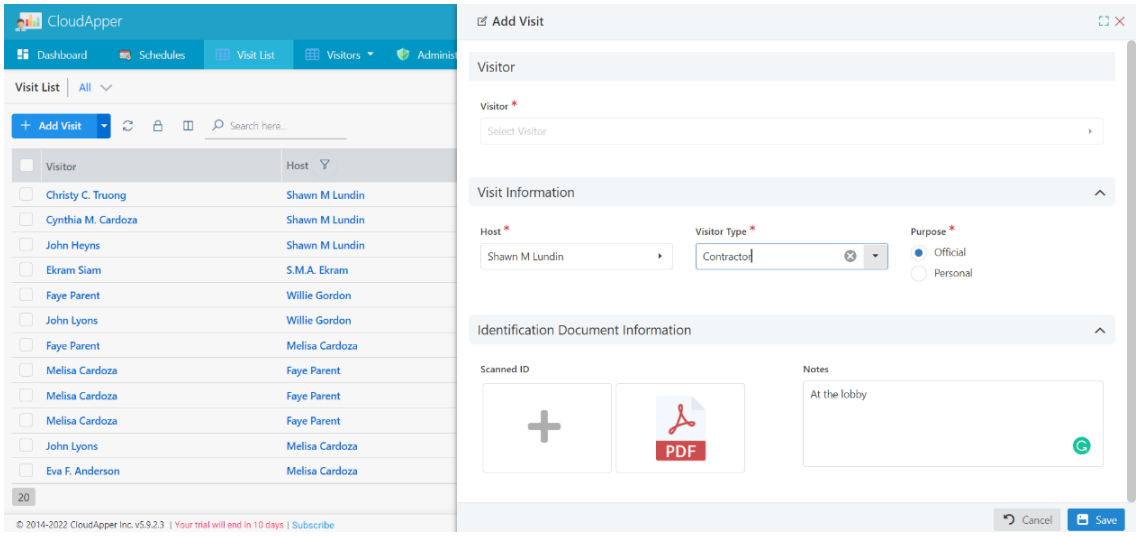


Figure 2.7 The add visit page of CloudApper

In addition, the system has a calendar view that helps the receptionist to view the scheduled visit. This feature is helpful, especially when there are many appointment records. In Figure 2.8, the system has a schedule page that shows the appointment schedules in the calendar view. It is easier to monitor in the calendar view than in the list view, and they can filter the calendar by day, week, or month. They can also view in detail by viewing the 'Agenda' button. They can add schedules in the calendar by clicking the 'Add Schedule' button and then enter the information needed. In contrast, the system does not provide notification to notify the host that the visitor has arrived. It is hard to contact the host if many visitors come at one time.

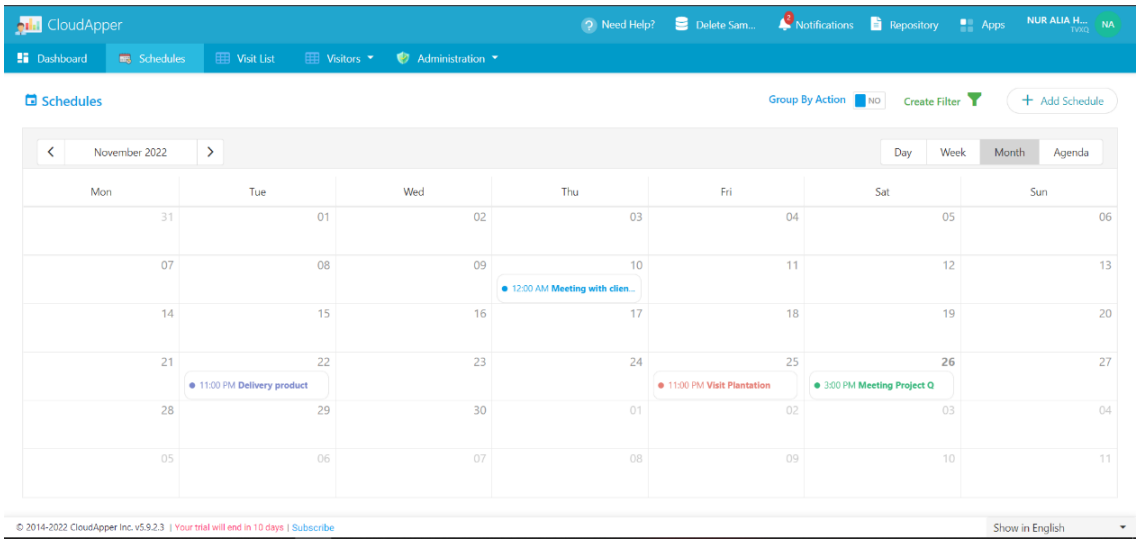


Figure 2.8 The calendar view of Vizito

However, the system still has drawbacks which cannot integrate with an iPad like Vizito and The Receptionist and does not have a notification feature in the system.

2.2.3 The Receptionist

The Receptionist system is the same concept as the manual registration in a logbook but in a digital way. The Receptionist is same as Vizito in subsection 2.2.1 which the system integrates with an iPad as a device as a digital form for the visitor to sign in when check-in the premises (*The Receptionist - Home Screen*, n.d.). The visitors must choose the reason for their visit, as shown in Figure 2.9. For the employee, they also can clock in in this system by choosing the Check In button. For the delivery purpose, they need to choose the Delivery button and for the visit with the employee, they need to choose the 'Employee' button to choose the hosts they want to visit. They can check out by clicking the 'Checkout' button to check out after visiting.

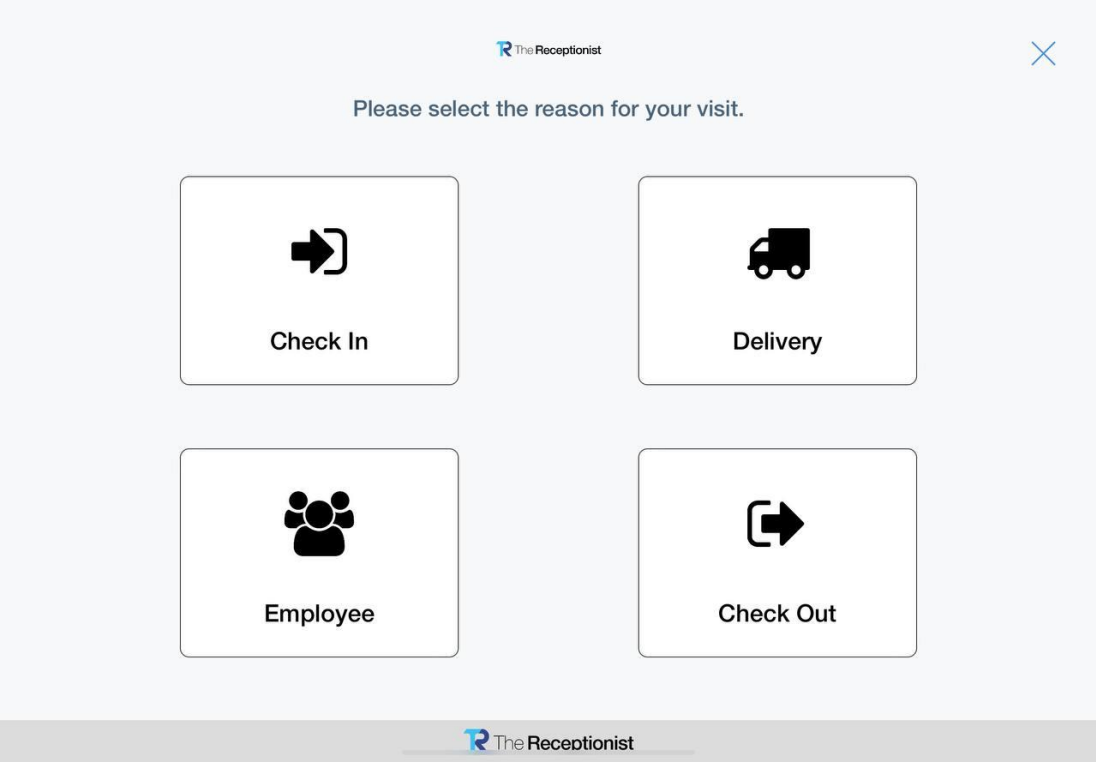


Figure 2.9 The interface of visit on iPad for The Receptionist

Next, on the landed page of The Receptionist in the web-based system, the system displays the visitor log that shows the lists of the current visitors' details displayed in Figure 2.10. They can search the records and filter the record by date range, departments and buttons. The system allows exporting the data by clicking the 'Export' button.

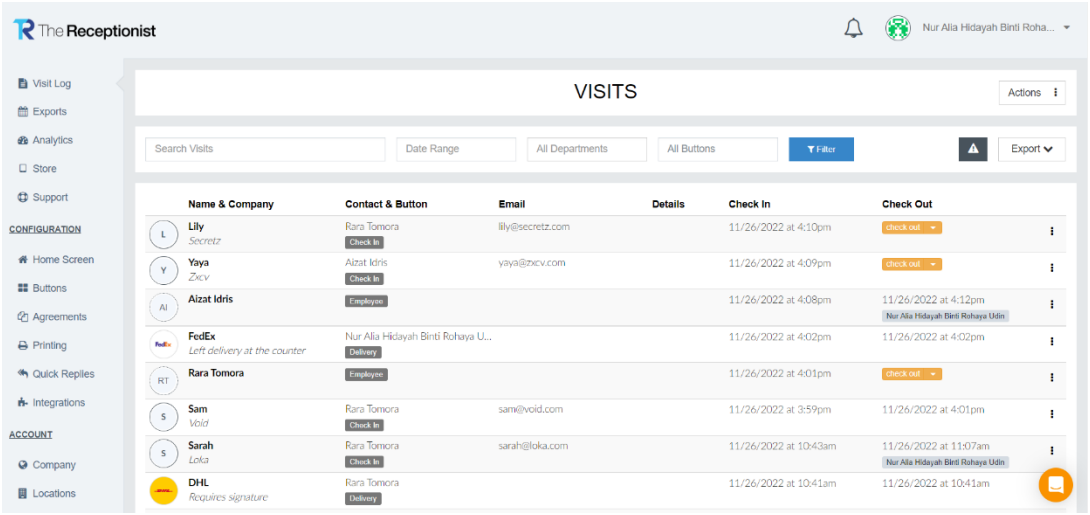


Figure 2.10 The visitor log of The Receptionist

In the analytics page shown in Figure 2.11, it shows the dashboard of the system. It shows the bar chart of the visitor for every hour. They can also view the chart in 7 days, 30 days, 90 days and 365 days.

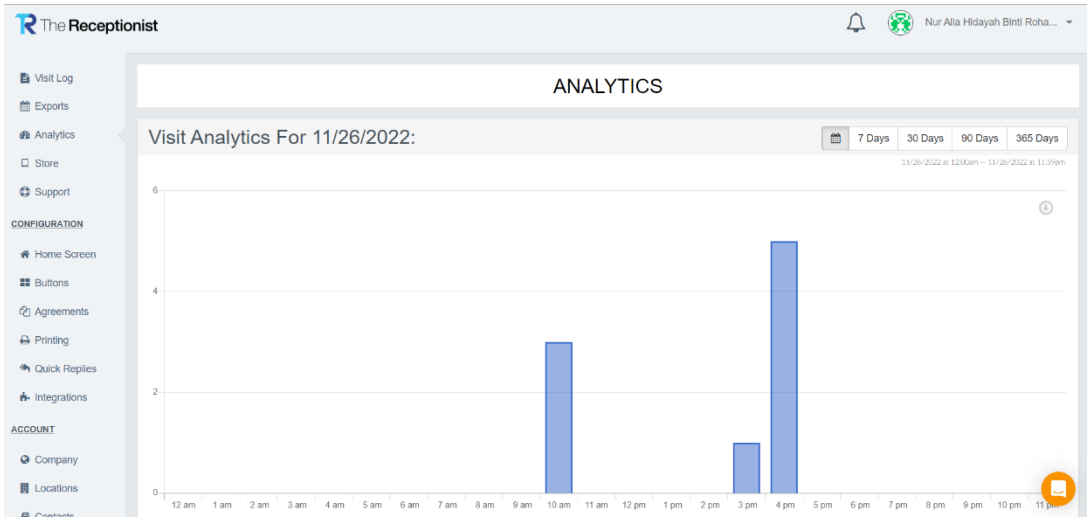


Figure 2.11 The analytics dashboard of The Receptionist

In contrast, the system cannot make an appointment for a future date as they only have to sign in immediately before the visit. It will cause longer time to sign in as many people will queue to sign in the form especially during peak hours. The system is too simple as it provides only a few features

2.3 Analysis / Comparison of Existing System

2.3.1 Analysis of comparison on existing system

Table 2.1 shows the comparison on existing systems for Vizito System, CloudApper System and The Receptionist System while Table 2.2 displays advantages and disadvantages for those systems.

Table 2.1 Analysis comparison on existing system

	Vizito	**CloudApper**	**The Receptionist**
Technology used	Web-Based	Web-Based	Web-Based
Programming Language	AngularJS	AngularJS	Ruby
Performance	High	High	High
Integrated Devices	iPad	No	iPad
User-friendly interfaces	Simple	Yes	Yes
Security	Low	High	Low
Modules	- Dashboard - Visitor log - Manage hosts - Visitor check-in - Manage visitor appointment - Notification	- Dashboard - Visitor log - Manage hosts - Visitor check-in - Manage visitor appointment - Calendar	- Dashboard - Visitor log - Manage hosts - Visitor check-in - Notification

Integrations	- Microsoft Teams - Slack	None	- Microsoft Teams - Slack - Webhooks - Zapier

Table 2.2 Advantages and disadvantages of existing systems

	Advantages	**Disadvantages**
Vizito	• Integrate with an iPad • Provide a notification feature	• Not integrate with biometric recognition • Do not have calendar view • Provide a notification feature
CloudApper	• Integrate with a biometric recognition (fingerprint) • Have a calendar view	• Do not integrate with iPad • Do not provide notification features
The Receptionist	• Integrate with an iPad	• Not integrate with biometric recognition • Unable to make an appointment on a future date • Do not have calendar view

2.3.2 Relevance of comparison with Vizika System

Based on Table 2.3 below, relevance comparison be made for those existing systems and the proposed system, Vizika.

Table 2.3 Relevance comparison with Vizika System

	Vizito	**CloudApper**	**The Receptionist**	**Vizika**
User friendly system	✓	✓	✓	✓
Dashboard	✓	✓	✓	✓
Visitor log	✓	✓	✓	✓
Integrate with iPad (apps)	✓	X	✓	X
Appointment	✓	✓	X	✓
Notifications	✓	X	X	✓
Calendar	X	✓	X	✓
Biometric recognition	X	✓	X	✓
Unwanted visitor (blacklist)	X	X	X	✓

2.4 Summary

Vizito, CloudApper, and The Receptionist had a user-friendly system and displayed a dashboard on their system. Those dashboards have some charts and graphs that summarize the data into a graphic to ease the user to see the data. Besides, all the systems have visitor logs that display the signed-in and signed-out users. Vizito and The Receptionist had integrated the system with an iPad, which means that the user will sign in the form digitally on the iPad. Besides, only Vizito and CloudApper can make an appointment for a visit.

On the other hand, only Vizito that is able to send notifications to the host when the visitor has arrived. CloudApper had a calendar view on the system to ease the receptionist's view of the schedule and integrated the system with biometric recognition. Hence, CloudApper is the best existing system to be chosen for my benchmark to develop the Vizika system because the system is almost the same as what the proposed system will be developed.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Methodology explained about the flow of the system development. There is an explanation of the methodology that will be used which is Rapid Application Development (RAD) model in subsection 3.2. The methodology helps as a guideline to finish the project by following the phases of the model. In subsection 3.3, Project Requirements will be described about the software and hardware requirements that will be used along with the project development. The functional and non-functional of the system will be described in this subsection as well constraints and limitations of the system. Propose Design that includes flowchart, context diagram, use case diagram and description, activity diagram and storyboard will be illustrated in subsection 3.4. Then, Data Design in subsections 3.5 will display the Entity Relationship Diagram (ERD) and data dictionary of the system. Proof of the initial concept will show the initial design of the web-based system, testing plan shows the lists of testing plans that will be used, and potential use of the proposed solution will be analyzed in subsections 3.6, 3.7, and 3.8 respectively. Then, the gantt chart will explain about the planning to complete the entire project over a period of time in subsection 3.9.

3.2 Project Management Methodology

To develop a proposed system, which is Vizika, the methodology is important to produce a high-quality system within the shortest possible time frame. Methodology is important to create a clear understanding of the tasks that will be done in future. The suitable methodology for this system is the Rapid Application Development (RAD) model which has 4 stages such as requirements planning, user design, construction, and cutover that is shown in Figure 3.1.

The RAD model has been chosen because the Vizika system has a strict deadline then, the system needs to be developed in a short time which is less than six (6) months. As the time is limited, the documentation cannot be finished first before developing the system. Therefore, the documentation must be made at the same time as developing the system. When the time is limited then the cost can be decreased as well. Next, the client from the Kaneka Malaysia Sdn. Bhd. can be involved during the project implementation which means the system will make changes many times based on client feedback. This is the most benefit for this model because we can enhance maximum satisfaction from the user (*Rapid Application Development (RAD) | Definition, Steps & Full Guide*, n.d.). The phases in the RAD model will be in line with the Gantt Chart that explained in subsection 3.9.

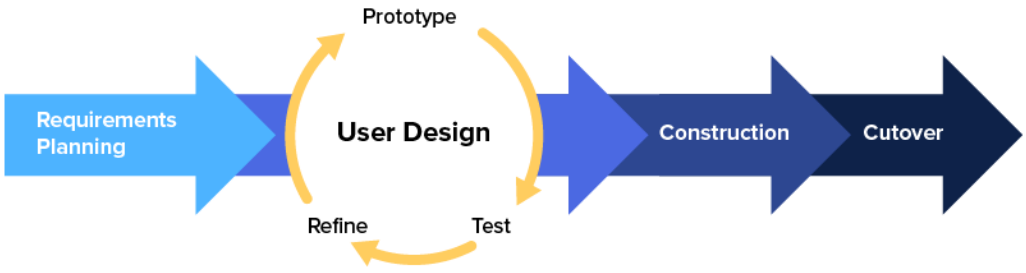


Figure 3.1 RAD Model

Phase 1: Requirements Planning

During this phase, the problem statement, objectives and scope of the project will be determined by collecting the requirements from the client. By analysing the problem statement, objectives and scope for Vizika System can be identified to solve the problem. All data from different resources are researched to locate the best choice to build up the project. The end-user and target-user requirements also will be settled on the expectations from the user on how it is performed. Survey and interview will be conducted during this phase to get the requirements from general users and clients to get their expectations on the proposed system. Then, the system requirements also needed to plan to choose the best software and hardware that will be used before developing the project. After that, the functional and non-functional will be clarified to ensure that those will be achieved during the development. Constraints and limitations have also been discussed to understand what challenges during the development next. By doing this, we can get a clear view of requirements before designing the Vizika System. Hence, with a proper requirement planning, the system can have a better result without any ambiguity.

Phase 2: User Design

In this phase, the problem statement, objectives and scope of the project will be determined by collecting the requirements from the client. By analysing the problem statement, objectives and scope for Vizika System can be identified to solve the problem. All data from different resources are researched to locate the best choice to build up the project. The end-user and target-user requirements also will be settled on the expectations from the user on how it is performed. Survey and interview will be conducted during this phase to get the requirements from general users and clients to get their expectations on the proposed system. Then, the system requirements also needed to plan to choose the best software and hardware that will be used before developing the project. After that, the functional and non-functional will be clarified to ensure that those will be achieved during the development. Constraints and limitations have also been discussed to understand what challenges during the development next. By doing this, we can get a clear view of requirements before designing the Vizika System. Hence, with a proper requirement planning, the system can have a better result without anytime.

Phase 3: Construction

In construction phase, the development process will be involved. Vizika System will be developed based on the final decision of the prototypes from the user design phase. As the changes have been made during the user design phase, it is easier for the developer to develop the system rapidly. The system will be developed using Microsoft Visual Studio Code as the software to write the code and PHP as the programming language. MySQL will be the database that connects with the system to store the data and Xampp as the local server to debug the system. The testing stage to test the functionality of the system will be held during this phase. The User Acceptance Test will be done by choosing some end-users to test the system. UAT can help to ensure that the system runs smoothly and achieve the goal and users' satisfaction. If the error has occurred, the developer needs to revise and recode to solve the problem until the system is error-free and ready to be launched.

Phase 4: Cutover

After the system has already developed with no error and bugs, the system is ready to be launched to the end-users. The system will be uploaded to the real server. The system can do Beta Testing for the end-users to get feedback and review to maintain the system from time to time.

3.3 Project Requirement

This section explains about the project requirement that is needed to develop this web-based system. There are some software requirements that will be used in the Vizika system and two types of hardware requirements that are mentioned in subsection 3.3.1 and 3.3.2 respectively. Then, in subsections 3.3.3 and 3.3.4 will analyse the functional and non-functional of the Vizika system. Constraints and Limitations, and user requirements also are discussed in subsection 3.3.5 and 3.3.6 accordingly.

3.3.1 Software Requirements

The software requirements will describe all the softwares that will be used in this project. There are five (5) softwares that use during the design and development phases. Table 3.1 described the software requirements in detail.

Table 3.1 Software requirements

No	Software	Description	Function
1.	Visual studio code	A software tool to write the code	To develop the Vizika system in PHP language
2.	Figma	A software to prototype the interfaces of the system	To design the interfaces of the Vizika system and do the prototypes of the system
3.	Xampp	A local server that provide the Apache web-server	To test the system with local web-server for testing the functionality of Vizika system
4.	MySQL	An open-source database	To store all the data to the database
5.	GitHub	A version control	To store the code online

3.3.2 Hardware Requirements

The hardware requirements will describe two types of devices that will be integrated with the Vizika system. There is only one (1) hardware that will be used and described in detail in Table 3.2.

Table 3.2 Hardware Requirements

No.	Hardware	Description	Function
1.	Webcam device	A webcam that already built on the laptop	To store the facial picture of visitors and contractors at Kaneka Malaysia Sdn. Bhd.

3.3.3 Functional

The functional is the functions that will be implemented in the Vizika System as the references for the developers to ensure that all the functions are developed in the system. It is a guide on what the tasks that need to be developed. Below are the functional of the Vizika System: -

- The system can register visitor and contractor information with biometric details such as facial recognition.
- The system displays the analytics dashboard to display the records in charts and graphs.
- The system can manage the appointment of the visitors and contractors three (3) days before the visit date and send the email to them as the notice.
- The system shows the visitor logs in the table by displaying the current visit that already check-in and check-out.
- The system manages to prevent the visitor from the blacklisted visitor to make an appointment at the company.
- The system has a calendar view of the visiting appointment.
- The system allows users to generate the report for auditing purposes in PDF and Excel format.
- The system can manage safety briefing session for contractor.
- The system can do the facial detection to detect whether the face is matched or not.

3.3.4 Non-Functional Requirements

Non-functional is specifications that describe the system capabilities that aim to improve the functionality and performance of the system. Below are the non-functional of the Vizika System:

- **Security**

The records in the database must be encrypted, especially in the table users because it contains the sensitive information such as password. The system must be protected with high-level security to avoid the system easily being hacked by unauthorized access. (Non-Functional Requirements: Examples, Types, Approaches | AltexSoft, n.d.). Therefore, the sign in module is a must so not anyone can use the system without an account.

- **Usability**

The system must be user-friendly, and the icons used are familiar with real-world use. It is to make the user learn fast when they see the interfaces of the Vizika system. The system also needs to have clear navigation and instructions.

- **Maintainability**

The system must be maintained frequently to ensure there is no crash or bugs during the work day. Hence, the maintenance can be done during midnight or weekend to avoid disruption during the working days.

- **Performance**

The system must have better performance to always display the real-time data. Depending whether refresh the page or not, the page must be refreshed at regular intervals. The system must react in every two (2) seconds.

3.3.5 Constraints and Limitations

Constraints and limitations are about what the process should be prevented in the system to assure that the system can run smoothly without any errors and bugs. Below are the constraints and limitations in the Vizika System: -

- A visitor and visitor can only register once in the system to avoid ambiguity during fetching the data from the database.
- Only the staff of the system can register the visitor and contractor account.
- The system must have a stable internet connection otherwise, they may experience disruption while using the system.
- The system will reject the check-in from the visitor if the biometric recognition does not match the record from the database. It also rejects the blacklisted visitor from visiting and making an appointment.
- The visitor must make an appointment three (3) days before the visit date. The system will not allow you to make an appointment on the same day and on the weekends.
- The system can be accessed in any browsers such as Google Chrome, Mozilla Firefox and Microsoft Edge.
- The system should not provide sensitive words, symbols and pictures because of the diverse races.
- Only the contractor who have expired validity pass can access the safety briefing page to enroll the briefing session.

3.3.6 User Requirements

The methods used to gather the user requirements for the system are through interviews and also surveys. The interview involved a chemical factory named Kaneka Malaysia Sdn. Bhd. The list of questions has been prepared before the interview sessions for the close-ended and open-ended for the interview. The close-ended question is narrow focus on the certain things while the open-ended question is to get the detailed specifications about what the clients' expectations for the project are.

Besides, the survey has been implemented through Google Form before being blasted to general users through WhatsApp platform. The survey managed to get 23 responses only. Based on Figure 3.2, most responders found that the manual process in CVMS is hard and take a long time.

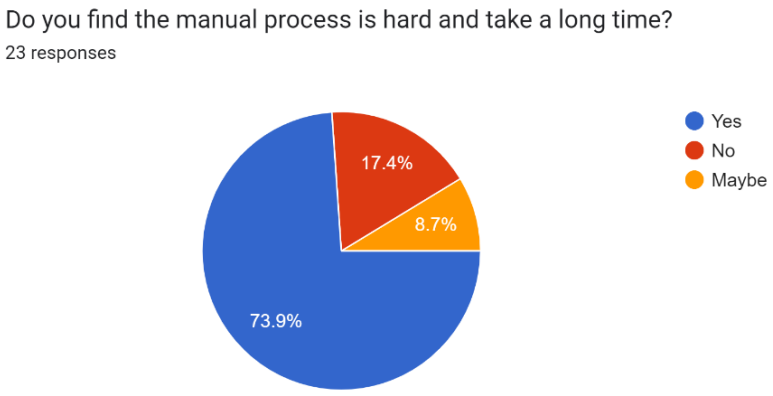


Figure 3.2 Pie chart of manual process is hard

In Figure 3.3, 91.3% agreed that having biometric recognition can help to ease the visitor check-in process. According to the feedback that been given in Figure 3.4, there are 23 reasons why based on their answers. Most responders said by having biometric recognition, the check-in process will be much easier, faster, and systematic.

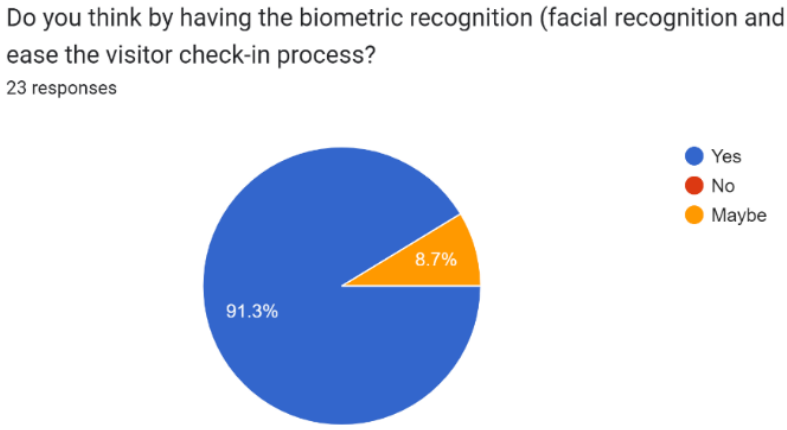


Figure 3.3 Pie chart of biometric eases the visitor check-in

Based on your answer above, why do you think so?
fast the process
easy and seamless process
it does not take so much time to handle & to do check on it.
because it will fasten the registration process
it make the process more easier and quick, people won't need to line up to fill some information.
fast and easy
More efficient as it doesn't take much time
MUCH FASTER
Based on my answer above, the biometric recognition can help to ease the visitor check-in process with only a short time term along with saving the greens by not using paper instead gadgets.
Im not sure
Spend less time
Because it can save more time and save paper from using manual logbook
Sbb tak perlu membuang masa utk berada di satu tempat utk mengisi maklumat dgn lama
Effective way
Because it's take not much time.
I don't think so
Convenient and fast
Facial and finger print recognition is very accurate and difficult to device
Easy and fast
Absolutely, because we only need to save the information once. Then just reuse the information, by using the biometric recognition if we want to use the same information again.
To make it easier and less time consuming
It doesn't take long time to fill of my information and much more easier
Because it is easier to manage but may have difficulties with the system

Figure 3.4 The reasons of biometric eases the visitor check-in

Next, based on the Figure 3.5, most respondents agreed that CVMS can improve the business process in each organization. In Figure 3.6, there are also 23 reasons why they think that CVMS can enhance the business process.

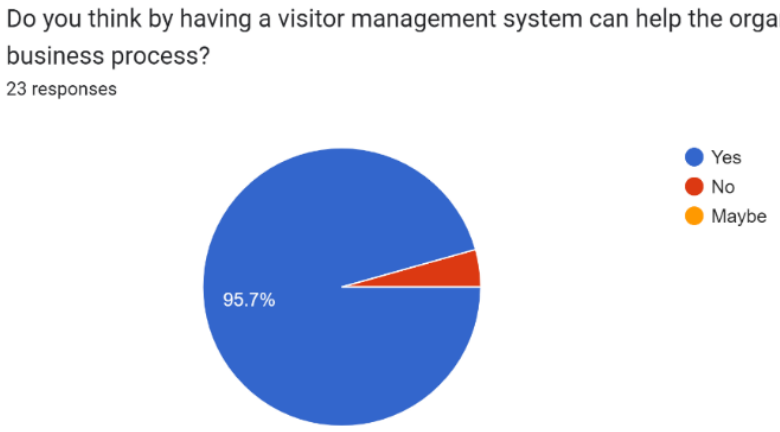


Figure 3.5 Pie chart of CVMS improves the flexibility of the system

Based on your answer above, why do you think so?	
Guest will easily access the system	
paperless and more efficient	
it will help the visitor as well, the visitor doesnt have to reinform the owner if anything happens, it will cause so much burden to many parties (owner-visitor-management). if the process give benefit (doesnt take so much time) to the visitor, each parties will not face any problem on this matter.	
because all the saved data will be secured	
organization can save up time when handling the visitor since there is visitor management system that will help them to observe the visitor	
keep track of everyone who comes in and out	
Improve user satisfaction as it make things easier	
MAKE THINGS EASIER AND SMOOTHLY	
Easy for the audit purposes.	
Yes	
To improve security	
Because it will be more systematic to handle and organize a lot of data	
Iyer sbb akan memudahkan urusan orang lain, mempercepatkan sesuatu urusan dan menjimatkan masa	
Save time consuming	
Because it cost too much money.	
I don't think so	
I think so because it can improve the security system where the organization can monitor the entry and exit of visitors into the building. Therefore, visitor safety is more guaranteed.	
Can get the visitor database quickly and accurately and facilitate visitor record matters quickly	
Manageable	
We can easliy keep track of previous and upcoming visitor.	
Because it reflects on the visitor review	
Can get the visitor preference that help boost business	
Because they can provide better service	

Figure 3.6 The reasons of CVMS improves the flexibility of the system

Any suggestion or improvement for the proposed system at manufacturing plant
Calendar view
location for meeting
integrate with Microsoft Teams for online meeting
fire alert
export file
categorized visit purpose
Provide location
LIVE CHAT AGENT
Generate report
Not sure
-
notifications
tidak pasti
Quick notes for meeting
Digital log book
No idea
Reminder for user
No
Dont know
Email noti
no
Calendar

Figure 3.7 Suggestions and improvement of Vizika System

Based on Figure 3.7 above, there are lists of suggestions for improvement of the Vizika System at Kaneka Malaysia Sdn. Bhd. Below are the requirements that has been obtained through the interview and survey to get the user requirements: -

- The visitor must register once only to get the biometric recognition data such as facial recognition at the company.
- The visitor only signs-in by scanning the facial every time they want to visit to avoid long queues during peak hours at the guardhouse.
- The system can only make an appointment a day before the visit date.
- The system can generate the report of the visitor check in and checkout in PDF format for the auditing purposes. The system allows users to filter the report by the range date that the user wants.
- The system can display the appointment visit in a calendar for a clear view instead in the table list.
- The system can send a notification to the hosts once their visitor has arrived at the company.

3.4 Propose Design

This section explains about the the proposed design before developing the Vizika System. The flowchart of the system will be illustrated in subsection 3.4.1. The context diagram will be defined in subsection 3.4.2. The use case diagram will be shown along with the use case description in subsection 3.4.3 and 3.4.4. Activity Diagram in subsection 3.4.5 and Storyboard of the system displays in subsection 3.4.6.

3.4.1 Flowchart

In this subsection, the flowchart of the system will be shown to analyze wide variety of processes and systems development. Figure 3.8 displays the flowchart for staff view, Figure 3.9 displays the flowchart for the visitor view. Figure 3.10 shows flowchart for contractor, Figure 3.11 illustrates flowchart for SHEQ guard, Figure 3.12 shows the flowchart for the SHEQ officer.

3.4.1.1 Flowchart for staff

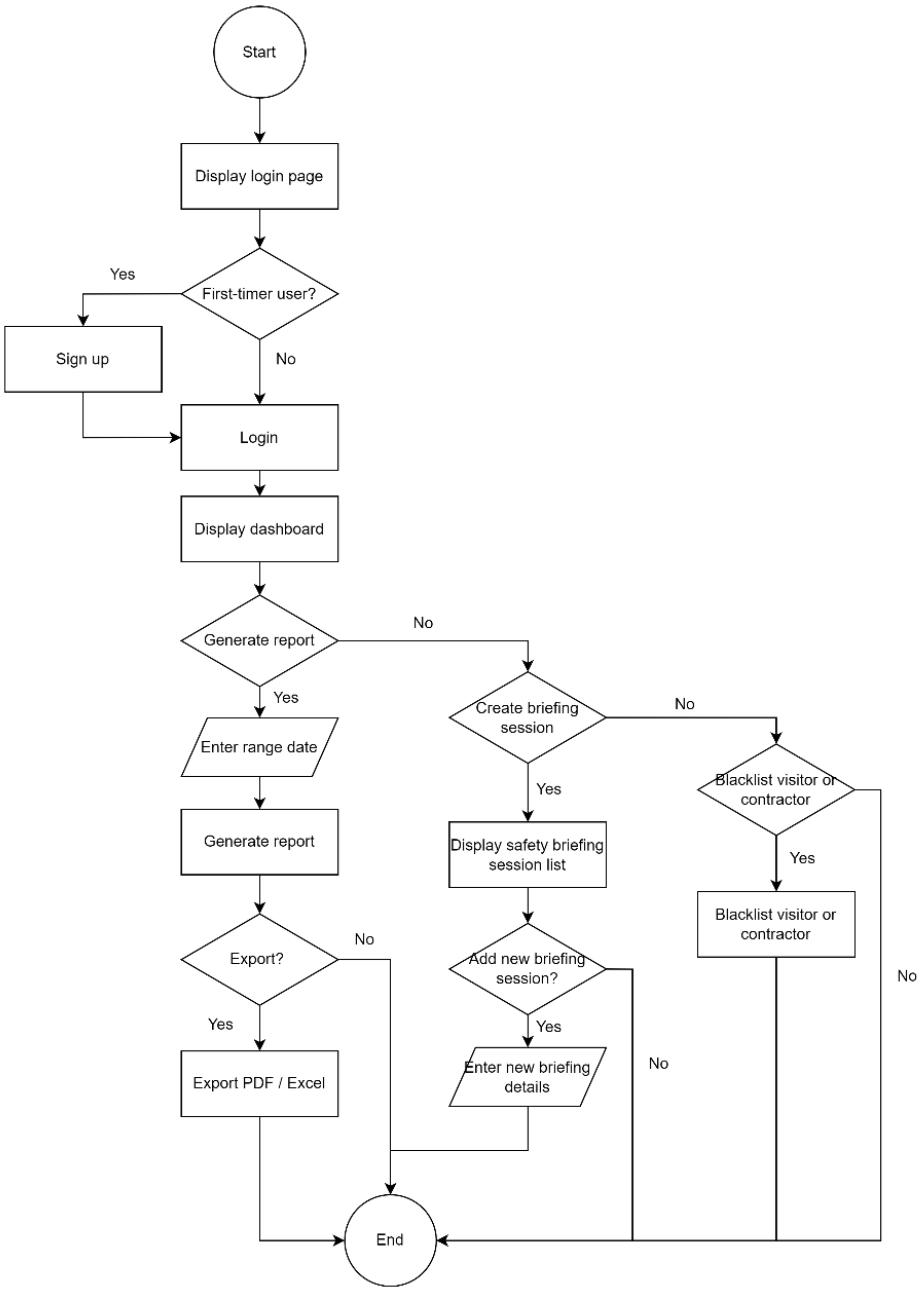


Figure 3.8 Flowchart for staff

3.4.1.2 Flowchart for visitor

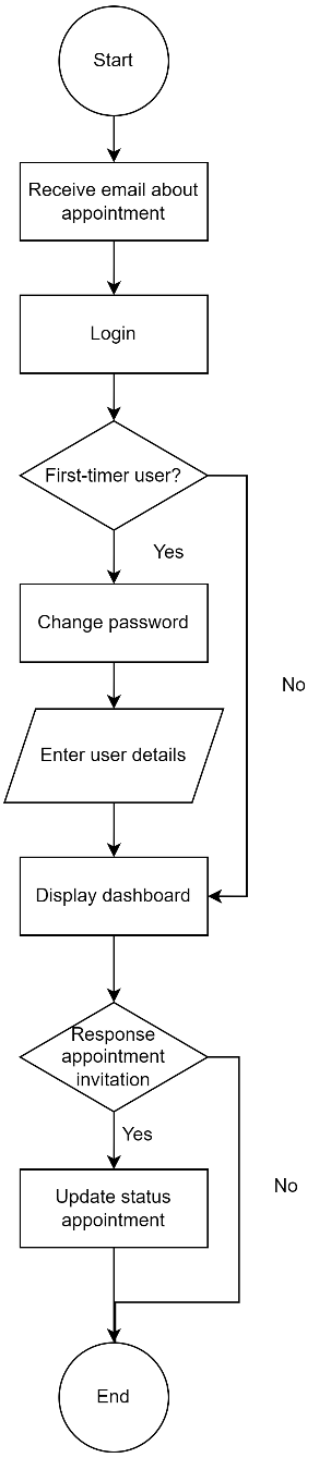


Figure 3.9 Flowchart for visitor

3.4.1.3 Flowchart for contractor

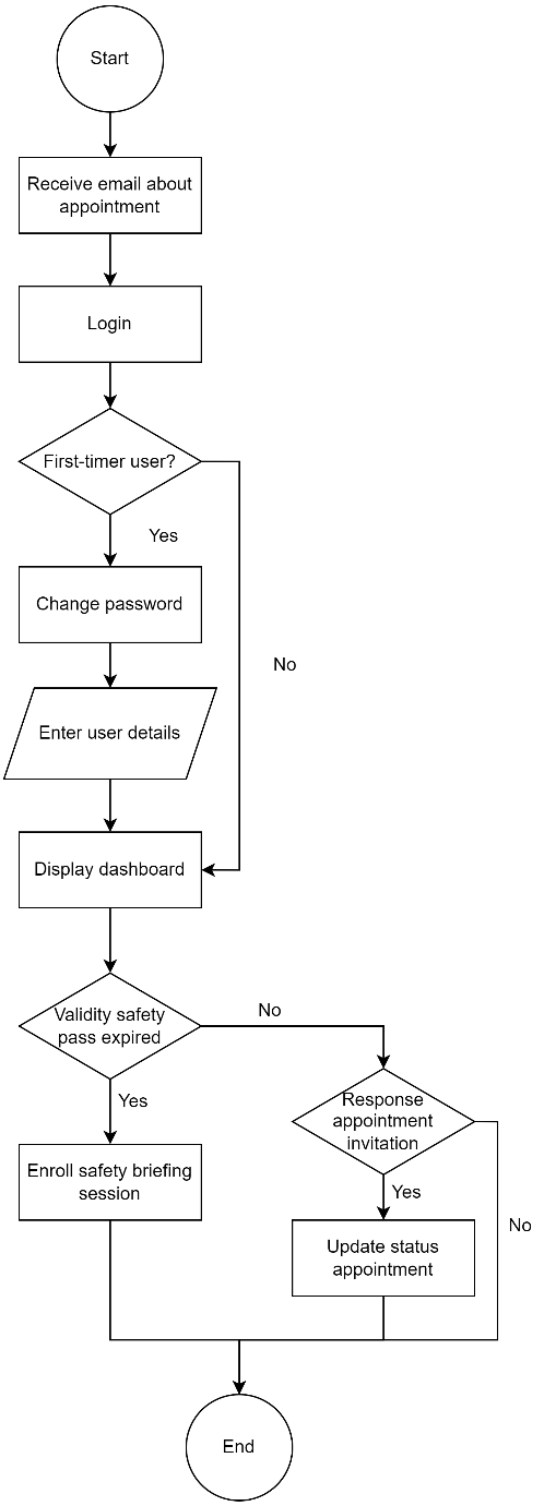


Figure 3.10 Flowchart for contractor

3.4.1.4 Flowchart for SHEQ guard

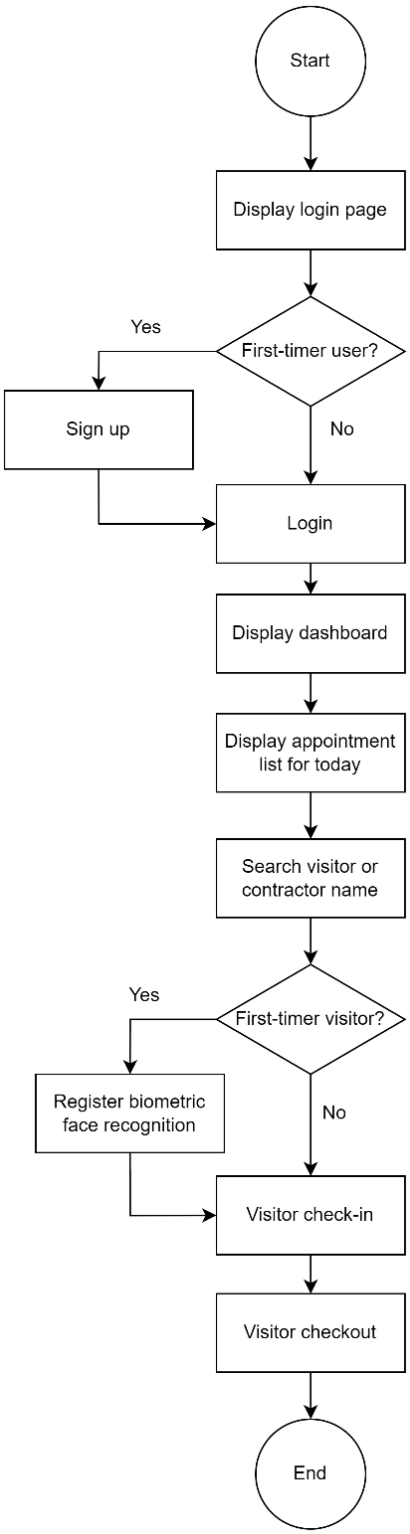


Figure 3.11 Flowchart for SHEQ guard

3.4.1.5 Flowchart for SHEQ officer

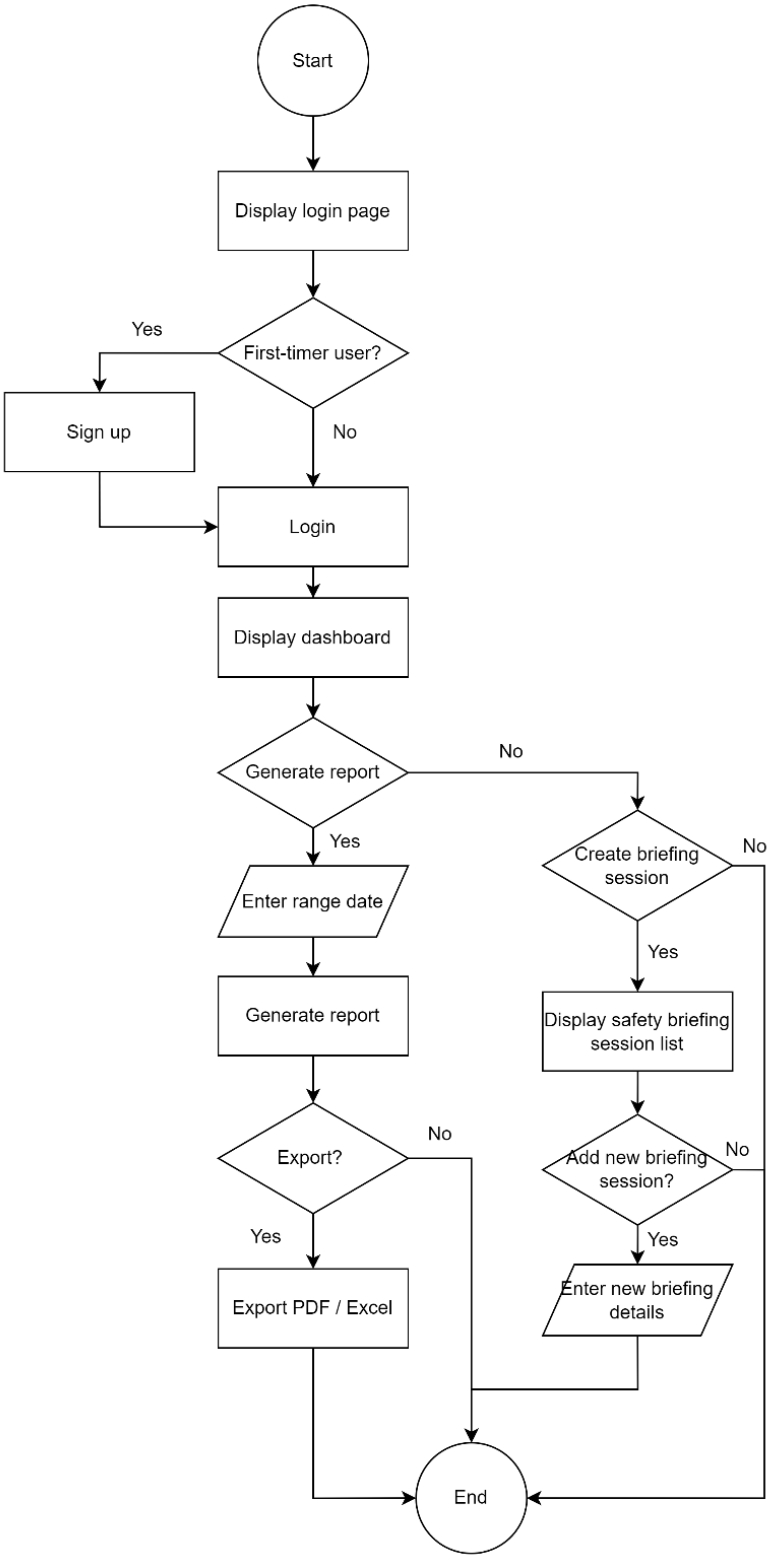


Figure 3.12 Flowchart for SHEQ officer

3.4.2 Context Diagram

A context diagram is as shown in Figure 3.13, shows the user activities in the system and being processed to let the admin get the information from the user and return the output to the user.

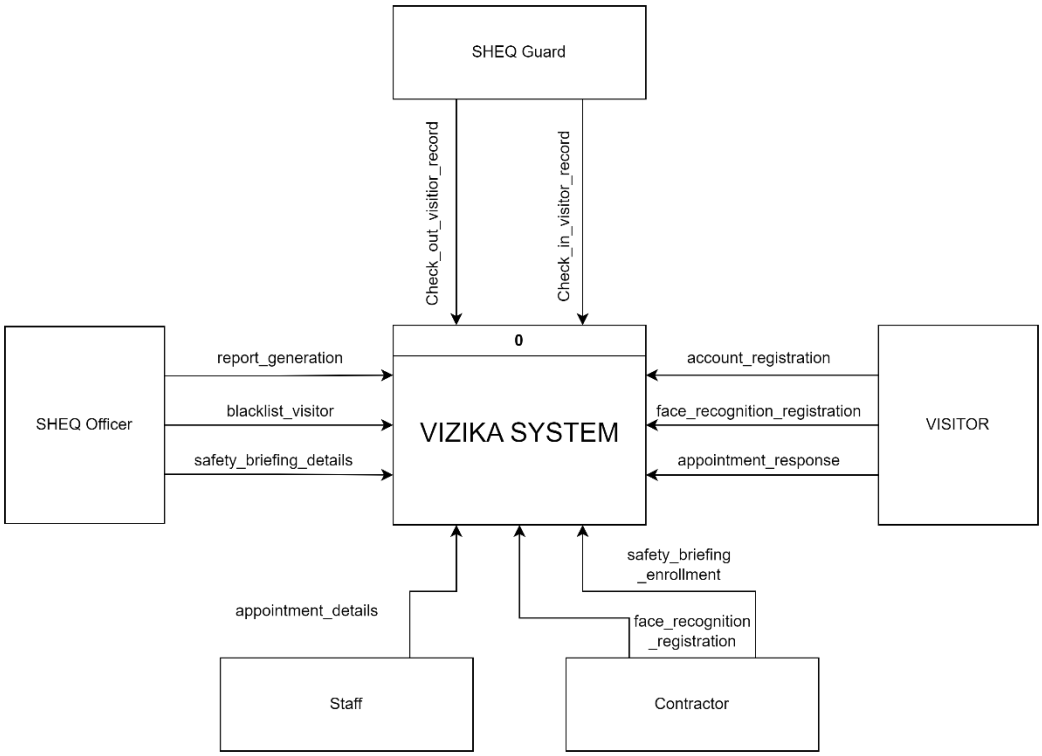


Figure 3.13 Context diagram of Vizika System

3.4.3 Use Case Diagram

The use case diagram shows the interaction between SHEQ Officer, SHEQ Guard, staff, contractor and visitor with their roles in the system in Figure 3.14.

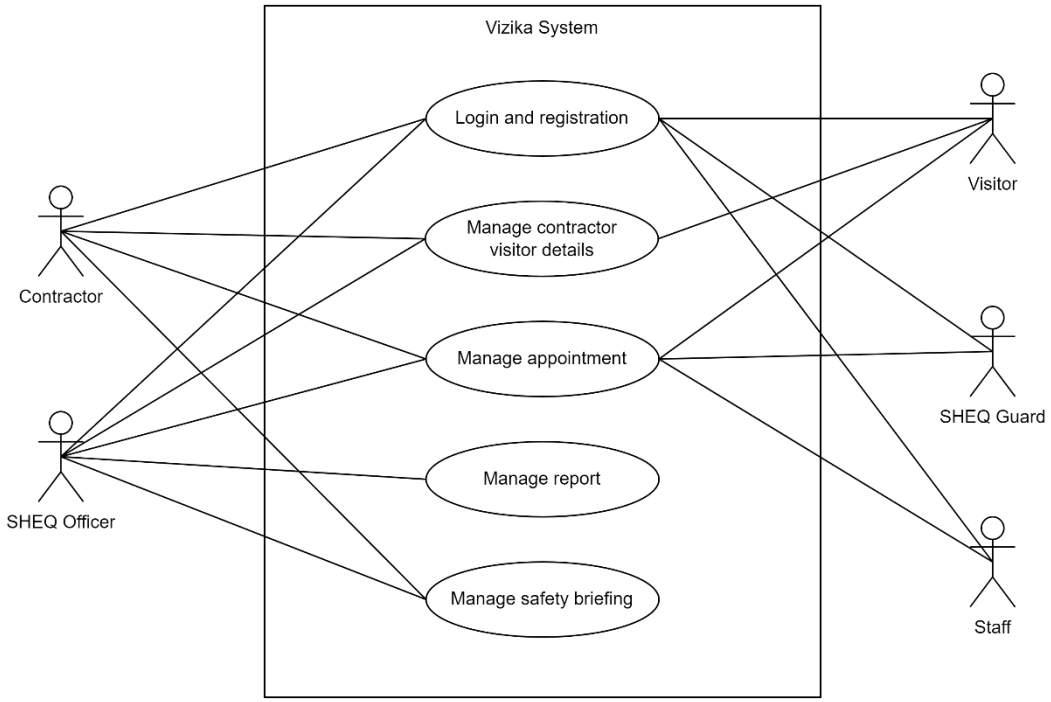


Figure 3.14 Use case diagram of Vizika System

3.4.4 Use Case Description

3.4.4.1 Manage Login and Registration Module

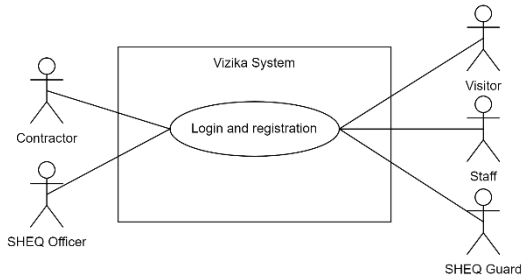


Figure 3.15 Use case diagram for login and registration module

Table 3.3 Use case description for login and registration module

Use Case Name	Login and registration
Brief Description	The use case is for SHEQ Officer, SHEQ Guard and staff to create their own account, the visitor and contractor account will be created by staff and all users to login into their account.
Actor	SHEQ Officer, SHEQ Guard, Staff, Contractor, Visitor
Pre-conditions	• The user already has an account for log in process
Basic Flow	**[SHEQ Officer, SHEQ Guard, Staff]** 1. The use case begins when the system displays a Registration page. 2. From the Registration page, the user is able to: i. Register a new account. **[A1 – Register new account]** ii. Login account. **[A2 – Login account]** 3. Use case ends. **[Staff]** 1. The use case begins when the system displays a Contractor Visitor page. 2. From the Contractor Visitor page, the user is able to: i. Register new account for contractor and visitor. **[A3 – Register new account for contractor and visitor]**

	[Visitor, Contractor] 1. The use case begins when the system displays a Login page. 2. From the Login page, the user is able to: i. Login account. **[A4 – Login account as contractor and visitor]** 3. Use case ends.
Alternative Flow	**[A1: Register new account]** 1. User enters a name, email, password and confirm password to create an account. 2. User chooses user type. 3. System validates the format of email, name and password. **[C1: Password length]** 4. User clicks the 'Register' button. 5. System validates the data with the existing account. **[E1: User already existed].** 6. The use case continues with step 3 in Basic Flow (SHEQ Officer, SHEQ Guard, Staff). **[A2: Login account]** 1. User clicks the 'Login' link. 2. System displays a Login page. 3. User enters the email and password. 4. User clicks the 'Login' button. **[E2: Wrong combination email and password].** 5. Use case continues with step 3 in Basic Flow (SHEQ Officer, SHEQ Guard, Staff). **[A3: Register new account for contractor and visitor]** 1. User enters email and name. 2. User chooses user type. 3. User clicks the 'Register' button.

	4. System validates the data with the existing account. **[E1: User already existed]** 5. The use case continues with step 3 in Basic Flow (Staff). **[A4: Login account as contractor and visitor]** 1. System displays a Login page. 2. User enters the email and password. 3. User clicks the 'Login' button. **[E2: Wrong combination ID and password].** 4. If the user is a first timer, the user needs to enter user additional information. 5. User clicks 'Next' button. 6. User captures the face recognition. 7. Use case continues with step 3 in Basic Flow. (Visitor, Contractor)
Exception Flow	**[E1: User already existed]** 1. System shows message "The email has already been taken." 2. System displays Login page. 3. The use case continues with step 3 in Basic Flow. **[E2: Wrong combination ID and password]** 1. System shows message "These credentials do not match our records." 2. The use case continues with step 3 in Basic Flow.
Post-Conditions	- Account registration been created
Rules	Not applicable
Constraints	**[C1: Password length]** Passwords should be more than 8 alphabets.

3.4.4.2 Manage Contractor Visitor Details Module

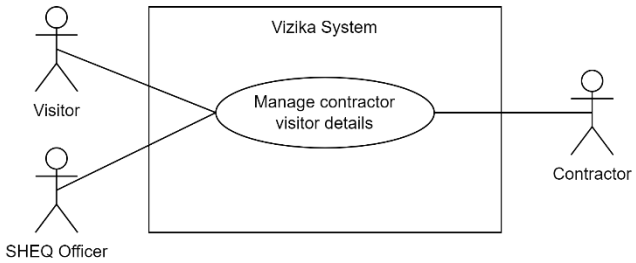


Figure 3.16 Use case diagram for manage contractor visitor details module

Table 3.4 Use case description for manage contractor visitor details module

Use Case Name	Manage contractor visitor details
Brief Description	The use case is for Contractor and visitor can edit profile details and SHEQ Officer to blacklist contractor and visitor.
Actor	Contractor, Visitor, SHEQ Officer
Pre-conditions	• The user already has an account • The user already login to the Vizika System
Basic Flow	**[Visitor, Contractor]** 1. The use case begins when the system displays a Dashboard page. 2. From the dashboard page, the user is able to: i. Edit profile details. **[A1 – Edit profile details]** 3. Use case ends. **[SHEQ Officer]** 1. The use case begins when the system displays a Active User List page. 2. From the New Visitor Records page, the user is able to: i. Blacklist visitor. **[A2 - Blacklist visitor]** 3. Use case ends.
Alternative Flow	**[A1: Edit profile details]** 1. User clicks Profile icon button. 2. User clicks ‘Edit Profile’ button 3. System displays a form that displays the profile page.

	4. User edits the visitor details. 5. User clicks the ‘Update’ button. 6. Use case continues with step 3 in Basic Flow (Visitor, Contractor). **[A2: Blacklist visitor]** 1. User clicks the vertical dots located at the right end of the row of the user. 2. User clicks the ‘View’. 3. System displays the profile of the user. 4. User clicks the ‘Blacklist’ button to blacklist the user. 5. User enters the reason of the blacklist. 6. User clicks the ‘Submit’ button. 7. System saves the data to the database. 8. Use case continues with step 3 in Basic Flow (SHEQ Officer)
Exception Flow	Not applicable
Post-Conditions	- The contractors and visitors’ profile will be updated. - The users are blacklisted.
Rules	Not applicable
Constraints	Not applicable

3.4.4.3 Manage Appointment Module

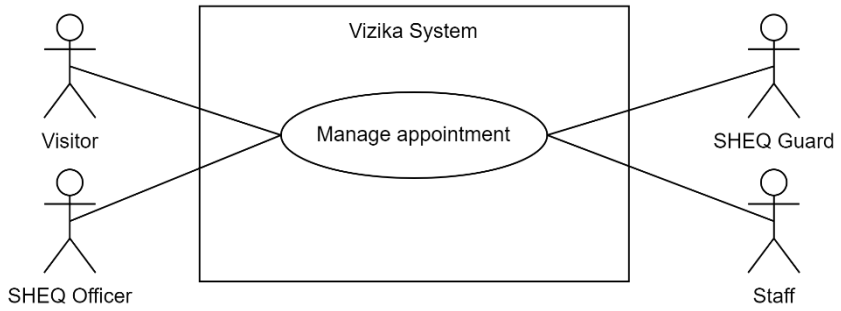


Figure 3.17 Use case diagram for manage appointment module

Table 3.5 Use case description for manage appointment module

Use Case Name	Manage appointment
Brief Description	The use case is for staff to schedule the appointment, visitor and contractor to view appointment, SHEQ Officer to view appointment and SHEQ guard to handle the visitors' check-in and checkout.
Actor	Staff, Visitor, Contractor, SHEQ Officer, SHEQ Guard
Pre-conditions	• The user already login to the Vizika System
Basic Flow	**[Staff]** 1. The use case begins when the system displays an Appointment page. 2. From the Appointment Records page, the user is able to: i. Create a new appointment. **[A1 – Create new appointment]** ii. Edit appointment details. **[A2 – Edit appointment]** 3. Use case ends. **[Visitor, Contractor]** 1. The use case begins when the system displays a Appointment page. 2. From the Appointment page, the user is able to: i. Enter appointment details **[A3 – Response appointment invitation]** 3. Use case ends.

	[SHEQ Officer] 1. The use case begins when the system displays a Calendar page. 2. System displays the appointment that has been made in the calendar view. 3. Use case ends. **[SHEQ Guard]** 1. The use case begins when the system displays Appointment Records. 2. From the Appointment Records page, the user is able to: - i. Check-in contractor and visitor. **[A4: Check-in user]** ii. Check-out contractor and visitor. **[A5: Check-out user]** 3. Use case ends.
Alternative Flow	**[A1: Create new appointment]** 1. User clicks the 'Create appointment' button. 2. System displays the new appointment form page. 3. User enters appointment information such date, time, purpose, agenda. 4. Choose multiple contractors or visitors name that wants to invite by ticking the checkbox. 5. User clicks the 'Select' button to insert in array. 6. User clicks the 'Invite' button. **[C1: Appointment Date]** 7. The invitation will be sent by email. 8. The system saves the data to the database. 9. Use case continues with step 3 in Basic Flow (Staff). **[A2: Edit appointment]** 1. User clicks edit button. 2. System displays edit appointment page. 3. User edits the appointment details.

	4. User clicks the 'Update' button. 5. System updates the records in the database. [**C1: Appointment Date]** 6. Use case continues with step 3 in Basic Flow. (Staff) **[A3: Response appointment invitation]** 1. User needs to choose either 'Attend' or 'Not Attend'. 2. System updates the records in the database. 3. Use case continues with step 3 in Basic Flow. (Visitor, Contractor) **[A4: Check-in user]** 1. User searches the user's name. 2. User clicks 'View' button to display the details information. 3. User clicks the Scan Face. 4. System scans the user's facial recognition to ensure the data is match. 5. User enters the pass number that will be given to them. 6. User clicks the 'Check-in' button to admit the user. 7. System saves the check-in records in the database. 8. Use case continues with step 3 in Basic Flow (SHEQ Guard) **[A5: Check-out user]** 1. User clicks the 'Check-out' button to get the check-out time. 2. System updates the record in the database. 3. Use case continues with step 3 in Basic Flow (SHEQ Guard)
Exception Flow	Not applicable
Post-Conditions	- Appointment created. - Records created

Rules	- Only staff can create an appointment date and time for the visitor and contractor. - Only the SHEQ Guard can admit the visitor and contractor. - The visitors must respond to the appointment one day before the appointment either to attend or not.
Constraints	**[C1: Appointment Date]** - The visitors must make an appointment three days before the appointment.

3.4.4.4 Manage Report Module

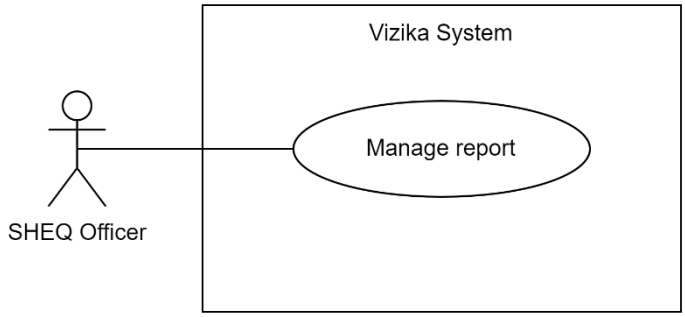


Figure 3.18 Use case diagram for manage report module

Table 3.6 Use case description for manage report module

Use Case Name	Manage report
Brief Description	The use case is for SHEQ Officer to manage report for audit purposes.
Actor	SHEQ Officer
Pre-conditions	• The user already has an account. • The user already login to the Vizika System.
Basic Flow	1. The use case begins when the system displays a Report page. 2. User enters the range date for the report. 3. Use clicks 'Generate Report' button to generate the report. 4. System displays the record based on the range date entered. 5. From the Report page, the user is able to: i. Export report to PDF **[A1 – Export PDF]** ii. Export report to Excel **[A2 – Export Excel]** 6. Use case ends.
Alternative Flow	**[A1: Export PDF]** 1. User clicks the 'Export PDF' button. 2. User clicks the 'Save' button. 3. Use case continues with step 6 in Basic Flow

	[A1: Export PDF] 1. User clicks the ‘Export Excel’ button. 2. User clicks the ‘Save’ button. 3. Use case continues with step 6 in Basic Flow
Exception Flow	Not applicable
Post-Conditions	- Report generated. - Report exported.
Rules	Not applicable
Constraints	Not applicable

3.4.4.5 Manage Safety Briefing Module

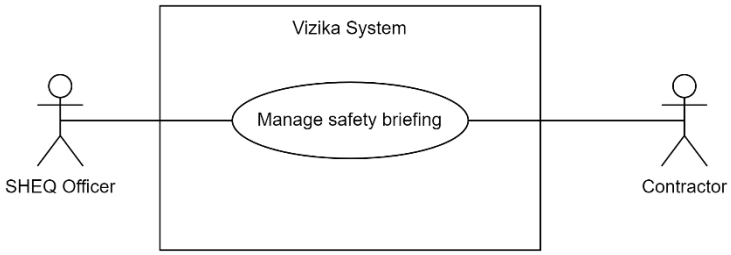


Figure 3.19 Use case diagram for manage safety briefing module

Table 3.7 Use case description for manage safety briefing module

Use Case Name	Manage safety briefing
Brief Description	The use case is for SHEQ Officer to manage safety briefing session and for contractor who involves with the safety briefing to renew their validity pass when expired.
Actor	SHEQ Officer, Contractor
Pre-conditions	• The user already has an account. • The user already login to the Vizika System.
Basic Flow	**[SHEQ Officer]** 1. The use case begins when the system displays Safety Briefing page. 2. From the Safety Briefing page, the user is able to: i. Add new briefing session **[A1 – Add new briefing session]** 3. Use case ends. **[Contractor]** 1. The use case begins when the system displays Safety Briefing page. 2. From the Safety Briefing page, the user is able to: i. Add new briefing session **[A2 – Choose briefing session date]** 3. Use case ends.

Alternative Flow	**[A1: Add new briefing session]** 1. User clicks the 'Create briefing' button. 2. System displays the form to add safety briefing details. 3. Users fill in the form that requires date, time start and maximum no. per session. 4. User clicks the 'Save' button to save the details. 5. System stores the details in the database. 6. Use case continues with step 3 in Basic Flow (SHEQ Officer). **[A2: Choose briefing session date]** 1. User chooses the date they are want to join the briefing. 2. User clicks the 'Enroll' button to enroll the session they want. **[C1: Session already full]** 3. System will store the data in the database. 4. Use case continues with step 3 in Basic Flow (Contractor).
Exception Flow	**[E1: Session already exists]** 1. System shows message "Session already existed". 2. System displays redirect to the same page. 3. The use case continues with step 3 in Basic Flow (SHEQ Officer).
Post-Conditions	- Safety briefing session created. - Contractor can enroll briefing.
Rules	Only for contractors whose validity pass have already expired can enroll the briefing session.
Constraints	**[C1: Session already full]** - If the session is already full, they need to enroll in another session.

3.4.5 Activity Diagram

Activity Diagram illustrates the workflow of the system based on each module that focused on the action sequences. Figure 3.20 displays the activity diagram of login and registration, Figure 3.21 shows the activity diagram of manage contractor visitor details, Figure 3.22 shows the activity diagram of manage appointment, Figure 3.23 shows the activity diagram of manage report and Figure 3.24 displays the manage safety briefing.

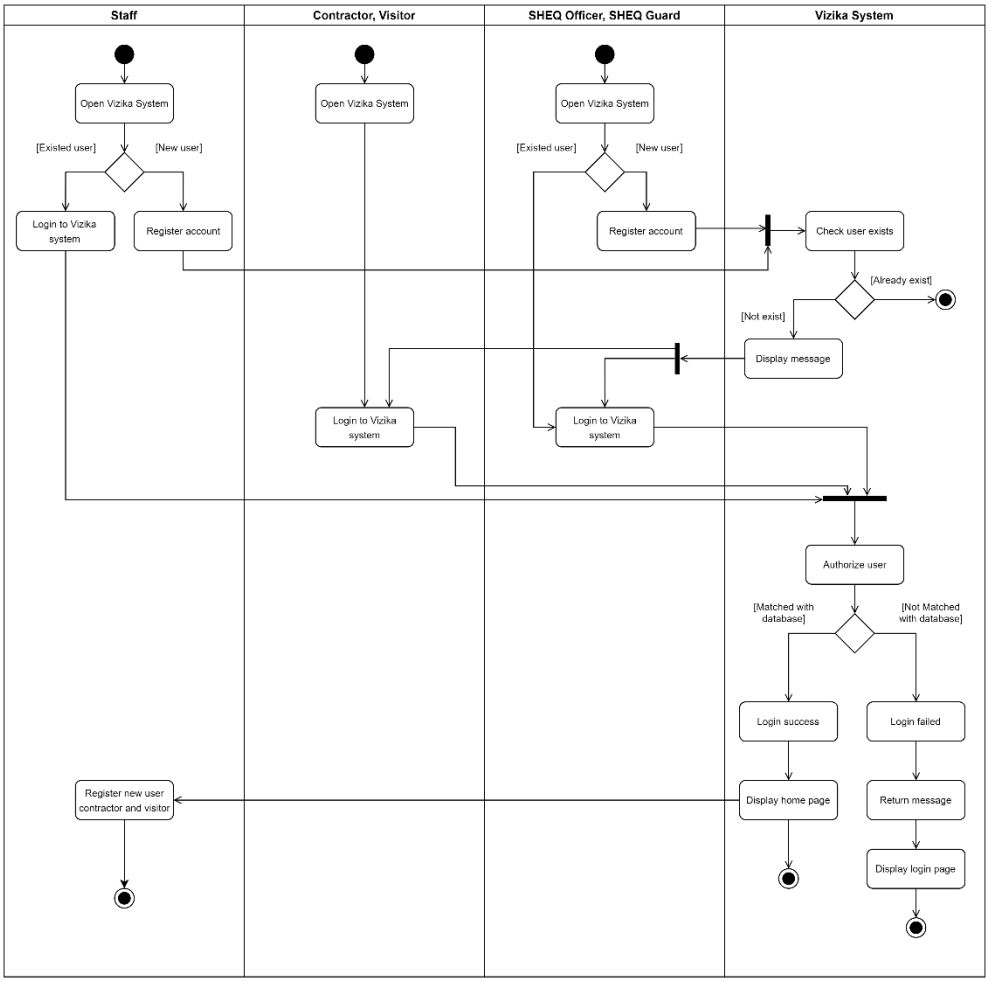


Figure 3.20 Activity diagram of login and registration

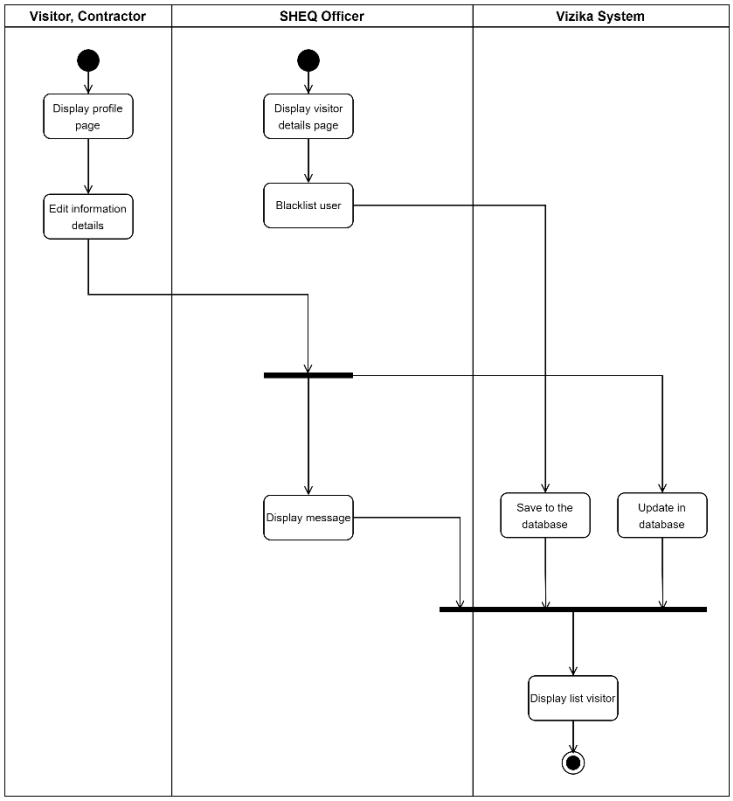


Figure 3.21 Activity diagram of manage contractor visitor details

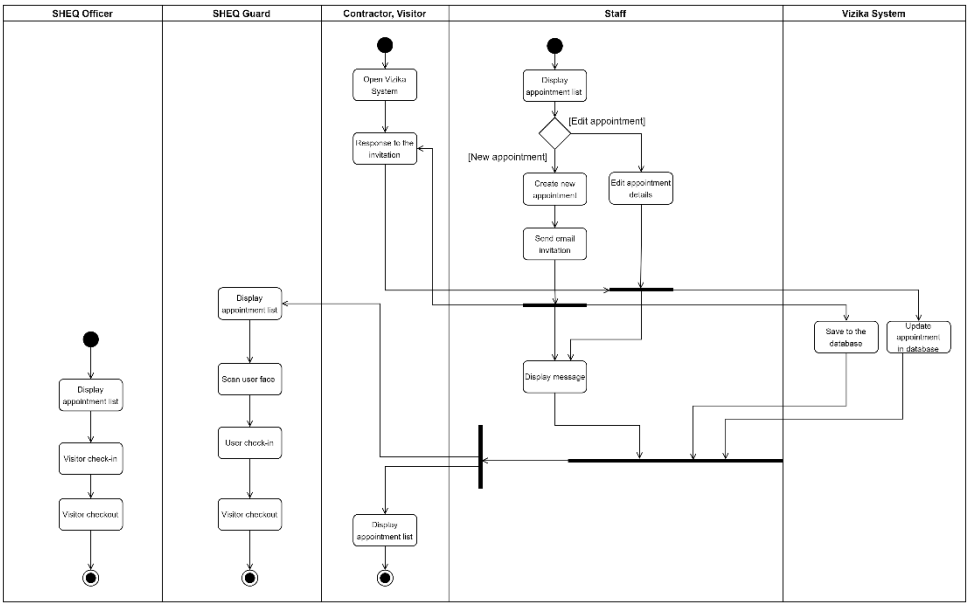


Figure 3.22 Activity diagram of manage appointment

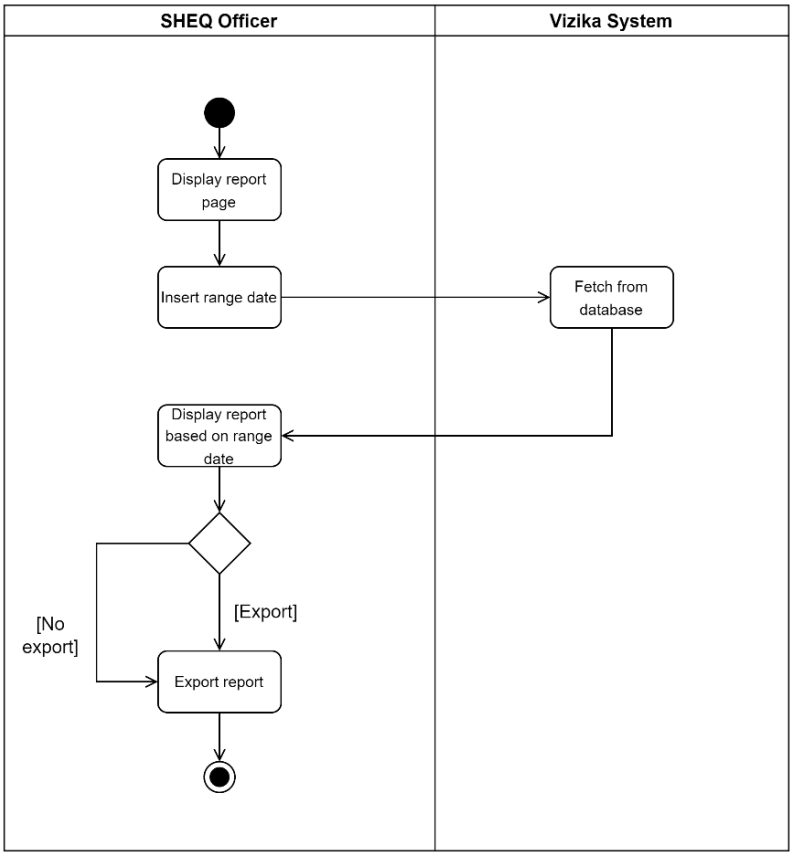


Figure 3.23 Activity diagram of manage report

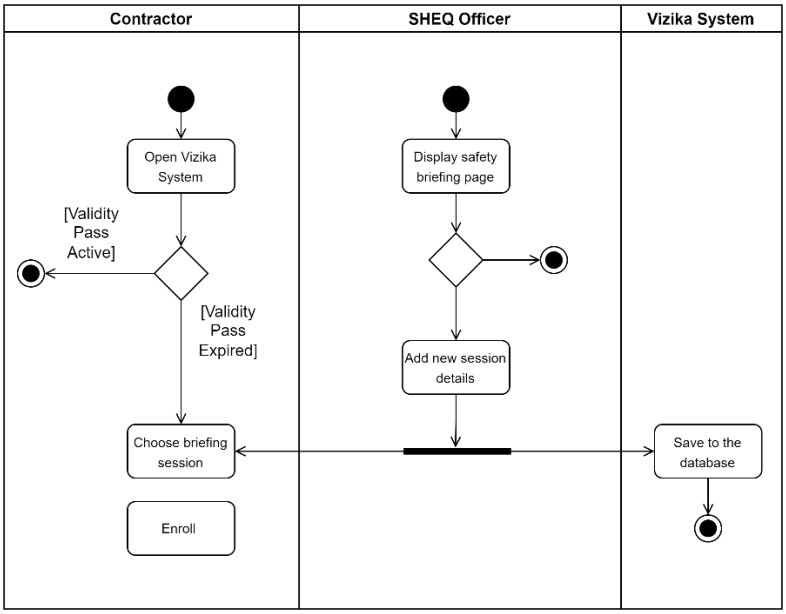


Figure 3.24 Activity diagram of manage safety briefing

3.4.6 Storyboard

Graphic organizer that plans a narrative of the interfaces in the system that flow in sequence can be called a storyboard. The register page in Figure 3.25, login page in Figure 3.26, visitor approval page in Figure 3.27, appointment visit page in Figure 3.28, calendar page in Figure 3.29, register biometric page in Figure 3.30, visitor log page in Figure 3.31, report page in Figure 3.32 and safety briefing page in Figure 3.33.

Register Page (Visitor)	Login Page (Visitor)	Visitor Approval Page (SHEQ Officer)

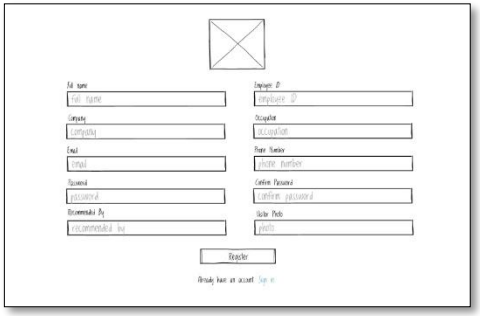
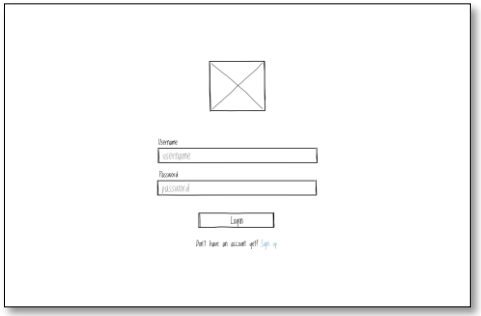
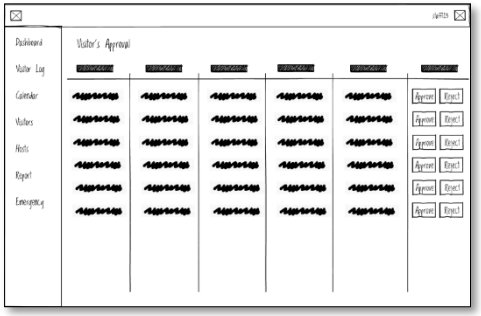

		

Figure 3.25 Storyboard of register page	Figure 3.26 Storyboard of login page	Figure 3.27 Storyboard of approval page
The user needs to register. They need to enter the information then click the 'Register' button. If the user has an account, they just need to click 'Login' link.	The user needs to enter the username and password, then click the 'Login' button. If they do not have an account, just click the 'Sign up' link.	In this page, the SHEQ Officer needs to approve the visitor registration so that the visitor can make an appointment.

Appointment Visit Page (Visitor)	Calendar Page (SHEQ Officer)	Register biometric Page (SHEQ Guard)

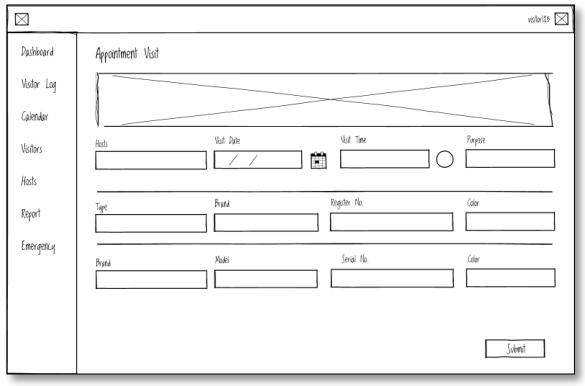
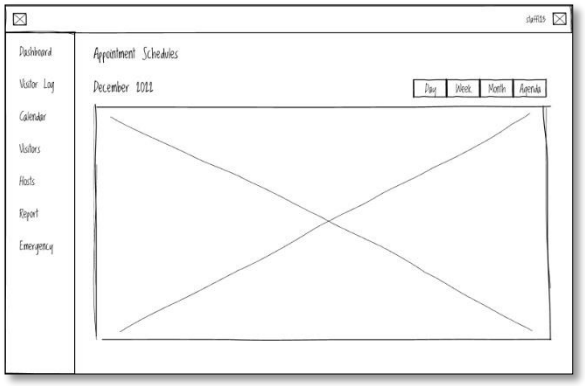
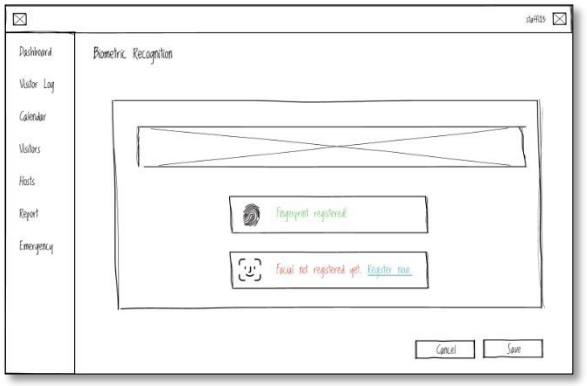

		

Figure 3.28 Storyboard of appointment visit page	Figure 3.29 Storyboard of calendar page	Figure 3.30 Storyboard of visitor registration page
The page will display the appointment form for the visitor to enter which are appointment information and vehicle. If the user wants to brings laptop, they need to enter the laptop information too.	The page will display the appointment visit in calendar view. They can filter to view the calendar.	The visitor registration page is for the new visitors that want to be registered by entering the visitor's information including the facial information. Click 'Save' button to save the data once it is done.

Visitor Log Page (SHEQ Officer)	Report Page (SHEQ Officer)	Safety Briefing Page (SHEQ Officer)

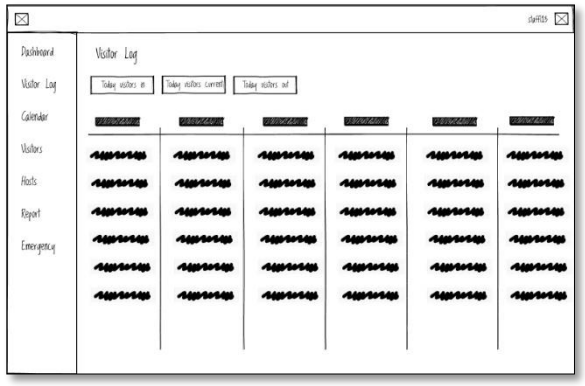
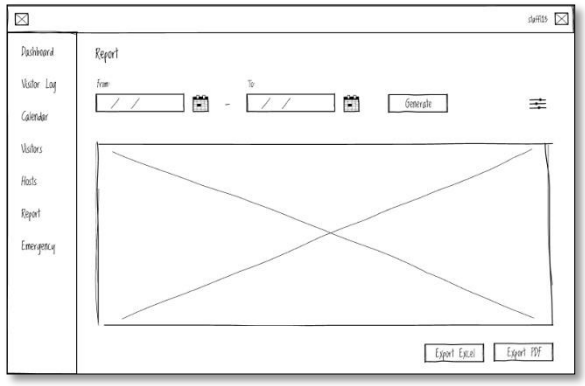
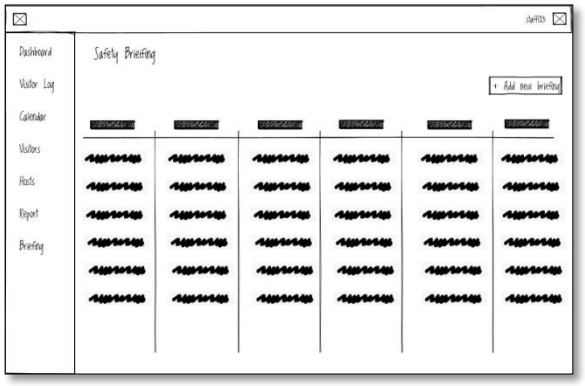

		

Figure 3.31 Storyboard of visitor log page	Figure 3.32 Storyboard of appointment visit page	Figure 3.33 Storyboard of safety briefing page
Visitor log page will display the record of the visitor check-in and check-out. They can filter the records to see the visitors in, current visitors and visitors out.	The user can generate the report that is needed such as for the audit purposes. They can choose the date range of the data then click the 'Generate' button to generate the report.	The system will display the safety briefing session list that provided by the company for the contractor to choose their session.

3.5 Data Design

In this section, the Entity Relationship Diagram will be illustrated to understand the connection between tables for the database shown in subsection 3.5.1. Then, from the diagram, the data dictionary will be made to explain in detail about the table and their attributes in subsection 3.5.2.

3.5.1 ERD

An entity relationship diagram (ERD) is an information demonstrating strategy that graphically shows an information system's entities and the relationships between those entities. An ERD is a theoretical and authentic model of information used to speak to the element system framework as shown in Figure 3.34.

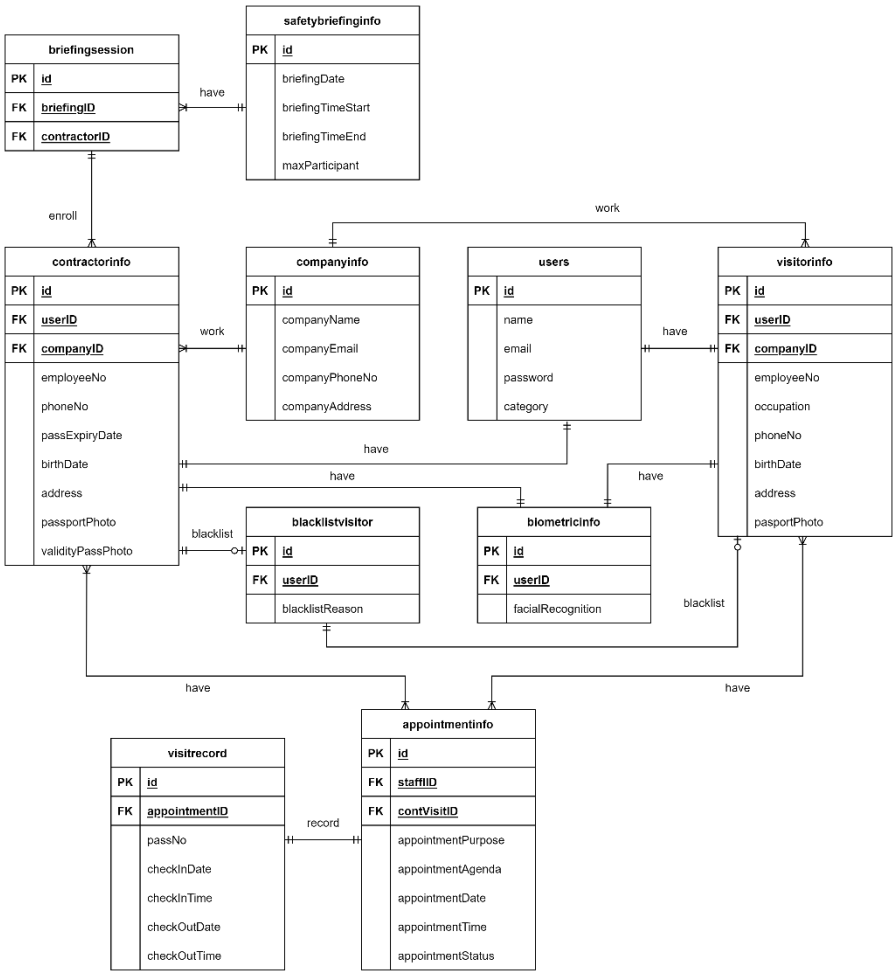


Figure 3.34 ER Diagram of Vizika System

3.5.2 Data Dictionary

Data dictionary will be made to explain in detail about the tables in the database including their attributes with type, size, description and constraint. Below are tables for users, companyinfo, visitorInfo, biometricinfo, blacklistvisitor, appointmentinfo, visitrecord, safetybriefinginfo, briefingsession and contractorinfo that can be shown in Table 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, and 3.18 respectively.

3.5.2.1 Users (users)

Table 3.8 Data dictionary of users

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for user	Primary Key (PK)
name	VARCHAR(255)	User's name	
email	VARCHAR(255)	User's email	
password	VARCHAR(255)	User's password	
category	VARCHAR(255)	User's category	

3.5.2.2 Company Information (companyinfo)

Table 3.9 Data dictionary of company info

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for company	Primary Key (PK)
companyName	VARCHAR(255)	Company's name	
companyEmail	VARCHAR(255)	Company's email	
companyPhoneNo	VARCHAR(255)	Company's phone number	
companyAddress	VARCHAR(255)	Company's address	

3.5.2.3 Visitor Information (visitorinfo)

Table 3.10 Data dictionary of visitor information

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for visitor	Primary Key (PK)
userID	BIGINT(20)	Unique number id for user	Foreign Key (FK)
companyID	BIGINT(20)	Visitor's company id where they worked	Foreign Key (FK)
employeeNo	VARCHAR(255)	Visitor's employee number at their company	
occupation	VARCHAR(255)	Visitor's occupation	
phoneNo	VARCHAR(255)	Visitor's phone number	
birthDate	VARCHAR(255)	Visitor's birth date	
address	VARCHAR(255)	Visitor's address	
passportPhoto	VARCHAR(255)	Visitor's passport photo	

3.5.2.4 User biometric (biometricinfo)

Table 3.11 Data dictionary of biometric information

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for biometric	Primary Key (PK)
userID	BIGINT(20)	Unique number id for user	Foreign Key (FK)
facialRecognition	VARCHAR(255)	User's facial recognition	

3.5.2.5 Blacklist Visitor (blacklistvisitor)

Table 3.12 Data dictionary of blacklist visitor

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for blacklist	Primary Key (PK)
userID	BIGINT(20)	Unique number id for user	Foreign Key (FK)
blacklistReason	VARCHAR(255)	Reason why user been blacklisted	

3.5.2.6 Appointment Information (appointmentinfo)

Table 3.13 Data dictionary of appointment information

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for appointment	Primary Key (PK)
staffID	BIGINT(20)	Unique number id for staff	Foreign Key (FK)
contVisitID	BIGINT(20)	Unique number id for contractor or visitor	Foreign Key (FK)
appointmentPurpose	VARCHAR(255)	Appointment's purpose	
appointmentAgenda	VARCHAR(255)	Appointment's agenda	
appointmentDate	DATE	Appointment's date	
appointmentTime	TIME	Appointment's time	
appointmentStatus	VARCHAR(255)	Appointment's status	

3.5.2.7 Visit Record (visitrecord)

Table 3.14 Data dictionary of visit record

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for record	Primary Key (PK)
appointmentID	BIGINT(20)	Unique number id for appointment	Foreign Key (FK)
passNo	VARCHAR(255)	Pass number that been given to the user	
checkInDate	DATE	Record's check in date	
checkInTime	TIME	Record's check in time	
checkOutDate	DATE	Record's check out date	
checkOutTime	TIME	Record's check in time	

3.5.2.8 Safety Briefing Information (safetybriefinginfo)

Table 3.15 Data dictionary of safety briefing information

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for safety briefing	Primary Key (PK)
briefingDate	DATE	Safety briefing's date	
briefingTimeStart	TIME	Safety briefing's time start	
briefingTimeEnd	TIME	Safety briefing's time end	
maxParticipant	INT(11)	Safety briefing's maximum number participant per session	

3.5.2.9 Briefing Session (briefingsession)

Table 3.16 Data dictionary of briefing session

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for briefing session	Primary Key (PK)
briefingID	BIGINT(20)	Safety briefing's unique number id	Foreign Key (FK)
contractorID	BIGINT(20)	Contractor unique number id	Foreign Key (FK)

3.5.2.10 Contractor Information (contractorinfo)

Table 3.17 Data dictionary of contractor information

Attribute	Type / Size	Description	Constraint
id	BIGINT(20)	Unique number id for contractor	Primary Key (PK)
userID	INT(11)	Unique number id for contractor	Foreign Key (FK)
companyID	BIGINT(20)	Contractor's company id where they work	Foreign Key (FK)
phoneNo	VARCHAR(255)	Contractor's phone number	
passExpiryDate	DATE	Contractor's expiry date of validity pass	
birthDate	DATE	Contractor's birth date	
address	VARCHAR(255)	Contractor's address	
passportPhoto	VARCHAR(255)	Contractor's email	

3.6 Proof of Initial Concept

Proof of initial concept contains the GUI elements and detail explanation about the interfaces for visitor in subsection 3.6.1, SHEQ Officer in subsection 3.6.2 and SHEQ Guard in subsection 3.6.3.

3.6.1 Visitor interfaces

Figure 3.35 displays the visitor registration page, Figure 3.36 displays the visitor login page and figure 3.37 shows the appointment booking page.

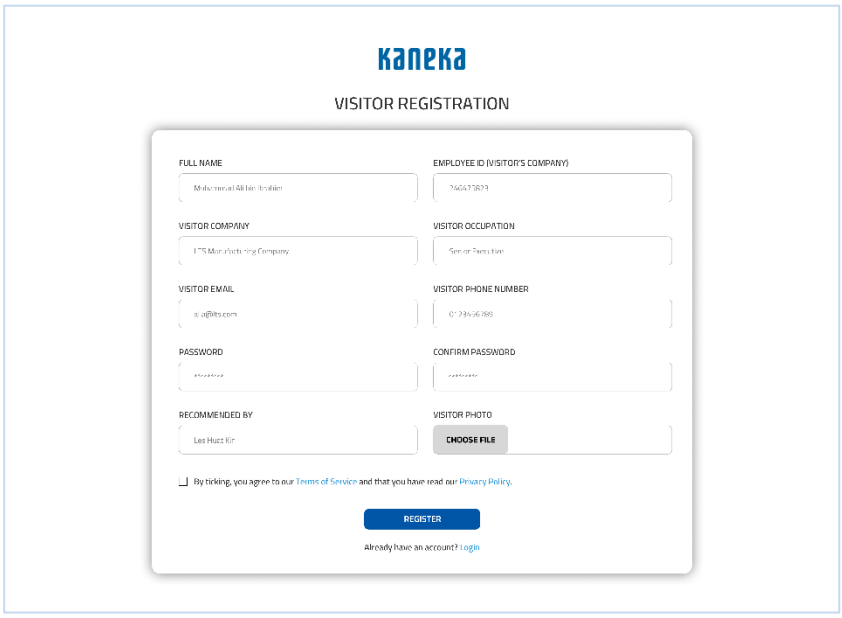


Figure 3.35 Visitor registration page

Visitor registration page in Figure 3.35 is for the visitor to register their account, they need to enter full name, employee ID, company, occupation, email, phone number, password, recommended by and photo. Recommended by is someone from the KANEKA who recommend them to register for the visit purposes. Tick the checkbox as we agree about the policy then click the ‘Register’ button to register. If the user already have an account, click the ‘Login’ link.

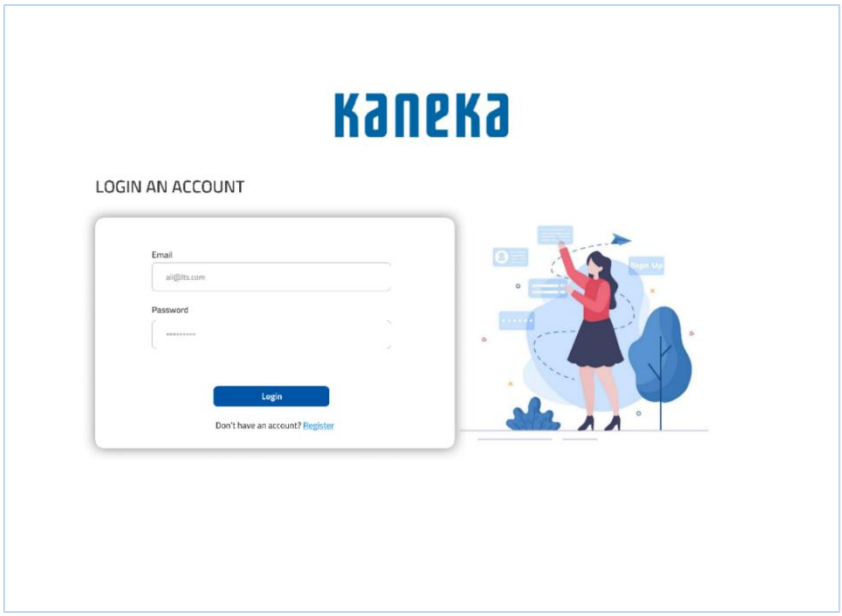


Figure 3.36 Visitor login page

In figure 3.36, if the user already has an account, enter the email and password. Then, click the ‘Login’ button to login.

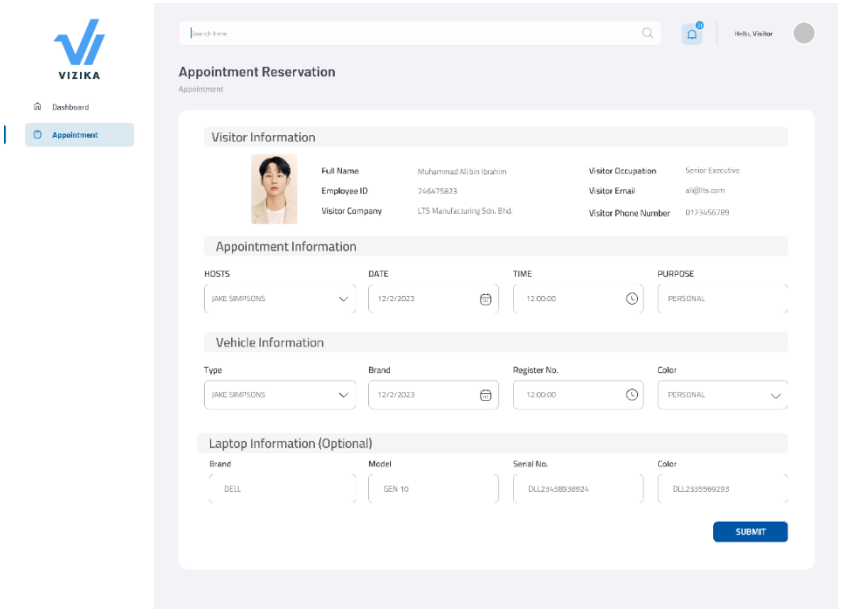


Figure 3.37 Visitor appointment page

In Figure 3.37, if the user wants to book an appointment visit at KANEKA, enter the appointment information and vehicle information. If the user must bring the laptop, they need to enter the laptop information. Then click the ‘Submit’ button.

3.6.2 SHEQ Officer interfaces

Figure 3.38 displays the dashboard page, Figure 3.39 displays the visitor log page, Figure 3.40 shows the visitors approval page, Figure 3.41 displays the appointment calendar page, Figure 3.42 displays the report page, and Figure 3.43 shows the safety briefing page.

Figure 3.38 Dashboard page

Figure 3.38 illustrates the dashboard page that shows the analytics that contains charts and graphs as the summary data.

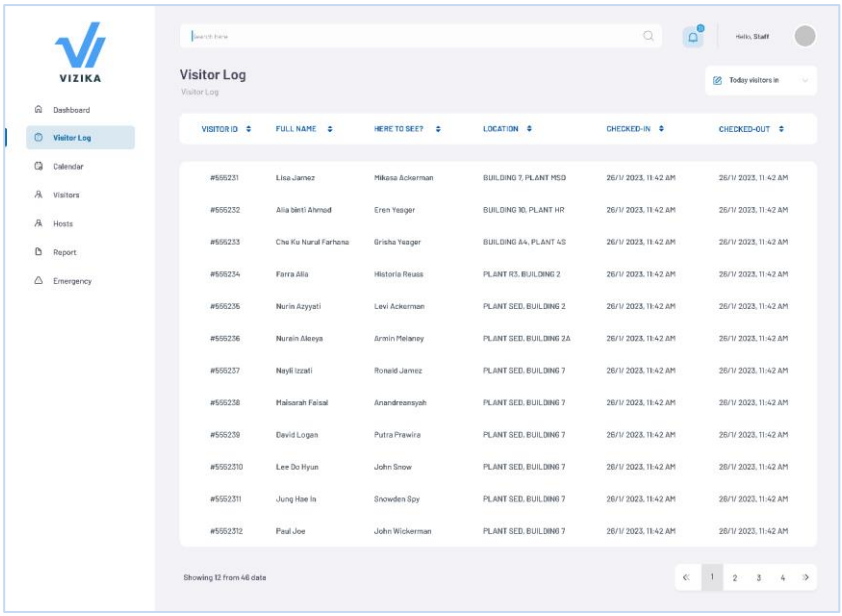


Figure 3.39 Visitor log page

Figure 3.39 displays the visitor log records that contain the visitor information including check-in and check-out timestamp.

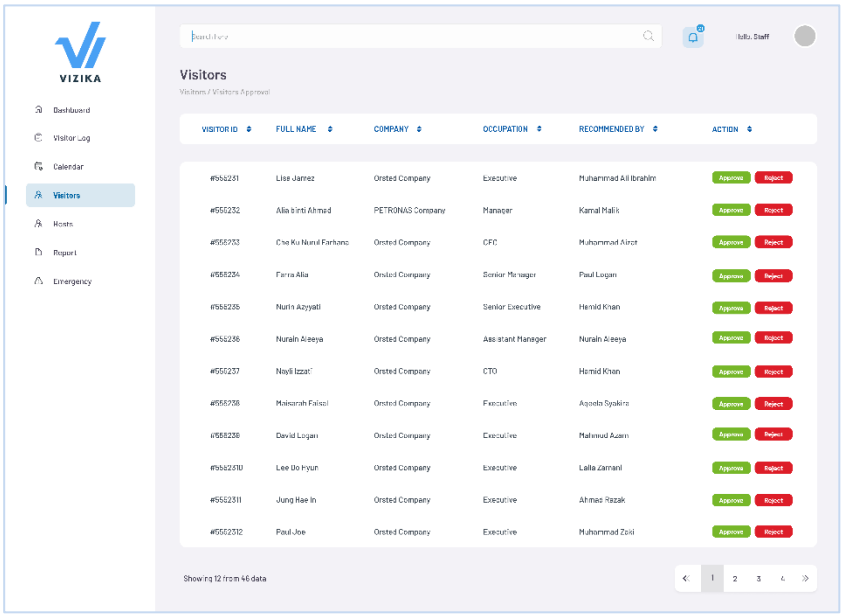


Figure 3.40 Visitors approval page

Figure 3.40 displays the visitor's registration approval so that the visitor can make an appointment once the registration has been approved.

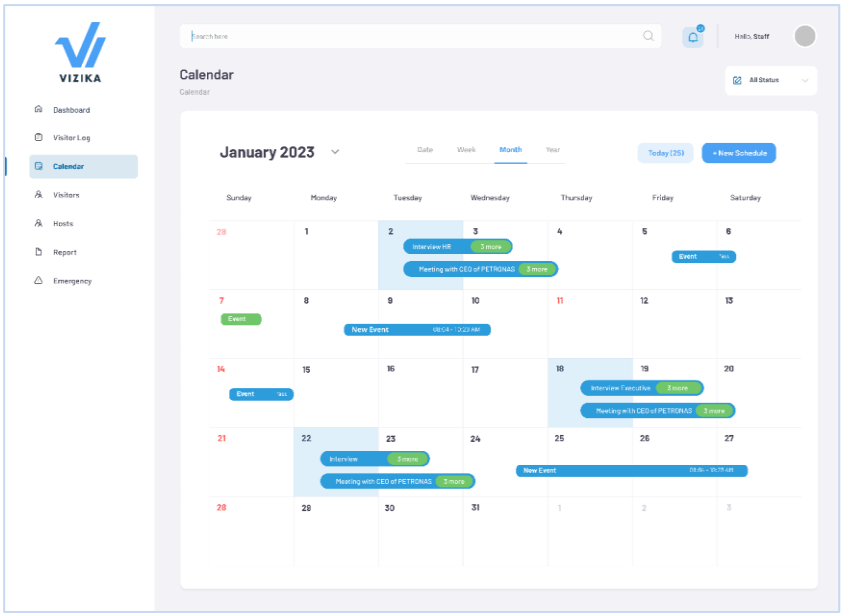


Figure 3.41 Appointment calendar page

In Figure 3.41, the calendar will shows all the appointment belongs to the visitors.

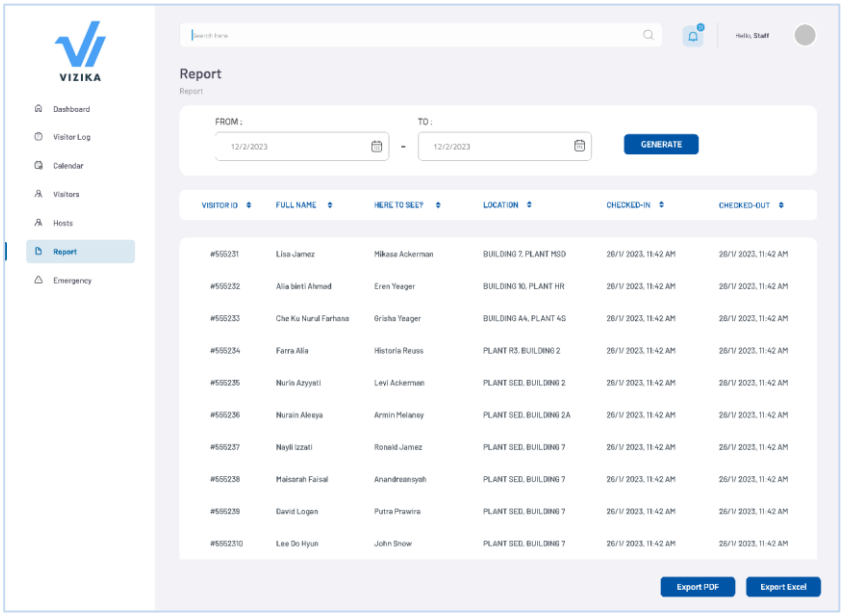


Figure 3.42 Report page

In Figure 3.42, the report page will allow the SHEQ Officer to generate the report based on the date range. The staff need to specify the start and end date of when the report needs to be generated and then click the ‘Generate’ button. After that, they are able to export the report in two ways either PDF by clicking ‘Export PDF’ or ‘Export Excel’ to export in Excel.

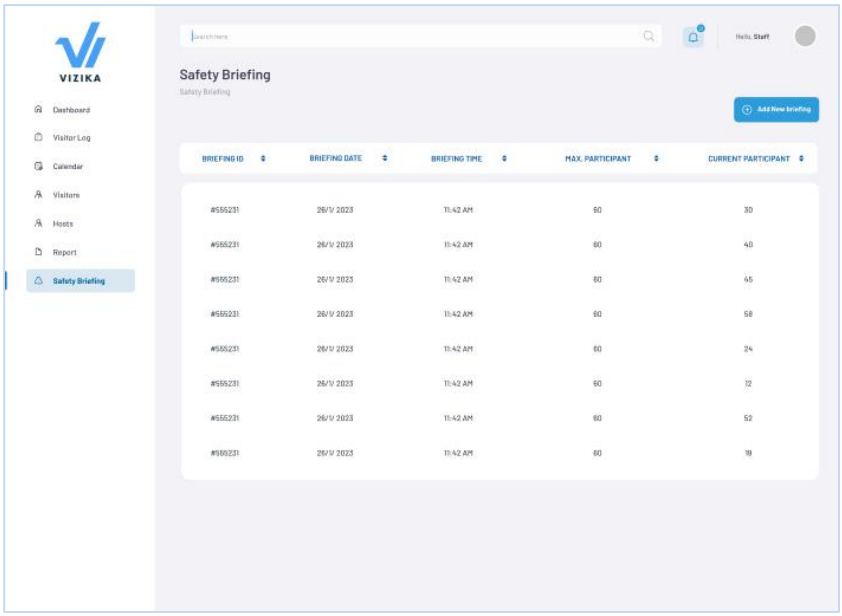


Figure 3.43 Safety briefing page

In Figure 3.43, the safety briefing page displays the list of safety briefing that includes the maximum number of participants per session and number of visitor that already enrolled in that session.

3.6.3 SHEQ Guard interfaces

Figure 3.44 displays the register biometric page and Figure 3.45 displays scan facial recognition page.

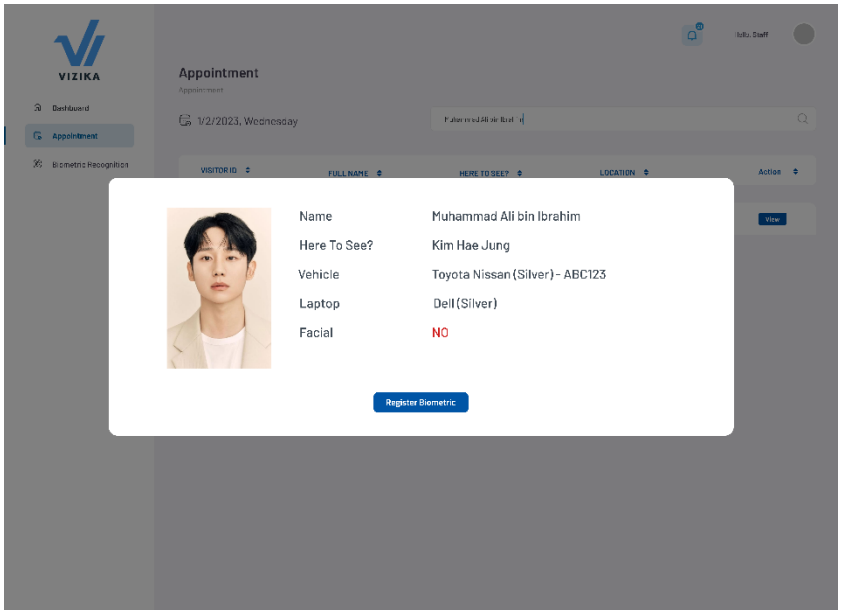


Figure 3.44 Register biometric before check-in page

Figure 3.44 displays when the visitor arrives at the company and wants to check-in, they need to pass through the guardhouse. If the user is the first timer and has not registered the biometric recognition yet, they need to register first before check-in. SHEQ Guard will click the ‘Register Biometric’ button to register the biometric.

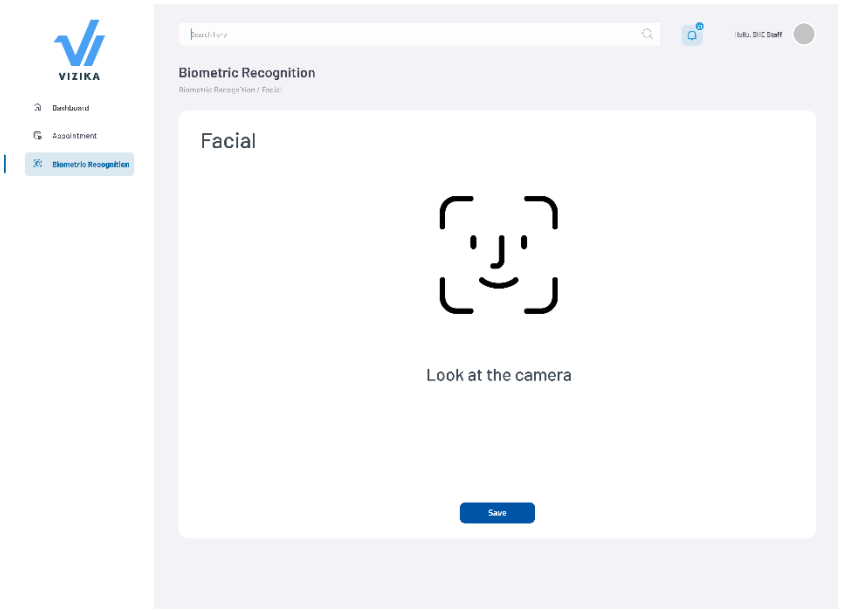


Figure 3.45 Scan facial recognition page

Figure 3.45 displays the scan facial registration page. Look at the camera that was provided by the company. Then click the ‘Save’ button.

3.7 Testing / Validation Plan

In the Vizika System, the testing process will include conducting User Acceptance Testing (UAT) with general users to test the functionality of the system. The primary objective of UAT is to identify any errors or issues that may have been overlooked during the development phase. By involving end users in the testing process, potential problems can be identified and addressed before the system is deployed to a wider end-user.

During UAT, users will have the opportunity to thoroughly test the system and provide feedback on its functionality and usability. This process is crucial as it allows for the detection and resolution of any errors or inconsistencies that may have gone unnoticed during internal testing. By addressing these issues prior to deployment, the system's overall quality and reliability can be improved.

UAT serves as an essential step in ensuring that the system meets user expectations and performs optimally in real-world scenarios. The feedback gathered during this process provides valuable insights that can help identify areas for improvement and make necessary adjustments to enhance the user experience. Table 3.18 shows the sample questions for UAT form of Vizika System.

Table 3.18 User Acceptance Testing (UAT) Form

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login			
		Insert information			
		Account validation			
2.	Manage contractor visitor details	Insert additional information			
		Biometric recognition: Register face			
3.	Manage appointment	Create appointment details with multiple contractors and visitors			

		Invitation email sent to the right person			
		Appointment date sync with calendar			
		Biometric recognition: Scan face to admit the contractor and visitors			
4.	Manage report	Generate report based on date filtered			
		Export data record to PDF			
		Export data record to Excel			
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll			
6.	Dashboard	Display charts and graphs with data accurately			
Usability					
7.	Learnability	User-friendly and easy to navigate			
8.	User-Interface	Aesthetic and minimalist design			
		Consistency design			
9.	Error prevention	Validation message to avoid mistakes from users			

The test has been performed by:

Name : _____

Signature : _____

Date : _____

3.8 Potential Use of Proposed System

The Vizika System is a proposed visitor management system that will be developed for Kaneka Malaysia Sdn. Bhd. The main goal of this solution is to improve a management system from a manual to an automatic system by using biometric recognition. Using this system, we can enhance the visitors' satisfaction to the maximum as the process is systematic and manageable. In a manufacturing plant, many visitors come from different companies with different purposes. Sometimes, many visitors come at the same time during peak hours, so there will be a long queue to register at the guardhouse as the registration process is manual. It shows that the process is unsystematic, whereas some visitors are regular visitors but still need to register every time they come to Kaneka.

Only the staff of Kaneka Malaysia Sdn. Bhd. have an authorized to use the system. The system provides many features, such as managing visitor details, appointment visits, reports, and emergencies.

There are many benefits to implementing the proposed system in Kaneka. The first one is to improve security which helps to ensure that only authorized individuals have access to the facility, which can help to prevent unauthorized access or to tamper with the equipment and avoid the suspicious person to enter the premises (*What Is Visitor Management and Why It Matters to Business? - Sine*, n.d.). Next, to increase efficiency as the registration and check-in processes can streamline the process of admitting visitors, reducing wait times and improving the facility's overall efficiency. The last one is to enhance professionalism as we know Kaneka is one of the top companies in Malaysia. Therefore, we can create a professional image for the manufacturing plant, as it demonstrates a commitment to security, safety, and efficiency. It will boost the company towards higher progress.

3.9 Gantt Chart

Gantt chart is a project schedule from beginning to end. The table 3.19 shows about the Gantt Chart for Projek Sarjana Muda I Semester 2022/2023 and the table 3.20 shows about the Projek Sarjana Muda II Semester 2022/2023.

Table 3.19 Gantt Chart of Projek Sarjana Muda I Semester 2022/2023

Milestone description	Start (Date)	Duration (Week)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Requirements Planning																	
Aims and objectives	17/10/2022	1															
Scope of the project	24/10/2022	1															
Project requirements	31/10/2022	2															
User requirements	14/11/2022	2															
User design																	
Flowchart	28/11/2022	2															
Context Diagram	12/12/2022	1															
Use Case Diagram and Description	26/12/2022	1															
Activity Diagram	2/1/2023	1															
Storyboard	9/1/2023	2															

Prototype System	16/1/2023	6															

Table 3.20 Gantt Chart of Projek Sarjana Muda II Semester 2022/2023

Milestone description	Start (Date)	Duration (Week)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Construction																	
Coding	13/3/2023	7															
Integrate with webcam	1/5/2023	4															
UAT Testing	29/5/2023	2															
Cutover																	
Upload to real server	12/6/2023	2															
Maintain system	26/6/2023	2															

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, it will explain the system implementation process that have been done during this system was developed to explain the web service method used in Vizika System in subsection 4.2. Besides, in subsection 4.3, it will be also discussing the input and output design for selected module which is appointment. Moreover, the database implementation will be discussed in subsection 4.4. Next, the coding implementation will be explained too in subsection 4.5. Then, the necessary user manual steps followed by all users in subsection 4.6. Last but not least, the test will be performed by all users to test the effectiveness of this system in subsection 4.7, user acceptance testing. All results by the tested users will be recorded in the form of acceptance tests.

4.2 System Implementation Process

Vizika system was developed using a web-based method. One of the most important aspects of the system is the interaction between users, including SHEQ Officer, SHEQ Guard, Staff, Contractor, and Visitor. Users can provide feedback on the system during user acceptance test, which can be used to improve it.

The backend of the system was developed using PHP Laravel Framework, which serves as a bridge to connect the system to the database and other server-side functionalities. HTML was also used as a programming markup language to build the project. The system will be developed by using Visual Studio Code as the code editor.

To design the system, Cascading Style Sheets (CSS) was utilized, including some bootstraps. In addition, JavaScript and ReactJS were used to create interactive effects within web browsers including many libraries such as Face-Api.js.

XAMPP was used as the local host to connect with the server. It is to test the functionality of the system, Overall, the Vizika system was carefully developed using a range of technologies to create a reliable and functional system with a user-friendly interface.

4.3 Input and Output Design

In this section, it will show the input and output design for selected module. For this section the appointment module has been selected.

Figure 4.1 shows the input design of the Staff to create an appointment by inserting date, time, purpose, agenda, user type and name for the invitation. Figure 4.2 shows the output design after the appointment has been created.

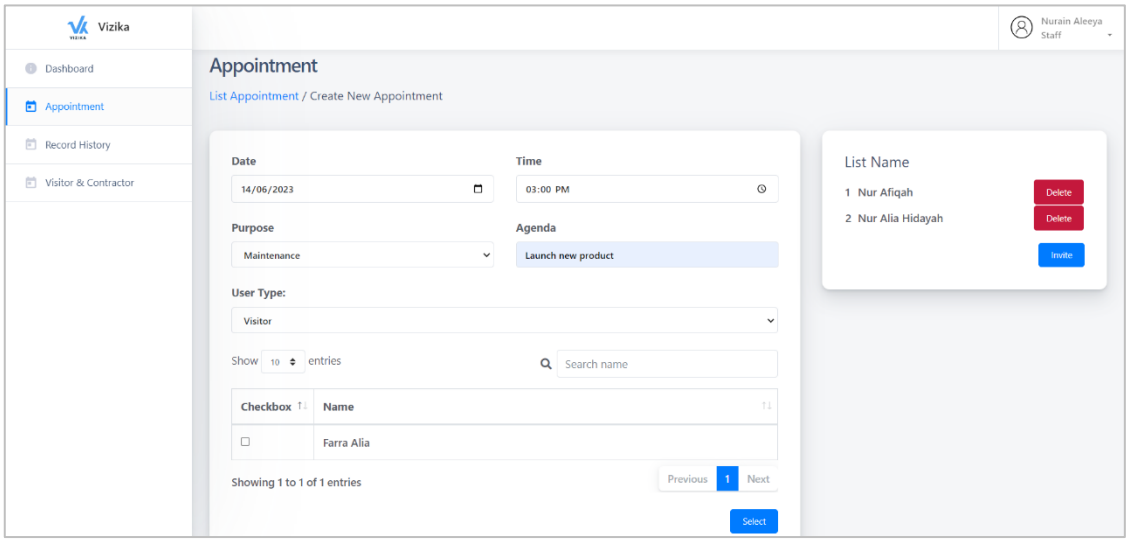


Figure 4.1 Input design for the create appointment

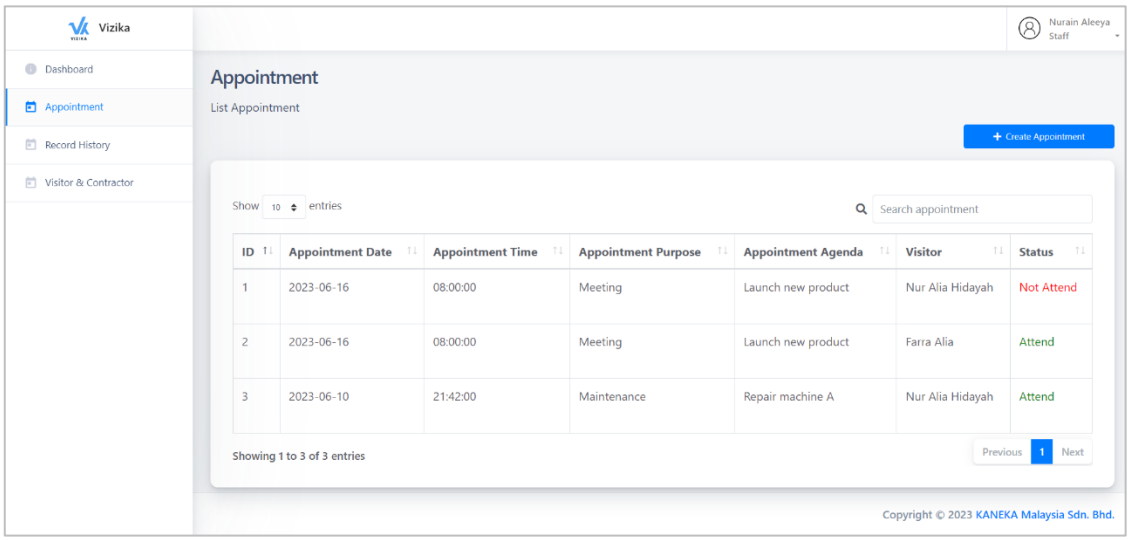


Figure 4.2 Output design after appointment has been created

4.4 Database Implementation

This section explained about the database of the Vizika system with the MySQL database. All the data will be recorded in this database called “vizika”. There are ten (10) tables that will be used in the system and another five (5) tables that are default tables from Laravel Framework.

Figure 4.3 shows all tables that been used in the Vizika system which are appointmentinfo, biometricinfo, blacklistvisitor, briefingsession, companyinfo, contractorinfo, safetybriefinginfo, users, visitorinfo, visitrecord. Other tables which are failed_jobs, migrations, password_resets, password_reset_tokens and personal_access_tokens are default tables from Laravel.

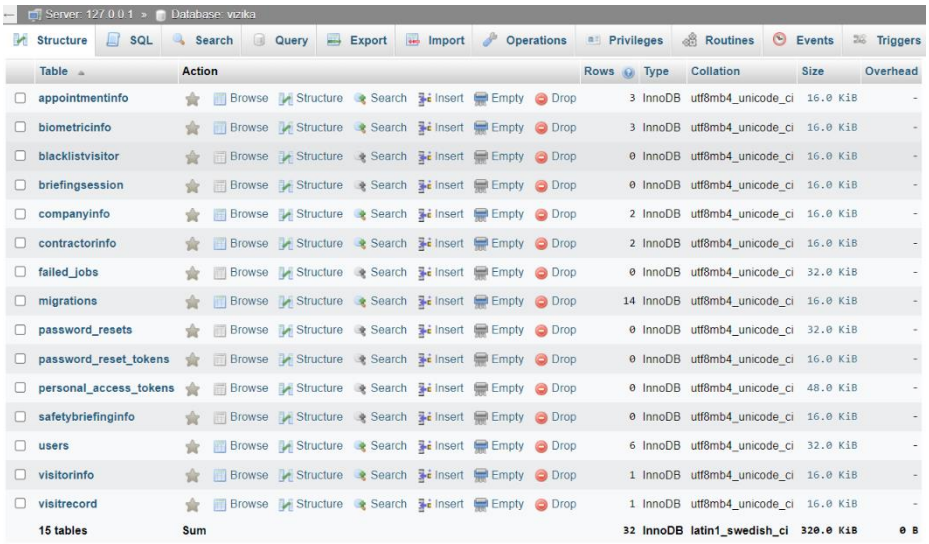
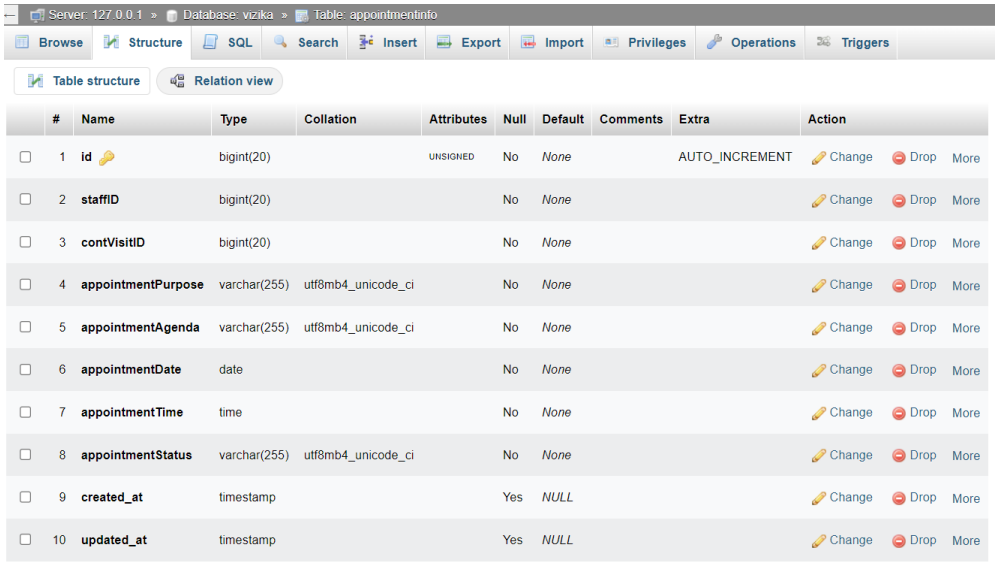


Figure 4.3 Tables in the database

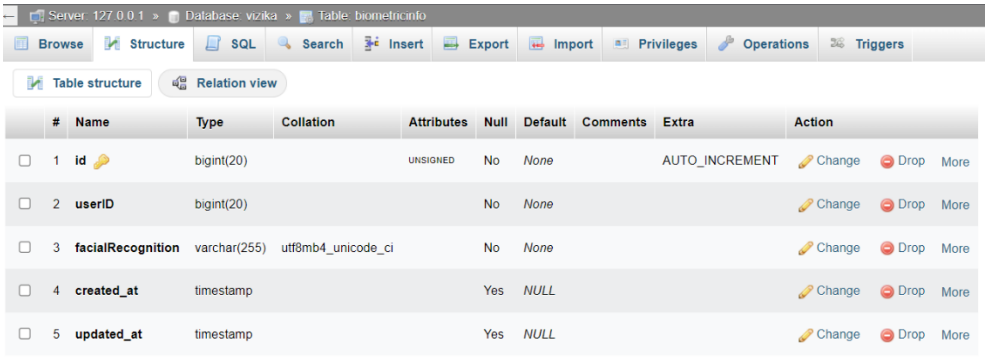
Figure 4.4 shows the structure of appointmentinfo table that have id as the primary key of appointment, staffID and contVisitID as the foreign key, appointmentPurpose, appointmentAgenda, appointmentDate, appointmentTime and appointmentStatus.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	staffID	bigint(20)			No	None			Change Drop More
3	contVisitID	bigint(20)			No	None			Change Drop More
4	appointmentPurpose	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
5	appointmentAgenda	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
6	appointmentDate	date			No	None			Change Drop More
7	appointmentTime	time			No	None			Change Drop More
8	appointmentStatus	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
9	created_at	timestamp			Yes	NULL			Change Drop More
10	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.4 Appointment info table

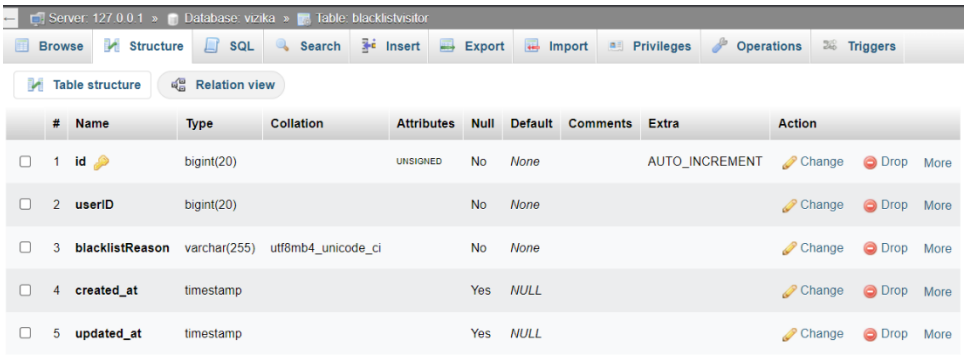
Figure 4.5 displays the biometricinfo table that have id as the primary key, userID as the foreign key and facialRecognition as the path of the captured images.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	userID	bigint(20)			No	None			Change Drop More
3	facialRecognition	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
4	created_at	timestamp			Yes	NULL			Change Drop More
5	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.5 Biometric info table

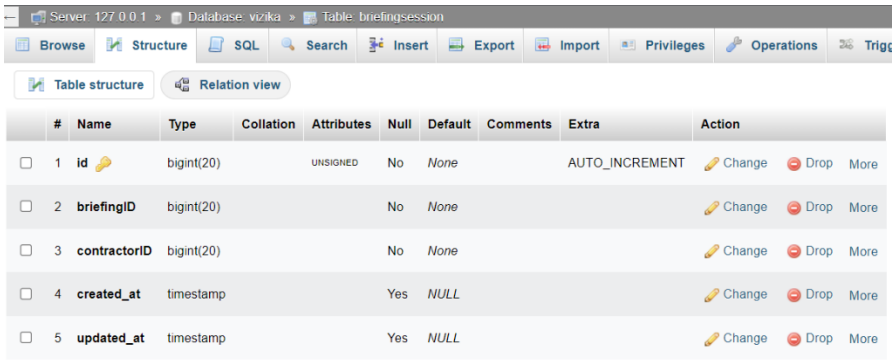
Figure 4.6 displays the blacklistvisitor table that have id as the primary key, userID as the foreign key and blacklistReason which is the reason they got blacklisted.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	userID	bigint(20)			No	None			Change Drop More
3	blacklistReason	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
4	created_at	timestamp			Yes	NULL			Change Drop More
5	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.6 Blacklist visitor table

Figure 4.7 displays the briefingsession that have id as the primary key, briefingID and contractorID as the foreign keys.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	briefingID	bigint(20)			No	None			Change Drop More
3	contractorID	bigint(20)			No	None			Change Drop More
4	created_at	timestamp			Yes	NULL			Change Drop More
5	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.7 Briefing session table

Figure 4.8 displays the companyinfo that have id as the primary key, companyName, companyEmail, companyPhoneNo and companyAddress.

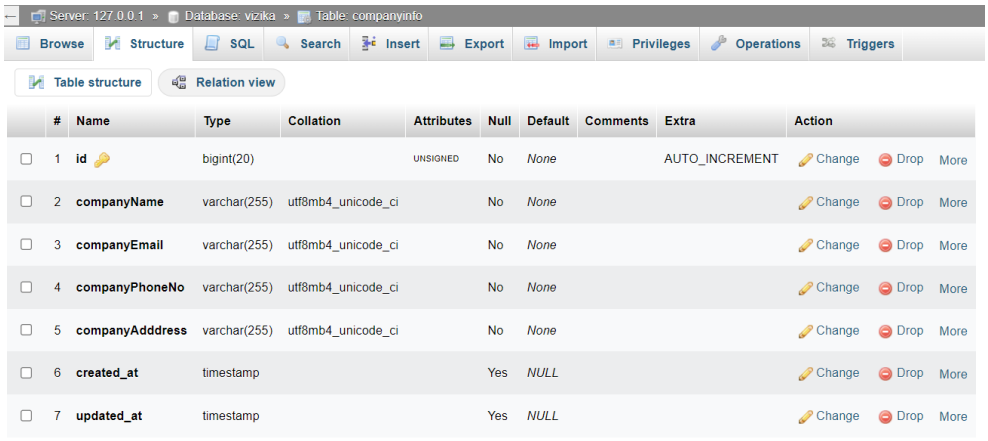


Figure 4.8 Company info table

Figure 4.9 displays the contractorInfo that have id as the primary key, userID and companyID as the foreign keys, employeeNo, phoneNo, passExpiryDate, birthdate, address, passportPhoto and validityPassPhoto.

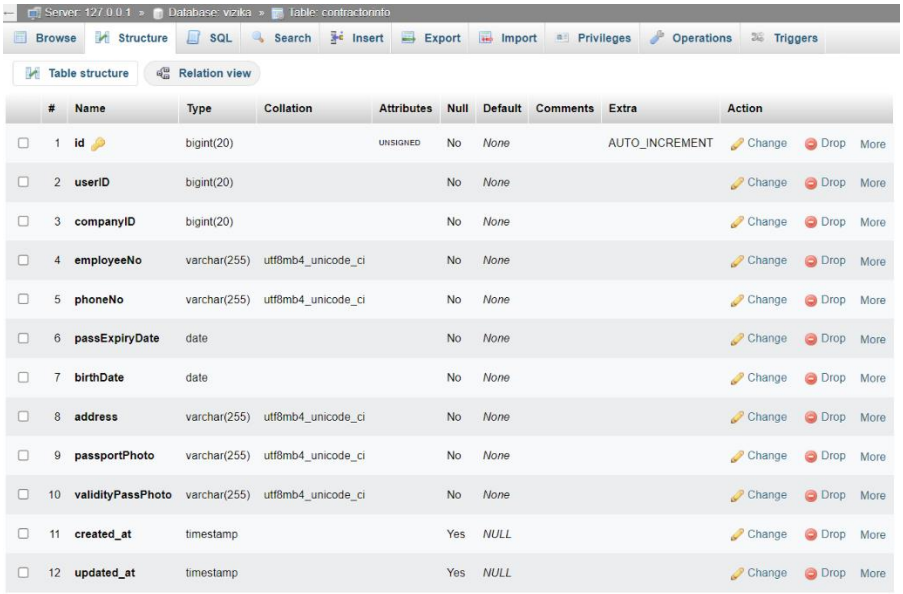
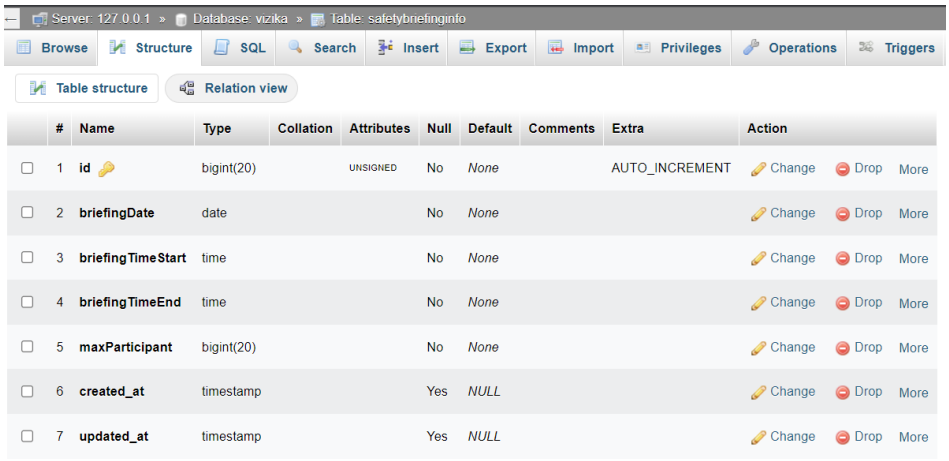


Figure 4.9 Contractor info table

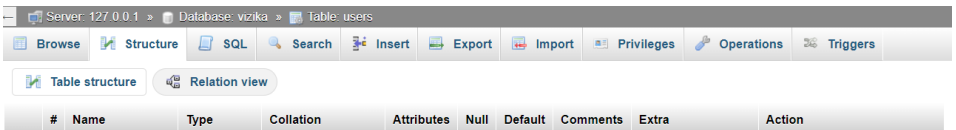
Figure 4.10 displays the safetybriefinginfo table that have id as the primary key, briefingDate, briefingTimeStart, briefingTimeEnd, and maxParticipant.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	briefingDate	date			No	None			Change Drop More
3	briefingTimeStart	time			No	None			Change Drop More
4	briefingTimeEnd	time			No	None			Change Drop More
5	maxParticipant	bigint(20)			No	None			Change Drop More
6	created_at	timestamp			Yes	NULL			Change Drop More
7	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.10 Safety briefing info table

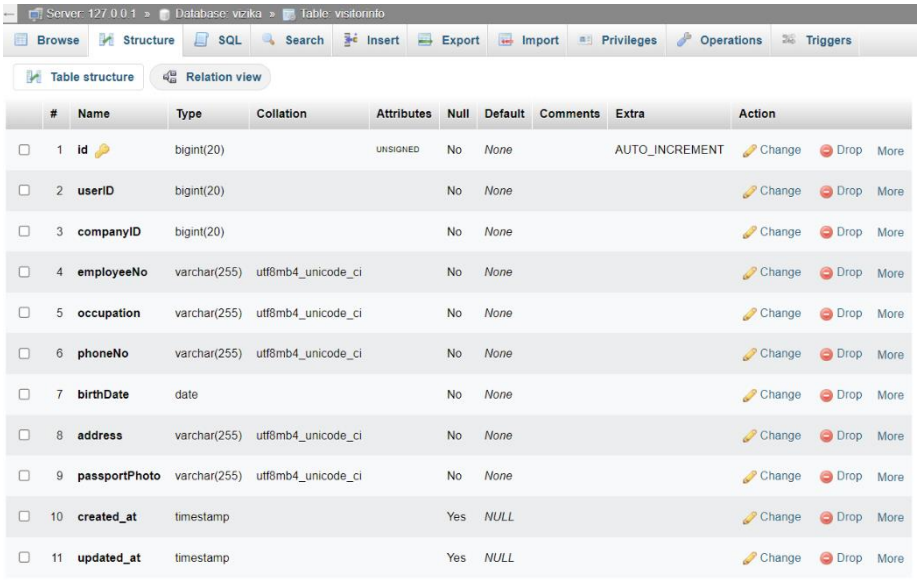
Figure 4.11 displays the users table that have id as the primary key, name, email, email_verified_at, password and category.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	name	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
3	email	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
4	email_verified_at	timestamp			Yes	NULL			Change Drop More
5	password	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
6	category	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
7	remember_token	varchar(100)	utf8mb4_unicode_ci		Yes	NULL			Change Drop More
8	created_at	timestamp			Yes	NULL			Change Drop More
9	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.11 Users table

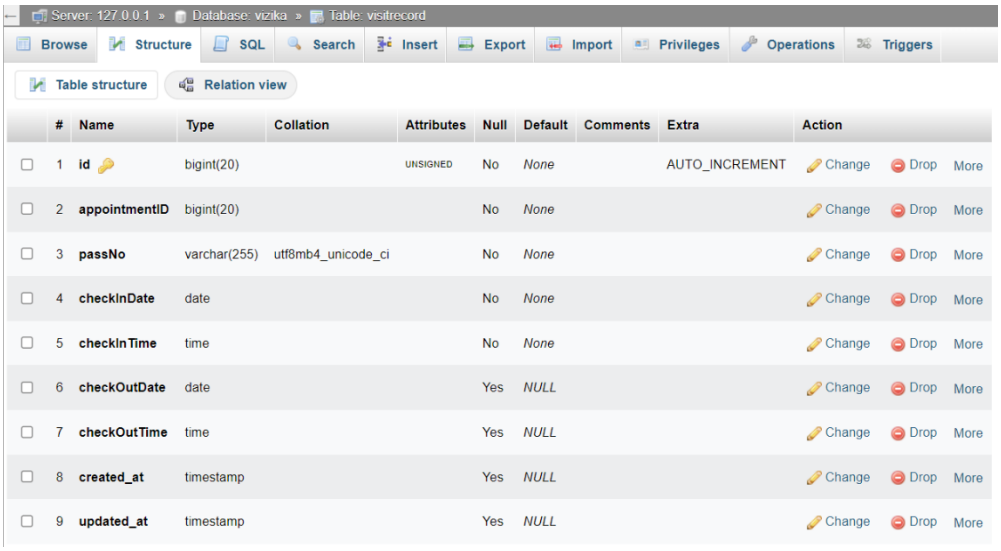
Figure 4.12 displays the visitorinfo that have id as the primary key, userID and companyID as the foreign keys, employeeNo, occupation, phoneNo, passExpiryDate, birthdate, address and passportPhoto.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	userID	bigint(20)			No	None			Change Drop More
3	companyID	bigint(20)			No	None			Change Drop More
4	employeeNo	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
5	occupation	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
6	phoneNo	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
7	birthDate	date			No	None			Change Drop More
8	address	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
9	passportPhoto	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
10	created_at	timestamp			Yes	NULL			Change Drop More
11	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.12 Visitor info table

Figure 4.13 displays the visitrecord that have id as the primary key, appointmentID as the foreign key, checkInDate, checkInTime, checkOutDate, checkOutTime.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	appointmentID	bigint(20)			No	None			Change Drop More
3	passNo	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
4	checkInDate	date			No	None			Change Drop More
5	checkInTime	time			No	None			Change Drop More
6	checkOutDate	date			Yes	NULL			Change Drop More
7	checkOutTime	time			Yes	NULL			Change Drop More
8	created_at	timestamp			Yes	NULL			Change Drop More
9	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.13 Visit record table

4.5 Coding Implementation

In this section, it will explain selected page and its coding. In this section, it will explain for Create, Read, Update and Delete (CRUD) for selected modules which are appointment, safety briefing and edit profile.

Figure 4.14 explains the Create query for creating an appointment by Staff that been done in storeappointment function in appointment controller.

```
public function storeappointment(Request $request)
{
    if ($request->input('contractorName')) {
        // Contractor dropdown was selected
        $contVisit = $request->input('contractorName');
        // process data for contractor
    } elseif ($request->input('visitorName')) {
        // Visitor dropdown was selected
        $contVisit = $request->input('visitorName');
        // process data for visitor
    }

    $dataquery = array(
        'staffID'            =>  Auth::user()->id,
        'contVisitID'        =>  $contVisit,
        'appointmentPurpose' =>  $request->appointmentPurpose,
        'appointmentAgenda'  =>  $request->appointmentAgenda,
        'appointmentDate'    =>  $request->appointmentDate,
        'appointmentTime'    =>  $request->appointmentTime,
        'appointmentStatus'  =>  'Pending',
    );
    // insert query appointment
    DB::table('appointmentinfo')->insert($dataquery);
```

Figure 4.14 Create query in appointment controller

In Figure 4.15 explains the select (read) query code in appointment controller to fetch the data from the database.

```php
//staff view
$appointmentStaff = DB::table('appointmentinfo')
    ->orderBy('appointmentinfo.id', 'desc')
    ->join('users', 'users.id', '=', 'appointmentinfo.contVisitID')
    ->select([
        'users.id AS staffID',
        'appointmentinfo.id AS appointmentID', 'users.*', 'appointmentinfo.*'
    ])
    ->where('staffID', Auth::user()->id)
    ->get();

//visitor view
$appointmentVisitor = DB::table('appointmentinfo')
    ->orderBy('appointmentinfo.id', 'desc')
    ->join('users', 'users.id', '=', 'appointmentinfo.staffID')
    ->select([
        'users.id AS staffID',
        'appointmentinfo.id AS appointmentID', 'users.*', 'appointmentinfo.*'
    ])
    ->where('contVisitID', Auth::user()->id)
    ->get();
```

Figure 4.15 Select (Read) query in appointment controller

Figure 4.16 displays the Update query for edit profile in profile controller to update their profile information.

```php
public function updateprofile(Request $request, $id)
{
    // find the id from contractorinfo

    $contractorinfo = ContractorInfo::find($id);

    if ($request->hasFile('passportPhoto')) {
        //unlink the old contractorinfo file from assets folder
        $path = public_path() . '/assets/' . $contractorinfo->passportPhoto;
        if (file_exists($path)) {
            unlink($path);
        }

        $contractorinfo->passportPhoto = $request->file('passportPhoto');

        //to rename the contractorinfo file
        $filename = time() . '.' . $contractorinfo->passportPhoto->getClientOriginalExtension();
        // to store the new file by moving to assets folder
        $request->passportPhoto->move('assets', $filename);

        $contractorinfo->passportPhoto = $filename;
    }

    $contractorinfo->companyName = $request->input('companyName');
    $contractorinfo->phoneNo = $request->input('phoneNo');
    $contractorinfo->passExpiryDate = $request->input('passExpiryDate');
    $contractorinfo->birthDate = $request->input('birthDate');
    $contractorinfo->address = $request->input('address');

    // upadate query in the database
    $contractorinfo->update();

    // display message box in the same page
    return redirect()->back()->with('message', 'Contractor Info Updated Successfully');
}
```

Figure 4.16 Update query for profile in profile controller

Figure 4.17 shows the Delete to delete the staff who are not active or already resigned. All the records that associated with the staff likes visitrecord and appointmentinfo will be deleted too to maintain the integrity data and prevent orphaned records in the system.

```php
public function deleteStaff(Request $request, $id)
{
    if ($request->ajax()) {
        User::where('id', '=', $id)->delete();

        // Get the appointment IDs associated with the staff
        $appointmentIds = AppointmentInfo::where('staffID', '=', $id)->pluck('id');

        // Delete VisitRecord records based on the appointment IDs
        VisitRecord::whereIn('appointmentID', $appointmentIds)->delete();

        // Delete AppointmentInfo records
        AppointmentInfo::where('staffID', '=', $id)->delete();

        return response()->json(array('success' => true));
    }
}
```

Figure 4.17 Delete query for staff record in profile controller

4.6 User Manual

The user manual subsection will be explained about the user interface of the system. There are five user manuals which are the staff that will be explained in subsection 4.6.1, visitor in subsection 4.6.2, subsection 4.6.3 for contractor, SHEQ Guard in subsection 4.6.4 and subsection 4.6.5 for SHEQ Officer.

4.6.1 Staff

Figure 4.18 shows the register page for user account. This is the same page for register staff, SHEQ Guard and SHEQ Officer. The user needs to enter name, email, password, confirm password and choose user type. Then click the 'Register' button. If the user is already having an account, click the 'Login' link.

Figure 4.18 Register page

Figure 4.19 shows the login page for user account. This page is same for staff, SHEQ Officer and SHEQ Guard. The user needs to enter email and password. Then, click the 'Login' button to login. If the system receives wrong combination of email and password, it will return to the same page with error message.

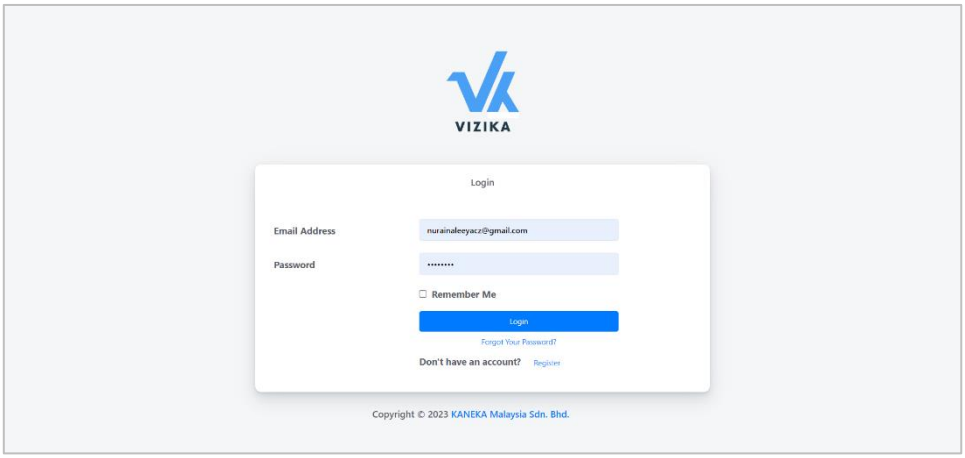


Figure 4.19 Login page

Figure 4.20 shows the main page for the staff which is dashboard page that displays the today appointment table and summarize record.

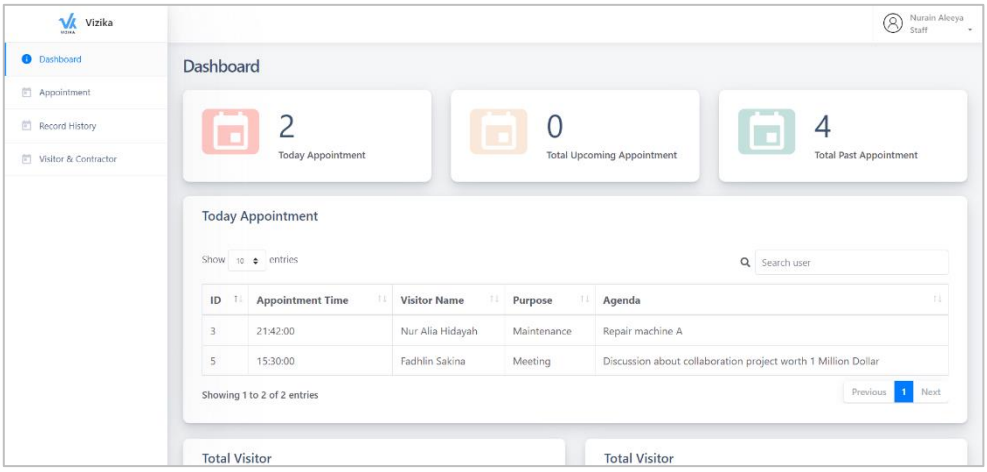


Figure 4.20 Main dashboard for staff page

Figure 4.21 displays list of appointment that has been created by user session. The user can search an appointment in search bar. If the user wants to create another appointment. They can click the ‘Create appointment’ button.

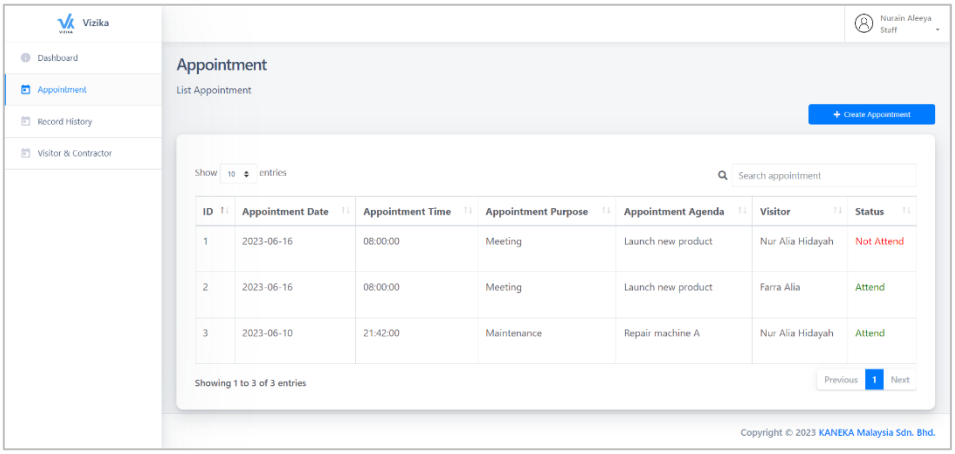


Figure 4.21 List appointment page

Figure 4.22 shows the create appointment form for the staff to create an appointment by inserting date, time, purpose, agenda, user type and user’s name. They can add multiple contractors and visitors for single appointment. Then, click ‘Invite’ button to save the appointment in the database and send the invitation through an email.

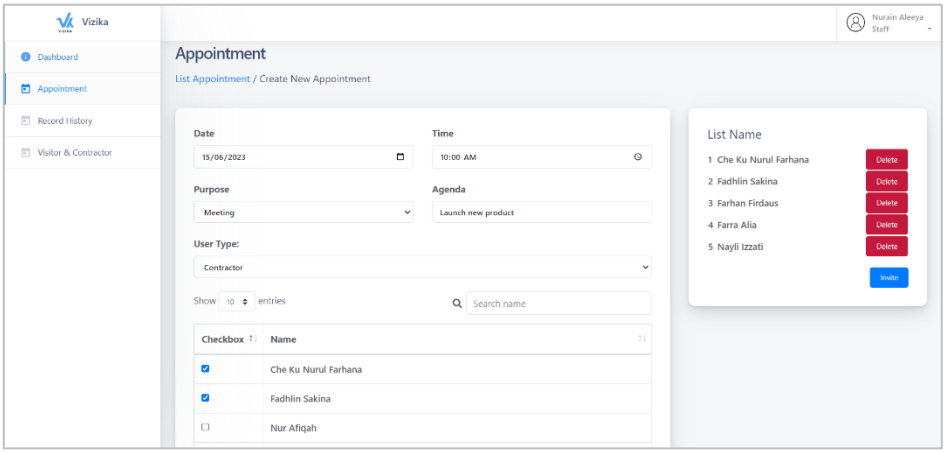


Figure 4.22 Create appointment form page

Figure 4.23 shows the visitor and appointment list name. Staff can search the visitor and contractor name in the search bar. If the name is not appeared, the staff needs to register the visitor and contractor by clicking the ‘Register User’ button.

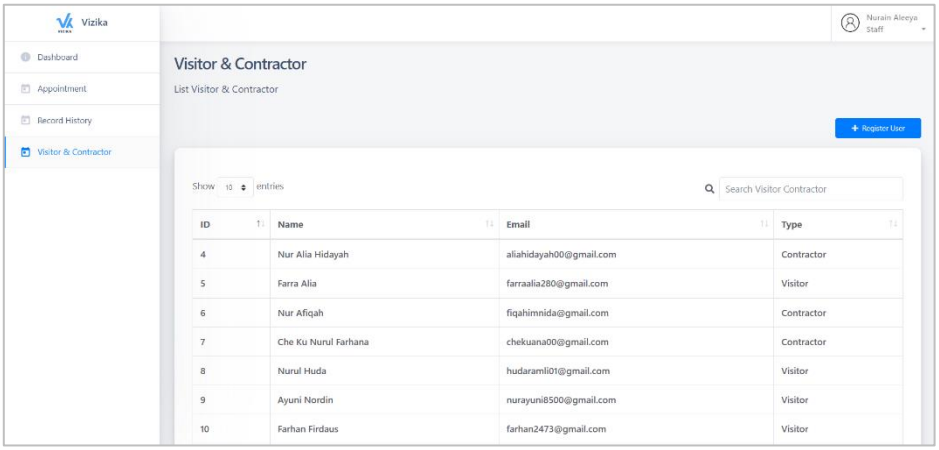


Figure 4.23 Visitor contractor list page

Figure 4.24 shows the register visitor contractor form for the staff to register the account for visitor and contractor by inserting name, email and user type. Then click ‘Register’ to register their account.

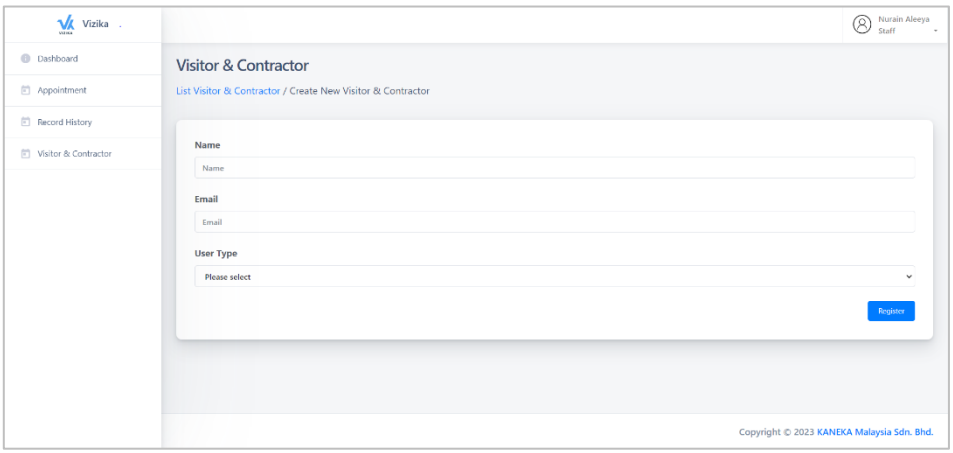


Figure 4.24 Register visitor contractor form page

4.6.2 Visitor

Figure 4.25 shows the login page for user account. This page is same for visitor and contractor. The user needs to enter email and password. Then, click the 'Login' button to login. If the system receives wrong combination of email and password, it will return to the same page with error message.

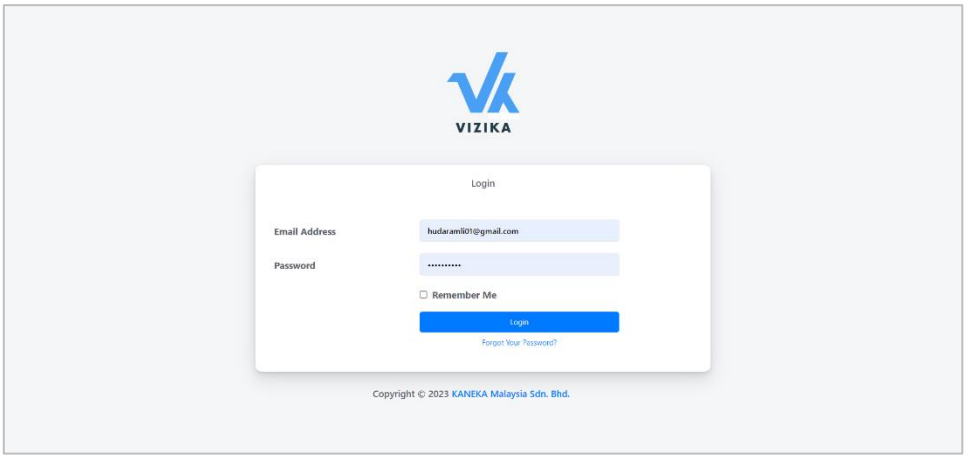


Figure 4.25 Login page

Figure 4.26 shows the additional information of visitor form for the staff to register the account for visitor and contractor. The first step they need to enter additional information of the user. Then click 'Next' to submit the additional information.

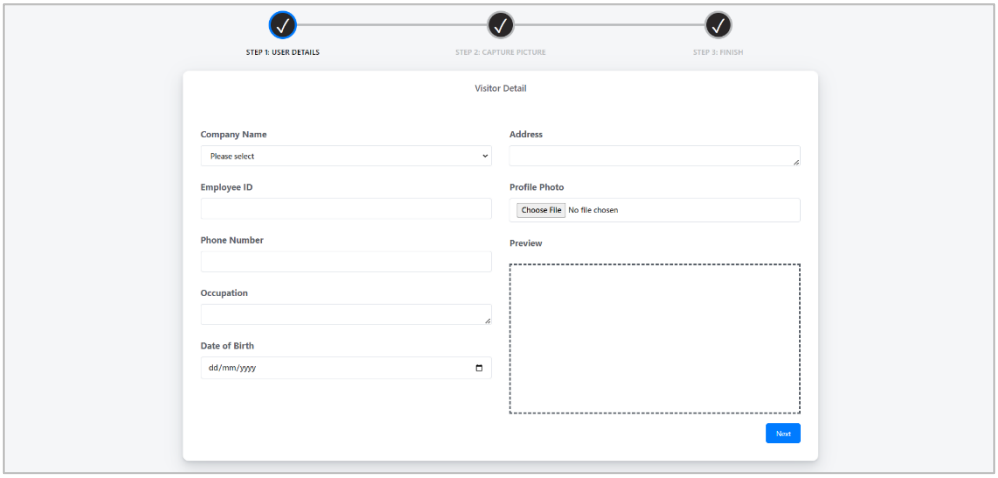


Figure 4.26 Step 1: Additional information page

Figure 4.27 shows the second step which is to capture the image for biometric purposes. Click the ‘Capture Image’ to capture the image. Then click ‘Next’ to submit the biometric data.

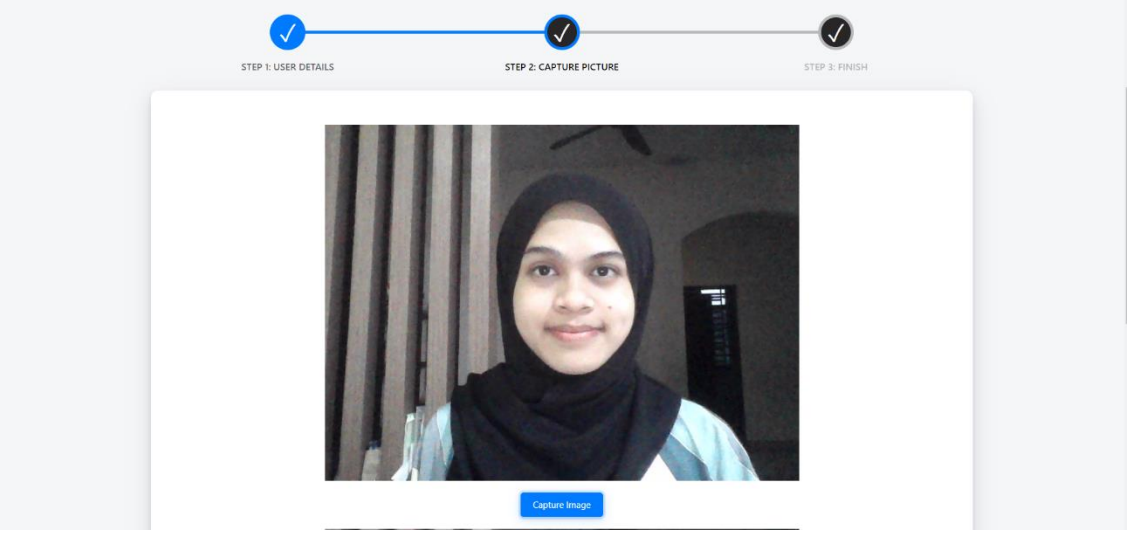


Figure 4.27 Step 2: Capture image page

Figure 4.28 shows the main page for the visitor which is dashboard that displays the records in charts and graphs.

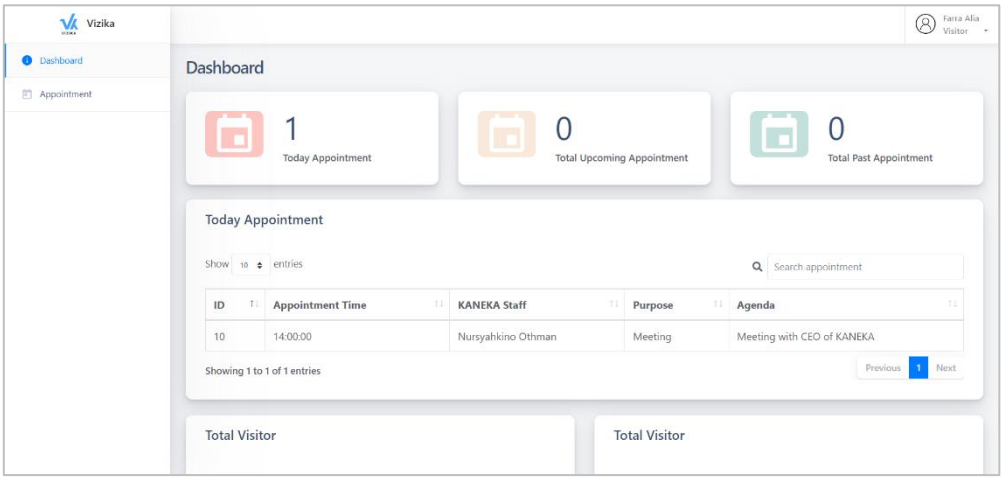


Figure 4.28 Main dashboard for visitor page

Figure 4.29 shows the response appointment invitation for the visitor to response whether ‘Attend’ or ‘Not Attend’ the appointment. If the visitor not response to this invitation, they cannot enter the premises. This page has the same view for the contractor.

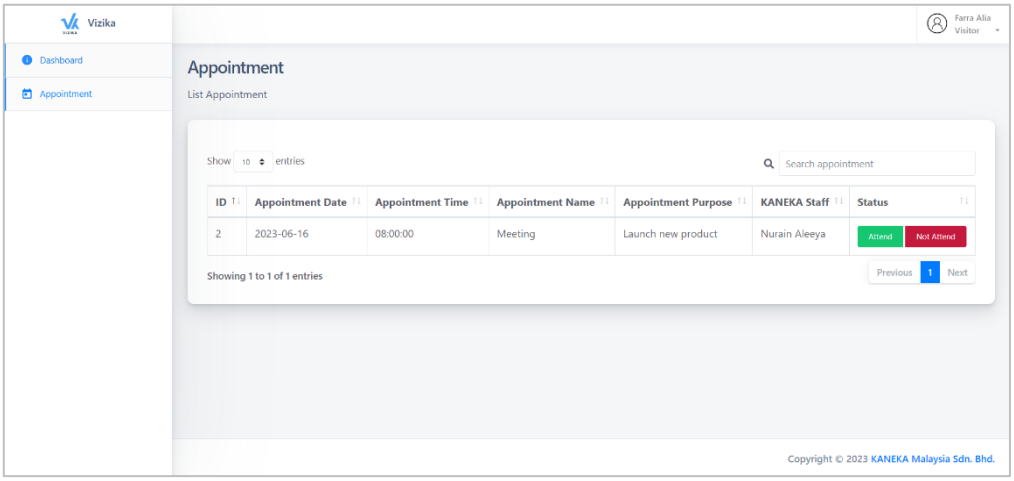


Figure 4.29 Response appointment invitation page

4.6.3 Contractor

Figure 4.30 shows the main page for the contractor which is dashboard that displays the summarize record and today appointment info.

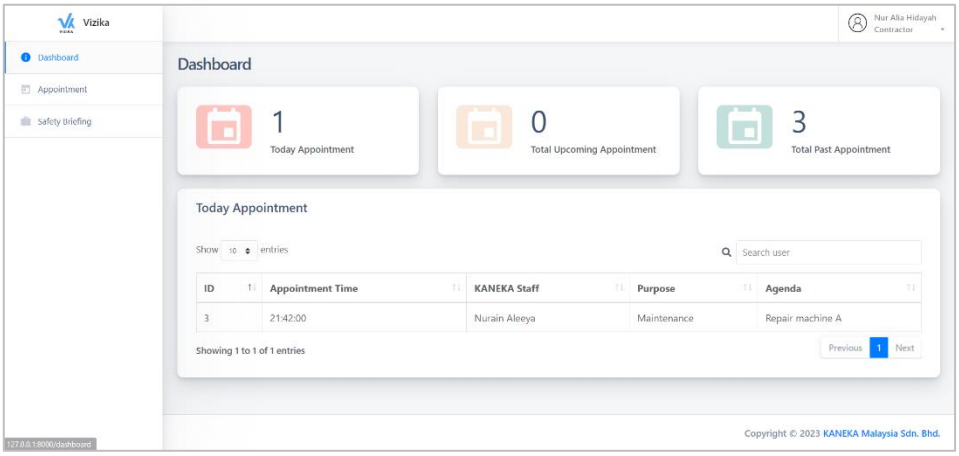


Figure 4.30 Main dashboard for contractor page

Figure 4.31 shows the safety briefing enroll page for the contractor who has validity pass that already expired. They need to enroll for any safety briefing session that are available. If not, they cannot enter the premises due to the expiry validity pass.

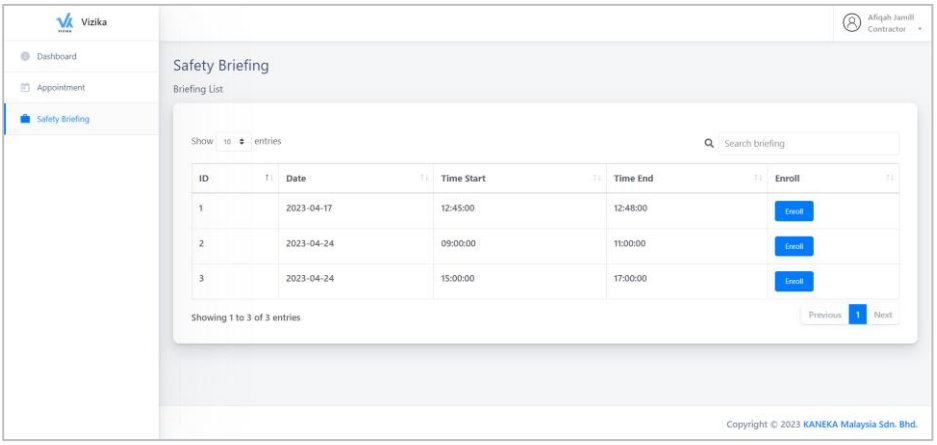


Figure 4.31 Safety briefing enrolment page

4.6.4 SHEQ Guard

Figure 4.32 displays the main dashboard for SHEQ Guard that display the visitor log which is the contractor and visitor who already admitted to the premises on today date. If the visitor or contractor wants to checkout, SHEQ Guard need to click ‘Checkout’ button. They can also search the record in the search bar.

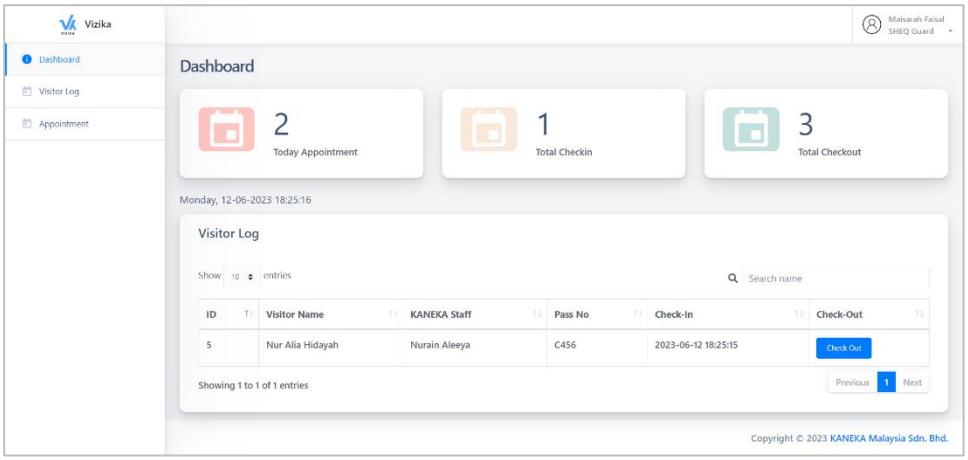


Figure 4.32 Main dashboard for SHEQ Guard page

Figure 4.33 displays the appointment check in page for the SHEQ Guard to admit the contractor or visitor to give them permission to enter the premise. The SHEQ Guard needs to find the name and scan the visitor or contractor’s face to identify the user. If the system detected the right person, the SHEQ Guard will enter pass number to be given to them and click the ‘Check-In’ button to admit them.

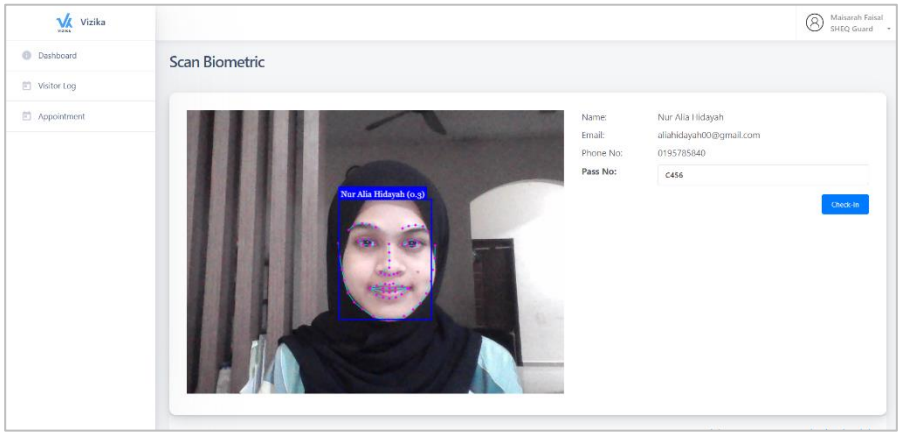


Figure 4.33 Appointment Check-in page

4.6.5 SHEQ Officer

Figure 4.34 displays the main dashboard for SHEQ Officer records in charts and graphs.

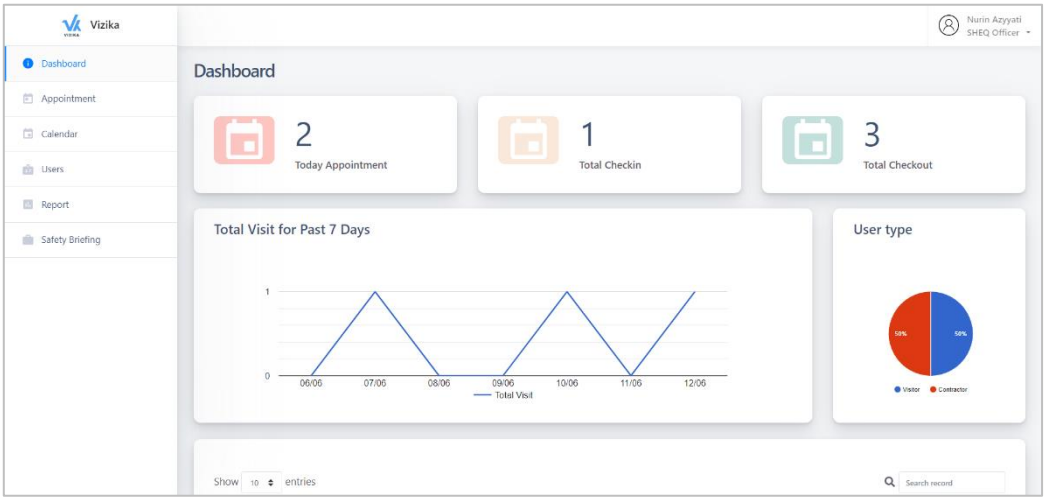


Figure 4.34 Main dashboard for the SHEQ Officer page

Figure 4.35 displays the list of contractor and visitor name details. SHEQ Officer have an authority to blacklist the visitor or contractor from coming to the premises due to negative reasons that has been received by the staff. They need to click the vertical dots on the right side and click the ‘Blacklist’ link.

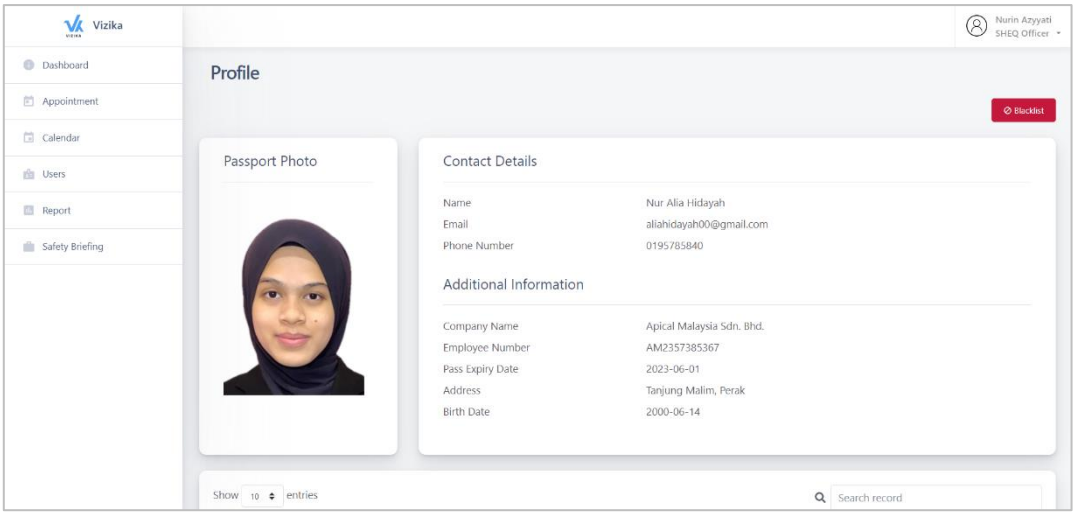


Figure 4.35 Blacklist visitor page

Figure 4.36 shows the list of safety briefing session that has been created to view how many participants that has been enrolled for each session. If they want to create another session, they can click the ‘Create Briefing’ button.

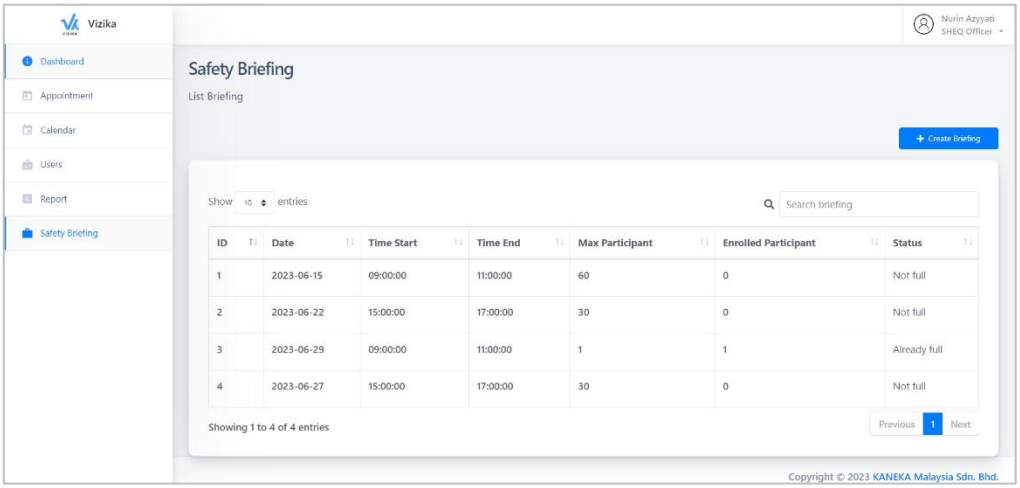


Figure 4.36 List of safety briefing session page

Figure 4.37 shows the create safety briefing session to create a new one. They need to enter the date, time start and max participant. The time end will automatically set two (2) hours after the time start.

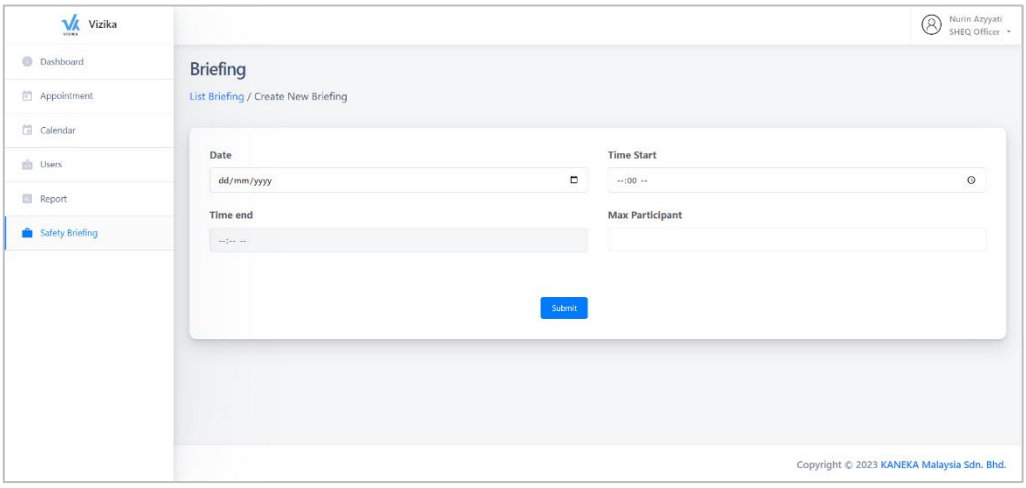


Figure 4.37 Create safety briefing session page

4.7 User Acceptance Testing

Table 4.1 and 4.2 shows the testing record that has been done by two respondents to test the functionality and usability of Vizika System. The additional UAT records will be presented in the appendix of the report.

Table 4.1 User Acceptance Testing - Respondent 1

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		

6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		
8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Farra Alia binti Rosli

Signature :

Date : 10 June 2023

Table 4.2 User Acceptance Testing – Respondent 2

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Nurin Azyyati binti Kamilizahri

Signature :

Date : 10 June 2023

CHAPTER 5

CONCLUSION

5.1 Introduction

In conclusion, this chapter summarizes the whole overview of Vizika system and the project development process. The primary purpose of the developed system is to address the various issues that arise by users. This system makes user more effective in scheduling appointments between KANEKA staff and visitors. The objectives of this system have been successfully accomplished. Section 5.2 will be described about the limitations of the project while section 5.3 will be discussed about the future works that relate to the limitations.

The main objective of this project was to study and understand the current practice and procedure on Visitor Management on manufacturing site. This was done to gain a comprehensive understanding of the system's workflow to get an idea and establish a clear picture before proceeding with the development phase. Next, the objective was to design and develop the Vizika System, a security system that helps to authenticate visitors and suitable for manufacturing site. The system was designed using Figma and develop the system using Visual Studio Code as the code editor. To ensure the security of the manufacturing site, a facial recognition was implemented. The last objective was to test and evaluate the functionality of the developed Vizika System. User Acceptance Testing (UAT) was conducted to validate the system's effectiveness and to gather feedback from users. Through thorough testing and evaluation, it can be concluded that the system has been successfully developed.

The primary aim of the Vizika system was to ease the check-in process for contractors and visitors, eliminating the need for manual data entry and long queues at the guardhouse. Indirectly, this objective has been achieved as all the system's features and functions have been well-implemented. The testing phase, specifically the User Acceptance Test (UAT), has demonstrated that all the objectives have been met successfully.

In summary, the Vizika system has effectively addressed the challenges faced by users in managing appointments between KANEKA staff and visitors. The system has been developed with careful consideration of the manufacturing site's requirements, incorporating a robust security system and efficient check-in process. The successful accomplishment of the project's objectives validates the effectiveness and usability of the Vizika system in enhancing the overall visitor management experience.

5.2 Limitations

The Vizika System has undergone a User Acceptance Test (UAT), resulting in flawless operation and no reported errors. Users have provided feedback indicating that the system's minimalist and user-friendly design makes it easy to use, allowing for easy adoption by individuals with varying technical backgrounds. However, the system does have limitations that need to be addressed.

The first limitation pertains to the face detection and recognition capability, which currently only allows for the detection and recognition of individuals one by one. This becomes problematic in scenarios with a high volume of people to process. Developing the capability to detect and recognize multiple faces simultaneously poses challenges due to limited resources and the need for algorithm training.

Another limitation is the system's lack of full support for mobile applications, hindering its seamless integration into mobile platforms and limiting its usability and accessibility in mobile environments. Additionally, the system is not mobile-friendly and lacks responsiveness to mobile views. The constraints of time and knowledge further hinder the ability to address this limitation effectively.

Furthermore, the system lacks robust data security measures. Despite its flawless functionality, there are insufficient safeguards in place to protect sensitive data from unauthorized access, manipulation, or breaches. The financial limitation of not being able to acquire an SSL certificate leaves the system vulnerable to potential security risks, such as data interception or unauthorized access.

5.3 Future Works

To overcome these limitations that mentioned in section 5.2, future work should focus on addressing the challenges in multi-face recognition, enhancing mobile application support and responsiveness, and implementing robust data security measures. By doing so, the Vizika System can ensure more efficient and secure operations, thereby providing users with enhanced functionality, usability, and data protection.

To enhance the system's efficiency, future research and development efforts should focus on enabling the simultaneous scanning of multiple faces. This would require additional resources and time to train the algorithms effectively. By implementing this capability, the system would be able to streamline processes in scenarios where there are multiple visitors or contractors arriving at the same time, improving overall efficiency and speed.

In terms of mobile support, future work should explore potential solutions to overcome the current limitations. Real-time compilation and continuous exploration of possibilities would facilitate the creation of a more effective system that operates smoothly on mobile platforms. By addressing this limitation, the system's reach and usability would expand, benefiting users who rely heavily on mobile applications for their tasks.

Next, for the security, future work should focus on implementing robust data security measures within the Vizika System. Considering the financial limitations earlier, exploring alternative solutions, such as seeking funding or grants specifically for acquiring an SSL certificate, could be beneficial. Prioritizing the acquisition of an SSL certificate would contribute to the overall security objectives of the Vizika System, providing users with increased confidence in the protection of their data. By prioritizing data security, the Vizika System can provide users with the confidence that their information is protected and reduce the likelihood of data breaches or unauthorized access.

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APPENDIX A
USER ACCEPTANCE TESTING (UAT)

User Acceptance Testing – Respondent 3

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					

7.	Learnability	User-friendly and easy to navigate	✓		
8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Nurain Aleeya binti Che Zaharudin

Signature :

Date : 10 June 2023

User Acceptance Testing – Respondent 4

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Nur Afiqah binti Mohammed Jamil

Signature :

Date : 10 June 2023

User Acceptance Testing – Respondent 5

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Nurul Huda binti Ramli

Signature :

Date : 10 June 2023

User Acceptance Testing – Respondent 6

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Maisarah binti Faisal

Signature :

Date : 10 June 2023

User Acceptance Testing – Respondent 7

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Nurayuni binti Nordin Sin

Signature :

Date : 10 June 2023

User Acceptance Testing – Respondent 8

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Muhammad Farhan Firdaus bin Hairol Zaman

Signature :

Date : 10 June 2023

User Acceptance Testing – Respondent 9

No.	Module	Activities	Status		Comment
			Yes	No	
Functionality					
1.	Login and registration	Users sign up and login	✓		
		Insert information	✓		
		Account validation	✓		
2.	Manage contractor visitor details	Insert additional information	✓		
		Biometric recognition: Register face	✓		
3.	Manage appointment	Create appointment details with multiple contractors and visitors	✓		
		Invitation email sent to the right person	✓		
		Appointment date sync with calendar	✓		
		Biometric recognition: Scan face to admit the contractor and visitors	✓		
4.	Manage report	Generate report based on date filtered	✓		
		Export data record to PDF	✓		
		Export data record to Excel	✓		
5.	Manage safety briefing	Contractor can choose date of safety briefing to enroll	✓		
6.	Dashboard	Display charts and graphs with data accurately	✓		
Usability					
7.	Learnability	User-friendly and easy to navigate	✓		

8.	User-Interface	Aesthetic and minimalist design	✓		
		Consistency design	✓		
9.	Error prevention	Validation message to avoid mistakes from users	✓		

The test has been performed by:

Name : Nuramira Natasha binti Zainuddin

Signature :

Date : 10 June 2023