BUSINESS ISSUES MANAGEMENT SYSTEM

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development) with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I hereby declare that this project report entitled

BUSINESS ISSUES MANAGEMENT SYSTEM

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : _____ Date : 9/9/2021

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I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Software Development) with Honours.

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DEDICATION

I want to dedicate this project to my beloved family, friend, and all the worker who is having challenging time in managing their workload.

ACKNOWLEDGEMENTS

The outcome of this workshop project required a lot of guidance and help from many people, and I am incredibly fortunate to have completed the project. First, I would like to express our sincere gratitude to Dr Abdul Karim bin Mohamad for his guidance and valuable support throughout completing this project. His guidance has helped improve the project and open my eyes to innovative ideas and knowledge.

Moreover, I would like to acknowledge the encouragement and inspiration received from our faculty members and colleagues with a deep sense of gratitude. I extend our gratitude to University Technical Malaysia Melaka for allowing me to do the project.

Finally, I would also like to thank my family and friends for their love, support and understanding in the duration of completing the project. I perceive this opportunity as a significant milestone in improving myself for the world.

ABSTRACT

Business Issues Management System is a software application to manage most issue activity from a business operation perspective. This system is developed as a website. The website is a visualization of the issue that business needs to solve and manage for their operation purposes. This system aims to assist the business to manage their communication and collaboratively manage issues. Using conventional ways of managing issue in business which require a lot of paperwork can be costly, inefficient, and time-consuming. This project report will explain the development process and related information such as introducing the proposed system, methodology to develop the system, system analysis, system designing, system implementation and system testing. The application will assist the business to be more organize, whole and efficient in their organization.

ABSTRAK

Sistem Pengurusan Masalah Perniagaan adalah aplikasi perisian untuk menguruskan aktiviti terbanyak dari perspektif operasi perniagaan. Sistem ini dibangunkan sebagai laman web. Laman web adalah visualisasi masalah yang perlu diselesaikan dan diuruskan oleh perniagaan untuk tujuan operasi mereka. Sistem ini bertujuan untuk membantu perniagaan menguruskan komunikasi mereka dan mengurus masalah secara kolaboratif. Menggunakan kaedah konvensional untuk menguruskan masalah dalam perniagaan yang memerlukan banyak kertas kerja boleh menjadi mahal, tidak efisien, dan memakan masa. Laporan projek ini akan menjelaskan proses pembangunan dan maklumat yang berkaitan seperti memperkenalkan sistem yang dicadangkan, metodologi untuk mengembangkan sistem, analisis sistem, perancangan sistem, pelaksanaan sistem dan pengujian sistem. Aplikasi ini akan membantu perniagaan menjadi lebih teratur, utuh dan cekap dalam organisasi mereka.

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LIST OF ABBREVIATIONS

FYP	**-**	**Final Year Project**
BIMS	**-**	**Business Issues Management System**
SDLC	**-**	**System Development Life Cycle**
Y	**-**	**Yes**
N	**-**	**No**
MVC	**-**	**Model View Controller**
HTML	**-**	**Hypertext Markup Language**
CSS	**-**	**Cascading Style Sheet**
IDE	**-**	**Integrated Development Environment**
API	**-**	**Application Programming Interface**
PDF	**-**	**Portable Document Format**

LIST OF ATTACHMENTS

CHAPTER 1:
INTRODUCTION

1.1 Introduction

This chapter will introduce the system that will be developed for the Final Year Project (FYP). The project developed is called the Business Issues Management System (BIMS). It is designed to be used by businesses interested in implementing technology to their operation on handling issues and tasks. This chapter will describe the background, problem statement, goals, scope, importance of the project, expected results and conclusions of the project.

1.2 Project Background

Business Issues Management System will be developed for the use of all sorts of business. Issue management of a business is crucial as it impacts the deliverable of a business. Issues in the term are an unexpected problem with time, labor and financial dependencies that need to be resolved. The problem conventional ways of issue management within a business are it requires a lot of paper usage. People tend to write and pass issues within an organization using paper which is a wastage. Miscommunication between employee can happen because of the unavailable centralized issue log. Unorganized issue management uses email, verbal command, post-it note, which tend to be inefficient and cause a problem. The objective of the Business Issue Management System (BIMS) development is to record, track, and communicate the issue in a business. Moreover, the system aims to assist in organizing task that will lead to efficiency and productivity within an organization. Furthermore, it will allow centralized issues log within a business that can be accessed by the business staff anywhere and anytime. The Business Issue Management System

(BIMS) will be developed as a website. The website will implement the Kanban board as the tool to assist in managing the issue. Also, it will implement calendar for a problem that needed to be resolved. The project aims to help a business to be more organized, efficient, and productive.

1.3 Problem Statements

The problem statement is the description of a faulty condition of the current system. The system's problem needs to be identified as it will set the goals for the future system to be improved. Below are the problem statements of the current system:

a) Tracking and following up issues manually requires more labor.

b) Tasks and issues are not centralized and hard to be access by all employees.

c) Wastage of paper when recording and passing task and issues manually.

d) No proper ways of communicating task in an organization.

e) Hard to keep track important task.

1.4 Objectives

The objectives are the goals set for the development system. It is to specify what product needed to be generated in the early stage, which will have the functionality to its user. Below is the objective of the BIMS:

a) To record, track, resolve, and communicate all task or issue in an organization.

The ability to save, organize and share information will improve productivity and efficiency of a business. Thus, making a business product or service offered to be higher in quality. The platform BIMS will cater for ease in handling tasks

and issues that need to be done in a manner of more reliable and better than conventional ways.

b) To organize issues within a business.

Issues is an unexpected or scheduled matter for every business. It is important to solve and follow up by certain members of an organization to ensure business function. BIMS will enable the organization of issues by implementing Kanban board. This function enable user to drag and drop issue card depending on its priority that will ease the searching of records.

c) To implement centralized issues and tasks within an organization.

Centralized issues and tasks are the ability to interact with issues located in one place. Typically, an employee only keep their task or issue in hand on their own. The system aim to create an environment share their workload and information regarding their business with member of business to remind themselves and their coworker of tasks and issues that need to be completed.

d) To secure data of an organization.

The system also work toward improving personal and data security. An organization data is more secure as it is saved into database instead of using paper. This ease the process of making backup. Furthermore, retrieval of data can be done faster.

e) To improve teamwork within an organization.

BIMS aims to significantly improve teamwork of an organization. The system improve the ability of sharing workload within a business. The system motivate the employees and employer to be hands on of their work.

1.5 Scopes

The scope of a project is part of the planning where determining and documenting specific goals, deliverables, features, function, and task to be done. Moreover, it defines what needs to be achieved in a project.

1.5.1 Users

The user scope is the functionalities that are design to the user based on role assign in the system. Below are the user scope to be develop:

i. Business

- User can be an administrator or owner of a business. User who will organize by adding, updating, and deleting the board in the organization that will use the system. Also, business owner has the authorization to update and remove employee user.

ii. Employee

- User is an employee of a business which will use the system assigning and communicating task and issues within their department on the Kanban board.

1.5.2 Functionality

The functionality scope is the features to be developed in the system. The functionality is defined in the planning stage as it create the boundary for the system to be complete. Below are the functionality scope to be develop:

a) Authentication module

- Verify the user who logged into the system. This function is built to improve the data security and ease the data collection of the application. This module include registration, retrieve forgotten password and login activity.

b) Dashboard module

- User can view their personal information. The performance of managing issue or completing task can be access in this module.

c) Board module

- Real-time issue logger which displays in the module. User can interact with the board if assigned to the board. Each board module will have their own Kanban board which only the business owner can create. The progress of the issue is shown in the Kanban board.

d) Task module

- User can create task to set them a reminder of what to do in their business operation. The task start date and due date will later be shown in the calendar which will assist user in reminding them of the task in hand.

1.6 Project significance

Without a doubt, managing a task requires a lot of effort, time, and discipline for a business to operate at its peak performance. The conventional issue management skill lacks communication and not optimal. BIMS system is a solution for the repetitive process of passing a note to be replaced with a technology implemented system. For the same reason, the user will have no worries about communicating their task with their workplace, and less misinformation can be avoided. An organization can view all the incomplete, in progress, and completed task on the global Kanban board made

available. Additionally, everyone in the organization can view the board anywhere and anytime by accessing it on the internet.

1.7 Expected Output

BIMS will be developed as a web-based application. A website that assists the user with managing tasks and issues in an organization. The website has user authentication functionality, a dashboard to monitor performance, a board that implement Kanban board for each department of the business, and a task module for a personal task tracker. The system will be available anywhere, anytime with an internet connection as it is hosted on a server. This system will improve the remote mode of working and communicating within a business.

1.8 Conclusion

In summary, BIMS is a solution to problem of managing task and issue of an organization creating an efficient and productive working environment that can be monitor from afar. The next chapter will be discussing the fact and finding of the domain, existing system. Moreover, the project methodology, requirements, schedule, and milestones will be discussed.

CHAPTER 2:
LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter will expose the literature review of the system that will be used to develop Business Issues Management System (BIMS). This chapter will describe the project domain, existing system, technique, methodology, requirements, schedule, and milestones that need to be analyze before developing the system.

2.2 Facts and Findings

Fact-finding is a process of collecting information about system problems and preferences. There is a lot of fact-finding technique which can be implemented such as research, meetings, interviews, questionnaires, sampling, and other processes to gather or collect data. In this project, fact-finding is done by implementing the observation method. The existing system is observed, and finding is examined and recorded in this chapter.

2.2.1 Domain

The domain of the Business Issues Management System (BIMS) is web development. Web development is the task of creating a website, maintaining, and updating. Also, web development involves building the front-end pages and back-end server-side code that connect the web system to the database and the system's front. Since the introduction of the world wide web, web development has been improving in design, user interaction, data handling. Website has been implemented in many ways, such as advertisement, e-commerce, management and many more.

Implementing the project as web development enable the system to be used in multiplatform with the terms of the device has an internet connection and able to use the web browser.

2.2.2 Existing system

Existing system is system that has already available and being use at the time. A lot of issue management system is already available in the world wide web. The focuses of the analysis for the existing system is by searching for issues and task management system. The system Trac which has the similar requirement as the proposed system is analyze and compared.

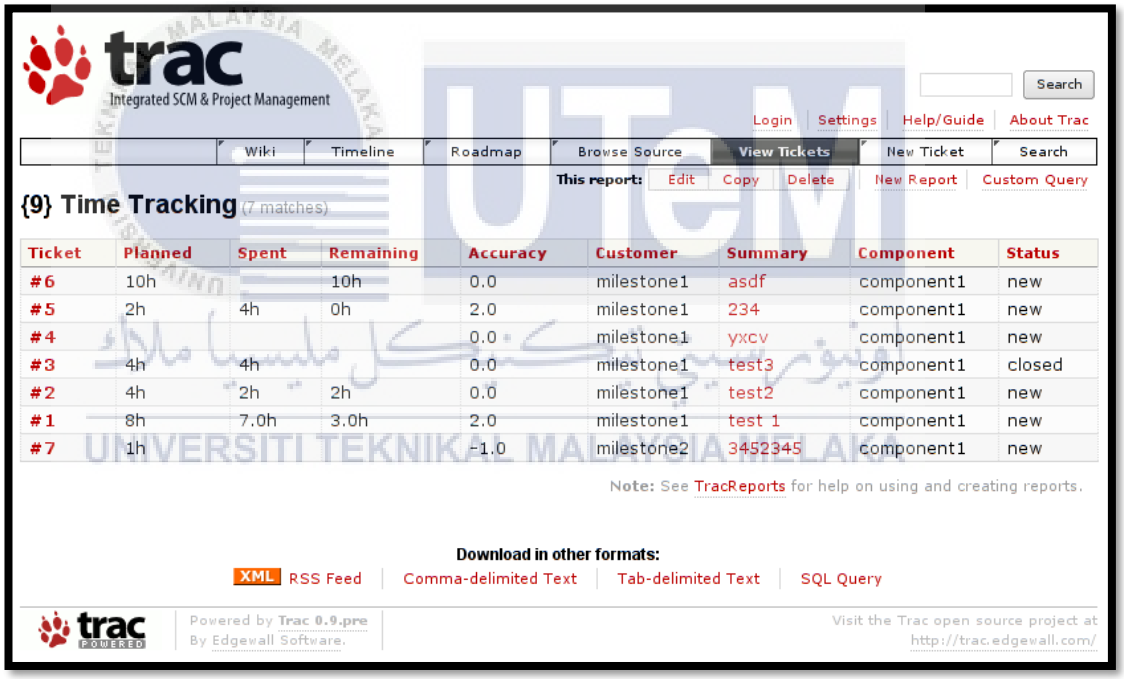

Figure 2.1 Trac ticketing system

Trac is an open-source project management and issue tracking system used by several businesses, including WordPress, OpenStreetMap, and Django. It employs a basic approach to web-based software project management and includes a built-in wiki and reporting capabilities. (Edgewall Software, 2020)

2.2.3 Comparison of development tool.

Table 2.1 Development tool comparision between Trac and BIMS.

Development tools	**Trac**	**BIMS**
Programming language	Python	JavaScript
Database	SQLite, PostgreSQL, MySQL	MongoDB
Designing template	Jinja2	ReactJS

2.2.4 Comparison of features.

In Trac, issues are referred to as "tickets," and the ticket management system in Trac may also be used to handle tasks. Trac is applicable to all major operating systems and various cloud hosting services. Although Trac's documentation is very comprehensive, compared with commercial products such as JIRA, its support still has many shortcomings.

Table 2.2 Feature comparison between Trac and BIMS.

Features	**Trac**	**BIMS**
Assigning issue	Tickets are created and assigned to member of the project.	Issues are created and can be accessed by members assigned of the organization to be followed up.
Team communication	Focusses on project task and issues assignment	Focusses on business operation task and issues assignment.

2.2.5 Technique

There are many methods for implementing the System Development Life Cycle (SDLC) throughout the system development process. The System Development Life Cycle (SDLC) is a conceptual model that entails several stages that must be

completed in order to create a system. Planning, analysis, design, implementation, testing, and maintenance are the phases of the SDLC. Waterfall development methodology

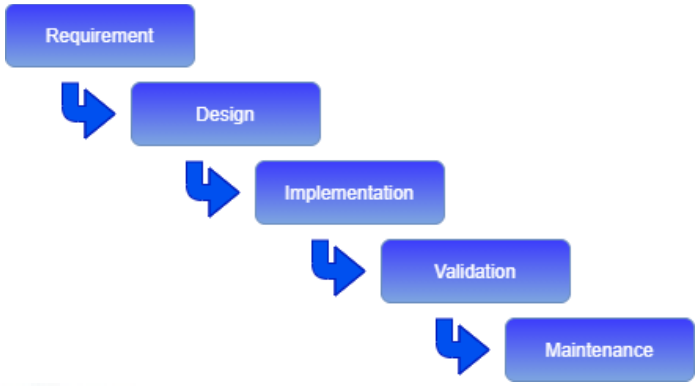

Figure 2.2 Waterfall development life cycle.

The waterfall model was created to assist developers in the software development process. This model will assist developers through the process of developing software. The model originated due to the form of its processes, which mimics that of a waterfall. By using this approach, the project will be divided into many phases, each of which must be finished before continuing to the next step. **(**Sommerville**,** 2016**)**

The advantage and disadvantage of implementing waterfall model is taken account for the development of the system.

Table 2.3 Advantages and disadvantages of waterfall model

Advantages	Disadvantages
To avoid requirement modifications, precise needs are specified early in the process before proceeding to the next phase.	Before proceeding to the next step, the previous one must be accomplished.

Communication is made easier by the fact that it is simple to use and comprehend.	The time required for each step is unusually long, which may cause the project to be delayed.
Detailed descriptions of all phases assist new members of the development team in understanding the project and carrying out the assignment.	As users do not offer timely feedback, user participation in the project is extremely low.

The waterfall model is a popular choice for developers since it is straightforward and simple to comprehend. A thorough explanation of each step enables new members of the development team to get a better understanding of the program and complete tasks more rapidly. Due to the waterfall model's inherent lack of backtracking throughout the development stage, using it to build a website would incur significant costs.

2.2.5.1 Agile development methodology

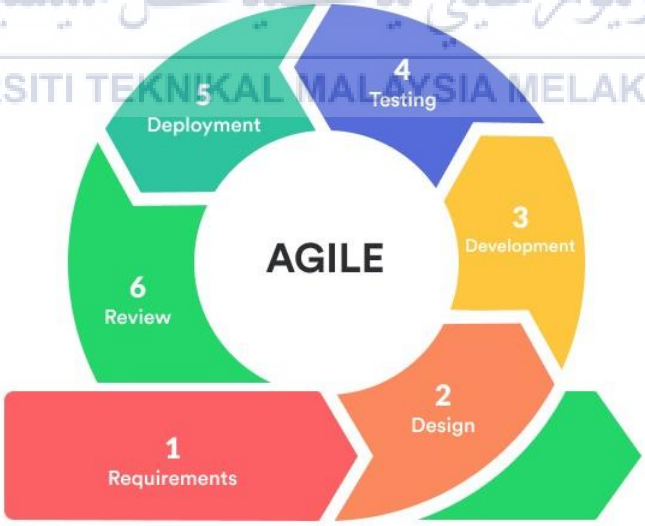

Figure 2.3 Agile development life cycle

Agile development is an incremental process in which tiny increments are made and the newest version of the system is usually developed and delivered to clients every two to three weeks. They include consumers into the development process to get timely input on changing customer requirements. They reduce paperwork by communicating informally rather than via formal sessions accompanied by written papers. (Sommerville, 2016).

Table 2.4 Advantage and disadvantage of agile development.

Advantages	Disadvantages
Enable deployment of software quicker.	Documentation is prone to becoming sidetracked, making it difficult for new members to come up to speed.
Requires less resources.	Since progress spans through multiple cycles, it is more difficult to monitor than the waterfall approach.
Immediate feedback from client where improvement need to be applied.	While programmers and consumers must continuously interact with each other, Agile demands everyone to devote more time and energy.

Single-phase software development might take anything from 6 to 18 months. All requirements gathering and risk management aspects are initially foreseen in single-stage development. Viable products frequently provide feedback to the agile software development process. Within 1 to 4 weeks of iteration, a usable product is delivered. When developing in a collaborative environment, Agile approach works best.

2.2.5.2 Spiral Development Methodology

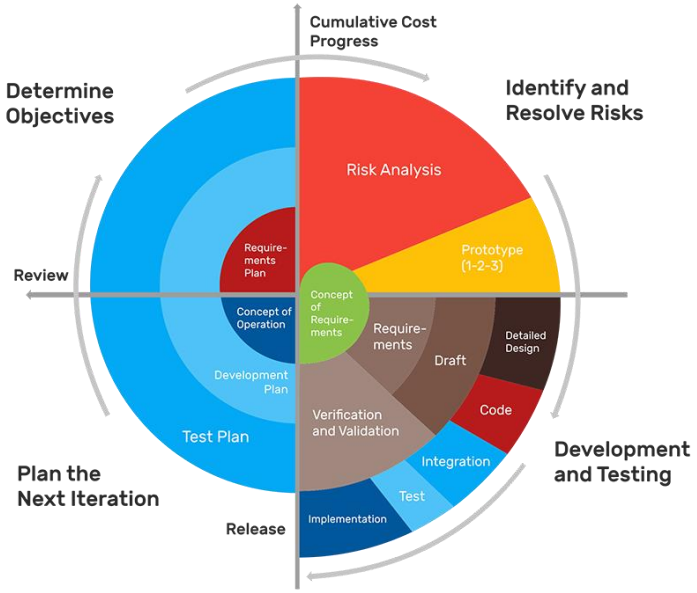

Figure 2.4 Spiral development life cycle

The spiral model is a risk-based approach to software development. It's a cross between the waterfall and iterative approaches. The Spiral Model allows software development components from multiple process models to be included into a software project based on unique risk patterns, ensuring a smooth development process. (PAL, 2020).

Table 2.5 Advantage and disadvantage of spiral methodology.

Advantages	Disadvantages
Changes or additional features can be made at a later stage.	Risk of not meeting the schedule or budget of a project.
Cost estimation is made easier because the construction of the prototype is done in small pieces.	Spiral development works best for large projects that only require risk assessment expertise.
Continuous or repeated development helps in risk management.	For proper operation, the protocol of the spiral model should be strictly followed.

Each stage of the software engineering spiral begins with a design objective and concludes with an evaluation of the customer's progress. The spiral approach is best

suited for big projects with regular releases. In the case of the BIMS project, the period is too short to be incorporated in the spiral model life cycle.

2.3 Project Methodology

The chosen methodology for the project Business Issue Management System is agile methodology. The rapid application development cycle that derived from agile software development methodology which prioritizes rapid prototype iteration and release is crucial since timeframe to complete the project is short. The benefit of implementing rapid application development methodology is the flexibility and adaptability during system development.

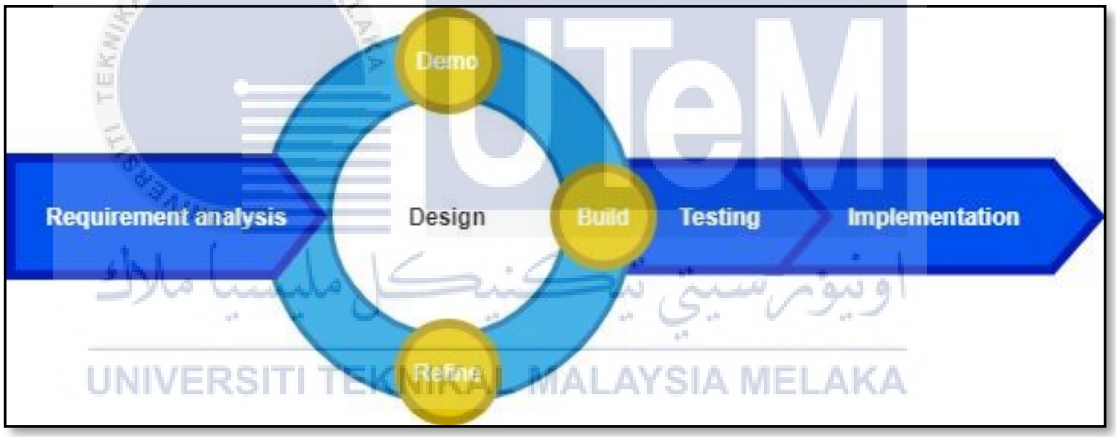

Figure 2.5 Rapid development life cycle.

There are four steps in the Agile rapid application development technique, including requirements planning, design, testing, and implementation. The focus of RAD on reducing the planning step and focusing system development allows for this fast-paced application development.

For the first phase which is requirement planning, it is equivalent to a project scoping meeting. Throughout this stage, the project's goals and expectations are established, as well as any current concerns that will need to be handled during

development. This stage involves researching the problem, defining the requirement for the project and to developers need to finalize the requirements. Although the planning phase is shorter than in other project management approaches, it is nevertheless an important stage in the project's completion to be quick.

The second phase is design which involves building, refining, and demoing a prototype. It is considered as the production of the project where the developers work to produce a satisfying project. The prototype is tested iteratively as it refines the software until the software meet the expectation.

For the third phase named as testing of the completed product is used. In this phase, the prototype of the product from the design phase is converted into a processing model. Plus, developers can construct the final working model more quickly since most of the problem and changes have been managed during the design phase. Rapid preparation, program development, coding, testing, and integration are the processes that need to go through during the phase. Both need to ensure that the project is excellently made to satisfy the expectation and qualification.

The fourth phase is referred to as implementation. The finished product will be released at this point. Data translation, testing, and migration to the new system, as well as user training, are all part of the project. The system's usefulness can be tested by both developers and users. Furthermore, adjustments can still be made during this stage. This is where the project's launch phase takes place.

2.4 Project Requirements

Project requirement is a description of the work that needs to be done. It is a condition that ensure the success or completion of the project.

2.4.1 Software Requirement

The software required to run the Business Issue Management System are as follow:

Table 2.6 Software requirement for user.

Description	**Tools**
Operating system	Windows 7 or newer
Internet browser	Mozilla Firefox version 70 or newer

The software required to develop the Business Issue Management System are as follow:

Table 2.7 Software requirement for developer.

Description	**Tools**
Operating system	Windows 7 or newer
Internet browser	Mozilla Firefox version 70 or newer
Code editor	Visual Studio Code
Database	MongoDB
User interface design	Material UI
Hosting server	Heroku
JavaScript package library	npm
JavaScript environment	Node.js

2.4.2 Hardware Requirement

The hardware required to run the Business Issue Management System are as follow:

Table 2.8 Hardware requirements for user.

Description	Minimum requirement
Processor	2.0GHz or faster processor
Memory	1GB or higher
Storage space	5GB of available storage
Graphics	DirectX 9 or higher

The hardware required to develop the Business Issue Management System are as follow:

Table 2.9 Hardware requirements for developer.

Description	Minimum requirement
Processor	2.5GHz or faster processor
Memory	4GB or higher
Storage space	10GB of available storage
Graphics	DirectX 9 or higher

2.4.3 Other Requirements

Table 2.10 Other requirements to develop system.

Description	Tools
Image editing	Adobe Photoshop 2020
Screen recorder	Open Broadcaster Software
Word processing application	Microsoft Office

2.5 Project Schedule and Milestones

Project schedule and milestones is an organized project tasks and milestones on a timetable. Project scheduling is to control the resources and deliverables is accounted during the project development. It is essential for delivering project on time and within budget.

2.5.1 Gantt chart

A Gantt chart is a visualization that helps plan, manage, and monitor specific tasks and resources in a project. Gantt charts are used to illustrate the project timeline. Below are the Gantt chart for the proposed project:

TASK	WEEK													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Proposal														
Project introduction														
Literature review														
Project methodology														
Project Analysis														
Project Design														
Project Implementation														

Figure 2.6 Gantt chart of BIMS project.

2.5.2 Milestones

A project milestone is a describe the point in a project scheduling. This point consist of the start and due date of a project or major phase in project development (Westland, 2020). The proposed project starts at 15/3/2021 and there are milestones that need to be completed before the due date.

Table 2.11 Milestones of BIMS project.

No	Milestone	Start date	Due Date
1	Proposal documentation	15/3/2021	25/3/2021
2	Project proposal submission	15/3/2021	26/3/2021
3	Project introduction documentation	27/3/2021	7/4/2021
4	Project development start	7/3/2021	20/6/2021
5	Literature review documentation	8/4/2021	18/4/2021
6	Project methodology documentation	19/4/2021	25/4/2021
7	Project analysis documentation	26/4/2021	2/5/2021
8	Project design documentation	3/5/2021	23/5/2021
9	Project implementation documentation	17/5/2021	20/6/2021

10	Project demo	21/6/2021	27/6/2021
11	Project testing	27/7/2021	22/8/2021
12	Final project presentation	30/8/2021	5/9/2021

2.6 Conclusion

In summary, a comparison of the existing domain and system is described in this chapter. BIMS will be an upgraded version of Trac system. BIMS is the most important task and problem visualization goal of an enterprise. In addition, SDLC used for system development is very flexible as it focuses on rapid product release and system development. In addition, project requirements, planning and milestones are made to control the development of the system. The next chapter of this report will deal with systems analysis. This includes issues, requirements, data, functional, non-functional, and other analyzes.

CHAPTER 3:
ANALYSIS

3.1 Introduction

The analysis section is where direction of the project will be identified. The requirement gathering is elaborated in this section.

3.2 Problem Analysis

a) Tracking and following up issues manually requires more labor.

Tracking and following-up issues are of exchanging information of the issue in a business operation. Typically, a meeting is conducted to discuss the issue and requires an individual to constantly remind the person who is assigned to solve the issue, which needs more effort. Information of the critical issue may get lost and unattended by the worker if no clear visualization of the issue progress.

b) Task and issue is not centralized and hard to be track by all employees.

The absence of centralized tasks and issues logger may cause problems and delays in a business. Centralized tasks and issues are where all the business keep and exchanges their task and issue. Without system that exchange, information is lost because the information is passed via verbal, email, text, or any other information-sharing platform. Furthermore, without a centralized log for issue and task will create confusion for the worker and communication error.

c) Wastage of paper when recording and passing task manually.

The conventional ways of tracking issue are by writing issue on books or post-it note which is a wastage of paper. An issue or task recorded on a post-it note is then thrown away after the issue or task is complete. The habit of paper wastage will cause the increase of deforestation and eventually global warming.

d) No proper ways of communicating task in an organization.

Communication within a business is essential in a business. Communication is a process of sharing information. It improves the productivity and quality of a business. Without effective communication within a business, the operation will be delayed and inefficient.

e) Hard to keep track important task.

A task is an activity that needs to be done. It requires a lot of reminders from self or others in verbal, message or written as consideration of time is required. Without the constant reminder and assist of technology, the task could get lost or delayed.

3.3 Requirement Analysis

Requirement analysis is the process of determining system goals for new or updated software. The services or features that a system should deliver, as well as the limitations on its functioning, are described in a system's requirements analysis. These specifications represent a customer's need for a system that does a certain task, such as operating equipment, placing orders, or locating information. (Sommerville, 2016)

3.3.1 Data Requirement

Data requirement is a process to identity, prioritize, precisely formulate, and validate the data needed to create an effective system. Data model is used to visualize the flow of data requirement.

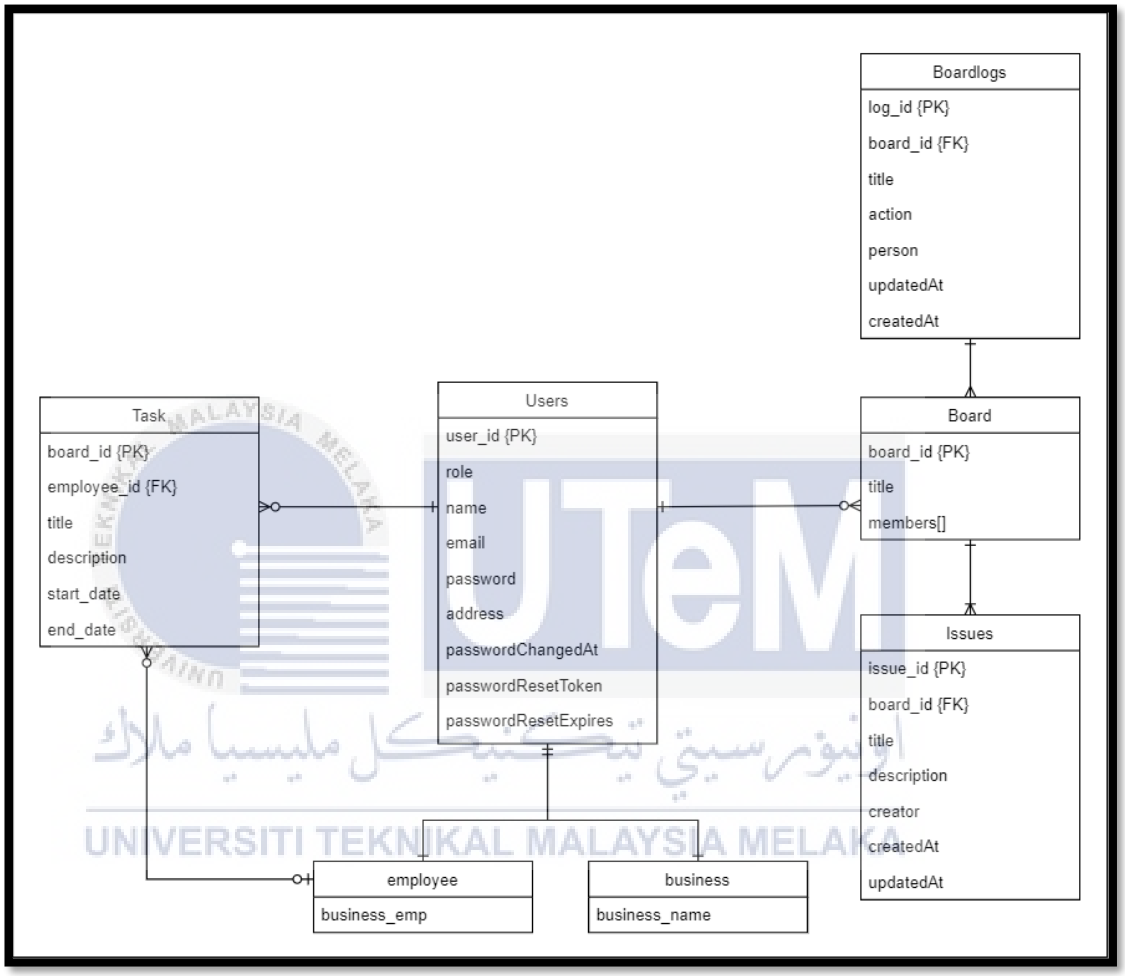

Figure 3.1 Data model of BIMS.

3.3.2 Functional Requirement

Functional requirements describe the system's services, how the system should react to inputs, and how the system should behave on the system.

Table 3.1 Functional requirement of BIMS.

No.	Functional requirement description
FR 1	All users should be able to create issue.
FR 2	Issue in a board can be move to progress and review by board member.
FR 3	Only user with business account can interact with review and complete issue.
FR 4	Only user with business account can manage employee.
FR 5	Every board will be able to generate report by the business account.
FR 6	Business account can create and assign task to employee account.
FR 7	Calendars can be generated based on the task of an employee account
FR 8	Generate log of board action from all users.

3.3.3 Non-functional Requirement

Non-functional requirements describe the constraints on the services or functions offered by the system, such as timing constraints, conditions on the development process, standards, etc.

- **Efficiency**

  The system can perform create, read, update, and delete to its database 99% without failure.

- **Security**

  Authentication check on user logged in id is perform on every page and if no user account is logged in, the router of the webpage redirect user to login page.

- **Availability**

  The system must be consistent in its execution of functions in real time, with no errors or delays.

- **Usability**

  The system can be executed in all type of web browser system and have mobile phone size compatibility.

- **Performance**

  The system supporting 5 thousand users per hour must provide 6 seconds or less response time.

3.3.4 Other Requirement

- Licensing

  Most of the application used in the development of the BIMS is open-source software and available to be download online without hassle.

3.4 Conclusion

In summary, the problem statement and system requirement for BIMS is describe in this chapter. It is important to have unclouded vision of the problem statement and system requirement as it set the goal of what the system need to achieve in deployment. The next chapter will be discussing the system design for BIMS.

CHAPTER 4:
DESIGN

4.1 Introduction

In this chapter, analysis from preliminary design and the result of the detailed design are defined. In design phase of the development of the system BIMS is to define software methods, functions, objects, overall structure, and interaction to satisfy requirement as stated in the previous chapter.

The design chapter include three level of design which is interface, architectural, and detailed design. The prototype of the system user are developed to ease the explanation of user interface interaction. Moreover, package diagram is used to describe the grouping between hierarchical relationship between package and object along with unified modelling language. Other than that, the conceptual, logical, and physical database design is drawn to describe the database and its dataflow.

It is important to document design well as it will benefit the software development. The development of software become more flexible, reusable, and understandable if the design is documented well.

4.2 High-Level Design

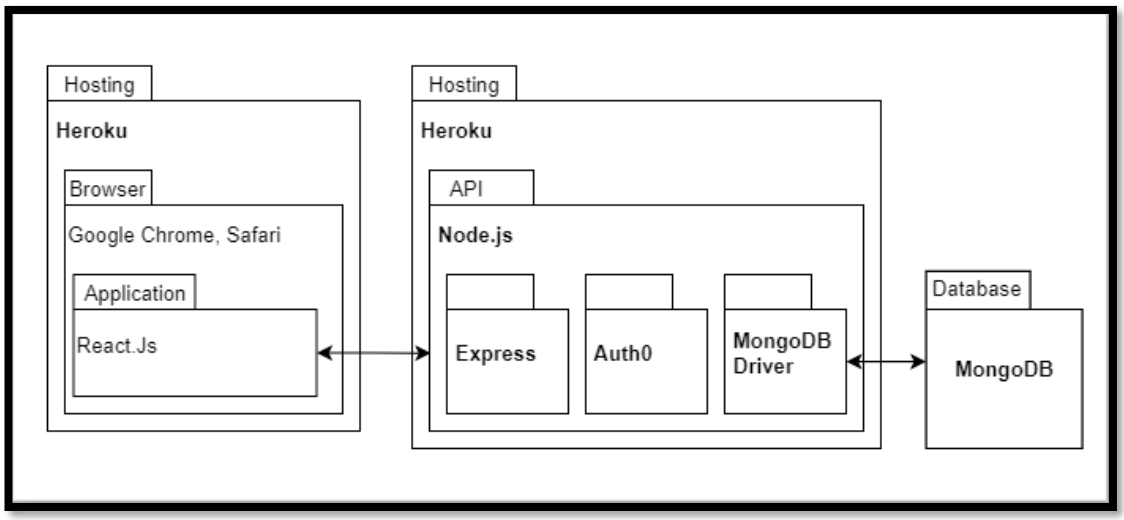

Figure 4.1 Deployment architecture of BIMS.

High-level design supplies an overview of the system, service, or process. It is important during the development of a project to have a clear design that supports each component as it ensures the compatibility of each component to build a complete system. BIMS use 3-tier architectural pattern which include front-end display, application tier and database tier.

The BIMS will be comprised of several components, The application will be developed using React.js framework and MongoDB as the application backend. React.js will deployed on hosting to enable client accessing the website using internet browser. MongoDB enable the retrieve, delete, and update of the database. The React.js will send data through Data Access Language and redirected by express to the MongoDB driver which is mongoose to interact with database. Both front-end and backend of the system is deployed in the hosting website which is Heroku to enable data access using the internet.

To conclude, the system implement the component as it is compatible with each other. This system implements the MERN development stack which is MongoDB, Express, React, and Node. The application is build using JavaScript programming language and JSON oriented database.

4.2.1 System Architecture

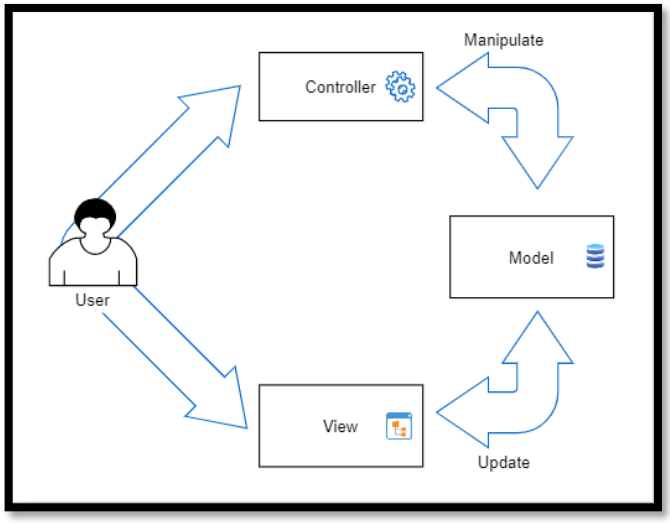

Figure 4.2 Model view controller design

Model-view-controller as its software design pattern commonly used for designing and developing a web application. It is commonly used for developing user interfaces that divides the related program logic into three interconnected components.

BIMS implements the design of MVC for its web application. As for the model, the component is responsible getting and manipulating data for the frontend of the web application. The model of the data is created with mongoose package, which enable interaction between the web application and MongoDB database. After that, the view is responsible for displaying resources to the user. This consist of HTML, CSS, and template engine. The templating engine use in the development of BIMS is React. Moreover, controller accepts input and convert it into command for the model or view. The controller interact with both model and view to make the system communicate with each other.

Nowadays, MVC has been widely adopted as for designing web application. MVC framework implement thin client approach that the model in a server. The client of the system sends either hyperlink request or form submission to controller as an interaction with the webpage.

4.2.2 User Interface Design

a) Navigation Design

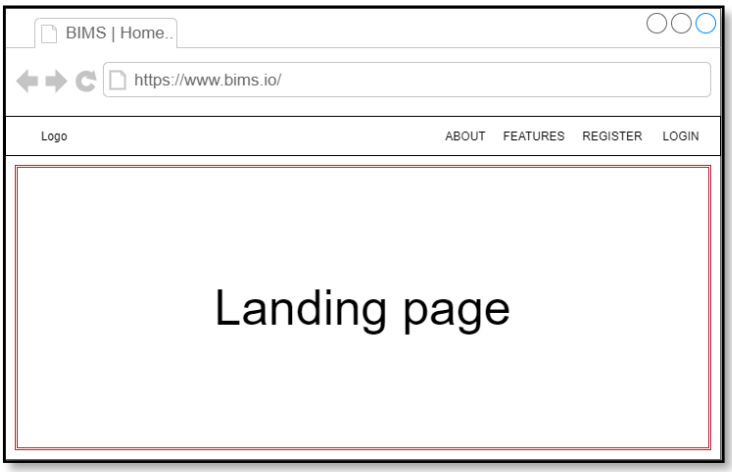

Figure 4.3 Navigation bar of landing page.

Navigation of the landing page uses toolbar which all the navigation appear at the top of the page. From the landing page, user can navigate to about, features, register and login.

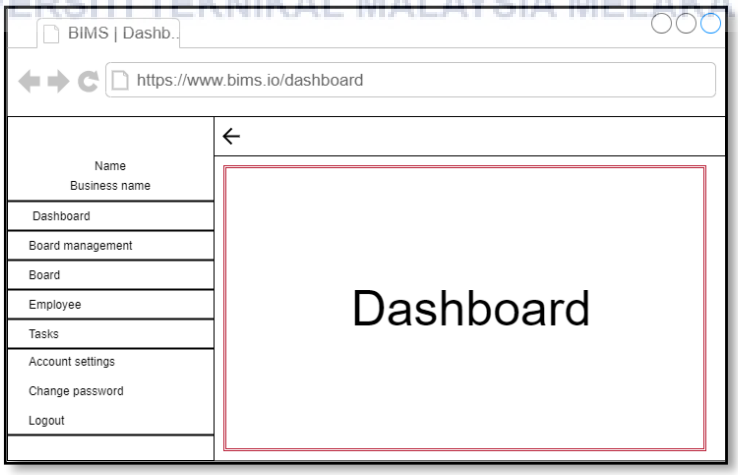

Figure 4.4 Navigation drawer of business owner account.

Navigation of the business role uses drawer which all the navigation appear at the left of the page. This page appear after user are logged into the system using a

business account. Dashboard will appear on login and navigation to board management, board, employee tasks, account settings, change password and logout can be access from the navigation.

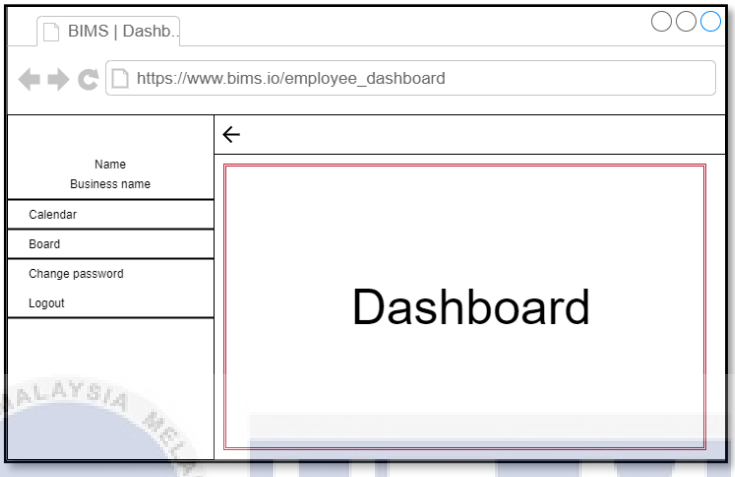

Figure 4.5 Navigation drawer of employee account.

Navigation of the employee role uses drawer similar with the business role which all the navigation appear at the left of the page. This page appear after user are logged into the system using an employee account. Dashboard will appear on login and navigation to calendar, board, change password and logout can be access from the navigation.

b) Input Design

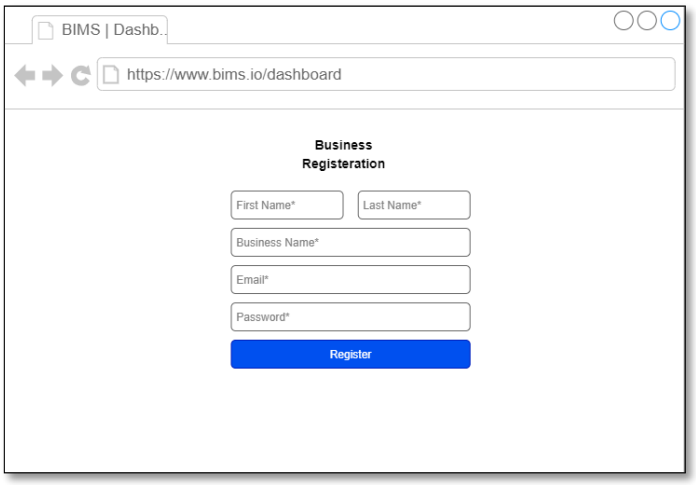

Figure 4.6 Registration of business.

This page is to register user with business role. The form will need data to complete the registration. This include requiring first name, last name, business name, email, and password of the organization. It can be access at the landing page and choosing to register.

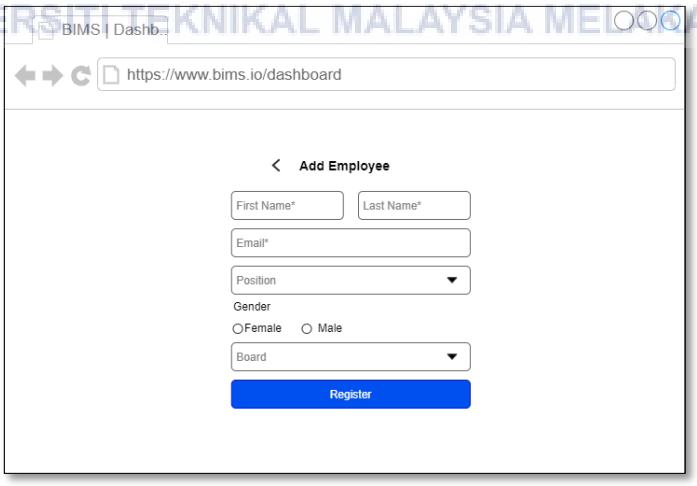

Figure 4.7 Registration of employee.

This page is to register user with employee role. The form will need data to complete the registration. This include requiring first name, last name, email, position,

gender, and board assignment of the organization. It can be access at the landing page and choosing to register. The page can only be done by business owner.

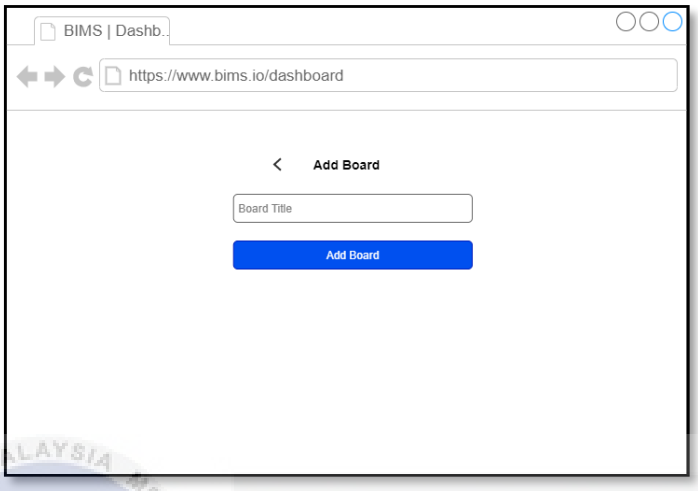

Figure 4.8 Adding board within a business.

This page is to add board in a business. The form will need board data to complete the board. It can be access at the navigation of board management. The page can only be done by business account.

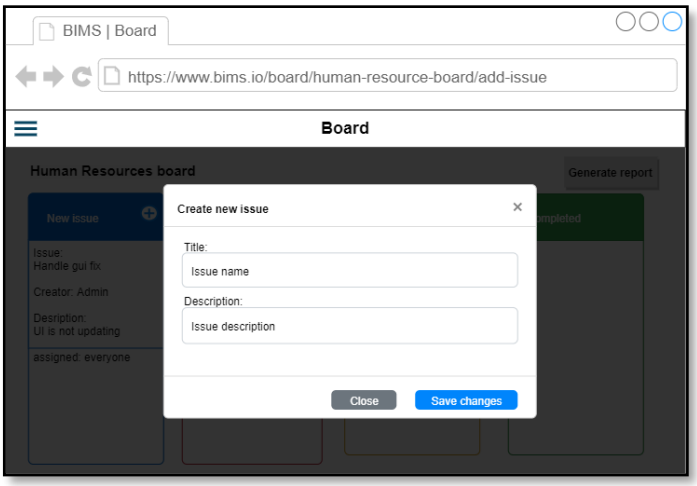

Figure 4.9 Creating an issue within a board.

This page is to add issue in a board. The form will need issue data to complete the board. It can be access at board. Business and employee can interact using the issue within the board.

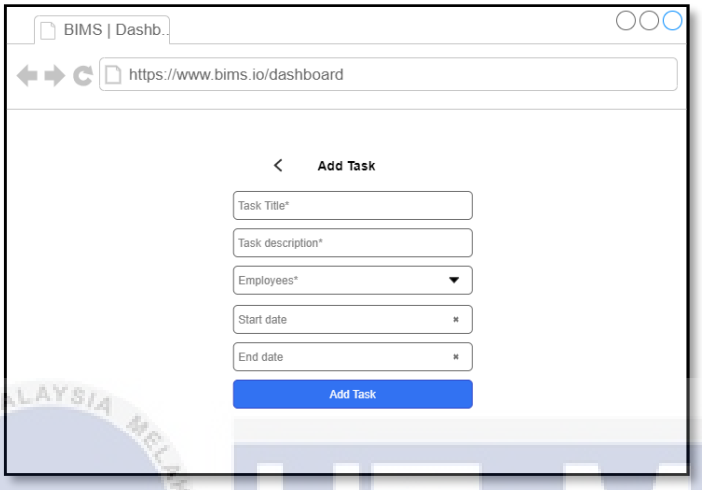

Figure 4.10 Creating and assigning task to employee.

This page is to add task and assign it to an employee. The task then appear on assigned employee calendar.

c) Output Design

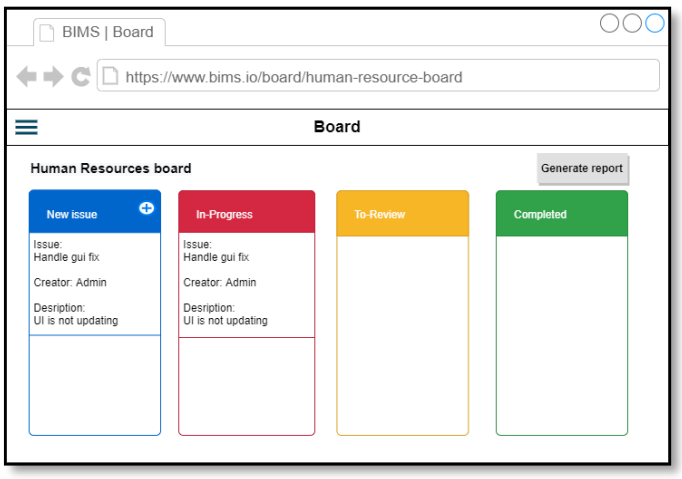

Figure 4.11 Output of board.

This page will have Kanban board. All board can be accessed by the business owner account and employee can only accessed to their assigned board. Issue in a board can be created and interacted by the user. Reviewing and completing an issue can only be done by the business owner.

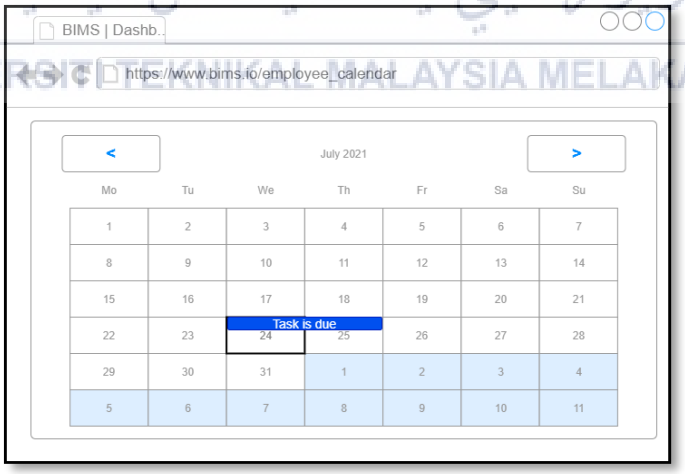

Figure 4.12 Calendar generated by BIMS for employee.

This page will have calendar on it with the assigned task of an employee. It can be access after employee logged it to the system. All tasks are managed by the business owner.

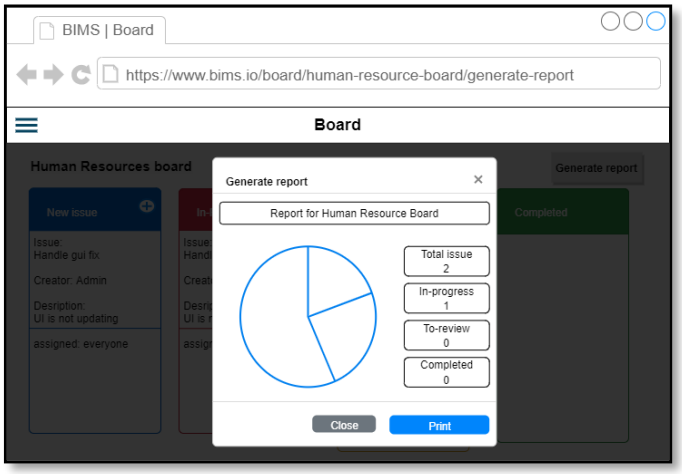

Figure 4.13 Report of an individual board

This output will have generated the statistics of a board. This can only be done by the business owner. Business owner can generate the statistic of the selected board by clicking on "Generate Report" button in board page. Also, printing of report can be done once the report is generated.

4.2.3 Database Design

Database design is the process of organizing data according to the database model stated on previous chapter. The data stored and its relationship are determined. There are three database designs in this documentation, which is conceptual, logical, and physical design. Conceptualization is a process of building a data model to use, independent of any physical considerations. Additionally, logical design is the process of building a data model for use in a business based on a specific data model, but independent of a particular DBMS and other physical considerations. Moreover, physical design are the database query statement of the actual input and output process.

4.2.3.1 Conceptual and Logical Database Design

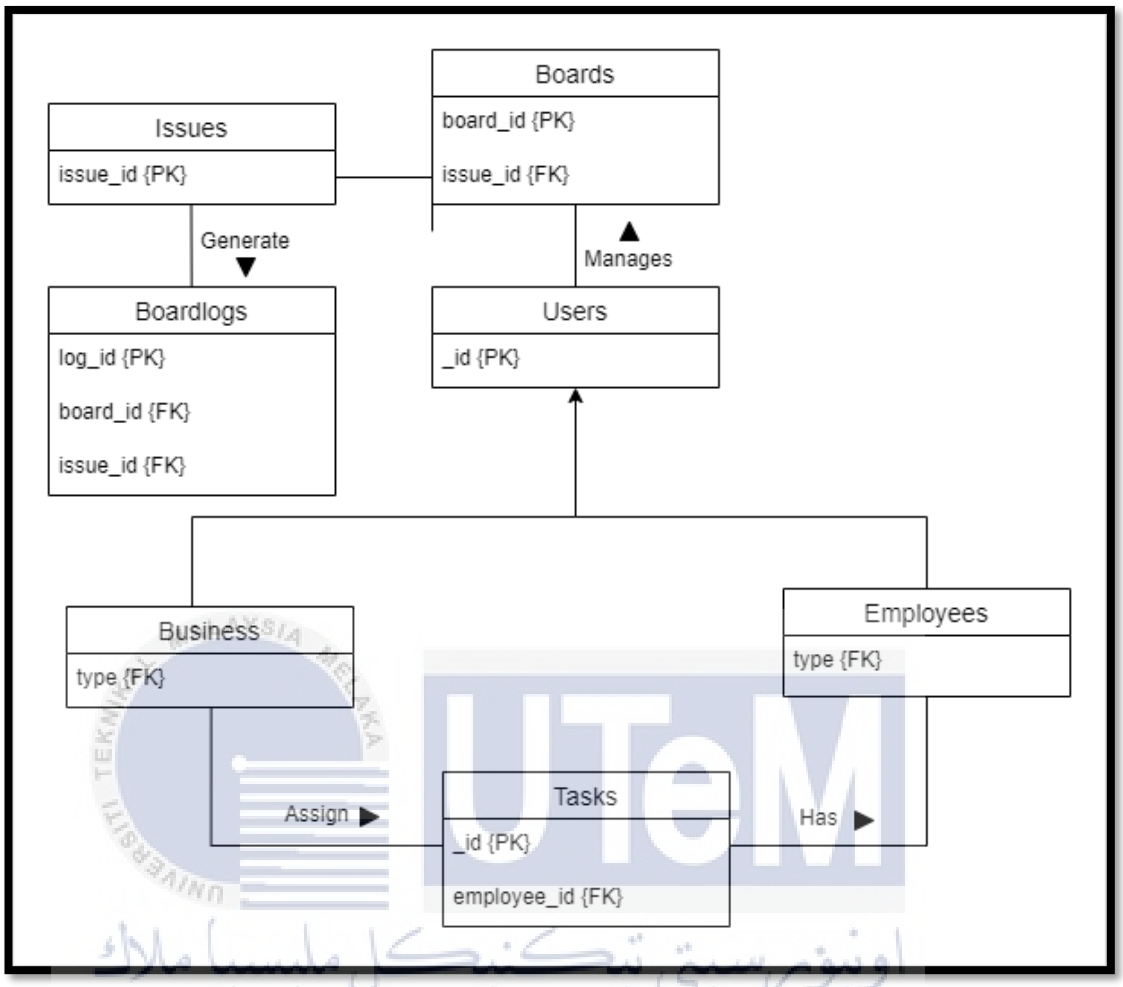

Figure 4.14 Conceptual database design of BIMS.

Table 4.1 Users data dictionary

Column	Data type	Description	PK	FK	Required	Length
_id	varchar	Identification number of users.	Y	N	Yes	25
type	number	Type of account.	N	N	Yes	1
email	varchar	Email of the user account.	N	N	Yes	100

password	varchar	User password that has been encrypt.	N	N	Yes	100
createdAt	Date	Date of user account creation.	N	Y	Yes	50
updatedAt	Date	Date of user account update.	N	N	No	50

Table 4.2 Business data dictionary

Column	Data type	Description	PK	FK	Required	Length
_id	varchar	Identification number of businesses.	Y	N	Yes	25
first_name	varchar	First name of the business owner.	N	N	Yes	50
last_name	varchar	Last name of the business owner.	N	N	Yes	50
business_name	varchar	Business name.	N	N	Yes	100
user_id	varchar	Identification number of users.	N	Y	Yes	25

Table 4.3 Board data dictionary

Column	Data type	Description	PK	FK	Required	Length
_id	varchar	Identification number of business.	Y	N	Yes	25
title	varchar	Name of the board.	N	N	Yes	100
business_id	varchar	Identification of the board owner.	N	Y	Yes	25

Table 4.4 Issue data dictionary

Column	Data type	Description	PK	FK	Required	Length
_id	varchar	Identification number of issues.	Y	N	Yes	25
title	varchar	Name of the issue.	N	N	Yes	100
business_id	varchar	Identification of the board owner.	N	Y	Yes	25
created_at	date	Date of the issue created	N	N	Yes	20
creator	varchar	Issue creator full name	N	N	Yes	100

Table 4.5 Task data dictionary

Column	Data type	Description	PK	FK	Required	Length
_id	varchar	Identification number of tasks.	Y	N	Yes	25
title	varchar	Name of the task.	N	N	Yes	100
description	varchar	Description of the task.	N	N	Yes	150
start_date	date	Start date of the task.	N	N	Yes	30
end_date	date	End date of the task.	N	N	Yes	30
employee_id	varchar	Identification of the employee.	N	Y	Yes	25

4.3 Detailed Design

Detail design is the design of the software's content. Detailed design work includes detailed specifications of the classes, their relationships, and their interactions. Templates must contain sufficient information to permit their use as a program specification.

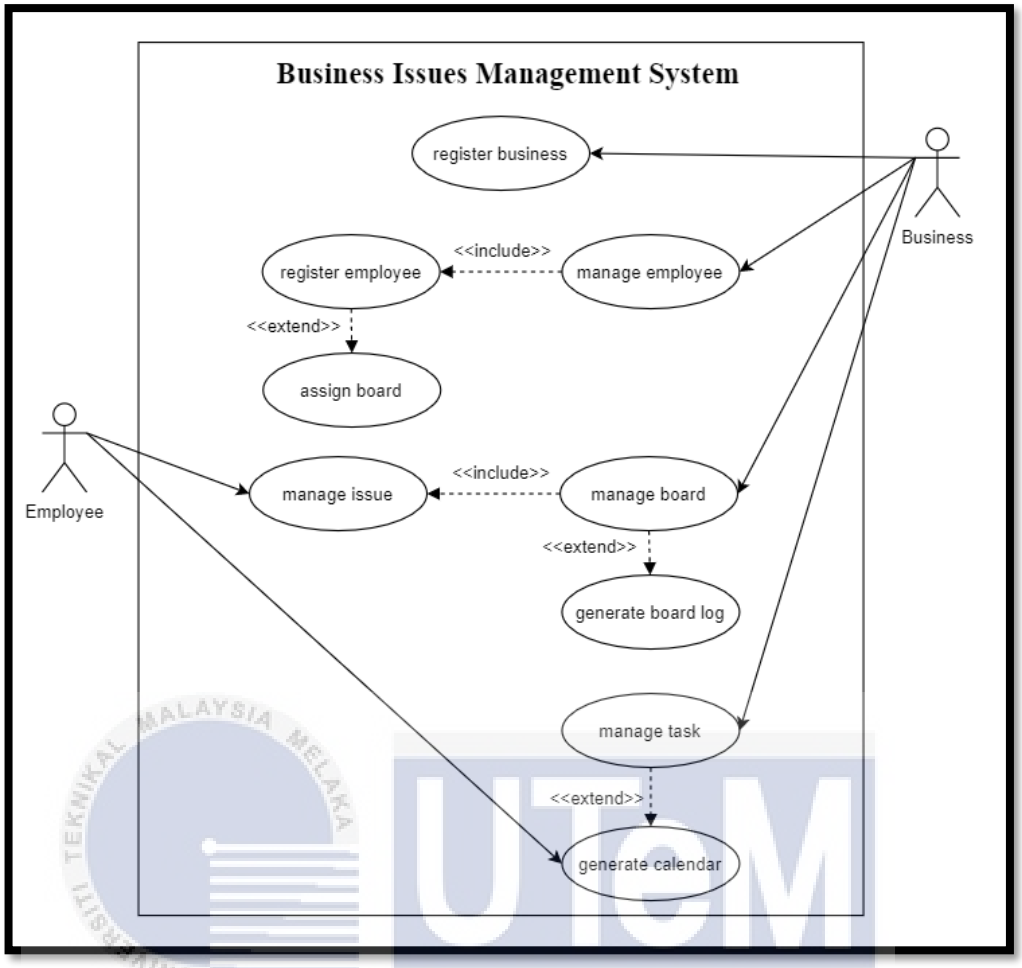

Figure 4.15 Use case of BIMS

4.3.1 Software Design

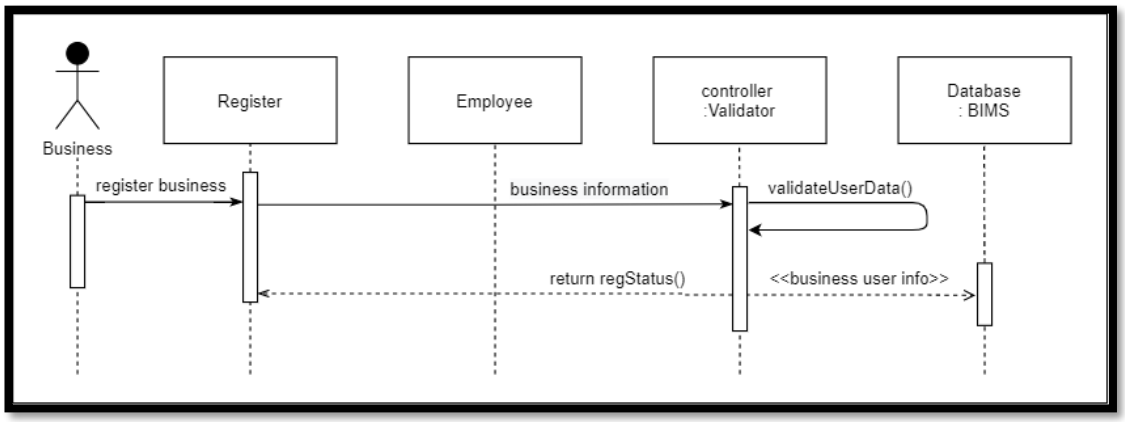

Figure 4.16 Register business sequence diagram.

A business must register to the system to use the system. Registration can be done on the registration page. After the registration is completed, it is wise to add employee of the business as it will improve the experience in using the system.

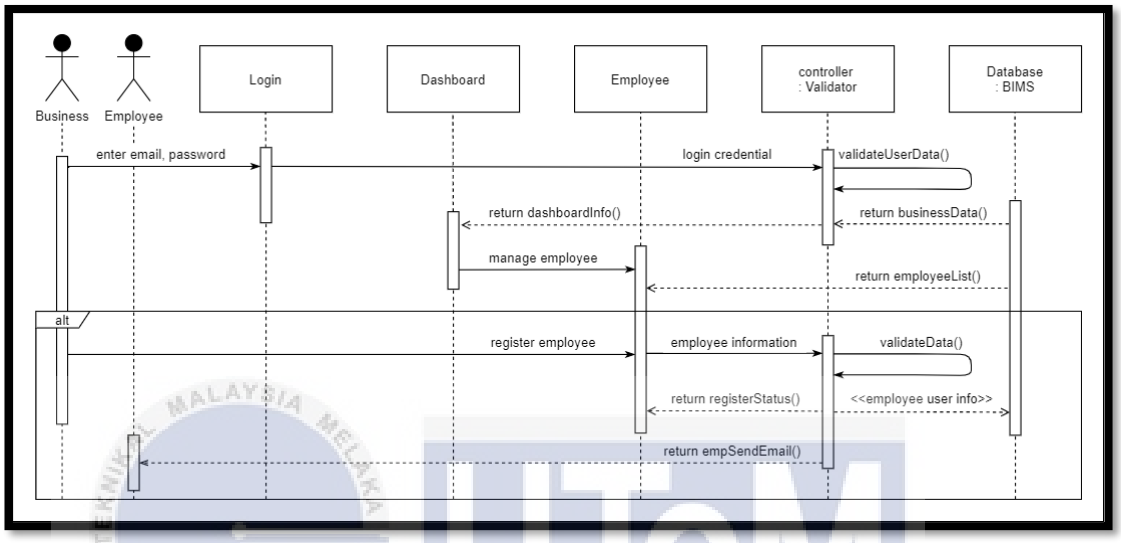

Figure 4.17 Manage employee sequence diagram.

Managing employee enable a business to add, edit and remove employee. The employee later will interact with the system to use board and task they are assigned by the business.

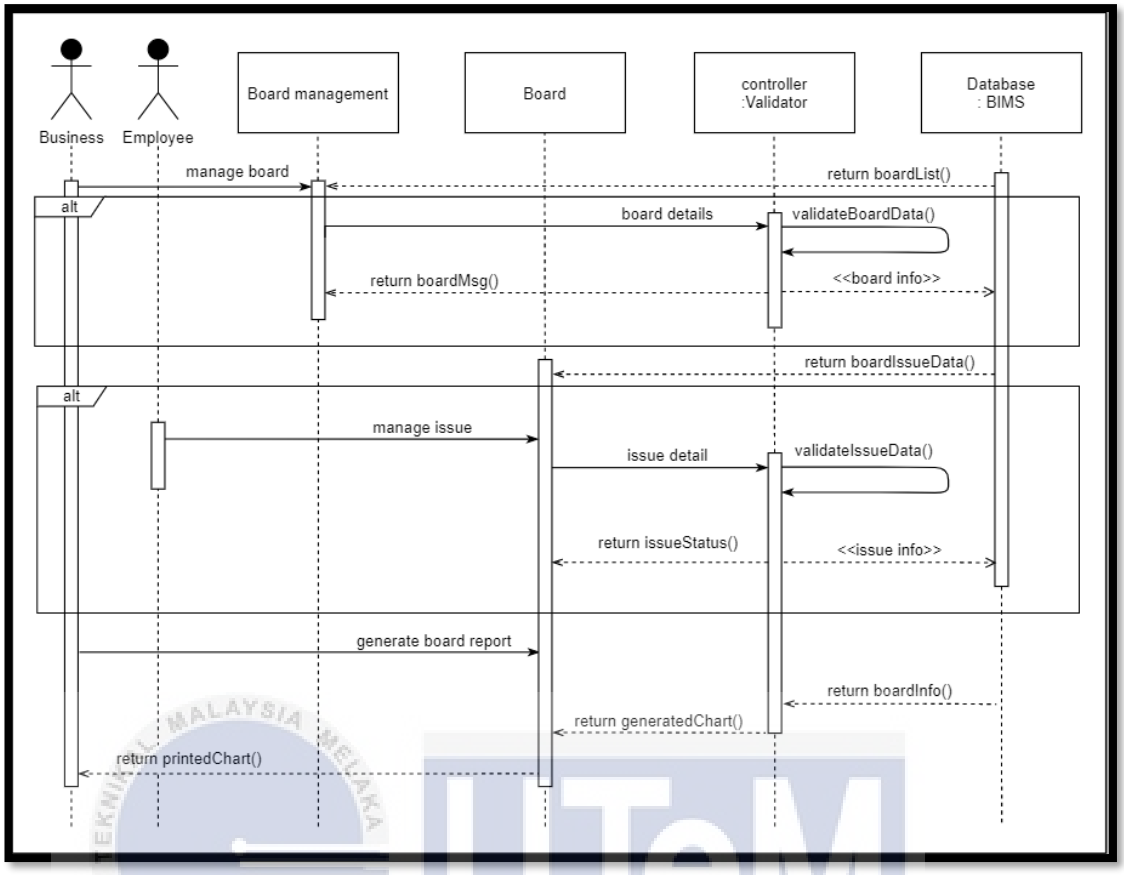

Figure 4.18 Manage board sequence diagram.

A board can be added to a business by using board management. User with business account can add, edit, and remove a board. The board that has been created will be include a Kanban board on create. The business can also generate report from the board which will compute the progression of the selected board.

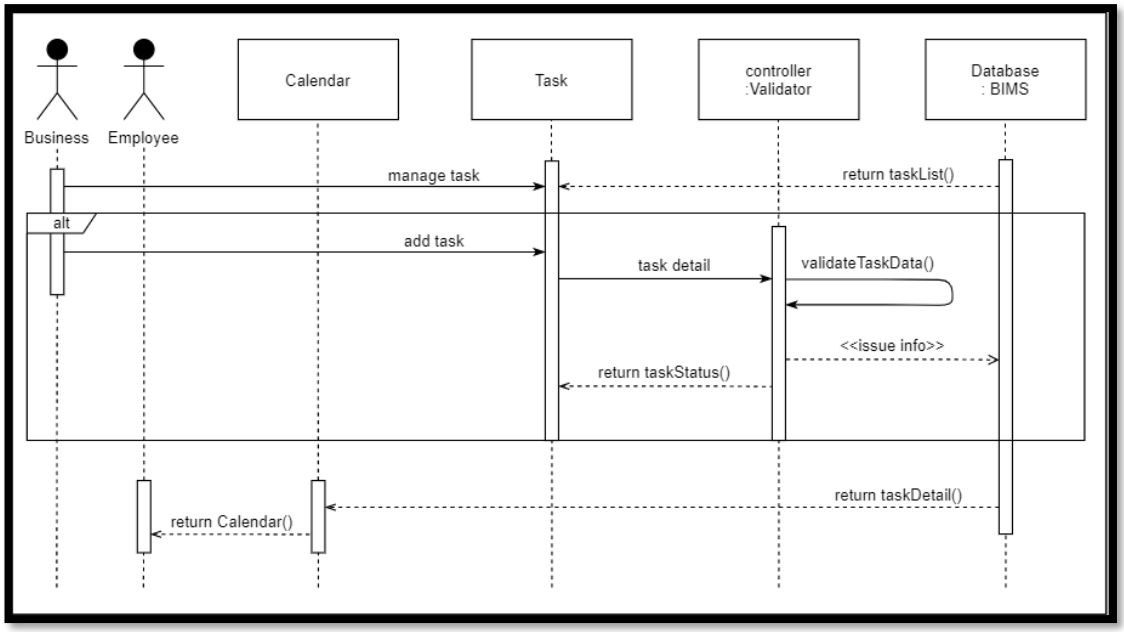

Figure 4.19 Manage task sequence diagram.

A task can be added by business owner account and assign to the employee. Then, it will appear on the calendar of the assign employee. Each employee has their own calendar generated by the system.

4.3.2 Physical Database Design

The physical database design is describe using Database Design Language. DBDL is a standard database notation used to display tables and keys during database design. A table is represented by defining the primary key with the list of all fields and columns.

User data:

Users (

user_id:	Variable length character string, length 25
type:	Integer, range 0-1
status:	Boolean, default false.
employee_id:	Variable length character string, length 25
business_id:	Variable length character string, length 25
email:	Variable length character string, length 100
password:	Variable length character string, length 100
createdAt:	Date, UTC datetime

PRIMARY KEY (user_id),

FOREIGN KEY (employee_id) REFERENCES (employee_id) ON UPDATE CASECADE ON DELETE SET NULL,

FOREIGN KEY (business_id) REFERENCES (business_id) ON UPDATE CASECADE ON DELETE SET NULL));

Business account data:

Business (

business_id:	Variable length character string, length 25
first_name:	Variable length character string, length 50
last_name:	Variable length character string, length 50
business_name:	Variable length character string, length 50
createdAt:	Date, UTC datetime

PRIMARY KEY (business_id));

Employee account data:

Employees (

employee_id:	Variable length character string, length 25
first_name:	Variable length character string, length 50
last_name:	Variable length character string, length 50
gender:	Variable length character string, length 50
position:	Variable length character string, length 50
board_id:	Variable length character string, length 25

PRIMARY KEY (business_id);

FOREIGN KEY (board _id) REFERENCES (board_id) ON UPDATE
CASECADE ON DELETE SET NULL);)

Issue data:

Issues (

issue_id:	Variable length character string, length 25
title:	Variable length character string, length 50
description:	Variable length character string, length 255
createdAt:	Date, UTC datetime
creator_id:	Variable length character string, length 25
board_id:	Variable length character string, length 25

PRIMARY KEY (issue_id);

FOREIGN KEY (creator_id) REFERENCES (creator_id) ON UPDATE
CASECADE ON DELETE NO ACTION);

FOREIGN KEY (board_id) REFERENCES (board_id) ON UPDATE
CASECADE ON DELETE NO ACTION);)

Boards data:

Boards (

board_id:	Variable length character string, length 25
title:	Variable length character string, length 50
business_id:	Variable length character string, length 25
createdAt:	Date, UTC datetime

PRIMARY KEY (board_id);

FOREIGN KEY (business _id) REFERENCES (business_id) ON UPDATE CASECADE ON DELETE NO ACTION);)

Tasks data:

Tasks (

task_id:	Variable length character string, length 25
title:	Variable length character string, length 50
description_id:	Variable length character string, length 255
start_date:	Date, UTC datetime
end_date:	Date, UTC datetime
createdAt:	Date, UTC datetime
employee_id:	Variable length character string, length 25

PRIMARY KEY (task_id);

FOREIGN KEY (employee_id) REFERENCES (employee_id) ON UPDATE CASECADE ON DELETE NO ACTION);)

Board log data:

Boardlogs (

log_id:	Variable length character string, length 25
board_id:	Variable length character string, length 25
actions:	Variable length character string, length 50
issue_id:	Variable length character string, length 25
person:	Variable length character string, length 50
updatedAt:	Date, UTC datetime
createdAt:	Date, UTC datetime

PRIMARY KEY (log_id);

FOREIGN KEY (board_id) REFERENCES (board_id) ON UPDATE CASECADE ON DELETE NO ACTION);

FOREIGN KEY (issue_id) REFERENCES (issue_id) ON UPDATE CASECADE ON DELETE NO ACTION);)

4.4 Conclusion

In summary, the design for BIMS is describe in this chapter. The design is created to satisfy the requirement of the project. The next chapter will be discussing the system implementation for BIMS.

CHAPTER 5:
IMPLEMENTATION

5.1 Introduction

In this chapter, implementation of the system is carried out. At this phase, procedures to complete the design on the previous chapter is plan, perform, and install the development plan of the system. The output of this chapter is a complete documentation of the BIMS development.

5.2 Software Development Environment Setup

The software development environment setup to develop the system start with the integrated development environment which is using Visual Studio Code. This application serves as translator for the source code. This software is an essential tool in building the software application.

Next, the integrated development environment requires Node.js that will enable the system to understand and run JavaScript programming language. Node.js is uses and non-blocking input/output model which is event driven that creates an efficient and lightweight system.

Moreover, the system require database which implement MongoDB. MongoDB require registration to use the database system. MongoDB stores data in JSON document. MongoDB is a great database that will enable high and diverse data availability. Comparing to SQL database, which ensure the reliability of data transaction.

Github is a distributed version control system to handle project. It serves as a vital role as it track the changes in development and later will be used as a deployment of the system on a web server. The source code of the front-end and the backend is deployed on a separate Git repository.

Other than that, the website is deployed the using Heroku to enable user to access the application using web-browser. Heroku is a service that enable building, run, and operate application on a cloud.

To conclude, all the stated software are required for the development of the system to be created. It is important to have system development to work with each other as it ease the implementation of a system.

5.3 Software Configuration Management

Software configuration management is repetitive task of controlling and tracking changes in a software project. The aim is to improve productivity with lesser error and can easily append changes.

5.3.1 Configuration environment setup

The configuration of the application requires installation of the IDE which is Visual Studio Code. The IDE can be download and install from the official website which is https://code.visualstudio.com/download. Then, create two folder which will separate the front-end and the backend of the system. In the folder, the source code will later be organized based on the system.

After that, installation of Node.js is required. Node.js can be download from the website which is https://nodejs.org/en/. After the installation of the application, by using the IDE installed earlier, redirect the terminal to the folder created and initialize each package required to develop the system. Installation of the package are included in Node.js application which is npm.

The npm is a package manager that is implemented on the development of the system. npm assist in installing package that are share in the JavaScript community. By running “npm i <package name>” will install package from millions of npm library. The BIMS development requires react, express, git, and mongoose to be use. This package is available online, so internet connection is required to install the packages. Before able to use npm, the initialization of the dependencies must be performed by running “npm init” on the command console on the backend folder. The “package.json” file will be generated and all the dependencies of the application can be view and configured. Then, using the terminal, navigate to the frontend folder and install the react package by running the command “npm create-react-app BIMS.” This will generate empty react application for the system BIMS that later will be develop.

Moreover, the database of the system need to be configured. On the backend folder of the system, initialize mongoose package by using the command “npm i mongoose.” This package enable the modelling of data on the application. Create a configuration environment file of the application to keep information which is sensitive to the public such as database information, cryptographic hash algorithm information and API keys. Then, go to https://www.mongodb.com/ and create an account. After creating an account, create a cluster and connect the cluster to the application by stating the key on the configuration file.

Git repository must be created and push the source-code to the repository. Login to https://github.com/ and create a repository. Then in the terminal of IDE, use the command “git init” to initialize github and add the repository URL by using command “git remote add origin <repository URL>.” Finally, push the source code to the repository. Then, connect the repository with Heroku to deploy the application.

5.3.2 Version Control Procedure

1) Distributed version control system

A version control system for tracking changes to computer files and coordinating operations on those files with multiple people. It is primarily used

for software development source code management but can be used to track changes to any set of files. Github is used for this procedure.

2) Numbering version control

By using numbering version control, document as source code folder, report, and logbook are implemented on the naming to ease the tracking of changes in document. The numbering function as:

a) The first index is the application changing such as adding new requirement the system occur example. 2.0.0.

b) The second index is for a major update such as addition of a new button to control system to occur example 1.2.0.

c) The third is a minor update such as bug fix such as size of display is adjusted. Example 1.2.11.

5.4 Implementation Status

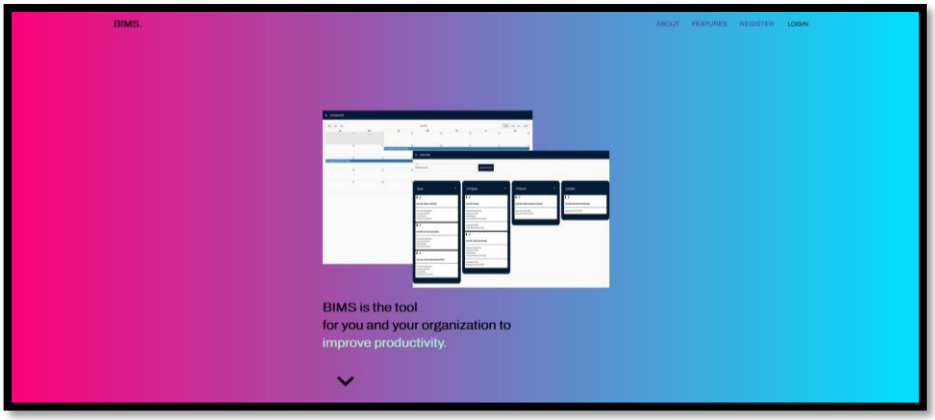

Figure 5.1 Landing page of BIMS.

Name: Landing page module.

Description: This module is when user enter the domain of the BIMS system which is https://bims-fyp.herokuapp.com and the index.html will be displayed on the screen. The navigation to login, register is available here.

Duration to complete: 3 days.

Date completed: 2/4/2021.

Figure 5.2 Login page for business user.

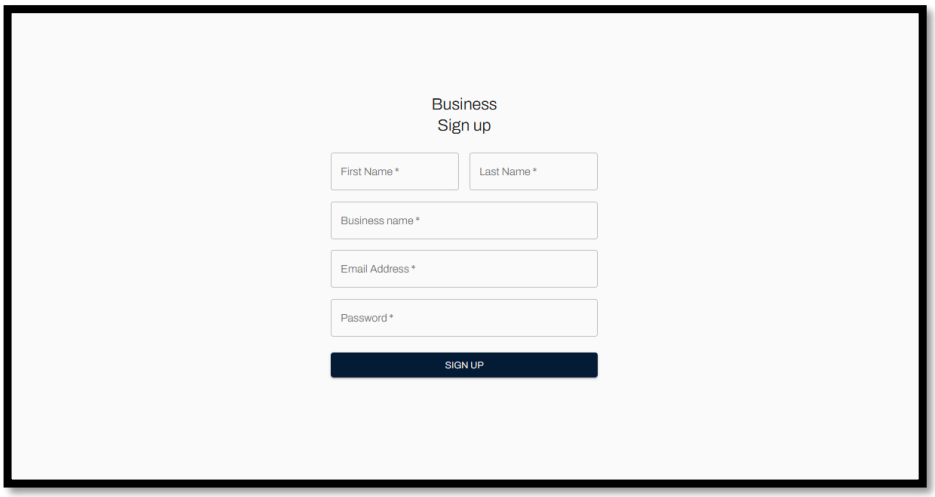

Figure 5.3 Register page for business user.

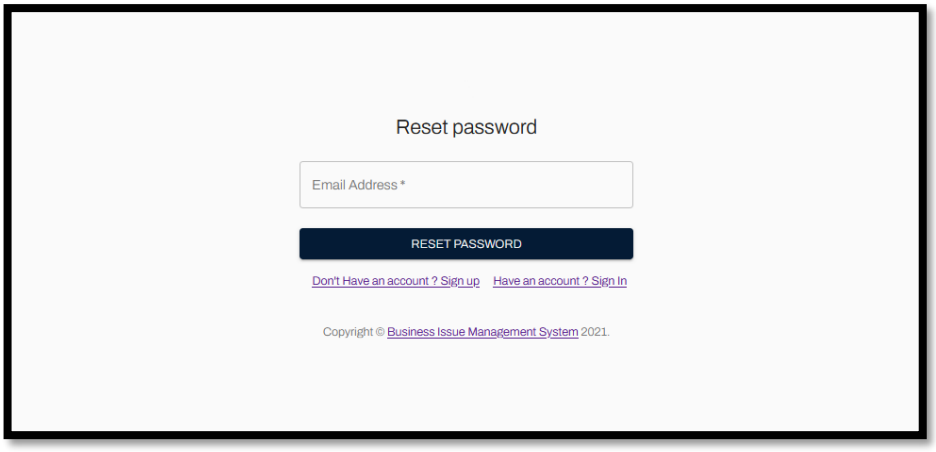

Figure 5.4 Reset password page for user.

Figure 5.5 Sign in for business page of BIMS.

Name: Authentication module

Description: This module handle the registration of business account. Other than that, it is responsible for user to login to the system and password recovery.

Duration to complete: 15 days

Date completed: 20/4/2021.

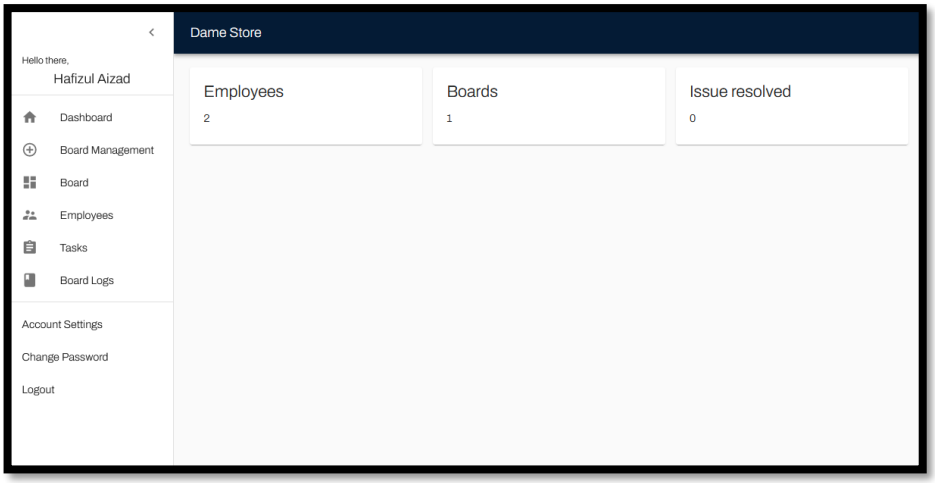

Figure 5.6 Dashboard page of BIMS.

Name: Dashboard module

Description: Dashboard of the user is implemented. Users can view their account information here.

Duration to complete: 2 day

Date completed: 22/4/2021.

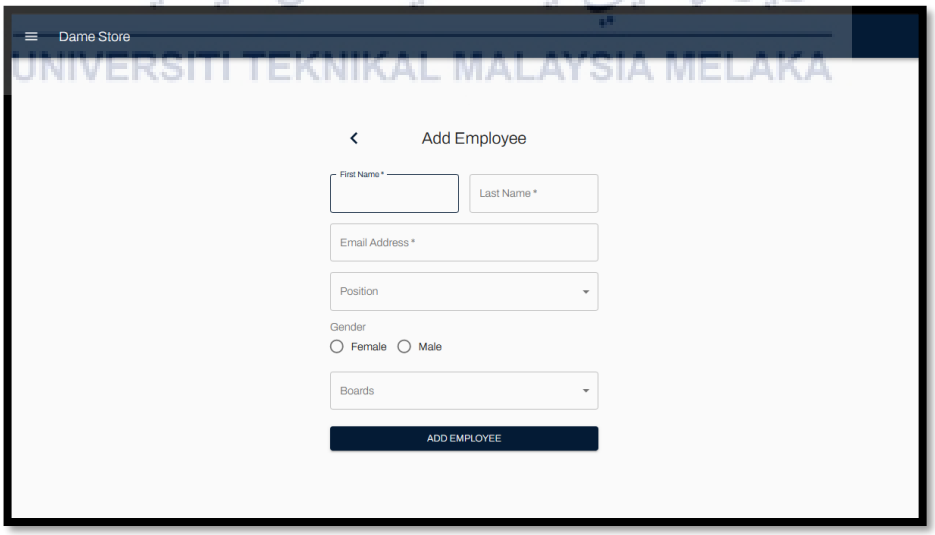

Figure 5.7 Register page of employee account.

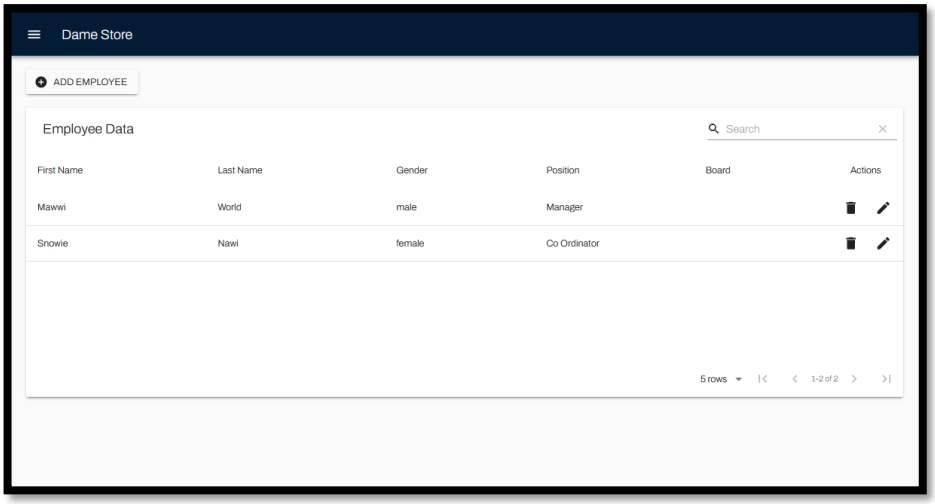

Figure 5.8 Employee management page.

Name: Business management module

Description: Business management module is only for the business owner role. Users can manage their business information and manage employee using this module.

Duration to complete: 13 day

Date completed: 10/5/2021.

Figure 5.9 Board management page of BIMS.

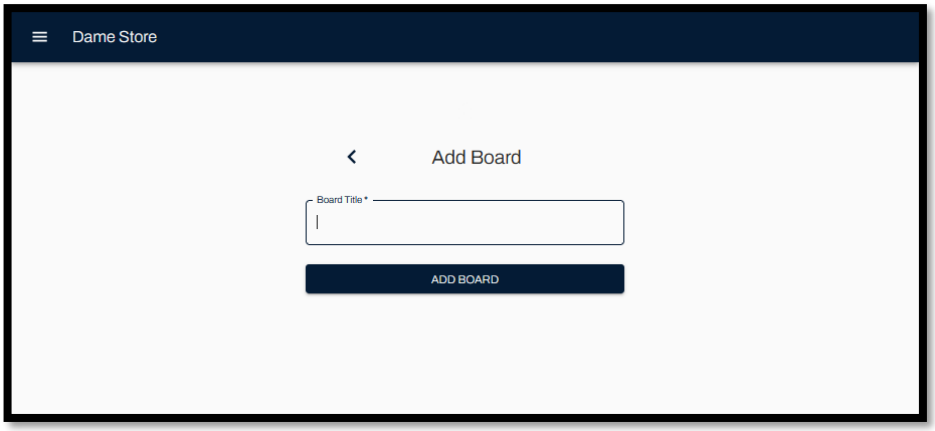

Figure 5.10 Create new board of board management page.

Figure 5.11 Board page of BIMS.

Name: Board module

Description: The module is for the communication of issue in a business. User can create an issue that will be access and followed up within the board member.

Duration to complete: 20 day

Date completed: 30/5/2021.

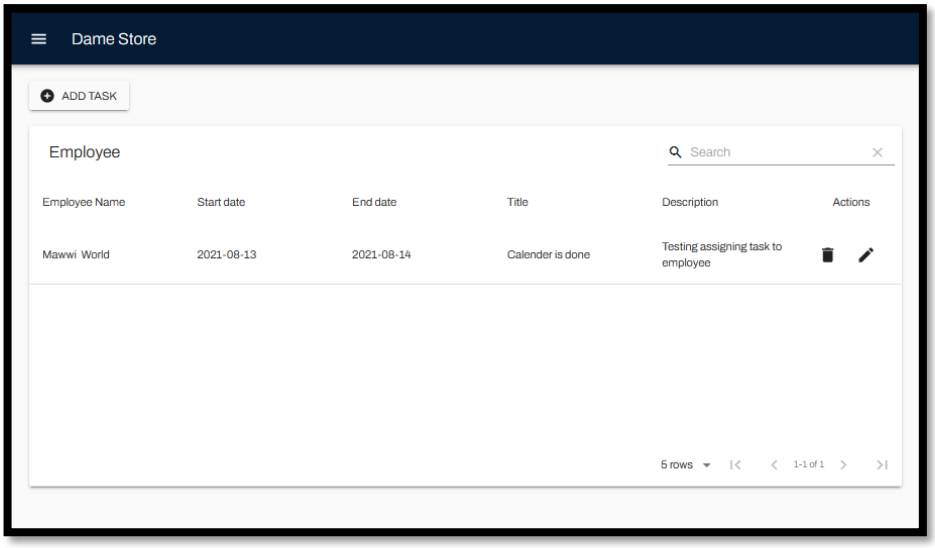

Figure 5.12 Task page of BIMS.

Figure 5.13 Create new task page from task page.

Name: Task module

Description: The module is for the personal use of tracking task of a user. User can manage their task and the task will be automatically added to the calendar module.

Duration to complete: 2 day

Date completed: 1/6/2021.

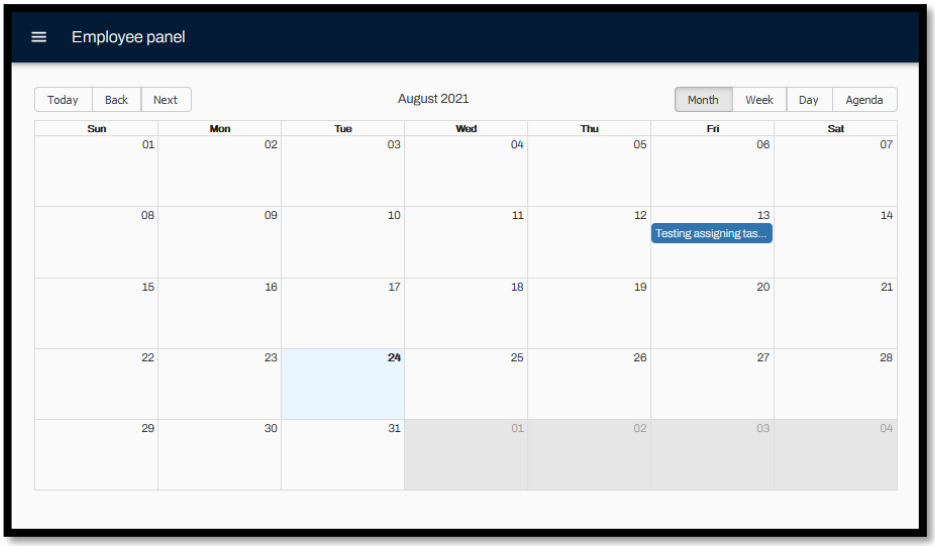

Figure 5.14 Calendar page of BIMS.

Name: Calendar module

Description: The module is generated based on dated in the task module. Get report of what need to be completed.

Duration to complete: 2 day

Date completed: 3/6/2021.

5.5 Conclusion

In summary, the implementation for BIMS is describe in this chapter. The implementation is where the design is created as a functioning web application. The next chapter will be discussing the system testing for BIMS. Instruction on how to install the system is to be run on local system is explained on Appendix A.

CHAPTER 6: TESTING

6.1 Introduction

This chapter will focus on performing software testing on the developed system to identify bugs and errors. Software testing is a combination of people, methods, measurement, and equipment which are integrated to test a software. The testing will also provide an overview of the system, indicating whether the system's objectives have been met. The testing documentation will include the test plan, strategy, design, and result. Before the system can be deployed for end-user to use, it must be thoroughly tested.

6.2 Test Plan

The test plan is the detail of objective, resources, and processes for a test of a software product. This is to test the system is to do test each module as the breakdown structure of the system. The system will be tested as below.

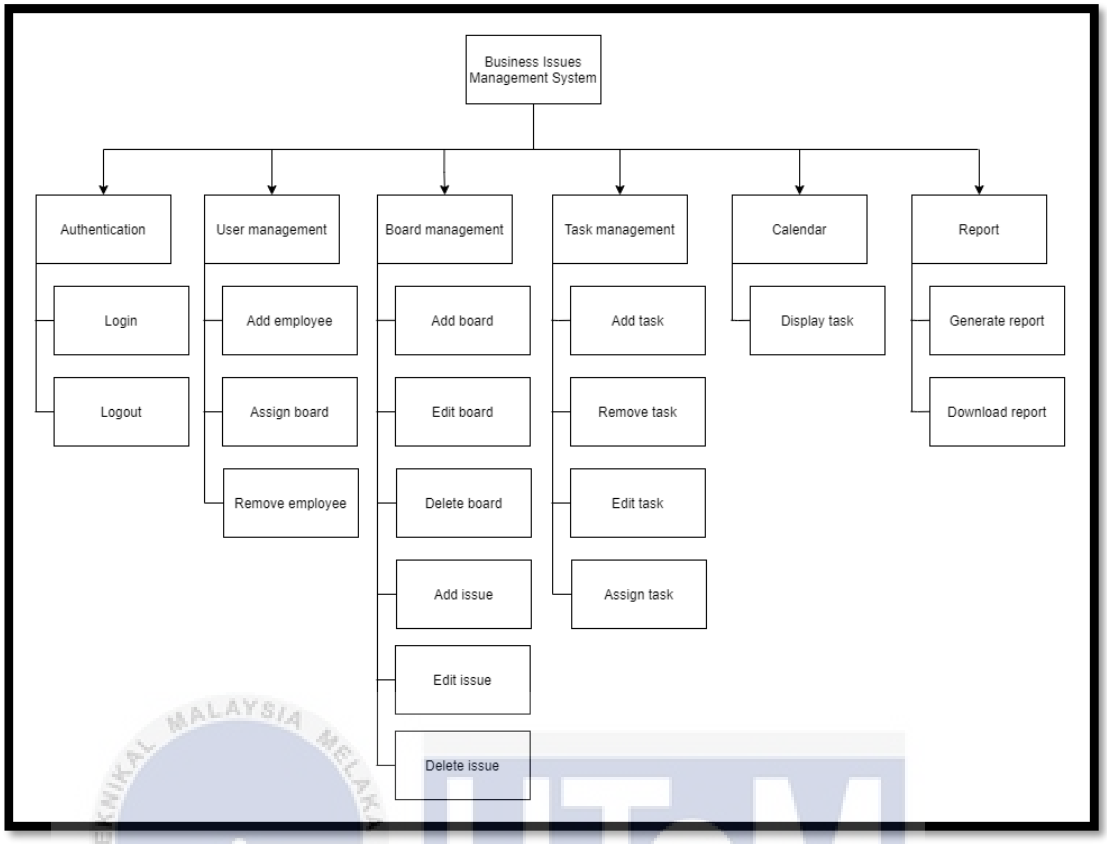

Figure 6.1 Breakdown of the system to be tested.

6.2.1 Test organization

The test organization is the person who is involve in the testing of the system. The person who is involved is described with their responsibility.

Table 6.1 invidual involved in testing of the BIMS and their responsibility

Test manager	Responsible for the testing plan, resources, and training to see whether testing objective have been reached.
Test moderator	Responsible for conducting testing meeting and execution of test plan.
Tester	Responsible to conduct and contribute to test plan.

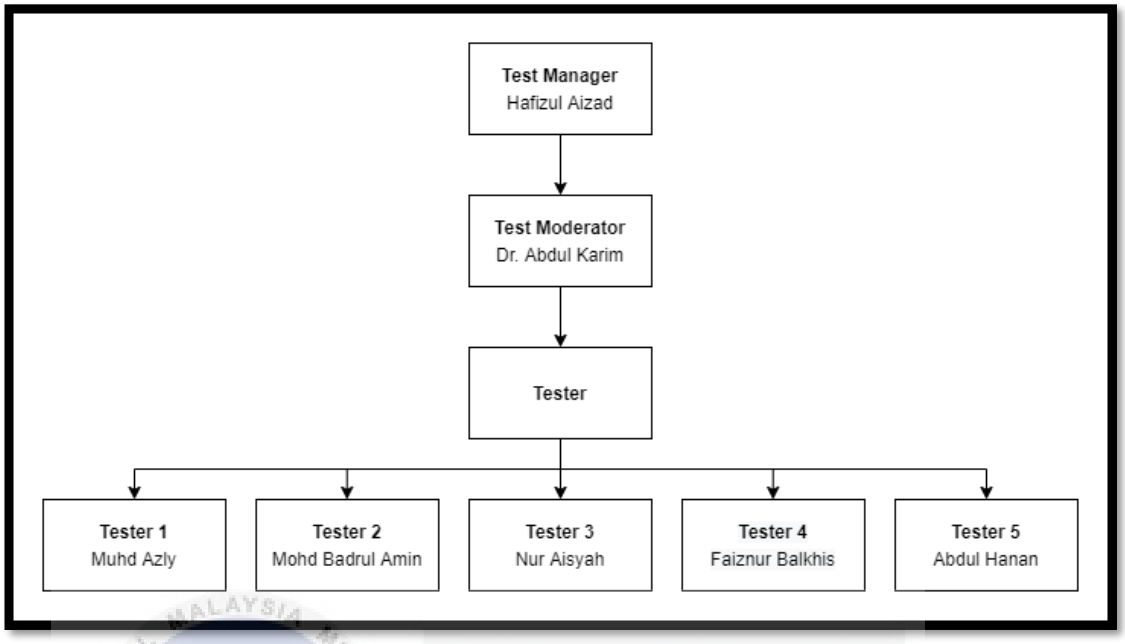

Figure 6.2 Test organization of the testing phase.

6.2.2 Test environment

A test environment is an environment that allows testers to conduct test cases that have been assigned by the test manager. The test environment can be in the form of a system on a server which can be accessed by all the testers. It involves hardware and network configuration of the implemented system.

The test environment of the system BIMS can be accessed at https://bims-fyp.herokuapp.com that will be accessed by the tester to carry out software testing.

As for the hardware and software requirements, the equipment as stated in the table.

Table 6.2 Test environment requirement.

Hardware / Software	Minimum requirement
Operating system	Windows 7, Windows 8, Windows 8.1, Windows 10 or later
Processor	Intel Pentium 4 processor or with speed of at least 2.0Mhz
Web Browser	Chrome: Google Chrome 45.0.2454.86, or latest Safari: 4.0.4 Nov 13th, 2009, or latest Firefox: Mozilla Firefox 2.0.0.20, or latest
Internet connection	10Mbps or faster internet connection

6.2.3 Test schedule

The test will require 20 days to be completed, starting from 2 August 2021 until 22 August 2021. The test will undergo only one cycle.

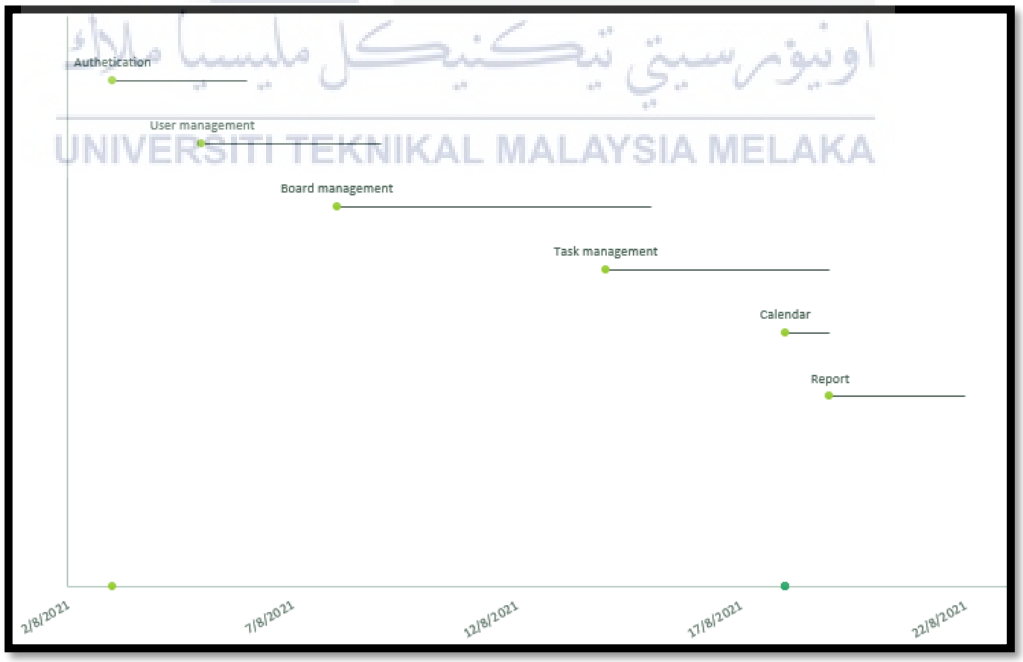

Figure 6.3 Testing schedule of the BIMS.

6.3 Test strategy

A test strategy is a well-defined set of software testing processes that defines the software application's specific testing approach and testing objectives. Black box and white box testing strategies are used to evaluate the system. White box testing is a technique for examining the application's structure. Additionally, black box testing is focused on the application's externals. The testing strategy's aim is to identify errors, increase confidence, and mitigate risks associated with the general and specific behaviors, functionalities, and reactions of the system under test.

The integration testing for BIMS has been chosen from the top-down testing technique of the system's breakdown structure. System integration testing is crucial for detecting bug of component connected to other unit on system. Testing will be conducted on each component specified in the system's breakdown structure which is the unit testing. Integration testing and unit testing is a part of white box testing implemented to test BIMS system.

As for the black box testing, system testing is conducted on the whole system to indicate whether the system perform as intended. The test technique to be implemented to the system testing are decision testing, path analysis, equivalence analysis and use case.

Finally, this technique is used to validate and verify the system, ensuring that the production system of BIMS operates as planned.

6.3.1 Classes of test

The system will conduct many types of tests, with a particular emphasis on functionality, performance, reliability, usability, and security. Functionality testing is used to check that the functionality of a system complies to the requirements specification and is within the system's capabilities. Apart from that, performance testing identifies the BIMS's performance characteristics in a variety of circumstances. Additionally, reliability testing ensures that the system is error-free. Moreover,

usability testing ensures that the end user can operate the system without having to learn complex mechanics. Finally, security testing will ensure that only authorized users have access to system functions according to their security level. These classes of test will ensure the system is ready to be used by the public with confidence.

6.4 Test design

Test design focuses on tests themselves, including how many will need to be performed, the test circumstances and methods that testing will be handled. It is important for a test design to be created as it define and improves quality of testing on software to detect problem in the project.

6.4.1 Test description

The test description will describe the test case and expected result of the type of testing of a test case.

Unit testing will be done on test design below. Each unit is tested for fault insertion, error handling, string testing, statement coverage, and condition coverage. The unit need to work properly to avoid error on system integration.

Unit testing 1: Authentication module

TC-ID	Test case	Expected result
TC-1	Register as business account	Successfully created a new account.
TC-2	Login as business account	Successfully log into the business owner page of the system as business owner.
TC-3	Login as employee account	Successfully log into the employee page with the role of employee

TC-4	Logout from the system	Successfully clear the state of the authentication token.

Unit testing 2: User management module

TC-ID	**Test case**	**Expected result**
TC-5	Add employee	Successfully created a new employee account on the registered business and email is sent to employee.
TC-6	Edit employee information	Successfully edit employee registered to the business.
TC-7	Remove employee	Successfully remove employee from the business.
TC-8	Update user information	Successfully update information of the logged in account.
TC-9	Change user password	Successfully change password of the logged in account.

Unit testing 3: Board management module

TC-ID	**Test case**	**Expected result**
TC-10	Create a new board	Successfully created an empty board.
TC-11	Edit board	Successfully update information of the board.
TC-12	Remove board	Successfully remove board from the business.
TC-13	Display issues card on board	Successfully display issue cards on selected board of business and employee account.
TC-14	Add issue to board	Successfully created an issue on selected board.

TC-15	Edit issue of selected board	Successfully edit an issue on selected board.
TC-16	Remove issues from board	Successfully remove an issue on selected board.
TC-17	Change issue card status	Successfully change an issue status on selected board.

Unit testing 4: Task management module

TC-ID	**Test case**	**Expected result**
TC-18	Create a new task	Successfully created a task.
TC-19	Edit task	Successfully update information of a task.
TC-20	Remove task	Successfully remove a task.
TC-21	Assigning task to employee	Successfully assigned a task.

Unit testing 5: Calendar module

TC-ID	**Test case**	**Expected result**
TC-22	Display task marker of employee	Successfully generate task indicator on the calendar.
TC-23	Display the marker timeframe of a task	Successfully display the agenda of a task.

Unit testing 6: Report module

TC-ID	**Test case**	**Expected result**
TC-24	Generate report of selected board	Successfully generate a board report on selected board.
TC-25	Download report	Successfully download a board report as PDF on selected board.

6.4.2 Test data

Test data is the detailed information of the test that is applied to the system. Test data is in form of test cases which have the test identification, case, step, data, prerequisite. It is a must to create a test data as it make the testing phase easier to be carry out by the tester.

Test Case ID	TC-1
Test Case	Register as business account
Test Steps	1. Go to site https://bims-fyp.herokuapp.com/register 2. Click on “Register” 3. Enter “First name” and “Last name” 4. Enter “Email address” 5. Enter “Password” 6. Click on “Sign up” button
Test Data	First name: Business Last name: Corporation Email: business_owner@yahoo.com Password: Test@123
Prerequisite	None

Condition	1	2	3	4	5	6	7	8
Valid email	Y	Y	Y	Y	N	N	N	N
Valid password	Y	N	Y	N	Y	N	Y	N
Valid name	Y	Y	N	N	Y	Y	N	N
Expected output	Pass	Error	Error	Error	Error	Error	Error	Error

Test Case ID	TC-2
Test Case	Login as business account
Test Steps	1. Go to site https://bims-fyp.herokuapp.com/business-login 2. Enter “Email address”

	3. Enter “Password” 4. Click on “Sign in” button			
Test Data	Email: business_owner@yahoo.com Password: Test@123			
Prerequisite	Registered as a business account			
Condition	1	2	3	4
Valid email	N	Y	N	Y
Valid password	N	N	Y	Y
Expected output	Error	Error	Error	Pass

Test Case ID	TC-3			
Test Case	Login as employee account			
Test Steps	1. Go to site https://bims-fyp.herokuapp.com/employee-login 2. Enter “Email address” 3. Enter “Password” 4. Click on “Sign in” button			
Test Data	Email: employee_biz@yahoo.com Password: Test@123			
Prerequisite	Registered as an employee account			
Condition	1	2	3	4
Valid email	N	Y	N	Y
Valid password	N	N	Y	Y
Expected output	Error	Error	Error	Pass

Test Case ID	TC-4
Test Case	Logout from the system
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Logout” in the navigation.

Test Data	-
Prerequisite	Logged in to the system on either business or employee account.
Expected output	User should be navigated to homepage of the system and user token state is empty.

Test Case ID	TC-5
Test Case	Add employee
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Employee” in the drawer navigation. 3. Click on “Add employee” button 4. Click on “Register” 5. Enter “First name” and “Last name” 6. Enter “Email address” 7. Enter “Password” 8. Click on “Sign up” button
Test Data	First name: Snowing Last name: Rain Position: Employee Gender: Male Email: business_owner@yahoo.com Boards: Management Board
Prerequisite	Logged in to the system on business account.
Expected output	Email is sent to employee which will have temporary autogenerated password.

Test Case ID	TC-6
Test Case	Edit employee information
Test Steps	1. Click on “Employee” in the drawer navigation. 2. Input the name of the employee on the search bar. 3. Click on pencil icon located on the left side of the searched name.

	4. Enter “First name” and “Last name” 5. Enter “Email address” 6. Enter “Password” 7. Click on “Sign up” button
Test Data	First name: Hafizul Last name: Aizad Position: Manager Board: Finance board
Prerequisite	Logged in to the system on business account.
Expected output	Employee information must be updated.

Test Case ID	TC-7
Test Case	Remove employee
Test Steps	1. Click on “Employee” in the drawer navigation. 2. Input the name of the employee on the search bar. 3. Click on trash can icon located on the left side of the searched name. 4. Click “Confirm” on alert window.
Test Data	Search bar: Hafizul Aizad
Prerequisite	Logged in to the system on business account.
Expected output	Employee information must be deleted.
Test Case ID	TC-8
Test Case	Update user information
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Account setting” in the navigation. 3. Enter “First name” and “Last name”
Test Data	First name: Mawwi Last name: Nowie
Prerequisite	Logged in to the system on either business or employee account.

Expected output	User information must be updated.

Test Case ID	TC-9
Test Case	Change user password
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Change Password” in the navigation. 3. Enter “Old password”, “New Password” and “Confirm Password” field.
Test Data	Old Password: Test@123 New Password: Swallow!22 Confirm Password: Swallow!22
Prerequisite	Logged in to the system on either business or employee account.
Expected output	User should be navigated to login page of the system and user token state is empty.

Test Case ID	TC-10
Test Case	Create a new board
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board Management” in the navigation. 3. Click on “Add Board” button. 4. Insert “Board Title” field. 5. Click on “Add Board” button
Test Data	Board Title: HR board
Prerequisite	Logged in to the system on business account.
Expected output	A new board is added to the list of board

Test Case ID	TC-11
Test Case	Edit board
Test Steps	1. Click on the drawer at the upper right.

	2. Click on “Board Management” in the navigation. 3. Input the name of the board on the search bar. 4. Click on pencil icon located on the left side of the searched name. 5. Insert “Board Title” field. 6. Click on “Edit Board” button
Test Data	Search bar: HR Board Title: Human Resources board
Prerequisite	Logged in to the system on business account.
Expected output	A title of the board is updated

Test Case ID	TC-12
Test Case	Remove board
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board Management” in the navigation. 3. Input the name of the board on the search bar. 4. Click on trash can icon located on the left side of the searched name. 5. Click “Confirm” on alert window.
Test Data	Search bar: Human Resources board
Prerequisite	Logged in to the system on business account.
Expected output	Board must have removed from the system.

Test Case ID	TC-13
Test Case	Display issues card on board
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board” in the navigation. 3. Select the “Management Board” from dropdown.
Test Data	-

Prerequisite	Logged in to the system on either business or employee account.
Expected output	Kanban board is generated and created issue card will be displayed

Test Case ID	TC-14
Test Case	Add issue to board
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board” in the navigation. 3. Select the “Management Board” from dropdown. 4. Click on plus icon located on the beside Issue in Kanban board. 5. Enter “Issue Title” and “Issue description” field. 6. Click “ADD” button
Test Data	Issue title: Test add issue Issue description: Issue added to the system
Prerequisite	Logged in to the system on either business or employee account.
Expected output	Issue box of the created card will be displayed on issue section.

Test Case ID	TC-15
Test Case	Edit issue of selected board
Test Steps	4. Click on the drawer at the upper right. 5. Click on “Board” in the navigation. 6. Select the “Management Board” from dropdown. 7. Click on pencil icon located on the above issue card in issue section of the Kanban board. 8. Enter “Issue text”. 9. Click “EDIT” button
Test Data	Issue text: Alohamora
Prerequisite	Logged in to the system on either business or employee account.
Expected output	Issue title should be updated.

Test Case ID	TC-16
Test Case	Remove issues from board
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board” in the navigation. 3. Select the “Management Board” from dropdown. 4. Click on trash can icon located on the above issue card in issue section of the Kanban board. 5. Click “Confirm” on alert window.
Test Data	-
Prerequisite	Logged in to the system on either business or employee account.
Expected output	Issue card should be deleted from the Kanban board.

Test Case ID	TC-17
Test Case	Change issue card status
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board” in the navigation. 3. Select the “Management Board” from dropdown. 4. Right click on a single-issue card located at “Issues” on the Kanban board. 5. Select “Move to progress”
Test Data	-
Prerequisite	Logged in to the system on either business or employee account.
Expected output	Issue card should appear in “In-Progress” section of the Kanban board.

Test Case ID	TC-18
Test Case	Create a new task
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Task” in the navigation. 3. Click on the “Add task” button. 4. Fill in the field of “Task title” and “Task description” 5. Assign the task on the dropdown box of the employees. 6. Select the start date and end date on the date picker box. 7. Click on the “Add task” button to confirm.
Test Data	Task tittle: Create a meeting on 17/8 Task description: Meeting of vacancy needed to be filled. Employee: Mawi World Start date: 17/8/2021 End date: 17/8/2021
Prerequisite	Logged in to the system on business account.
Expected output	Task should appear on employee calendar.

Test Case ID	TC-19
Test Case	Edit task
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Task” in the navigation. 3. Input the title of the task on the search bar. 4. Click on pencil icon located on the left side of the task 5. Edit the field of “Task title” and “Task description” 6. Change assigned the task on the dropdown box of the employees. 7. Select the start date and end date on the date picker box. 8. Click on the “Add task” button to confirm.
Test Data	Task tittle: Meeting on 18/8 Task description: Meeting to discuss vacant of company. Employee: Mawi World Start date: 18/8/2021 End date: 19/8/2021
Prerequisite	Logged in to the system on business account.
Expected output	Task information should be updated on employee calendar.

Test Case ID	TC-20
Test Case	Remove task
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Task” in the navigation. 3. Input the title of the task on the search bar. 4. Click on trash can icon located on the left side of the task 5. Click “Confirm” on alert window.
Test Data	-
Prerequisite	Logged in to the system on business account.
Expected output	Task information should be removed on employee calendar.

Test Case ID	TC-21
Test Case	Assigning task to employee
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Task” in the navigation. 3. Input the title of the task on the search bar. 4. Click on pencil icon located on the left side of the task 5. Change assigned the task on the dropdown box of the employees.
Test Data	Employee: Snowie nig
Prerequisite	Logged in to the system on business account.
Expected output	Task information should appear on assigned employee calendar.

Test Case ID	TC-22
Test Case	Display task marker of employee
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Calendar” in the navigation.
Test Data	-
Prerequisite	Logged in to the system as employee account.
Expected output	Calendar should be displayed with assign task generated.

Test Case ID	TC-23
Test Case	Display the marker timeframe of a task
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Calendar” in the navigation. 3. Click on “Agenda” on upper left of the calendar
Test Data	-
Prerequisite	Logged in to the system as employee account.
Expected output	Calendar task be displayed with date range.

Test Case ID	TC-24
Test Case	Generate report of selected board
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board” in the navigation. 3. Select the “Management Board” from dropdown. 4. Click on “Generate report” beside the drop-down menu.
Test Data	-
Prerequisite	Logged in to the system on business account.
Expected output	Management board report should be generated.

Test Case ID	TC-25
Test Case	Download report
Test Steps	1. Click on the drawer at the upper right. 2. Click on “Board” in the navigation. 3. Select the “Management Board” from dropdown. 4. Click on “Generate report” button beside the drop-down menu. 5. Click on the “Download report” button on the upper side of the report.
Test Data	-
Prerequisite	Logged in to the system on business account.
Expected output	Report should be downloaded in form of PDF file.

6.5 Test results and analysis

The system has been undergone testing phase and the system is tested with the appointed tester as discussed on the testing plan. The result is documented and remark if given by the tester.

Table 6.3 Testing result of BIMS.

Test case ID	Tester	Test case result	Remark
TC-1	Mohd Azly Bin Musa	**Pass**	-
TC-2	Mohd Azly Bin Musa	**Pass**	-
TC-3	Mohd Azly Bin Musa	**Pass**	-
TC-4	Mohd Azly Bin Musa	**Pass**	-
TC-5	Mohd Azly Bin Musa	**Pass**	-
TC-6	Mohd Badrul Amin	**Pass**	-
TC-7	Mohd Badrul Amin	**Pass**	Add dialog on delete.
TC-8	Mohd Badrul Amin	**Pass**	-
TC-9	Mohd Badrul Amin	**Pass**	-
TC-10	Mohd Badrul Amin	**Pass**	-
TC-11	Nur Aishah Binti Rosli	**Pass**	-
TC-12	Nur Aishah Binti Rosli	**Pass**	Add dialog on delete.
TC-13	Nur Aishah Binti Rosli	**Pass**	-
TC-14	Nur Aishah Binti Rosli	**Pass**	-
TC-15	Nur Aishah Binti Rosli	**Pass**	-
TC-16	Faiznur Balkhis Binti Mohidi	**Pass**	-
TC-17	Faiznur Balkhis Binti Mohidi	**Pass**	-
TC-18	Faiznur Balkhis Binti Mohidi	**Pass**	-
TC-19	Faiznur Balkhis Binti Mohidi	**Pass**	-
TC-20	Faiznur Balkhis Binti Mohidi	**Pass**	Add dialog on delete.
TC-21	Abdul Hanan Bin Yusop	**Pass**	-
TC-22	Abdul Hanan Bin Yusop	**Pass**	-

TC-23	Abdul Hanan Bin Yusop	**Pass**	-
TC-24	Abdul Hanan Bin Yusop	**Pass**	-
TC-25	Abdul Hanan Bin Yusop	**Pass**	-

6.6 Conclusion

In summary, the testing phase for BIMS is describe in this chapter and conducted. All tests should pass the testing phase before it is able to be used by the public. I am very satisfied with the outcome of the testing result for BIMS system as the system work as intended. On the next chapter will be describing the project conclusion.

CHAPTER 7: PROJECT CONCLUSION

7.1 Observation on Weaknesses and Strengths

Every application system has its weaknesses and strengths. Even in production system we can find a few flaws and space for improvement. This maybe intentional as it create more room for improvement as technology of the world improves or unintentional that requires fixes and update.

A few limitations of the developed Business Issue Management System are recognized for the system. One for them the system is only available with presence of internet connection as the database is located on a server and requires connection to the internet for the system to be functional. Considering the price of internet nowadays it should not be a problem as it is cheaper and more available as all internet service provider are improving their service for everyone to have access to the internet.

As for the strength of the system, it has improved working environment to be more scheduled and workload of any business can be control. Tasks and issue can be easily communicated between members of small team, business, or even a corporation. The system also enable worker that work from home to be more productive and easily get notified if there's anything to be done. This system also improves the experience working remotely without disturbing privacy of employee as it is located on a single platform.

7.2 Propositions for Improvement

The Business Issues Management System can be improved by implementing adding several features that is in mind but too large to be implement in the duration of the final year project. This features that can be additional feature which are Gantt chart integration, video conferencing meeting room, mobile device application adaptation, and batch updating to enable offline use of the system. As for the Gantt chart integration, the system acquire task and issues with date assigned to each. The date can be converse into more meaningful data which the date can is illustrated as a chart. Moreover, the system has a grouping mechanism for members each board and by adding a video conferencing on the board module, the system can more helpful toward working remotely. More than that, the system can improve its usability by adapting the system as a mobile application. This improvement enable the user to use mobile phone rather than a computer to use the system which will improve the usability and user of the system. Additionally, the system also can improve by adding tracking of status of individual tasks assigned to members of a business. Finally, improvement can be made to the system that can integrate the system to work offline is a great addition.

7.3 Project contribution

The project of Business Issues Management System is completed as schedule regarding of support offered by several individuals. There are few people to mention for contribution toward this success, which are the tester of the system, Mohd Azly Bin Musa, Muhd Badrul Amin Bin Abu Bakar, Nur Aishah Binti Rosli, Faiznur Balkhis Binti Mohidi and Abdul Hanan Bin Yusop. Also, the system has improved a lot as for the ideas provided by Dr. Abdul Karim Bin Mohamad is implemented. Their support and feedback has been a great addition toward the system completion. The system user manual of BIMS can be found in Appendix B.

7.4 Conclusion

In the twenty-first century, web-based apps are critical in assisting humans in completing laborious and time-consuming activities. Without the programmed software application, activities that would take much longer to complete and would need considerable effort on the part of the human.

Business Issues Management System is developed for the purpose track, monitor, follow up on, report on, and address all tasks and unexpected issue within working environment. It strive to create a method to simplify processes in order to get the greatest possible results in the least amount of time and with the least amount of resources. For example, whenever a team encounter a heavy workload, there is often tasks or issues that are oversight which lead to major consequence and failure in the production of the business. This system will keep worker in the right path to with scheduling and incoming unexpected issue to increase workplace efficiency, productivity, and communication.

In conclusion, the Business Issues Management System is to assist on creating a better environment for the workplace to be more organized, improve productivity and communication. The production system of BIMS works and functions as planned in the final year project report.

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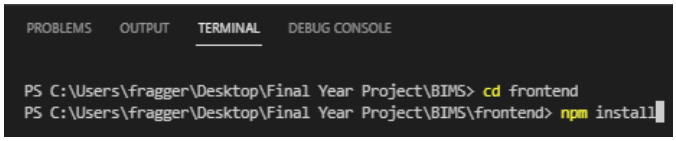
APPENDIX A – Installation of system on local host.

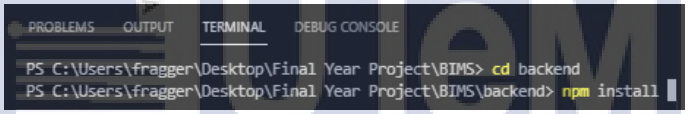
1. Acquire the source code of the project BIMS.

2. Make sure all the required system development environment is installed and setup prior to run the application on local.

3. Open the system on Visual Studio Code program.



4. Open the frontend folder and on the terminal use the command “npm install” as stated in Figure A.1.



5. Next, open a new terminal and go to the backend folder and install all the packages by using the command “npm install” as stated in Figure A.2.

6. After installing all the package, on the backend terminal, use the command “npm run local” to run the backend on the local host.

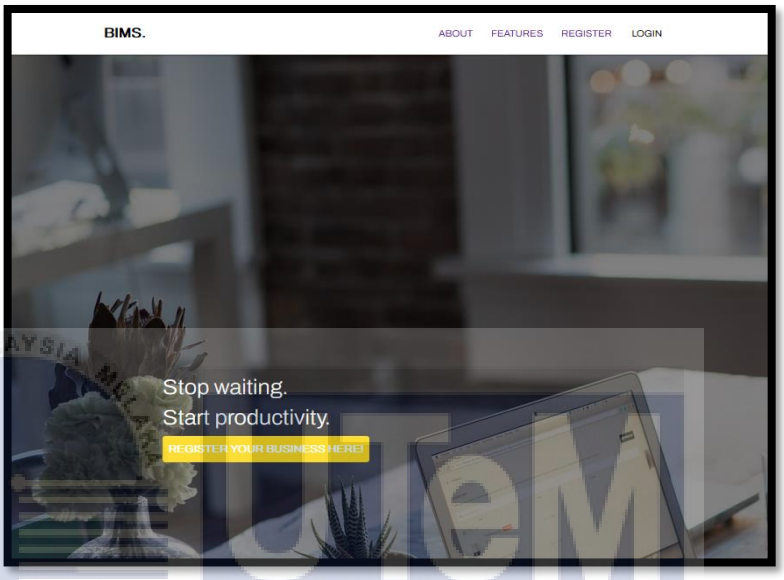
7. On the frontend terminal, use the command “npm run dev” to run the application.

8. Both backend and frontend need to be run synchronously to enable communication between them. The application will be access by using http://localhost:3000/ on any browser.

APPENDIX B – User manual for Business Issues Management System

A. Business account registration

1. Click on the button “REGISTER YOUR BUSINESS HERE!”, then the registration form will appear.



2. Next fill in the form with information of the business.

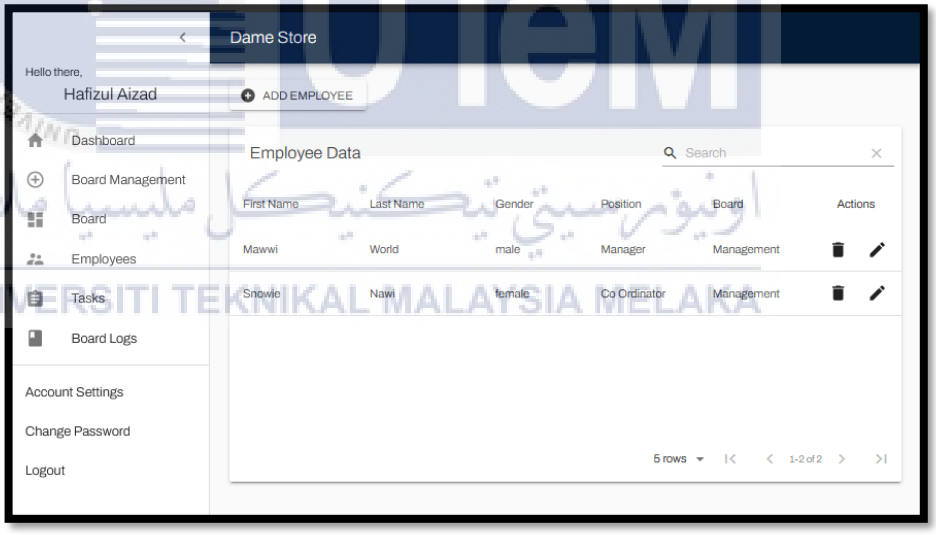
3. Click on the button “SIGN UP” to complete the business registration.

B. Employee registration

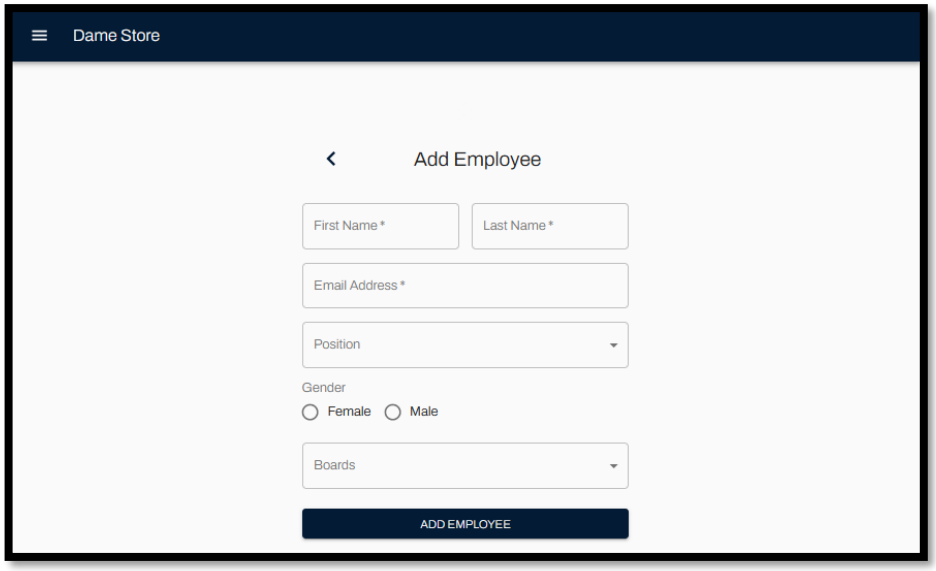
1. Employee of a business can only be registered by using the business account. To register an employee to the system. Log in the system as a business account.

2. On the top left, click on the drawer icon and choose “Employees” on the navigation.

3. A list of employees which is already registered to the business will appear. To add an employee, click on the “ADD EMPLOYEE” button.

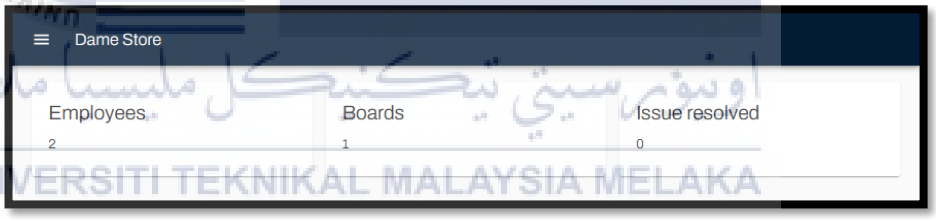


4. Fill in the employee information and click the “ADD EMPLOYEE” button. An email will be delivered to the employee email used in the form which will provide a temporary password for the employee to log in to the system.



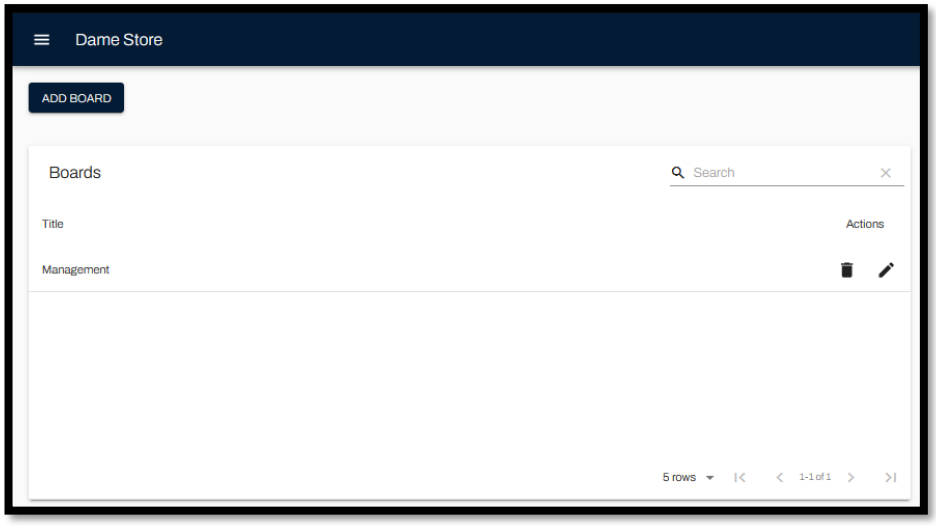
C. Creating Board

1. On the top left, click on the drawer icon.

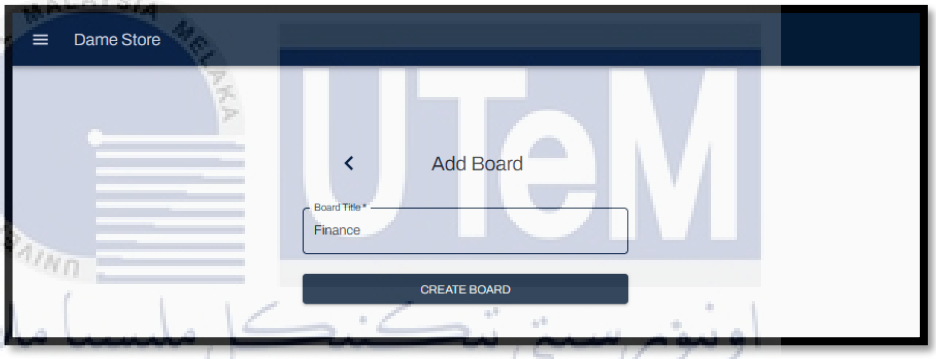


2. Select “Board Management” on the drawer navigation to reveal list of board of the business.

3. Click on “ADD BOARD” to add an empty board.



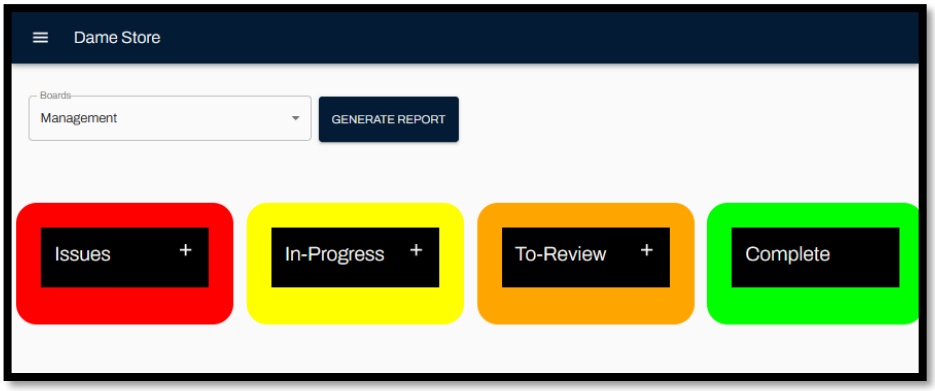
4. Insert tittle of the board and click “CREATE BOARD”.



D. Using board

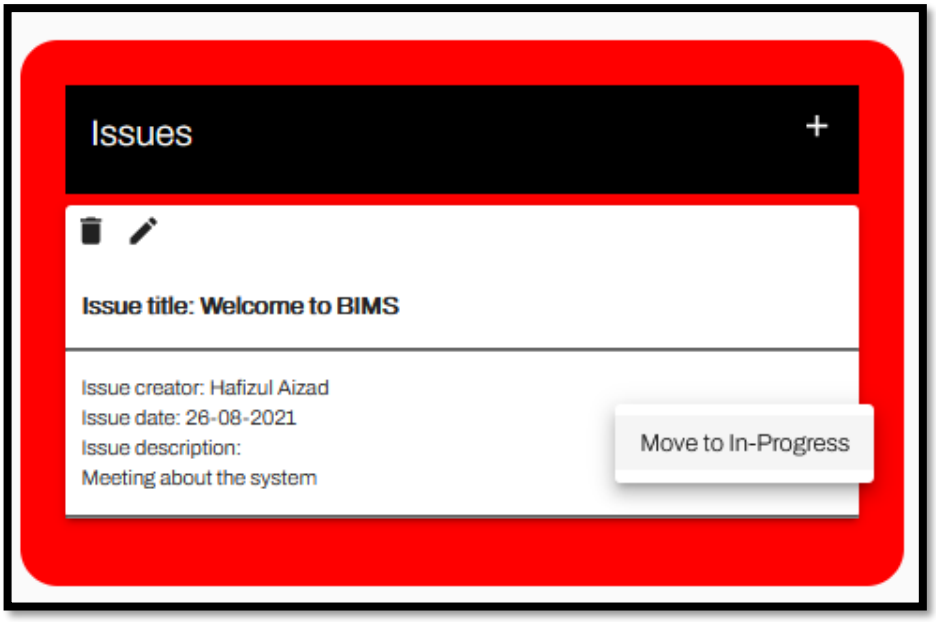
1. On the top left, click on the drawer icon. Select “Board” in the navigation drawer.

2. On the top left, below the navigation bar, use the select option to open desired board to be interact with.



3. To add new issue card on the board, Click the "+" icon above each grid. A dialog will appear that will prompt user to add information of the card.

4. To move the issue card to the next progress status, right click on the desired card and a dialog will appear. To move the card, click on the "Move to …"



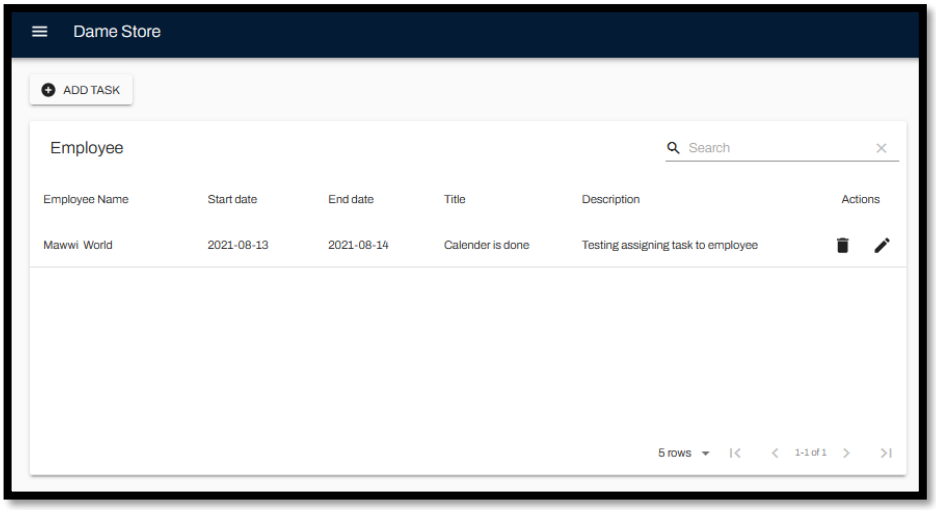
5. To delete an issue card, click on the trash can icon locate on the upper most left of each card.

6. To edit an issue card, click on the pencil icon located on the top left next to trash can icon of each card.

E. Using Task

1. On the top left, click on the drawer icon. Select “Tasks” in the navigation drawer.

2. A list of tasks which is assign to employees will appear. To add a task, click on the “ADD TASK” button.



3. Fill in the form to add task. Click on “CREATE TASK” to complete.

4. To delete a task, click on the trash can icon locate on the right side of the task.

5. To edit a task, click on the pencil icon of the task.