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RISK MANAGEMENT SYSTEM

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RISK MANAGEMENT SYSTEM

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Abstract

In recent years, the global business landscape has growth and undergoing a transformation driven by rapid evolvement in technology. This growing global business landscape has evolved how businesses operate and communicate to deliver the products and services to their customers more effectively. The broad use of advanced technology has made businesses become more exposed to the internal and external risks. Internal and external risk such as operational risk, financial risk, strategic risk, and political risk can impact organization sustainability and performance. Development of a centralized platform for risk management system to fulfil the requirement needs in manage business efficiently. This system helps UKM Holdings to manage risk across all the subsidiaries to ensure all the risk can been avoided and been handled effectively. This project which is Risk Management System is a web-based system developed to helps UKM Holdings to manage risk efficiently.

This project been developed to reduce manual works in risk management process, to enable consistent and real-time risk data sharing across all subsidiaries and to provide real-time dashboards and reports. Agile methodology been selected in the project development that supported by data collection through interviews, literature review and questionnaire to understand the user requirement to fulfil the system needs. The project had been undergoing the robust development to design the design interfaces and system features. The system providing the dashboard and report generation features and also others automation features to do the risk assessment. The system implementing Role-Based Access Control (RBAC) to ensure all the user will use the system according to their roles and permissions.

Risk Management System successfully solve the problems that faced by UKM Holdings in doing risk management after undergoing feedback analysis from the users. This system has reduced manual works in doing risk management process such as risk registration, risk assessment, risk treatments, risk monitoring and also risk reporting with automation features that have been applied in this system which is automation in calculating risk level, automation in doing reports and dashboards. This system also enables consistent and real-time risk data sharing by implementation of the centralized Risk Management System to helps UKM Holdings in storing, updating and adding all the risk-related data across all subsidiaries. The system also successfully providing dashboard and automated reports with implementation of the system which is system have a real-time dashboard according subsidiary and report generation to PDF. This project has helped the UKM Holdings in solving their problems in doing risk management and system will have future enhancement in future development to improve this system.

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1 INTRODUCTION

1.1 Introduction

In recent years, the global business landscape has growth and undergoing a transformation driven by rapid evolvement in technology. The rapid growth of the global business landscape is also driven by the expansion of the business market and the integration of the digital technologies into business landscape (Ancillai et al., 2023). This growing global business landscape has evolved how businesses operate and communicate to deliver the products and services to their customers more effectively. Using the advances technology such as big data analytics, digital communication platforms, artificial intelligence (AI), automation and Internet of Things (IoT) have made business operations more efficiently by reducing the business operation costs, streamlining business processes and improve business decision making (Ancillai et al., 2023).

The adoption of these advances technologies provides business organizations with deeper insights to understand customer preferences, market trends and business operations resulted personalized customization of product and services. A major factor contributing businesses to rapidly evolved their business operations by using advances technology is the changing needs of customer which have become complex (Li et al., 2024). Nowadays, customers demand a quicker services and seamless digital experiences in business operations. The broad use of mobile technology, e-commerce and social media platforms has raised customer expectations which allowed them to interact with businesses in real time across the world.

The broad use of advanced technology has made businesses become more exposed to the internal and external risks. Internal and external risk such as operational risk, financial risk, technological risk, cybersecurity threats and political risk are common example risks that can impact organization sustainability and performance (Straková, Talíř, & Váchal, 2022). As these risks continue to increase, businesses are making a counter measure to preventing and solving the risks from affecting the businesses. In response, many organizations have begun to implement risk management to identifying, assessing and addressing potential risks before making a decision. This helped organization to do the decision making and helped the organizations to protect from external and internal risks.

However, most of the organizations have traditionally implemented conventional risk management approaches to address the risks. Most of the conventional risk management often involve basic risk identification and assessment practices carried out by individual for each department. While such approaches have provided a foundation for risk mitigation, they are typically reactive and lack integration across the organization because they rely on manual processes and no real time information to identify and address potential risk effectively. As a result, organizations are insufficiently equipped to address the increasing and evolving risk faced by modern businesses. Traditional systems often fail to provide real-time insights or predictive analysis and limiting the organization's ability to anticipate threats before the threats become critical. This has led to the evolvement of risk management systems to become more dynamic by replacing into technology-driven risk management systems that can provide real time data to enhance strategic decision-making (Musostova et al., 2022).

This development of a centralized platform for risk management system are been proposed to fulfil the requirement needs in manage business efficiently. This system can help business organization to manage risk across all the subsidiaries and departments to ensure all the risk can been avoided and been handled effectively. By offering a user-friendly interface, it can encourage and helps all the user to make a transition from traditional risk management to a digital risk management system. All the features at new risk management system need to been studied and been research from doing a data collection and interview analysis. All of this can help in development of risk management system that can help organization to improved decision making and also improved respond to the risk that happen in organizations.

1.2 Project Background

Managing risk effectively and efficiently become a complex challenge for all the modern businesses because of the complicated process in manage all the different type of risk that occurred in businesses. It is complicated process because the businesses need to address risk that happen and forecast risk that can happen before decision making are made. Addressing different type of risk that occurred in external or internal are hard for the businesses that have many departments and also have many subsidiaries. Nowadays, many businesses still using old method in managing risk which is manage risk manually at spreadsheets or paper based. In today rapid digital landscape, all the businesses need to act differently to manage risk, that's why a digital centralized risk management system are need to help the businesses to manage risk effectively to improve decision making and helps improve organization to growth.

UKM Holdings Sdn. Bhd., as the commercial arm of Universiti Kebangsaan Malaysia (UKM), manages a diverse range of business activities including education, property development, consultancy, healthcare, and facility management. Due to its wide range of operations, UKM Holdings faces complex risk exposures that require a centralized system to manage and monitor risks consistently. Currently, risk-related processes are handled manually or through basic documentation which limits the ability of management to identify and respond to risks in a timely and coordinated manner. Manual risk management processes often lead to delays in identifying and responding to threats, which can slow down critical decision-making and increase organizational vulnerability (Musostova et al., 2022).

In this context, risk management refers to the structured approach used by organizations to identify risks, assessing the risks and respond to potential risks that could disrupt business operations. A centralized risk management system is a centralized system that allows for consistent tracking, analysis and reporting of risks across all departments or subsidiaries that can enable for better coordination and decision-making. Digital risk tools refer to technology-based systems that automate parts of the risk management process using real-time data, dashboards or automatic analytics.(Panyukov et al., 2023)

The proposed system will serve as a digital solution designed to enhance the risk assessment capabilities of UKM Holdings and its subsidiaries. By providing risk assessment features it can help the organization to assign new risk and identify risk scoring also its priority. Centralized risk managements system can significantly improve the speed in decision-making to help businesses to make a measure to the risk that happen and can happen in future (Safaeian et al., 2024). The risk management system aims to streamline risk-related process across UKM Holdings subsidiaries and helps UKM holdings manage their subsidiaries to improve business growth. This will help UKM Holdings and its subsidiaries to manage risk efficiently and help the upper management in UKM Holdings to make a better decision making to make a counter measure of potential threat that can happen.

This project achievement will be achieved if accurate and consistent risk data from each subsidiary can help in improve better decision making in future. Another important factor is how the system interfaces that user friendly can helps staff UKM Holdings to make a transition from manual risk management process to digital risk management. By proving a staff training, it can help all the staff to use the system effectively because the transition from manual risk management process to digital is a major for the staff because the staff are comfortable to use manual method. While the system offers a user-friendly interface and it designed to be flexible, it needs to regularly updated and maintenance to fulfil the requirement needs for the organization that change from time to time.

In conclusion, the transition from manual risk management process to centralized risk management system can helps UKM Holdings to manage risk that occurred across its subsidiaries. The system can help improve better decision-making for UKM Holding to manage a big project or daily operations for their businesses. The system aims to helps all the staff to reduce all the delayed in providing the insight data to the upper management with a real time dashboard and reports. All of this are important to businesses like UKM Holdings because its size and have many subsidiaries that operates in different segment markets.

1.3 Problem Statement

A problem statement is a brief description of the main issues or challenges that a project aims to address. It outlines the current situation, highlights any gaps or shortcomings and explains why solving these problems is important. Essentially, it defines the problem clearly so that the purpose and direction of the project are understood.

1.3.1 High manual workload in risk management process

Currently, risk management process at UKM Holdings relies heavily on manual tasks such as data entry, documentation and report preparation which are time-consuming and prone to human error. Although manual processes using Excel make staff familiar and flexible, this manual process also slow down the organization's ability to quickly identify and take counter measure to the risks and limiting overall efficiency. The lack of automation creates delays and vulnerabilities in managing risks effectively (Rigger et al., 2022). Therefore, introducing an automated system is crucial to enhance accuracy, reduce workload, and improve the speed of risk detection and response.

1.3.2 Risk data distribution across subsidiaries is inconsistent and uncoordinated

Each subsidiary within UKM Holdings manages and shares risk-related data independently and often using on Excel spreadsheets to exchange the data across the subsidiary. This approach leads into inconsistent data formats, duplication and data fragmentation making it difficult for organization to compile risk information accurately. According to Musostova et al. (2022), relying on manual and decentralized processes can slow down the ability to respond to risks effectively and may weaken the organization's ability to monitor and manage risks comprehensively. As a result, it becomes difficult to obtain an accurate and up to date overview of the risk information which make decision making become delay and ineffective.

1.3.3 Excel dashboards and reports are static and lack real-time analysis

Currently, UKM holdings relies on Power BI and Excel dashboards to track and report risk related data. These tools provide a useful visualization but the dashboard are static and require manual updates to insert the data. This manual updating process limits the ability to provide real-time analysis which resulted to outdated data visualization by the time it reaches decision-makers. Excel-based dashboards are prone to delays and errors due to their static nature and dependence on manual data entry (Kusleika, 2021). Without real-time insights, the organization faces delays in identifying emerging risks and responding promptly which can increase vulnerability to unexpected threats.

1.4 Project Objectives

The project objective section identifies the project expected results and goals in response to the project problems. Each objective is designed to be measurable, achievable and aligned with the overall purpose of the project. This section is critical and based on the findings from the problem statements as practical steps to overcome limitations in UKM Holdings risk management process.

1.4.1 To reduce manual work in risk management process

Through implementing an automated system, this goal aims to reduce reliance on manual techniques for risk management process including data entry and documentation. Risk identification and counter measure action are delayed because of the time consuming and error prone present approach. Risk management processes will be streamlined and repetitive tasks will be automated which result employees will be able to manage risks more effective thanks to the suggested system. The risk management team will be able to concentrate on high-level tasks as a result of the time and error reduction.

1.4.2 To enable consistent and real-time risk data sharing across all subsidiaries

This objective focus on improving method risk information is shared across UKM Holdings subsidiaries. Currently, each subsidiaries manage and submit risk information manually which can lead to inconsistent formats, data fragmentation and delays in sharing the risk information. By developing a centralized system, all subsidiaries will able to submit and access risk information through a standardized platform. This will ensure that data us accurate, up to date and easily accessible to help management to make decisions and manage risks more effectively across the entire organizations.

1.4.3 To provide real-time dashboard and automated reports

With dynamic, real-time dashboards and automated reporting tools will improve the way risk information been present and analyse. The current approach requires manual data updates which limits management to get insight of risk information. The proposed system will automatically generate reports and dashboards using live data inputs for risk monitoring by upper management in UKM Holdings. This real-time dashboard will help decision-makers act quick and respond to risk efficiently.

1.5 Scope and Target User

In this section, the system's coverage and the areas it will address are outlined by clarifying its specific functions and features. It also identifies the primary users for whom the system is intended, describing their characteristics, needs and how they will interact with the solution. The scope and its target user are important to ensure system requirements for the target user are been fulfil.

1.5.1 Project Scope

The project scope for the risk management system at UKM Holdings aims to digitalize and streamline the process in risk management which includes identifying risk, assessing the risk, treating the risk and monitoring the risk. This risk management system will help in managing four types of risk which is operational risk, legal and compliance risk, strategic risk and financial risk. This system will serve as a centralized risk management system to automates risk assessment and automates all the manual process such as building a dashboard and reports. Also, streamlining risk registration which is identifying risk will helps UKM Holdings to manage risk within the company and across its subsidiaries which includes UKM Specialist Centre, UNIPEQ, UKM Dagang, UKM Pakarunding, UKM Digital, UKM Medicare and UKM Real Estate. This system will help UKM Holdings to manage risk within its 7 subsidiaries because of the centralized platform.

Additionally, implementing real-time dashboards and automated reports at risk managements for timely risk monitoring by upper management at UKM Holdings helps a better decision making. It helps in risk tracking and reduce staff effort to send a risk reports and dashboards to upper management from others subsidiary. Integration of advanced predictive analytic tools will not be included in this project because this projects only aims to make a centralized platform that change from manual risk process. The integration of predictive analytic tools can be a future consideration for future developments and enhancements. Overall, the project aims to improve coordination of the staff across all different subsidiaries to make a better management process in managing risk and helps better decision making to respond for the potential threats.

1.5.2 Product Scope

The centralized risk management system for UKM Holdings is focused helps organization in identifying the risk, monitoring and responding to various potential. The system's functions include risk data management which is risk assessment, risk tracking, risk reporting, and risk insight that using real time dashboard. By minimizing manual works in risk management process it can helps in reducing errors in data collection from each subsidiary. It will feature risk input forms to ensure consistency across the subsidiaries in UKM Holdings to make sure all the data is consistent and not fragmented.

A centralized database will store all risk-related information securely to make sure all the data are safe from the threats. The system will allow authorized users to login and use the system according to their roles. The system will also provide real-time dashboards that visually display current risk statuses and measure along with automated reports that can be generated facilitating timely insights for the upper management and risk compliance teams.

Overall, this development of the system aims to provide UKM Holdings with a user-friendly risk assessment to modernize its risk management practices from manual works to reduce errors in operations and support a risk awareness culture throughout the company and its subsidiaries.

1.5.3 Target User

The primary users of the centralized risk management system for UKM Holdings and its subsidiaries. These users can be categorized into 3 main groups:

- **Admin**

Admin which is head of risk management and compliance at UKM Holdings will be responsible for register risk, assessing the risk, do a migration plan and monitor all the risk-related activities for all of the organization and its subsidiaries. They will use the system daily for managing risks to ensuring timely reporting.

- **Executive**

Executive is an executive for parent company which is UKM Holdings. Executive can register the risk, assessing the risk, request the amendments to the admin and can see all the subsidiaries risk-related data.

- **Head of Subsidiary**

Head of subsidiary are the head of each subsidiary which is UNIPEQ, UKM Dagang, UKM Pakarunding, UKM Digital, UKM Medicare, UKM Specialist Centre and UKM Real Estate. They can only see the data related to their subsidiary only and can't do the risk assessment or register the risk. They can only view the risks mitigation and see the progress of risk management.

- **Staff**

Actively involved in entering, updating and tracking risk data within their own subsidiary. This role includes Risk Officers, Department Staff and Project Managers who submit risk reports, monitor status and implement mitigation actions.

- **Viewer**

Has read-only access to view dashboards, reports and risk summaries. This role is suited for executives, auditors or other stakeholders who need visibility without editing permissions.

1.6 Overview of This Report

Chapter 1 – Introduction: The background of the project is defined here, it outlined the project objective, scope and target user by identifying problem statements.

Chapter 2 – Literature Review: In this section, it covers a study about risk management system and all the features that have in other similar project.

Chapter 3 – Methodology: This chapter cover all the research technique and approach to use in this project.

Chapter 4 – Requirements: This chapter provides on the project requirements from the information that have been gathered.

Chapter 5 – Analysis: This chapter cover all discussion about data collection from questionnaire to finalizing the stage and visualize findings.

Chapter 6 – Design: This chapter covers on the system design which is front-end and back-end of the system. This chapter also covers on drafting database system architecture using flowcharts and other design models.

Chapter 7 – Implementation: In this chapter, all the system development process are been highlighted including software, hardware and programming language that been use in development process.

Chapter 8 – Testing: In this chapter, it covers all the various testing activities that been conducted to ensure the system works according to the all requirements needs.

Chapter 9 – Project Management: In this chapter, it focusing on how the project been manage and discuss all the duration and time used in this project.

Chapter 10 – Implementation: This chapter which is final chapter, it summarizes all the achievement and limitation of the project and outlining the recommendations to enhance overall system function in future development.

2 LITERATURE REVIEW

2.1 Introduction

In this section, a closer look at existing research and studies to establish strong theoretical basis for developing risk management system. It explores important concepts in research and existing technologies that related to studies (Barry et al., 2022). The purpose of this literature reviews is to investigate and evaluated related studies and system that related to the risk management system. This will help in developing the new system for UKM Holdings. This literature review will research of the previous research and real-world examples to emphasizes the importance of creating a modern, technology-driven risk management that is adaptable, user-friendly and specifically designed to meet the unique challenges faced by organizational operations.

2.2 Investigation

This section explores critical aspects of risk management systems based on previous research. The investigation will divide into several areas that explain risk management process, limitation of manual process that can results data errors and automation of the system.

2.2.1 Limitation of Manual Risk Management

A Manual risk management involves risk management several process which is identifying, assigning, identify priority and risk counter measure using traditional and manual methods such as excel spreadsheets, sending risk data using emails and making reports manually. This method often lacks efficiency, accuracy and scalability especially in large and a lot of subsidiaries across organizations. According to Panyukov et al. (2023), a risk management system is a structured risk framework that helps in identify risk, assessing risk, monitoring risk that and make a counter measure for the risk. Using old manual methods, it can lead to delayed responses from organizations in making decision and also resulted a lot of human error in assigning risk.

Organizations commonly deal a risk within several categories which is operational, strategic, financial and legal or compliance. Operational risks are risk that arise from failure in internal process, policies and events that can disrupt organization operations. Organizations also deal with financial risk that impacting the organization's financial that includes revenue, costs and budgets. Also, organization faced the strategic risk that are refer potential issues that affect achievement of an organization's objectives. Compliance or legal risks also been deal by organization which is this risk are the risk that related to potential issues that related to legal requirements and regulatory obligations.

Manual processes in risk management make a risk management process become complex because didn't have a real-time information from other departments or subsidiary. Musostova et al. (2022) in research find out that modern risk management systems have advanced tool that beyond manual methods that include a lot of risk assessment or management features such as real-time dashboards or reports, predictive risk tools and real-time risk alerts for organization. These features in risk assessment and management helps organizations to respond quickly to the risk occurred and make informed decisions based on up-to-date information.

Without centralized platforms, it makes data in manual management process are outdated and fragmented. It is because the staff need to manage sending the data by email to other related department and subsidiary that can also resulted delay in sending data especially in a big organization that have many subsidiaries like UKM Holdings. Transitioning from manual risk processes to centralized risk management systems is become priority to enhance operational growth, improve risk migration and support decision-making.

2.2.2 Prone to Data-Handling Errors

For a risk management system to be truly effective, it must be implemented across all major departments and business units within an organization. Organizations that operate across multiple sectors often face a wide range of risks that are specific to individual subsidiaries that operates in different market segments. Each of this business subsidiary faced many and a lot of risk that unique to their only business operation such as segment market in education that faces risk of a lot of student intake making the student didn't get the hostel. Also, in real estate segment market can faced the increase in price of raw materials that can cause increase cost of estate. All this different risk were different according to their business operations are need a centralized risk management system that can helps them in handle risk data and reduce errors in handling a data.

A centralized risk management system that operates across different subsidiaries need to have a real time data risk visibility that can helps in monitoring in real time. As Musostova et al. (2022) research that risk management systems are most effective when been implemented at the wide and big organization as this big organization have specific risk departments that handle risk. It also can be effective when risk departments have the centralized platforms that can helps in reduce errors in handling data. Additionally, Panyukov et al. (2023) emphasize that a centralized system can enhances ability to reduce error in manual works and avoid data fragmented. Without integration of centralized digital platforms, management process when handling a data can cause a data errors and making a management to make a monitoring and decision making become hard.

2.2.3 Risk Identification and Classification

Risk management plays a crucial role in helping organizations stay stable and prepared for the future. By allowing businesses to identify potential threats early, the management can take migration plan for the risk occurred. Without a risk identification and classification features in risk management, the management are hard to manage and prioritize which risk that they need to prioritize first. Risk identification involves identifying potential risk that may occur when doing the activities. Meanwhile, risk classification involves classified the risk to the four categories of risk which are strategic risk, operational risk, financial risk and compliance risk. This risk classification allows management of the organizations to prioritize the risk based on the classification that may threat to the business processes.

As research by Safaeian et al. (2024) risk identification and classification can help management in negotiate with the risk efficiently. It is because management can divide the risk into several case and priority. Because of that management can do a schedule for manage the risk and prioritize what risk that need to be counter measure first. Having a solid risk identification process can helps organization with a lot of subsidiaries it can prioritize which risk that need to handle first according to the risk classification that been classified into four categories of risk which are strategic risk, operational risk, financial risk and compliance risk. Overall, a strong risk identification and classification in a risk management process enhances an organization's ability to reduce risks and maintain stable business operations.

2.2.4 Risk Assessment and Evaluation

Risk assessment and evaluation are been conducted after the risk have been identified. This assessment and evaluation involve stages in determining the likelihood and severity of the risk that occurred in organizations. One of the tools that determined the organizations likelihood and severity is by using risk matrix. Risk matrix are the maps of the probability of the event against the potential consequences. Risks that score high in probability and impacts are been determined as critical and require immediate action meanwhile risk that lower score can be accepted depending on management decision in manage the risk. However, the risk matrix structure is different across all organizations depending what their industries, risk trends and management needs. As noted by Fan et al. (2024), organizations often customized risk matrix models according their operational scale, strategic focus and operational scale.

Risk assessment that effective can improve the allocation of organizational resources that can enables management to focus on the most critical risk that can affect their organization objectives. Risk assessment will provide automated scoring to helps organization in making clear decision-making and helps interact among department and stakeholders. Risk assessment is important in making a clear decision-making the organization to helps business environment become more dynamic in preventing

operational disruptions and financial losses. Risk assessment not only identifies the score and the level of risk but can be the references to the management to select suitable mitigation strategy and monitoring plan.

2.2.5 Risk Mitigation and Strategies

Risk mitigation and strategies are been determined by organizations after the risk assessment and evaluations. There are 4 common approached in the treatment strategies which are accepted the risk, reduced the risk, transferred the risk and avoiding the risk (Kayouh and Dkhissi 2024). Accepting the risk means the organization chooses not to take further action to reduce and control the risk because usually the risk is not affected the objectives and operational strategies in organizations and also the risk after been assessed the risk determined as low level. Reducing the risk involves in taking the counter measure in decreasing whether the risk likelihood or the risk impacts. This strategy commonly been used through the improved process or staff training in organizations. Transferring the risk refers to the transfer the impact of the risk to other party by buying the insurances for employee when doing the activities.

This strategy moves the financial or operational burden to another entity that have better positioned to handle the risk. Avoiding the risk are the approach that been taken by organizations to eliminates activity and condition that can lead to risk permanently. This strategy been taken action by organization after the risk been identified to high and can't been managed through other method because it cost are too high from the cost of the organization operations. These four methods of risk mitigation strategies ensure the organizations can respond to the risk by selecting most suitable treatment strategies based on the likelihood and impact of the risk.

2.2.6 Automation in Risk Management System

By implementing automation risk management system, it can helps developing more efficient and accurate risk management system. Old manual methods are taking a lot of time and expose to the mistakes because of the manual works in handling a lot of data. Automation can help organizations to simplify risk tasks such as risk identification, risk monitoring and other risk management process.

According to Domnina et al. (2022), automation helps system be more responsive and more consistent because of replacing manual works into the automation. Automated systems can help organizations to reduce repetitive task such as creating dashboards and reports. This helps staff to reduce stress because of the repetitive works and helps staff to focus to others different task. Automation helps system become more efficient by reduce repetitive task and reduce manual human works, it can help organizations to manage organization efficiently and improve operations in businesses.

2.2.7 Real-Time Dashboards

Implementing real-time dashboard into the system have become essential for all the system because the dashboards are displaying data insight in visual. The dashboard helps to illustrates the data into charts and diagram to helps upper management to see the data and make a better decision-making. Implementing real-time dashboards into risk management system can helps upper management to see the risk charts and diagram data according to their years, months and subsidiary.

According to Susnjak et al. (2022) these real-time dashboards improve businesses decision making and responsiveness by offering a dynamic view of key risks and divided into several areas according to business landscape and operations. data-driven risk management in complex environments. Internal communication can be improved by centralized this feature because it helps staff and risk compliance to communicate with the upper management to presenting the data in charts and diagram. It can help upper management to make a fast decision making because of the dashboard. Upper management also can see the dashboard anywhere without requesting the dashboards from staff because the dashboard is real-updated.

2.3 Related Works

This related works section is looking at three existing risk management systems that meets the risk management criteria. The criteria are having risk assessment, risk reporting, risk scoring, real time dashboards and risk assigning. By reviewing all this three works, it can help in development of the risk management system by viewing their features and core functions that suitable for UKM Holdings.

2.3.1 ProjectManager

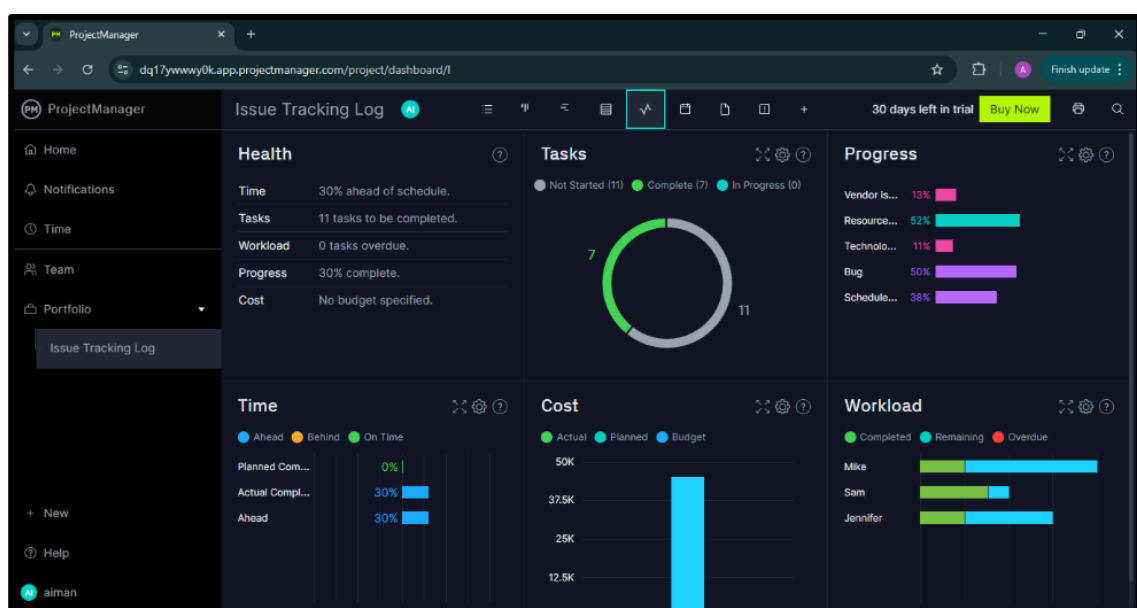


Figure 2.1: ProjectManager's Dashboard (ProjectManager, 2025)

Figure 2.1 shows the ProjectManager is a powerful cloud-based business management platform. Although Project Manager is not a risk specific platform but it meets all criteria that needed to be a risk management system. This platform is a business management platform that helps business operation. It is known for offering real-time features for business management process. It includes risk management process and all the features for risk assessment. The platform also includes key tools like Gantt charts and real-time dashboard that become essential for the centralized platforms.

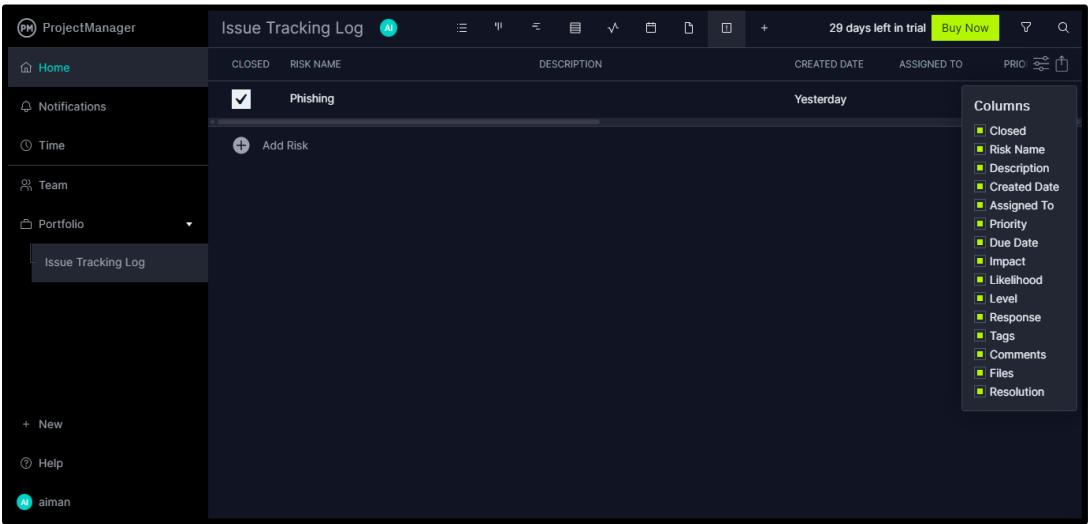


Figure 2.2: ProjectManager’s Risk Assigning (ProjectManager, 2025)

Figure above shows ProjectManager highlighted features is the platforms can assign the risk into specific person which is project manager that can be occurred when doing the projects. It also has a duration of the time to assign the risk and risk priority status that can helps manager to see risk that they need to handle first according to priority. It also helps user to assign the risk to others and see the risk tracking status to know whether it have been handles or not. All of this risk assigning are real time so the other user can see in real-time they risk assigning to handle the risk cases.

	TASK NAME	DURATION	PLANNED START	PLANNED FINISH	ASSIGNED	PERCENT COM.	PRIORITY	ACTUAL HOU.	PLANNED
1	Vendor issue	55 days	09/07/2025	23/09/2025		13%			144 hours
2	Communication cha...	55 days	09/07/2025	23/09/2025	Mike Smith (Sa		Medium	8 hours	
3	Supplier delay	10 days	15/07/2025	28/07/2025	Sam Watson (S	100%	Medium	80 hours	
4	Documents missing	6 days	28/07/2025	04/08/2025	Sam Watson (S		Low	48 hours	
5	Unexpected costs	1 day	05/09/2025	05/09/2025	Jennifer Jones		High	8 hours	
6	Resource issue	33 days	25/06/2025	08/08/2025		52%			272 hours
7	Resource availability	22 days	25/06/2025	24/07/2025	Sam Watson (S	100%	High	176 hours	
8	Delay in receiving re...	30 days	30/06/2025	08/08/2025	Jennifer Jones		Medium	8 hours	
9	Team missing skill	11 days	10/07/2025	24/07/2025	Sam Watson (S	100%	Critical	88 hours	
10	Technology issue	23 days	22/07/2025	21/08/2025		11%			112 hours
11	Component compat...	11 days	22/07/2025	05/08/2025	Mike Smith (Sa		Very High	8 hours	
12	Infrastructure change	16 days	25/07/2025	15/08/2025	Mike Smith (Sa		Critical	8 hours	
13	Training needed	5 days	28/07/2025	01/08/2025	Jennifer Jones	100%	Medium	8 hours	
14	System needs upda...	11 days	07/08/2025	21/08/2025	Mike Smith (Sa		Critical	88 hours	
15	Bug	20 days	15/07/2025	11/08/2025		50%			40 hours
16	Auto-save problem	2 days	15/07/2025	16/07/2025	Mike Smith (Sa	100%	Critical	8 hours	
17	Reports crashing	2 days	17/07/2025	18/07/2025	Jennifer Jones		Very High	16 hours	
18	Visible code	1 day	28/07/2025	28/07/2025	Mike Smith (Sa	100%	Low	8 hours	
19	Broken link	1 day	11/08/2025	11/08/2025	Mike Smith (Sa		Low	8 hours	

Figure 2.3: ProjectManager’s Risk Tracking Sheets (ProjectManager, 2025)

Figure above shows ProjectManager helps project teams to stay ahead of risks by letting the risk team to assign the risk along their daily operations when doing a project. The platform also can store a detailed information about each risk to each of the member by sorting it according into departments and teams. Risk tracking sheets are been divided into different colours that represent the risk impact and priority. The platforms also let user to attach different type of file in risk assigning and

also have a real-time comment to see comments from other users. The platform also aligned the function of risk system with project management system to see project timeline and project duration so the duration of the risk measure can be seen at project calendar.

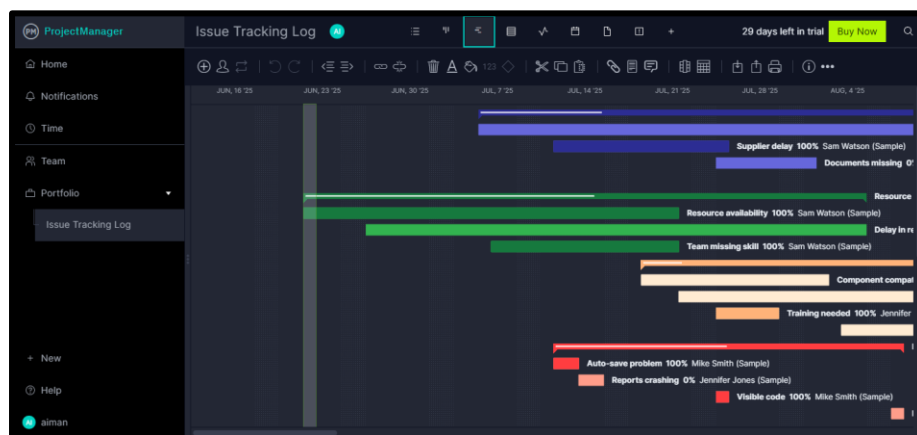


Figure 2.4: ProjectManager's Gantt Chart (ProjectManager, 2025)

Figure above shows ProjectManager's also provides Gantt chart that helps user to visualize the schedule and keep track of their risk task. Each task is presented as bar on a duration timeline to make user easy to see duration of the task. With drag-drop features, user can adjust the task timeline to update any changes from the schedule. It Gantt chart also shows percentage tracking progress and colour coding to give all the user a clear visualization. The Gantt chart works with the risk tracking to help risk compliance to see schedule of the risk and make sure the progress is aligned with the risk schedule. This Gantt chart helps top management to see the project timeline and task progress according to the duration that been assigned.

2.3.2 nTask

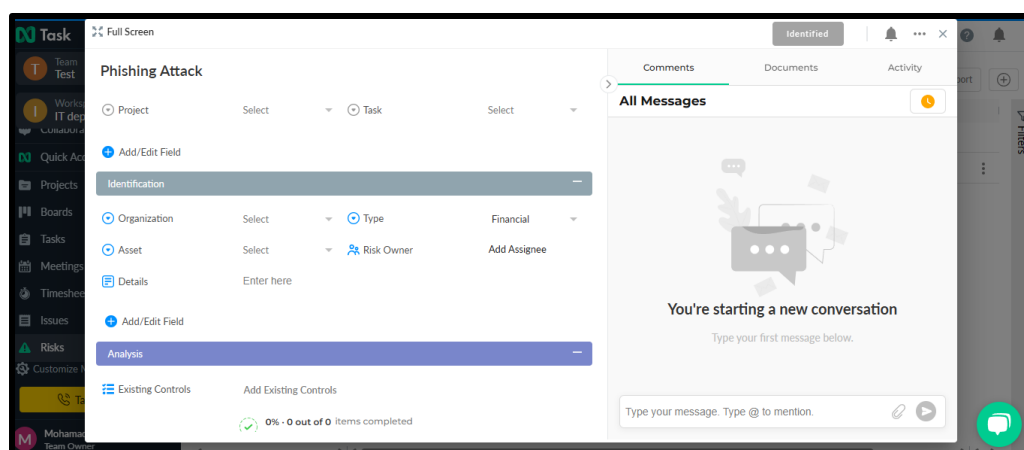


Figure 2.5: nTask Risk Identification and Analysis (nTask, 2025)

Figure above shows nTask is a cloud-based project management that offered risk tracking features that designed to helps teams assigned risk to specific person or departments. Risk assigning features include selecting the project that assigned to the risk and can do the analysis by putting the percentage of risk to generate risk scoring. It also has collaboration features such as messages at the right of the platforms. nTask suited for small to medium-sized organizations and is known for its simplicity. It easy to use and have a version that available to individual or startups.

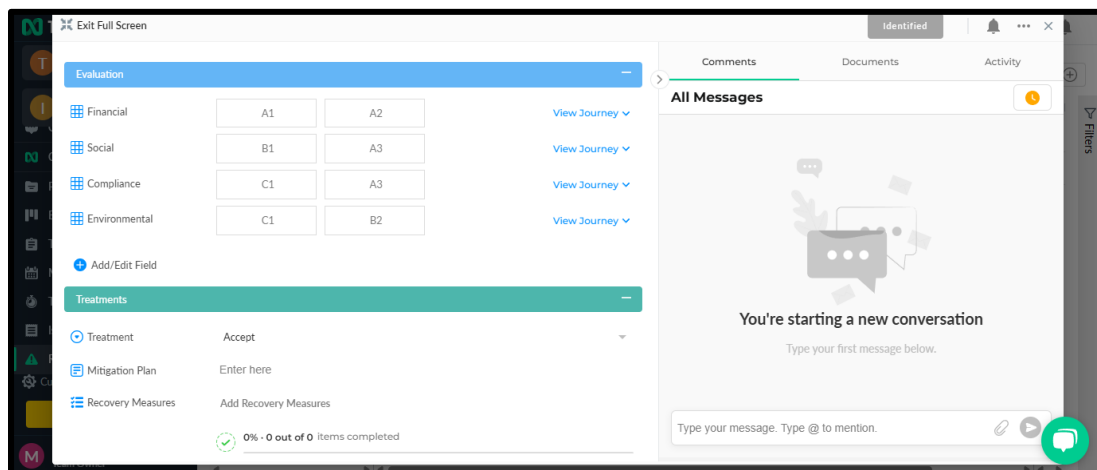


Figure 2.6: nTask Risk Evaluation and Treatments (nTask, 2025)

Figure above shows nTask provides a structured and user-friendly interface for managing risks. In risk evaluation and treatments features, nTask risk evaluation are faced this process which is risk identification, risk analysis, risk evaluation and risk treatments. This process helps user to document all the risk and manage the risk according to the process. The user can assign the risk to the specific departments and also attach important information. All the information such as causes, consequences, existing controls and recovery measures can help the user to make a better decision-making. These features help user to assess, prioritize and respond to the risk efficiently according to the duration that have been assigned.



Figure 2.7: nTask Risk Assessment Matrix (nTask, 2025)

nTask provides a built-in risk assessment matrix that helps teams visualize and prioritizing the risk that occurred. The matrix is colour with green, yellow and red that represents the risk potential effect on project. The green colour is minor risk potential, for the yellow moderate and for the red is major risk effect on project. All this colour helps user to make a decision in prioritizing the risk according to the colour. This risk assessment matrix enhances user visualize all the risk impact and helps in decision making in handle the project.

2.3.3 Monday

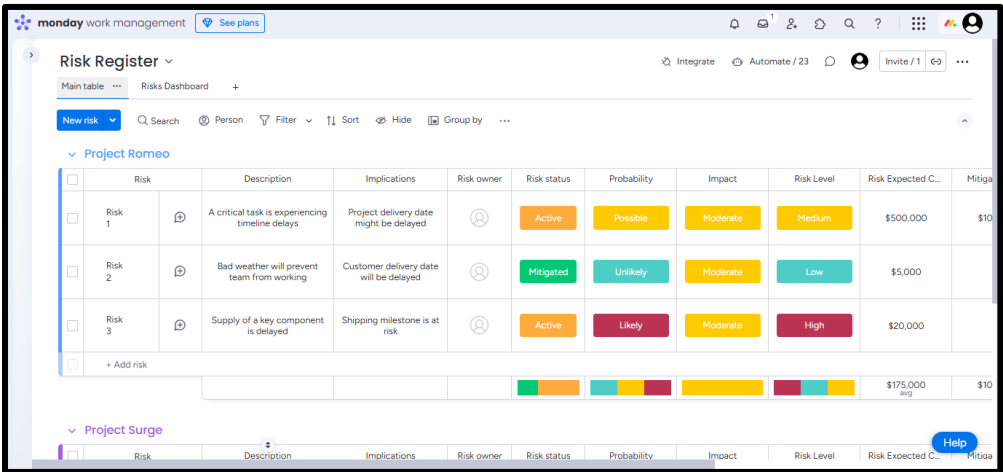


Figure 2.8: Monday's Risk Register (Monday, 2025)

Monday platform offers a user-friendly platform that helps in risk management. It can be customized according to the user preferences to risk tracking and migration process. Its customized structure allows user to create a customized risk register and risk tracking with important attributes such as risk type, severity level likelihood, mitigation strategy and assign responsible user to handle the risk.

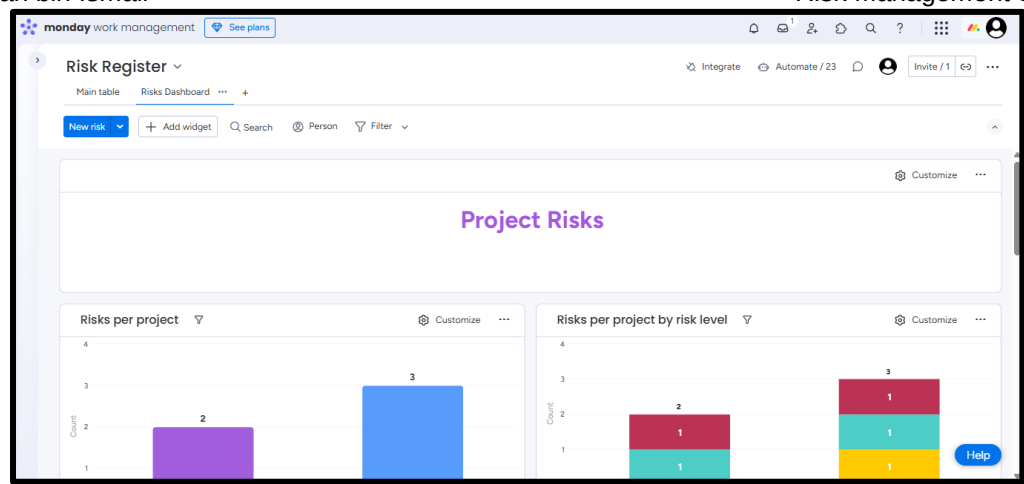


Figure 2.9: Monday’s Risk Dashboard (Monday, 2025)

The system’s real-time dashboards offer a visual of risk data that contain risk exposure across various projects. The dashboard also can display all the important information through visualization like bar graph to helps user check the risk progress and monitor the risk trend. By using this visualization, it can helps manager to make the informed decision based on data visualization.

2.4 Comparison

In this section, a comparison of three existing project that similar to risk management system which is ProjectManager, nTask and Monday are been summarized into table.

Table 2.1: Comparison of Existing Project

Feature	ProjectManager	nTask	Monday
Platform Type	Cloud-based, Web-based	Cloud-based	Cloud-based Work OS
Risk Register	In project workspace	Dedicated risk module	Custom boards required
Risk Assessment	Basic risk scoring not according to risk matrix	Built-in scoring (likelihood × impact)	Can custom the risk assessment scoring
Real-Time Dashboard	Risk overview and Gantt Chart	Task and Risk Overview	Highly customizable visual dashboards
Automation & Alerts	Basic notification	Trigger and basic notification	Triggers, emails, status changes
Collaboration Features	Comments, file sharing	Comments, attachments, time tracking	Comments, file sharing, tagging, integrations
Suitable For	Large project teams needing Gantt features	Small to mid-sized teams focused on risks	Flexible teams needing custom workflows

2.5 Discussion

From the comparative analysis conducted in this project, nTask platform will become our project guidance and references for the development of the risk management system. The platforms meet our criteria and our project objectives by offering a basic risk management process and have a data visualization such as dashboards and have reports. The platform has a function such as assigning risk responsibilities to the other user and evaluate risk severity and likelihood that become essential for risk mitigation process.

In addition, other platforms such as Monday and ProjectManager also highly customizable dashboard and automation features that can helps in developing risk management system. All these features can help user to see data visualization data to identify the risk trends, risk pattern, risk outcomes and many more. Our project plans to implement the real-time dashboards to fulfill our objective which is providing the dashboard to user.

Although ProjectManager does not offer a specialized risk module, it contributes to our design by emphasizing the importance of a clear and simplified project overview. To make the system more user-friendly, we will include an intuitive interface that allows users to monitor project health and risk exposure easily, without being overwhelmed. By combining the structured risk assigning features from nTask, the interactive dashboard capabilities from Monday and the clean overview style from ProjectManager. Our risk management system aims to deliver a practical, efficient and scalable solution for managing risks across the organization.

2.6 Conclusion

In conclusion, this chapter has given useful insights about risk management and helps in develop risk management system. By analyzing all the existing related project, the core functions for risk management system have been identified to be implement into our project. This topic also investigates essential topics that related to risk management, its limitation in doing risk management manual, automation in the system and implementation of the real-time dashboards. This useful chapter helps in develop risk management system that can address the problems that faced by UKM Holdings and each subsidiary.

Through a comparison and analysis of the existing system that similar such as ProjectManager, nTask and Monday platform, several key features have been identified in doing risk assessment. Risk register, risk scoring and risk counter measure are the activities and process that need in our system. This process will make our system can manage risk efficiently. The implementation of real-time dashboard also can help our system become more efficient by providing data visualization and insight about risk related data. This also can help upper management to monitor risk trends and insight of the risk related data. This will help upper management in doing decision making in business process. By doing this review and research in this chapter, useful information have been gathered to become a foundation for the system development process.

3 METHODOLOGY

3.1 Introduction

In this chapter, the methodology that been used in development of Risk Management System, which is the centralized risk management system for UKM Holdings are been explained. This project goals are to replacing current manual-based practices in managing risk for UKM Holdings and its subsidiaries. This centralized risk management system includes real-time risk management, real-time dashboards and role access control to ensure security of the data.

Methodology refers to the approach in outlining the project development process that contains planning process, executing process and managing process to make sure all the development process are aligned with objective of the project. In development process, methodology is important in managing all the development process to ensure all resources and duration of the project are been manage effectively. A suitable methodology plays an important role to ensure all the final project results are been accomplish align with the objective. (Leadley et al., 2023). In this development project, the methodology that been choose are Agile methodology.

3.2 Agile Methodology



Figure 3.1: Agile Methodology Diagram (Laoyan, 2025)

Agile methodology is a project management that been divide into smaller stages called sprints (Roshan & Santhosh, 2021). Agile usually breaks down of these smaller stages to allows teams to work in iterative changes and solutions effectively. Sprints usually take times one to three weeks for each stage in development process and allows for more responsive feedbacks from user to fulfil the user requirements that often evolve. This methodology is flexible in adapting to quick changes in project development to improve the outcomes.

Unlike traditional linear models, Agile allows overlapping phases, promoting ongoing learning, active problem-solving and early issue detection. This repeated cycle of planning, development, testing and feedback enables quicker and more efficient solutions. In the development of a risk management system, Agile offers a responsive need that supports continuous improvement. It ensures the system remains aligned with project goals while allowing for enhancements based on real-world feedback and changing organizational needs.

3.3 Phases in Agile Methodology

In this section, the phase or stages in agile methodology will be discussed. The phases in agile methodology are divided into smaller phase which are planning, designing, developing and testing.

3.3.1 Plan Phase

The planning phase involves defining the scope and objectives of the Risk Management System. All the requirements which are user requirements and project requirements are been gathered through doing the data collection related with the projects. The documentation of findings from data collection are important to give guidance in project planning. A questionnaire and study on similar existing project also been gathered to gain the insight of the system and user requirements needs. The data collection that develops insight and findings are helps to give the guidance in development of risk management system and ensure successful project outcomes.

3.3.2 Design Phase

In the design phase, the user interfaces, database structure and system structure are been develop according to the system architecture, use case diagrams and flow charts. All the process in designing the front end and back end must aligned with system architecture to make sure the system works according to the system that have been planned. The goal in these phases is to develop user friendly interfaces that align with the user requirements need that can works across all of the subsidiaries according to their roles.

3.3.3 Development Phase

During this development phase, the development of the risk management system is been conducted using software such as Visual Studio Code to be the foundation for the development of the front end which is user interfaces and back end which is how system works with databases. The database been developed by using pgAdmin 4 which is tools for handling the PostgreSQL. The user interfaces are been develop to support all the risk management features that have been planned in planning phases. The databases also are need to be develop in this phase to make sure all the data can be stored and be review. Core functionalities of this risk management system such as risk management and user management are implemented in these phases.

3.3.4 Testing Phase

In this phase, the system testing need to be conducted to make sure the system works align with the project planning. All the testing will be conducted including integration testing and user acceptance testing (UAT) with selected user from UKM Holdings. This are been conducted to make sure the system meets user and operational requirements. The bug testing also are been made to verify all the system works under various scene.

3.3.5 Deployment Phase

In the deployment phase, the systems are been implement into live action setting to see the system works in live environment. All the final configurations are conducted to ensure system works smoothly. In this phase also will be conducted the training sessions to trains user to use the system and monitor the system. This phase is making sure all the system features is fully functional for its user and fulfil user needs.

3.3.6 Review Phase

The review phase which is the final phases in development of risk management system. In this phase, all the evaluation from user where user give feedbacks about the system to recommended in future improvement. The insight from this phase are finding the future improvement for risk management system to develop more efficient according to user requirements need.

3.4 Conclusion

In conclusion, using the Agile methodology in the development of the risk management system has made sure all of its effectiveness in managing the entire development process in project. The flexible nature of Agile makes it easier to making any improvement to the system and allowing the system to be upgraded based on changes of technical requirements and changing user needs. Agile also encourages self-organization and teamwork by enhancing productivity, problem-solving and critical thinking leading to more efficient and high-quality project outcomes.

The specific phases of planning, design, development, testing, deployment and review outlined in this report reflect Agile methodology flexibility. By breaking the project into smaller segments make the team can better identify and manage risks in project, improve system quality and ensure development of the system is timely delivery. The successful adoption of Agile methodology is expected to produce a user-friendly risk management system that meets organizational needs and supports effective risk oversight across UKM Holdings.

4 REQUIREMENTS

4.1 Introduction

This chapter highlights several methods used for gathering information, emphasizing the critical steps involved in developing an effective risk management system. Requirement gathering is a crucial phase in the Software Development Life Cycle (SDLC) and forms the basis for building software that meets both user expectations and organizational needs (Tian & Gao, 2024).

This chapter explained the requirements in developing a risk management system that aimed to providing a structured solution for identifying, assessing and mitigating risks. Emphasis is placed on the importance of gathering clear, complete and accurate requirements to ensure the system aligns with user roles and complies with internal risk management standards (Astegher et al., 2023).

4.2 Data Gathering Techniques

Data gathering refers to methods that been used to collect the data related to the project. In this project data gathering techniques that been used is analysis of existing project that same as risk management system and questionnaire which is survey with the target user. For this section, data gathering techniques will be explained further to explained how the data is collected to develop risk management system.

4.2.1 Analysis of Existing Projects

Analysis of three similar projects with risk management system are been made to help in developing risk management system. These systems were selected based on the functionalities, features and related to the risk management system. These three systems were ProjectManager, nTask and Monday. Analysing each of the system can helps in gathering data of the system features and specifications. Information gathered by doing this analysis are to help in developing proposed system that have exact functionalities and features from these three similar systems.

4.2.2 Questionnaire

A survey using Google Forms was conducted to collect user requirements. A survey is targeting 50 respondent which are employees from UKM Holdings and each of the subsidiary. The questionnaire in the first section is made to gather demographic information and user's experience managing risk in manual. The next section focused on proposed risk management system features and suggested functionalities.

The feedback gathered from this survey serves as a guideline to ensure the system meets the specific needs of users across UKM Holdings and each subsidiary. Each of the feedback are important to developing risk management system that align with user expectations and requirements.

4.3 Functional Requirement

Functional requirements are description of the what system does by defining its system features and focusing on user requirements (AltexSoft Editorial Team, 2023). This section explained what the system should do to fulfil the user and system requirements.

Table 4.1: Functional Requirements for Admin

Function	Expected Result
Add User	Admin will be able to create a new user account in the system and assign roles for account subsidiary and top executive for each subsidiary.
Login	Admin will be able to access the system by login.
Access Control	Admin can activate or deactivate user access as needed.
Risk Oversight	Admin can view and manage all risk entries across all subsidiaries.
Assign Risks	Admin can assign specific risks to each subsidiary
Risk Configuration	Admin can set risk scoring
Dashboard	Admin can view real-time dashboards across subsidiaries
Report Generation	Admin can risk reports
Customize Profile	Admin will be able to customize their profile including name or password
Manage User	Admin can manage user by changing user password, changing user roles, changing departments or subsidiary and can view all user information such as id and password and subsidiary
Risk Assessment	Assign likelihood risk and impact
Manage Risks	Update and track status, mitigation and resolution of their risks.

Table 4.2: Functional Requirements for Executive

Function	Expected Result
Login	Able to access the system by login.
Risk Oversight	Can view and manage all risk entries across all subsidiaries.
Assign Risks	Can assign specific risks to each subsidiary
Risk Configuration	Can set risk scoring
Dashboard	Can view real-time dashboards across subsidiaries
Customize Profile	Able to customize their profile including name or password
Risk Assessment	Assign likelihood risk and impact
Manage Risks	Update and track status, mitigation and resolution of their risks.

Table 4.3: Functional Requirements for Head of Subsidiary

Function	Result
Login	Subsidiary User can login using their unique credentials.
View Own Data Only	Access is restricted to their own subsidiary's risk data.
Dashboard	Only can see data related to their own subsidiary

Table 4.4: Functional Requirements for Staff

Function	Result
Login	Subsidiary User can login using their unique credentials.
Add Risk Entries	Add new risks relevant to their own subsidiary.
Manage Risks	Update and track status, mitigation, and resolution of their risks.
View Own Data Only	Access is restricted to their own subsidiary's risk data.
Risk Assessment	Assign likelihood, impact risk
Dashboard	Only can see data related to their own subsidiary

Table 4.5: Functional Requirements for Viewer

Function	Result
Login	can login by using their unique credentials.
Dashboard Access	View dashboards across the all the subsidiaries.
Filter Insights	Filter dashboard data by subsidiary, risk level, or category.
Read-Only Data Access	View risk-related records without ability to edit or delete.

4.4 Non-Function Requirement

Non-functional requirements is description of how the system works (AltexSoft Editorial Team, 2023). This section explained what the system properties that focus on user expectation.

Table 4.4: Non-functional Requirements

Function	Result
Performance	The system must respond to user inputs within 2 seconds
Usability	The interface should be intuitive and user-friendly.
Reliability	The system must operate continuously without failure and minimizing the risk of unexpected downtime.
Security	Role-based access control must be implemented to restrict data access and the system must support secure login with password encryption.
Privacy	User and risk data must be stored securely and comply with data protection regulations; access to sensitive data should be limited by role.

4.5 System Requirement

This section outlines the hardware requirements and software requirements to ensure smooth development, deployment and operation of the risk management system for UKM Holdings.

4.5.1 Hardware Requirement

Table 4.5: Hardware Requirements

Device	HP 15-FC0105AU
Processor	AMD Athlon Silver 3050U with Radeon Graphics
Memory (RAM)	16 GB
System Type	64-bit operating system
Windows Edition	Windows 11 Home Single Language

4.5.2 Software Requirements

I. Visual Studio Code

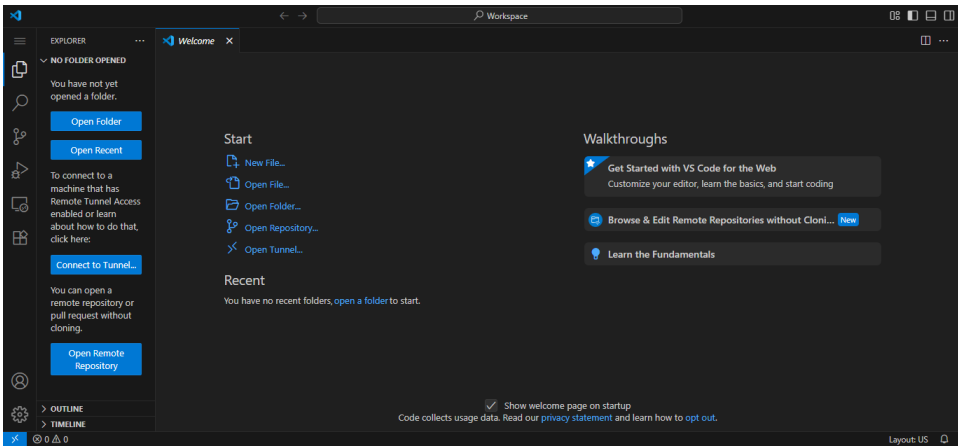


Figure 4.1: Visual Studio Code Interface (visualstudio.com, 2025)

Visual Studio Code or VS Code is a free and lightweight code editor developed by Microsoft (Jasiulionis, 2025). VS Code offers advanced features to help developers across the world. VS Code is suitable for beginners and experienced developers because it offers guides in using platforms. VS Code also a cross platform that works on Windows, macOS and Linux allowing developers using it on their operating system.

II. Node.js



Figure 4.2: Node.js Logo (Node.js, 2025)

Node.js is a powerful, open-source JavaScript runtime used for building fast and scalable backend applications. It allows developers to run JavaScript on the server side making it possible to handle tasks like database operations, user authentication and server logic using the same language as the frontend. Its non-blocking event-driven architecture makes it well-suited for real-time applications such as chat apps, APIs and streaming services (Brito et al., 2023).

III. React.js



Figure 4.3: React.js Logo (React.js, 2025)

React.js is a popular, open-source JavaScript library used for building dynamic and interactive user interfaces particularly for single page applications. Developed by Facebook, React focuses on the frontend which is what users see and interact with. It allows developers to create reusable UI components and efficiently update the user interface when data changes using a feature called the virtual DOM (Hasnain & Ullah, 2023).

4.6 Conclusion

This chapter summarizes the requirements need in developing risk managements system by outlining the functional and non- functional requirements that related. All these requirements are been outlined to ensure system is align with user's need and requirements. All of the data was gathered through questionnaire and by doing the analysis of existing system that similar to our proposed system. This chapter also has outlined the system and software requirements need in developing the proposed system. With these have been outlined, it can help us understanding the function and requirements for developing the risk management system to fulfil the user's expectation and requirements.

5 ANALYSIS

5.1 Introduction

This chapter provides a comprehensive analysis of the requirements needed to ensure the successful implementation of the Risk Management System for UKM Holdings. The primary objective is to develop a system that effectively supports users in managing organizational risks. To achieve the project objective, it is important to make an analysis from data collection to get the key insight regarding to the user and system requirements needs to be implement into risk management system. The findings of this analysis can help in developing system that can fulfils user and business operation needs.

5.2 Data Gathering Analysis

In this section, the data collection from questionnaires that have been distributed to users involved in risk management process. The purpose of the questionnaire was to gather all the requirements need and detailed feedback on current risk management practices. It also helps in giving data insights of the key features that need in the new risk management system. The results of this analysis serve as a guidance in system development that can fulfil user needs and improving overall risk handling process within the organization.

5.2.1 Questionnaire Analysis

A questionnaire using Google Forms are been made to collect user and system requirements needs for the Risk Management System. It included 15 questions focused on current practices and user expectations. The questionnaire was shared with staff involved in risk-related tasks. At least 50 responses were targeted to ensure reliable data. The collected results help identify key system features and user needs.

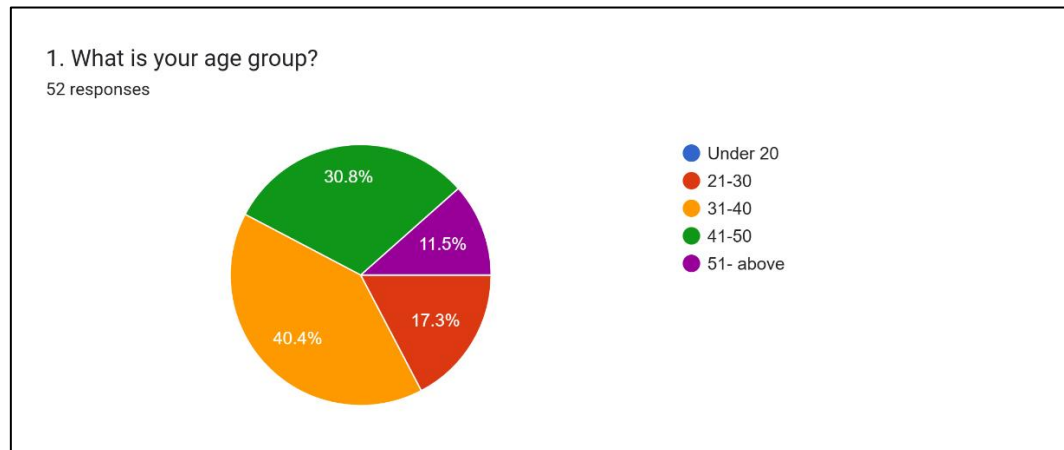


Figure 5.1: Question 1

Based on figure above, according to the responses, 40.4% of the 52 respondents are between the ages of 31 and 40, indicating that a significant portion of the sample consists of mid-career professionals. Additionally, 30.8% fall within the 41–50 age range, showing strong representation from experienced staff. The 21–30 age group accounts for 17.3% of the respondents, reflecting moderate participation from younger professionals. A smaller portion, 11.5%, are aged 51 and above, while no respondents were under the age of 20, suggesting that the survey primarily reached individuals with established roles in the organization.

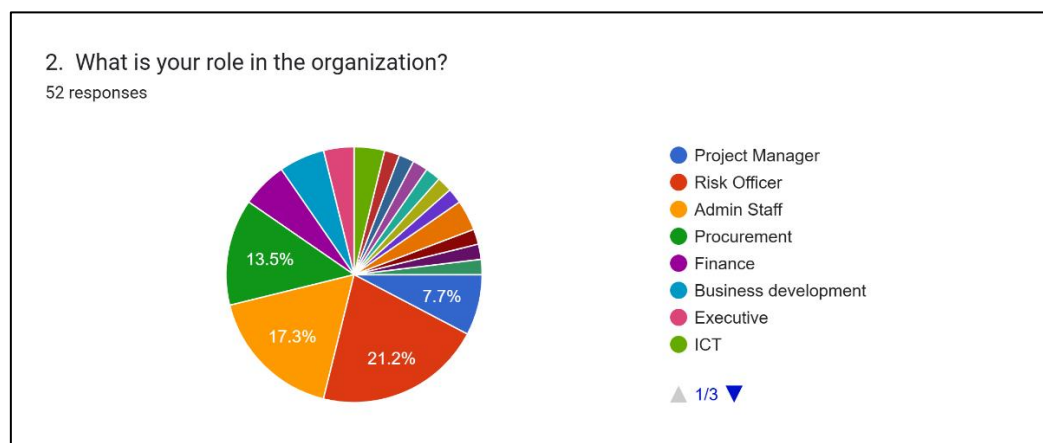


Figure 5.2: Question 2

Based on figure above, based on the questionnaire responses, a wide range of roles across UKM Holdings and its subsidiaries participated in the data collection process. The largest group of respondents were Risk Officers (21.2%), indicating strong involvement from those directly managing organizational risk. This was followed by Admin Staff (17.3%) and Procurement Personnel (13.5%), reflecting key support and operational roles.

Other notable roles included Business Development (9.6%), Project Managers (7.7%), and Finance Staff (5.8%). A smaller yet relevant group included Audit, ICT, Executives, and Interns—each representing 3.8% of the respondents. Roles with minimal representation such as Safety Officers, Legal & Secretarial, Data Entry, Operating Officers and Heads of Operations each accounted for 1.9%.

This finding shows the current risk management system have the users from multiple departments from each subsidiary of UKM Holding. The new risk management system must have unique features that can collaborate all the multiple departments across all the subsidiary in UKM Holdings.

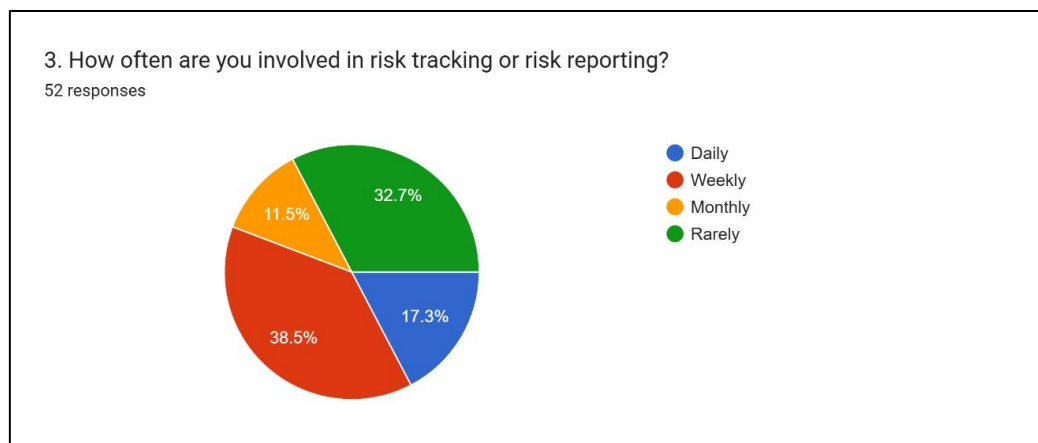


Figure 5.3: Question 3

Based on figure above, the question three results how often user involve in risk tracking and reporting among respondents from UKM Holdings and its subsidiaries. The majority user which are 38.5% of respondents are shows being involved in risk-related tasks weekly. This shows most of the user only manage risk related data weekly only. Next, 32.7% of respondents which are second most in this data indicated they are rarely involved in risk tracking or reporting. From this we can illustrates that many users only involve in risk related data rarely because they maybe only the staff that only need to see the reports or assign risk rarely. Meanwhile, 17.3% of respondents are involved in daily risk tracking and reporting. This shows daily risk tracking only been involve by a small group that have risk task responsibilities. Lastly, 11.5% of respondents are involve risk tracking monthly to show a smaller group with periodic risk responsibilities.

Overall, the findings from questions three shows the number of staff that regularly involve in risk management process and this highlights the importance developing risk management system that supports all the users that related in risk management in organizations.



Figure 5.4: Question 4

Based on figure above, the majority of respondents that represents 61.5% illustrates that they currently manage risks using Excel spreadsheets that is manual risk management process. This suggests for a need of integrated and automated system to improve efficiency and accuracy. Next, 32.7% number of respondents choose using manual processes such as using paper-based that may contribute to errors in data entry, and delays in sending the risk related data. Meanwhile, 5.8% of respondents use project management platforms shows limited use of dedicated digital tools specifically designed for risk management.

These all findings shows that most of the risk practices are been using excel. This shows the need of the replacing manual works into the centralized digital platforms in risk management process.

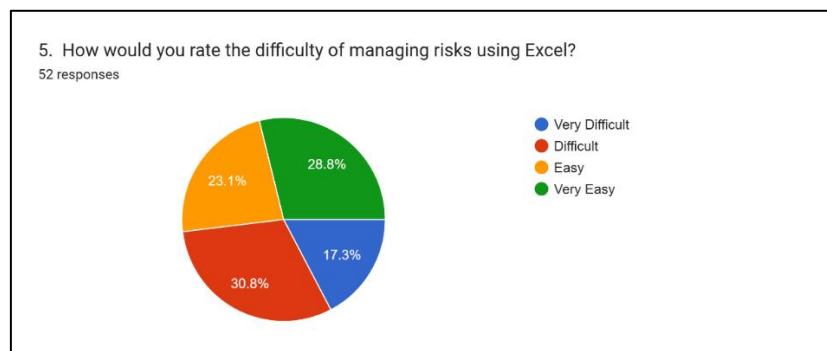


Figure 5.5: Question 5

Based on figure above, the question five ask on difficulties in using excel to manage risk. 30.8% of the respondent rated the process as difficult to manage the risk while 17.3% of respondent considered it very difficult. Combining this two indicates that nearly half of the users face challenges with using Excel in risk tracking and manage risk.

Meanwhile, 28.8% of the respondents illustrates managing risk with excel is very easy and 23.1% of the respondents rated it as easy. It shows that some users are comfortable with excel because the implementation of the excel is long time ago that show user knows to use excel.

Overall, the results from this question reflect that while Excel is commonly used by the user it may not be ideal for all users to manage risk in complex risk environments. These insights show that the risk management system that user friendly and not complex can helps user to change from manual risk process to digital process.

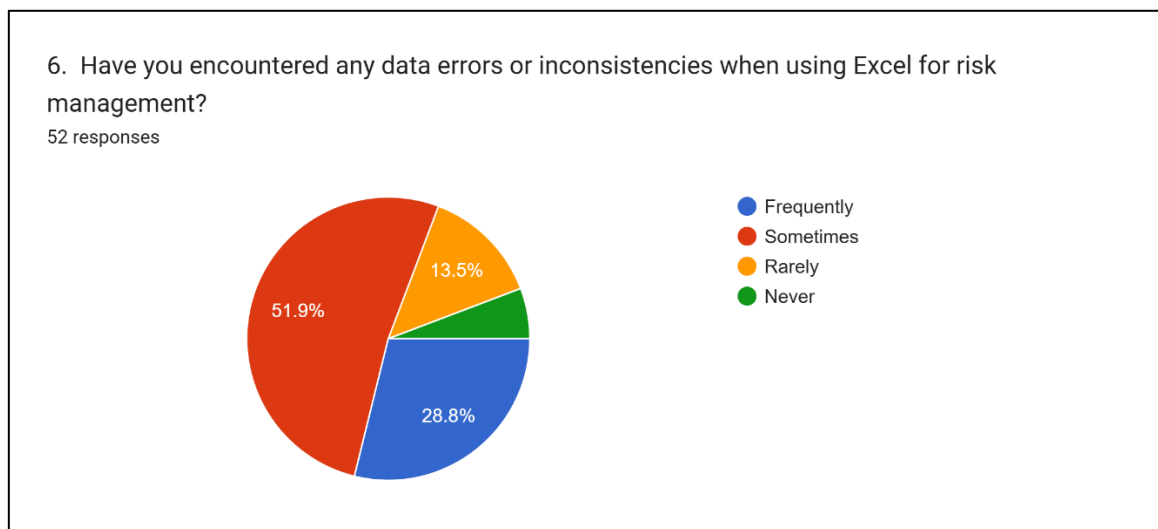


Figure 5.6: Question 6

Based on figure above, the majority of respondents reported experiencing data-related issues while using Excel for risk management. 51.9% indicated they sometimes encountered errors or inconsistencies, while 28.8% stated that such issues occurred frequently. This highlights a significant concern regarding the reliability of data managed through spreadsheets.

Only 13.5% reported rarely facing data problems, and a very small portion, 5.8%, claimed they never experienced any issues. These findings suggest that while Excel is widely used, it poses a notable risk in terms of data accuracy and consistency.

The results reinforce the need for a more structured and automated risk management system that can minimize manual data handling and reduce the likelihood of errors.

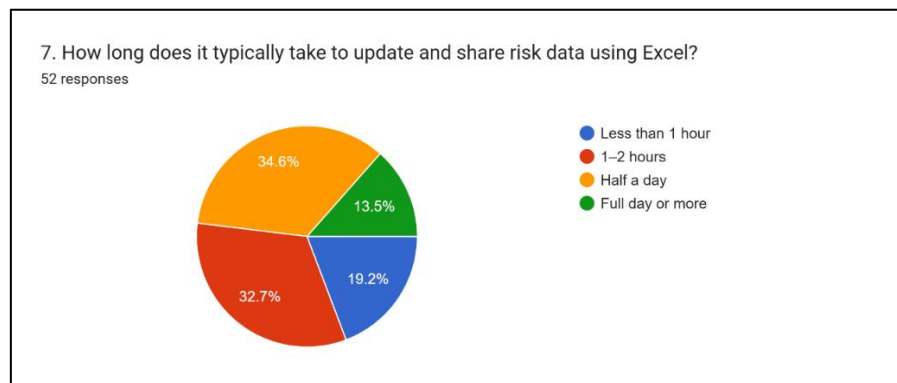


Figure 5.7: Question 7

Based on figure above, the majority of respondents which are 34.6% said that it takes half a day to share risk related data using excel because need to send the data to other departments in each of subsidiary. Next, 13.5% of respondent said that it takes a full day or more in sharing risk data using excel. Meanwhile, 32.7% of respondents need 1 to 2 hours to update and share risk related data maybe because of the urgent of the responding to the risk and method to overcome it. Only 19.2% of respondents complete to update and share risk data using excel indicates that few respondents find a method to use excel efficiently in sharing the data.

All these findings highlight that using excel for risk management process take a lot of time to share and update in organizations that have a lot of subsidiaries. This illustrates the need for a centralized risk management system that have real-time update and access across all the subsidiaries.

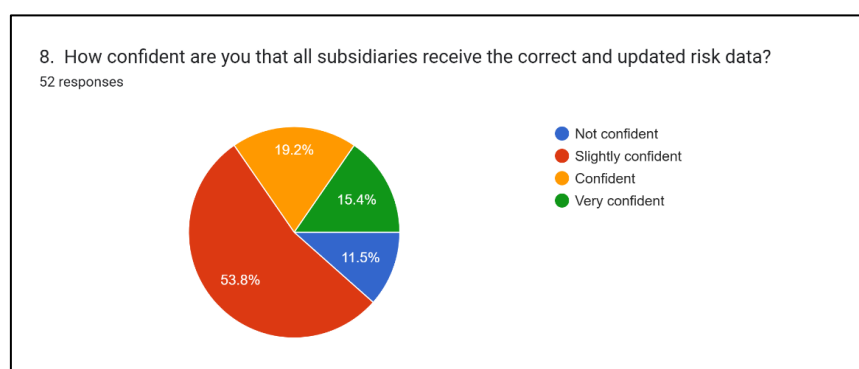


Figure 5.8: Question 8

Based on figure above, the question 8 ask respondents about the respondent confidence in in the accuracy and consistency of risk data shared across subsidiaries. Firstly, 53.8% of respondents said that they are slightly confident and 11.5% respondents said that they are not confident that all

subsidiaries receive the correct and updated risk data. Meanwhile, only 19.2% of respondents and 15.4% that said felt confident and very confident respectively.

The findings from this question most of the respondents are facing challenge in obtaining consistent risk data that accurate. This shows the development of the system must be centralized that can operates in different subsidiaries.

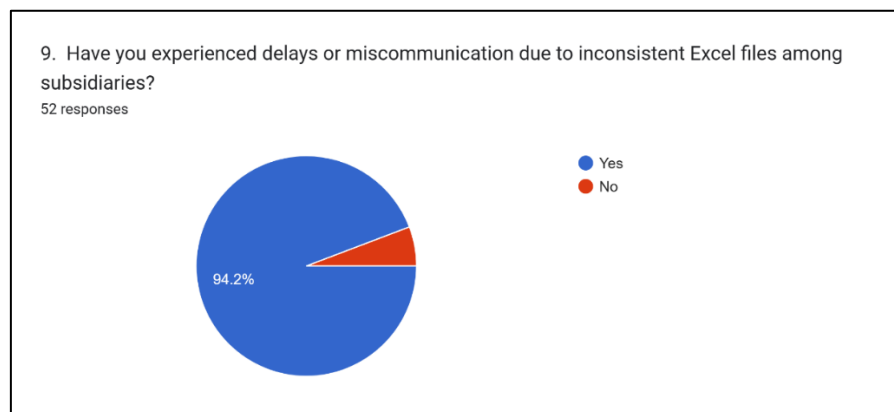


Figure 5.9: Question 9

Based on figure above, the major of respondents which are 94.2% said that they experiencing delays or miscommunication due to inconsistent Excel files shared among subsidiaries. This high percentage highlights a weakness in the current manual risk data management process. Meanwhile only 5.8% of respondents said that they had not faced such delays and miscommunication issues. These inconsistencies because of using excel can cause inconsistent risk data that can cause delay in making decision to address all this risk.

This findings from this question shows that a need for centralized risk management system that eliminates file version issues that occurred when using excel.

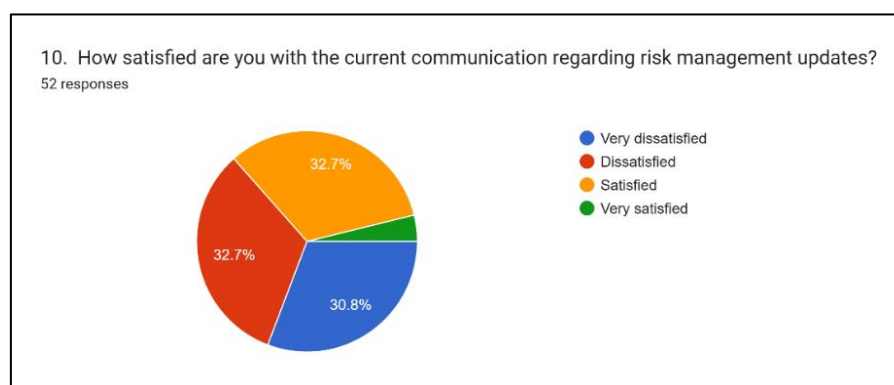


Figure 5.10: Question 10

Based on figure above, the question number 10 shows the satisfaction in current risk management practices. A more than half of respondents which are 63.5% combined from 30.8% of respondent that very dissatisfied and 32.7% of respondent that dissatisfied have highlighted that existing method to share the risk data are inconsistent. Meanwhile, 32.7% of respondents expressed satisfied in current communication while only 3.8% of respondents were very satisfied that shows positive experiences with communications method.

These results findings highlight the need to improve communication method and practices in the new risk management system. By implementing risk management system with can update real-time can increase satisfaction in communication in risk management updates.

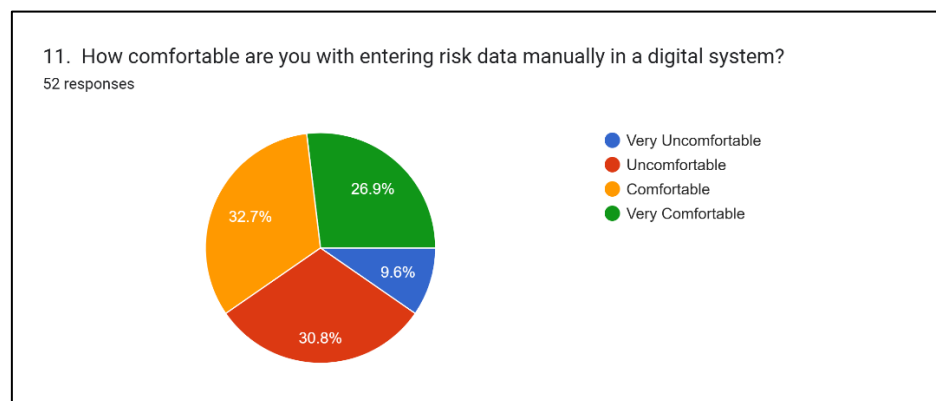


Figure 5.11: Question 11

Based on figure above, the question 11 ask the respondents status of comfort when enter data manually in a digital system. 32,7% of respondent feel comfortable and 26.9% of respondents feel very comfortable that resulted combined 59.6% that shows that majority respondents are ready with using digital system to do a data entry. Meanwhile 30.8% of respondents feels uncomfortable and 9.6% of respondents feel very uncomfortable shows that some respondent still prefers manual entry data method,

These findings highlight that development of risk management system is user friendly that make user easily use the system. Also, the training need to be conduct to teach all the user to us the system.

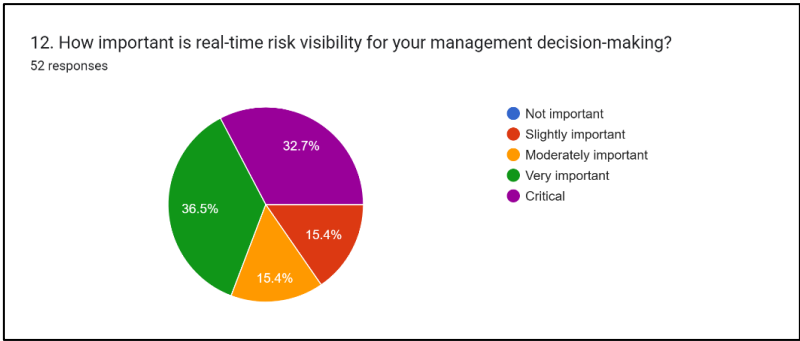


Figure 5.12: Question 12

Based on figure above, the question 12 shows result from real-time risk visibility is seen as a key factor in effective decision-making within UKM Holdings and its subsidiaries. A total of 69.2% of respondents rated it as either very important (36.5%) or critical (32.7%) that indicating a strong need for immediate access to accurate and up-to-date risk data. Meanwhile, 15.4% of respondents considered it moderately important and another 15.4% viewed it as slightly important. Importantly, none of the respondents considered it unimportant.

This indicates that while all respondents recognize the value of real-time visibility to some extent, the majority expect it to play a central role in supporting timely and well-informed risk decisions. A system that offers real-time monitoring will not only improve situational awareness but also strengthen proactive risk response and strategic planning across the organization.

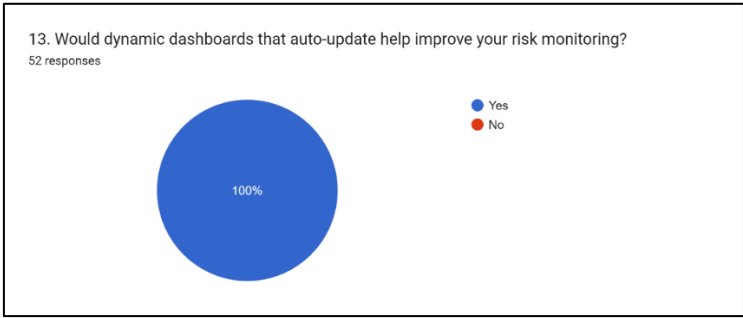


Figure 5.13: Question 13

Based on figure above, all respondents (100%) agreed that dynamic dashboards with auto-updating features would improve risk monitoring. This unanimous response highlights a strong demand for real-time, visual tools that can simplify the tracking of risk trends and statuses across departments and subsidiaries. The results clearly indicate that implementing dynamic dashboards should be a core feature of the proposed Risk Management System, as it aligns directly with user expectations for better visibility, faster decision-making, and more efficient risk communication.

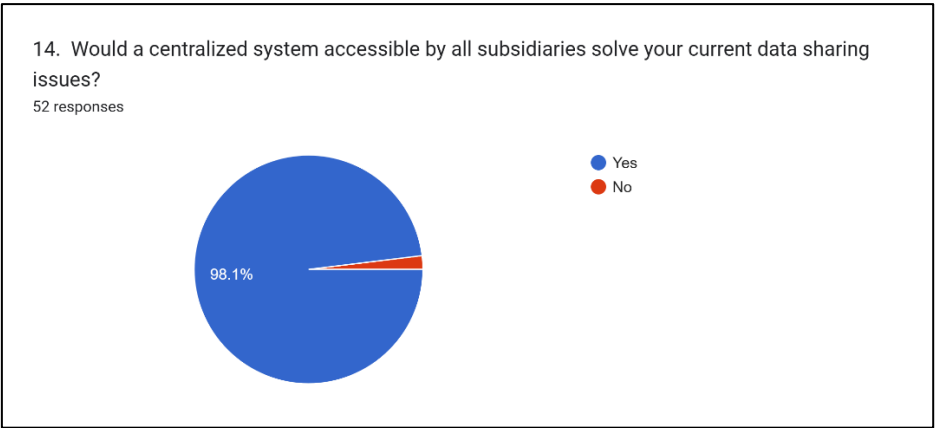


Figure 5.14: Question 14

Based on figure above, a significant majority of respondents (98.1%) indicated that implementing a centralized system accessible to all subsidiaries would effectively address their current data sharing challenges. This shows a clear organizational need for a unified platform to streamline communication and ensure consistent access to risk information. With only 1.9% of respondents expressing doubt the results strongly reinforce the value of centralized access in improving coordination reducing duplication and enhancing the overall efficiency of risk management across UKM Holdings and its subsidiaries.

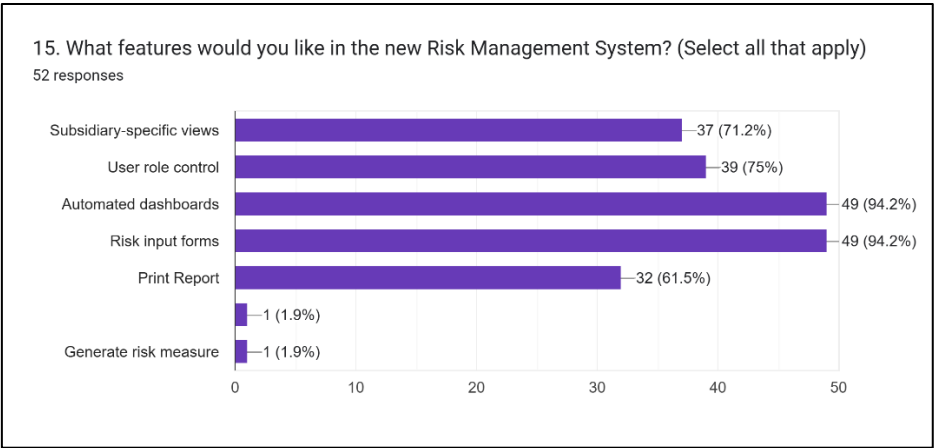
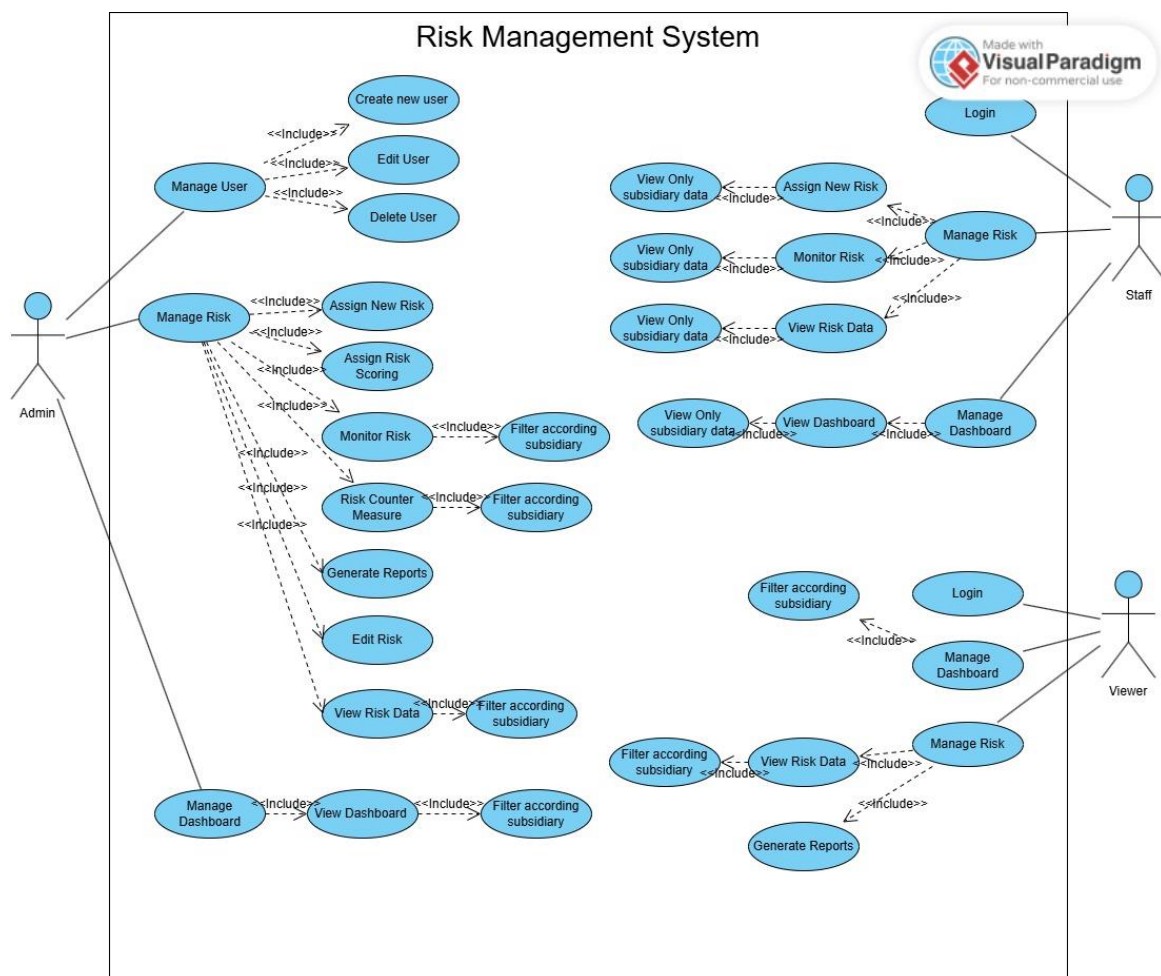


Figure 5.15: Question 15

Based on figure above, the responses show strong interest in several key features for the proposed Risk Management System. Automated dashboards and risk input forms were the most requested each selected by 94.2 percent of respondents highlighting a high demand for real-time tracking and simplified data entry.

Additionally, 61.5 percent of respondents requested a print report feature showing that documentation and reporting remain important for record keeping and compliance. One respondent representing 1.9 percent suggested an additional feature which is generate risk measure. This may refer to tools that automatically calculate risk scores or severity levels. This preference clearly reflects the need for a system that is flexible automated secure and capable of supporting both centralized and subsidiary level risk operations effectively.



The figure 5.16 above illustrates the Use Case Diagram for the Risk Management System developed for UKM Holdings and its subsidiaries. It highlights the interactions between three primary user roles which are Admin Staff and Viewer and the system's core functionalities. Admin granted the most comprehensive access with the ability to manage users submit and edit risk data monitor risks

and extend their actions to include generating dashboards and printing reports. This role is important for overseeing risk operations at the subsidiary level while ensuring data is managed consistently.

Staff role is designed for operational users such as risk officers and department personnel. They are permitted to assign risks and view relevant risk data and dashboards specific to their own subsidiary. Their access is limited to maintain data segregation and confidentiality. Viewer typically an executive auditor or compliance officer has read-only access. They can view risk data and dashboards but cannot make any changes. This ensures transparency and oversight without compromising data integrity. This diagram also shows extend relationships indicating optional interactions like generating dashboards or assigning risks that build upon core actions like submitting or monitoring risks. This structure promotes modularity and flexibility within the system's functionality.

5.4 Flowchart

5.4.1 Flowchart for Admin

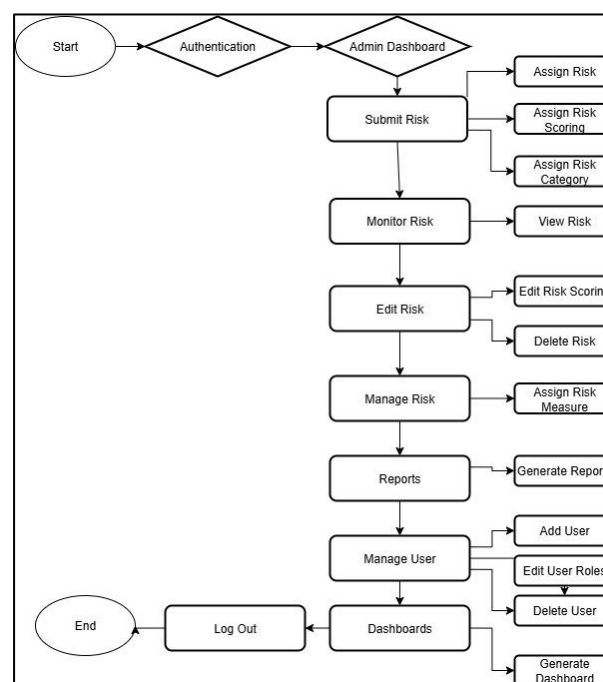


Figure 5.17: Flowchart for Admin

According to figure 5.17, this flowchart diagram provides overall steps for admin when using the risk management system. Firstly, admin need to login according to their authentication and then admin can submit risk which they can assign new risk and its category. Admin can monitor risk which can view all the subsidiary risk data across UKM Holdings. Admin also can edit risk which admin can edit risk scoring to update the scoring of the risk and delete risk. Admin also can manage risk which can assign risk measure to each department. Admin can generate reports and manage user by adding new user, edit the user roles and delete user. Lastly, admin can generate dashboard to view all the insight data from all the risk data from each subsidiary.

5.4.2 Flowchart for Staff

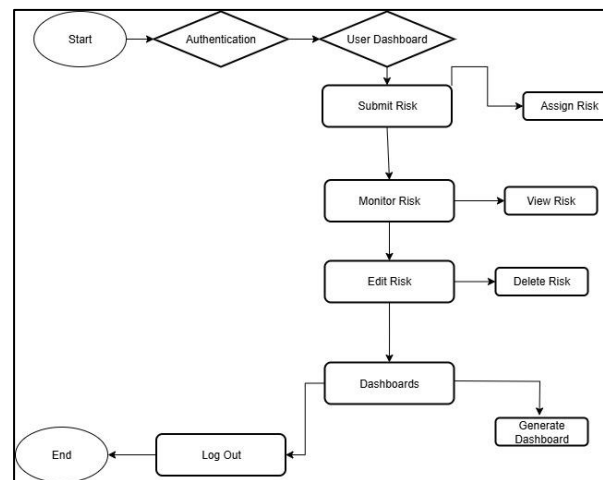


Figure 5.18: Flowchart for Staff

According to figure 5.18, this flowchart diagram provides overall steps for user when using the risk management system. Firstly, staff need to login according to their authentication and then staff can submit risk which they can assign new risk. Staff can monitor risk which can view all the only their subsidiary risk data only. Staff also can edit risk which user delete risk. Lastly, staff can generate dashboard to view only their subsidiary insight data.

5.4.3 Flowchart for Viewer

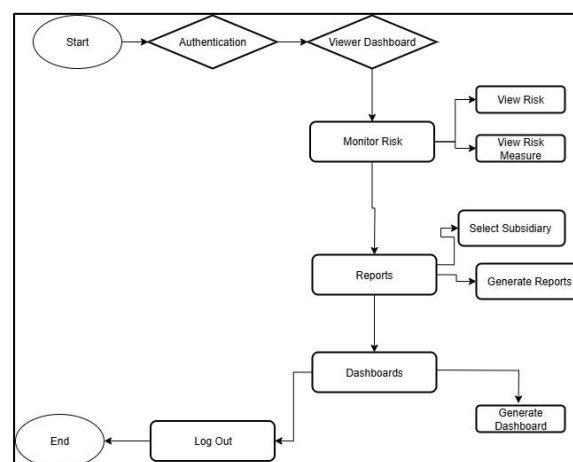


Figure 5.19: Flowchart for Viewer

According to figure 5.18, this flowchart diagram provides overall steps for viewer when using the risk management system. Firstly, viewer need to login according to their authentication and then viewer can monitor risk and risk measure that have been implement. Viewer can generate reports from each subsidiary. Lastly, viewer can generate dashboard to view all the subsidiary data across UKM Holdings.

5.5 BPMN (Business Process Modelling Notation)

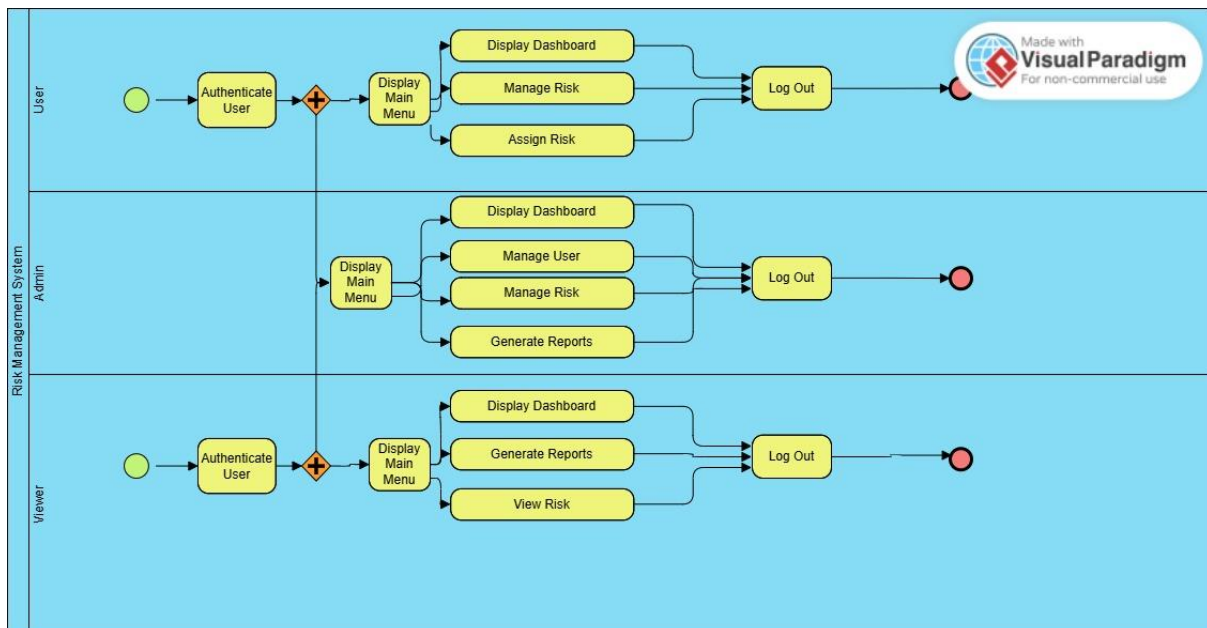


Figure 5.20: Business Process Modelling Notation

According to figure 5.20, it illustrates the business process modelling notation (BPMN). Standard symbols are used to visualize processes such as display dashboard, manage risk, assign risk, generate reports and view risk. BPMN helps map out how the admin, staff and viewer in visualize all the process in risk management system. Processes are simple, repeatable and intelligible, help reducing errors and increase productivity. It organizes the thinking so that bottlenecks can be found and the system designed more for higher scalability and reliability.

5.6 Conclusion

Chapter 5 discussed in detail the workflows and system interactions involved in the proposed Risk Management System, using various modeling techniques including use case diagrams, flowcharts, and BPMN. These models were used to illustrate the responsibilities and interactions of key user roles such as admins, staff, and viewers. They also demonstrated how the system will support efficient risk reporting, monitoring, documentation, and centralized oversight.

The use case diagrams highlighted system functionality and showed how different roles interact with the system to perform tasks like submitting risk reports, managing risk data, and viewing dashboards. The flowcharts presented a clear sequence of actions for each risk-related process, while BPMN diagrams outlined how these processes align to ensure smooth workflows across subsidiaries and departments, reducing delays and minimizing errors.

From these models, it is evident that the proposed Risk Management System addresses UKM Holdings' objectives of improving risk visibility, reducing manual handling and enabling informed decision-making in real time. The system's process-driven design affirms its potential to enhance operational efficiency, ensure compliance, and support both immediate and long-term organizational risk governance goals. This chapter thus establishes how the implementation of the Risk Management System will be both user-centered and operationally effective.

6 DESIGN

In this chapter, in developing a successful system, the interface design must be carefully constructed to meet user requirements and expectations to suit their preferences. Interface design, data flow design (DFD), database design, flow of the system are essential in this phase especially for systems that store a large amount of data such as Risk Management System (Yu et al. (2024).

6.1 Introduction

This chapter outlines the requirements for designing user interfaces, commonly known as Graphical User Interfaces (GUI). Interface design is a crucial component before the actual system development begins. In this phase, data collected from client interviews and user requirements is applied. This chapter outlines the requirements for designing user interfaces, commonly known as Graphical User Interfaces (GUI). Interface design is a crucial component before the actual system development begins (Li 2023). The design process adopts a user-centered approach that ensuring that all users including administrators, executive, head of subsidiary, staff and viewer can interact with the system efficiently and intuitively.

This chapter is organized into several key sections that cover different aspects in designing a system. The interface design section represents a wireframe that illustrates the visual layout of the user interaction into the system. The database section shows a detail of the data flow diagram (DFD), entity relationship diagram (ERD) and data dictionary. Finally, system flow section that demonstrates how different components interact to deliver to the complete functionality of the Risk Management System.

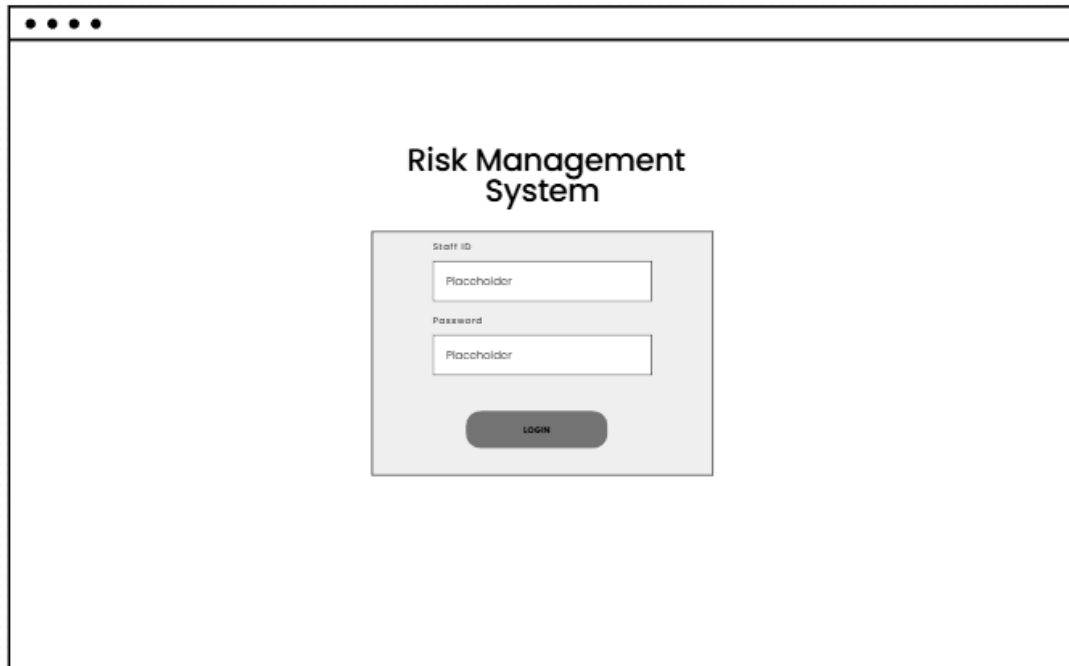
6.2 Interface Design

The interfaces design of the Risk Management System developed by focusing to the usability, accessibility and aesthetic appeal. Interface design involves how the information system is presented to users by allowing them to interact with the system effectively (Li 2023). The design of the system is been focusing to help all the users to navigate the system with minimal training and effort.

The Risk Management System will implementing a Role-Based Access Control (RBAC) that using same interfaces design across all users which are admin, executive, head of subsidiary, staff and viewer. The interface elements will be show and hide according to the user's role and permissions. By implementing Role-Based Access Control (RBAC), there are several advantages which are easier to maintain because using only one layout of interface design and reduced development times in develop the system.

Since this system are specifically developed for UKM Holdings, all the interfaces of the system will be designed in Bahasa Melayu because UKM Holdings are been owned by Universiti Kebangsaan Malaysia (UKM) which adopts Bahasa Melayu as its primary language for communication.

6.2.1 Login Page



The image shows a wireframe of a login page for the Risk Management System. The page is enclosed in a rectangular frame with a header bar at the top containing three dots. The main content area is white and contains the following elements:

- The title "Risk Management System" is centered at the top of the main area.
- Below the title is a light gray rectangular box containing the login form.
- Inside the gray box, the label "Staff ID" is positioned above a white input field with the placeholder text "Placeholder".
- Below the Staff ID field, the label "Password" is positioned above another white input field with the placeholder text "Placeholder".
- At the bottom of the gray box is a dark gray, rounded rectangular button with the word "LOGIN" in white capital letters.

Figure 6.1: Design of Login Page

Figure 6.1 depicts the Risk Management System login interfaces. All users which are admin, executive, head of subsidiary, staff and viewer will enter their staff id and password that have been given by admin.

6.2.2 Dashboard Page

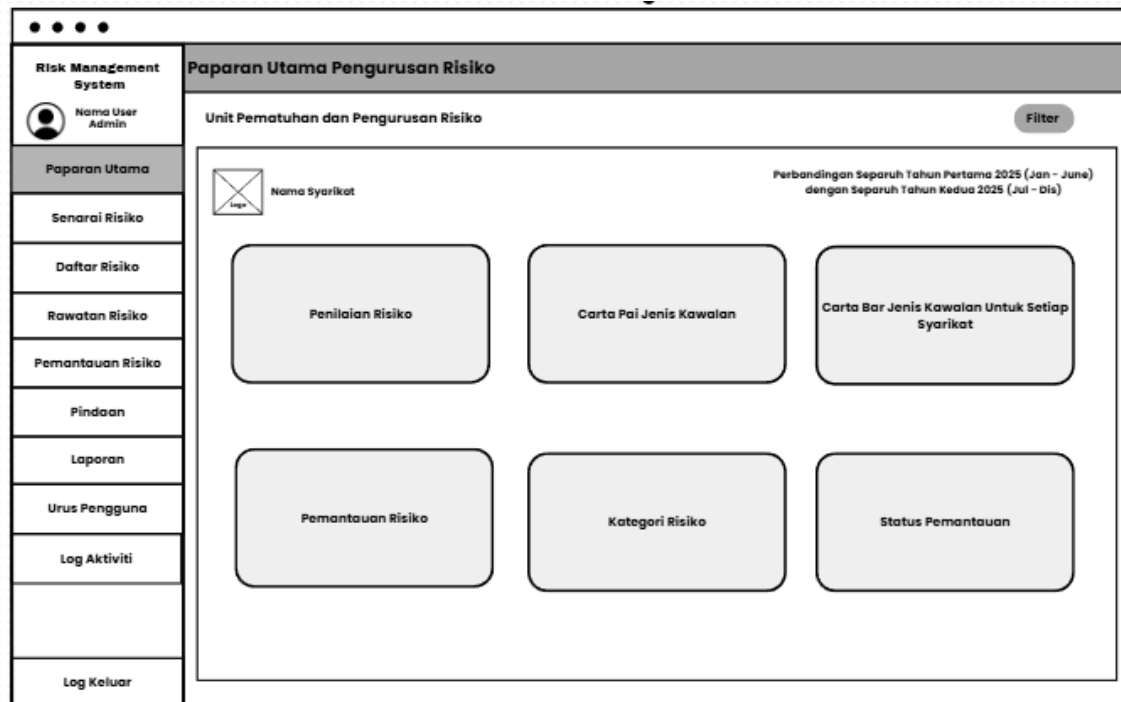


Figure 6.2: Design of Dashboard Page

Figure 6.2 shows the design of dashboard page which also called as “Paparan Utama”. The overall dashboard of subsidiary only be show to the admin, executive and viewer because they can see all the subsidiary data meanwhile head of subsidiary and staff only can see their represents subsidiary only and can’t see other’s subsidiary dashboard.

6.2.3 List of Risks Page

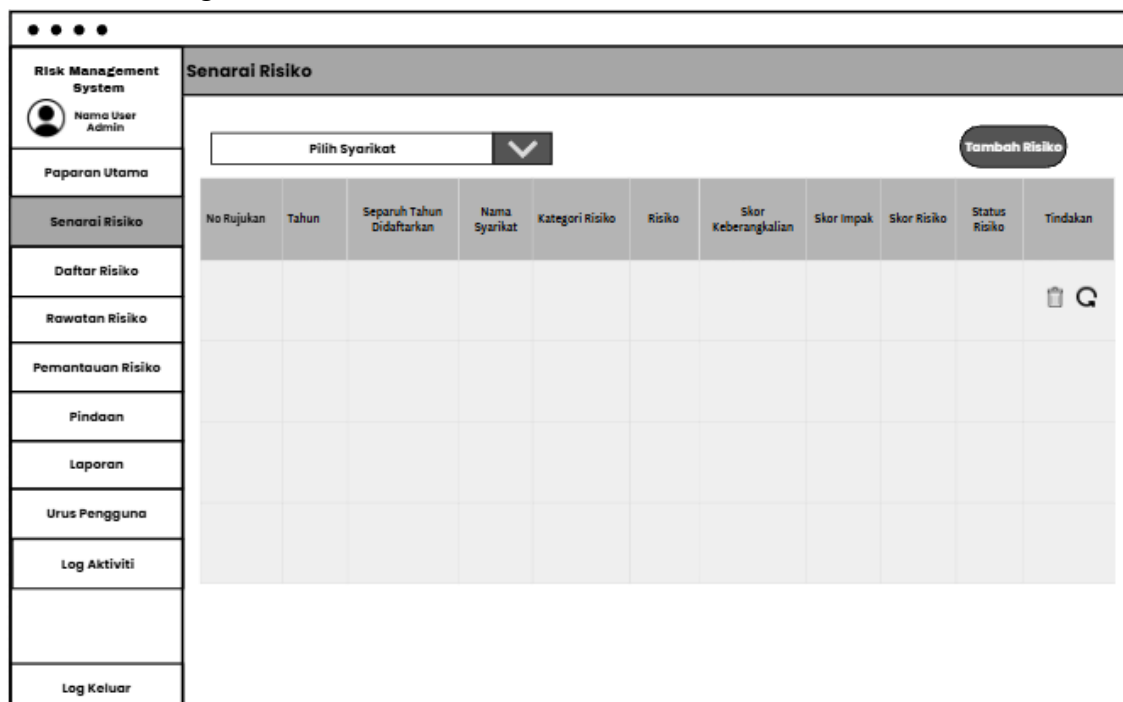


Figure 6.3: Design of List Risk Page

Figure 6.3 shows the design of list risk page which also called as “Senarai Risiko”. In this page, all the risk data will be show to the three users which are admin, executive and viewer, they can see all the risk related-data across all subsidiaries meanwhile head of subsidiary and staff only can see their subsidiary risk related data only.

6.2.4 Risk Detail Modal

The Risk Detail Modal is a comprehensive form for viewing risk details. It includes the following sections:

- Maklumat Risiko:** Fields for Nama Pengguna, No Rujukan, Tahun, Separuh Tahun Didaftarkan, Syarikat, and Status Pemantauan Terkini.
- Paparan Utama:** A section for the main view of the risk.
- Senarai Risiko:** A list of risks with columns for Kategori Risiko, Bahagian/Unit, Risiko, and Punca.
- Daftar Risiko:** A section for the risk register.
- Rawatan Risiko:** A section for risk treatment.
- Pemantauan Risiko:** A section for risk monitoring.
- Penilaian Risiko:** A section for risk assessment.
- Pindaan:** A section for risk change.
- Laporan:** A section for risk report.
- Urus Pengiraan:** A section for risk calculation.
- Log Keluar:** A section for risk log.

The modal also features a 'Kembali' (Back) button at the bottom.

Figure 6.4: Design of Risk Detail Modal

Figure 6.4 shows the risk detail modal that show the details of the risk which are information of the risk, risk identification, risk assessment, risk treatment and risk monitoring. All the users can see the detail of the risk when they click at the risk at list of risk page.

6.2.5 Edit Risk Modal

Risk Management System
Nama User: Admin

Paparan Utama
Senarai Risiko
Daftar Risiko
Rawatan Risiko
Pemantauan Risiko
Pindaan
Laporan
Urus Pengguna
Log Aktiviti
Log Keluar

Maklumat Risiko

No Rujukan: Tahun: Separuh Tahun Didaftarkan:
Syarikat:

Pengenalpastian Risiko

Kategori Risiko: Bahagian/Unit:
Risiko: Punca:
Keseluruhan:

Penilaian Risiko

Skor Kebimbangan	Skor Impak	Skor Risiko	Status Risiko
v	v		v

Figure 6.5: Design of Edit Risk Modal

Figure 6.5 shows interface design of edit risk modal which are editing function modal for admin and executive only. Admin can edit all the risk related data but executive cant edit's risk assessment data which are the risk data scoring of likelihood, impact and risk level.

6.2.6 Register Risk Page

The image shows a web application interface for a Risk Management System. On the left is a sidebar menu with the following items: 'Paparan Utama', 'Senarai Risiko', 'Daftar Risiko' (highlighted), 'Rawatan Risiko', 'Pemantauan Risiko', 'Pindaan', 'Laporan', 'Urus Pengguna', 'Log Aktiviti', and 'Log Keluar'. The main content area is titled 'Daftar Risiko' and contains three main sections:

- Registration Form:** Includes fields for 'No Rujukan:', 'Tahun:', 'Separuh Tahun Didaftarkan:', 'Syarikat:', 'Kategori Risiko:', and 'Bahagian/Unit:'. There is a 'Panduan' button.
- Risk Details:** Includes text input fields for 'Risiko:', 'Punca:', and 'Kesan:'.
- Penilaian Risiko (Risk Assessment):** A table with columns for 'Skor Keberangskalian', 'Keberangskalian', 'Skor Impak', 'Impak', 'Skor Risiko', and 'Status Risiko'. Each column has a dropdown arrow. Below the table is a 'Daftar' button.

Figure 6.6: Design of the Risk Register Page

Risk register page design is shown in figure 6.6 which is also called as “Daftar Risiko”. Only three users can register the risk which are admin, executive and staff. Admin and executive can do the risk assessment but staff can’t do the risk assessment and staff only can register the risk for their subsidiary only.

6.2.7 Risk Treatments Page

The interface for the Risk Treatments Page (Rawatan Risiko) includes a sidebar menu on the left with the following items: Risk Management System, Nama User Admin, Paparan Utama, Senarai Risiko, Daftar Risiko, Rawatan Risiko (highlighted), Pemantauan Risiko, Pindaan, Laporan, Urus Pengguna, Log Aktiviti, and Log Keluar.

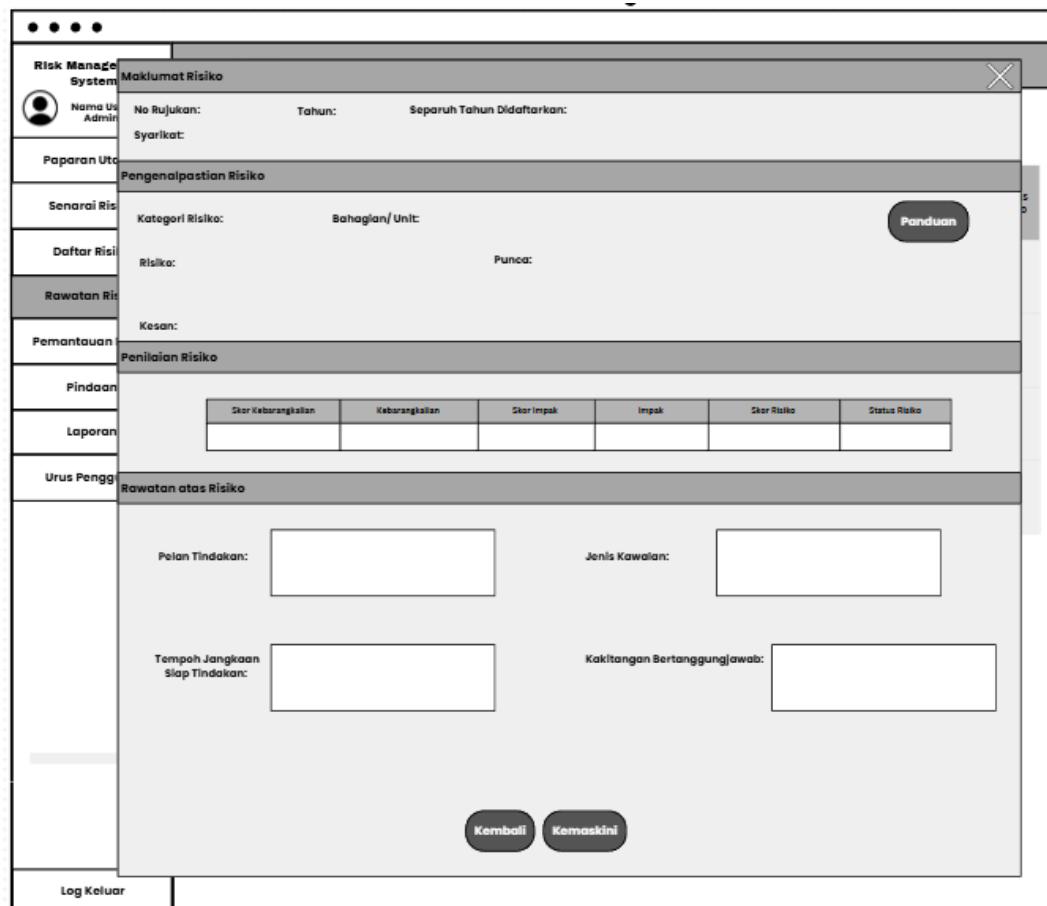
The main content area features a header 'Rawatan Risiko' with two filters: 'Pilih Syarikat' and 'Tahun'. Below these are two summary cards: '3 Bilangan Risiko Aktif' and '2 Bilangan Plan Rawatan'.

The main data table has the following columns: No Rujukan, Tahun, Separuh Tahun Didaftarkan, Nama Syarikat, Kategori Risiko, Risiko, Skor Risiko, Plan Tindakan, Jenis Kawalan, Tempoh Jangkaan Siap Tindakan, and Kakitangan Bertanggungjawab. The table contains 10 empty rows for data entry.

Figure 6.7: Design of Risk Treatments Page

Figure 6.7 shows the design interface for risk treatments page which also called “Rawatan Risiko”. This page shows the risk that have a treatment. All the users can see the risk treatments data but only admin and executive can click at risk to open a modal to add treatment to the risk.

6.2.8 Add and Edit Treatment Modal



The image shows a web application interface for a Risk Management System. It features a sidebar menu on the left with options: Risk Management System, Maklumat Risiko, Paparan Utama, Senarai Risiko, Daftar Risiko, Rawatan Risiko, Pemantauan, Pindaan, Laporan, and Urus Pengiraan. The main content area is titled 'Maklumat Risiko' and contains several sections: 'Maklumat Risiko' with fields for 'No Rujukan:', 'Tahun:', 'Separuh Tahun Didaftarkan:', and 'Syarikat:'; 'Pengenalan Risiko' with fields for 'Kategori Risiko:', 'Bahagian/Unit:', 'Risiko:', and 'Punca:'; 'Penilaian Risiko' with a table for risk assessment; and 'Rawatan atas Risiko' with fields for 'Pelan Tindakan:', 'Jenis Kawalan:', 'Tempoh Jangkaan Siap Tindakan:', and 'Kakitangan Bertanggungjawab:'. There are also buttons for 'Panduan', 'Kembali', and 'Kemaskini'.

Maklumat Risiko

No Rujukan: Tahun: Separuh Tahun Didaftarkan: Syarikat:

Pengenalan Risiko

Kategori Risiko: Bahagian/Unit: Risiko: Punca:

Penilaian Risiko

Skor Keberangskalan	Keberangskalan	Skor Impak	Impak	Skor Risiko	Status Risiko

Rawatan atas Risiko

Pelan Tindakan: Jenis Kawalan: Tempoh Jangkaan Siap Tindakan: Kakitangan Bertanggungjawab:

Kembali Kemaskini

Figure 6.8: Design of Add and Edit Treatment Modal

Figure 6.8 shows the interface for the adding and editing the treatment using the modal. Only admin and executive can add and edit the risk treatment. They need to fill at container at risk treatment section to add the treatment and edit the treatment.

6.2.9 Risk Monitoring Page

The interface for the Risk Monitoring Page (Pemantauan Risiko) includes a sidebar menu with the following items: Risk Management System, Nama User Admin, Paparan Utama, Senarai Risiko, Daftar Risiko, Rawatan Risiko, Pemantauan Risiko (highlighted), Pindaan, Laporan, Urus Pengguna, Log Aktiviti, and Log Keluar.

The main content area is titled "Pemantauan Risiko" and contains two dropdown filters: "Pilih Syarikat" and "Tahun". Below these filters is a placeholder for a "Pie Chart Status Pemantauan Risiko".

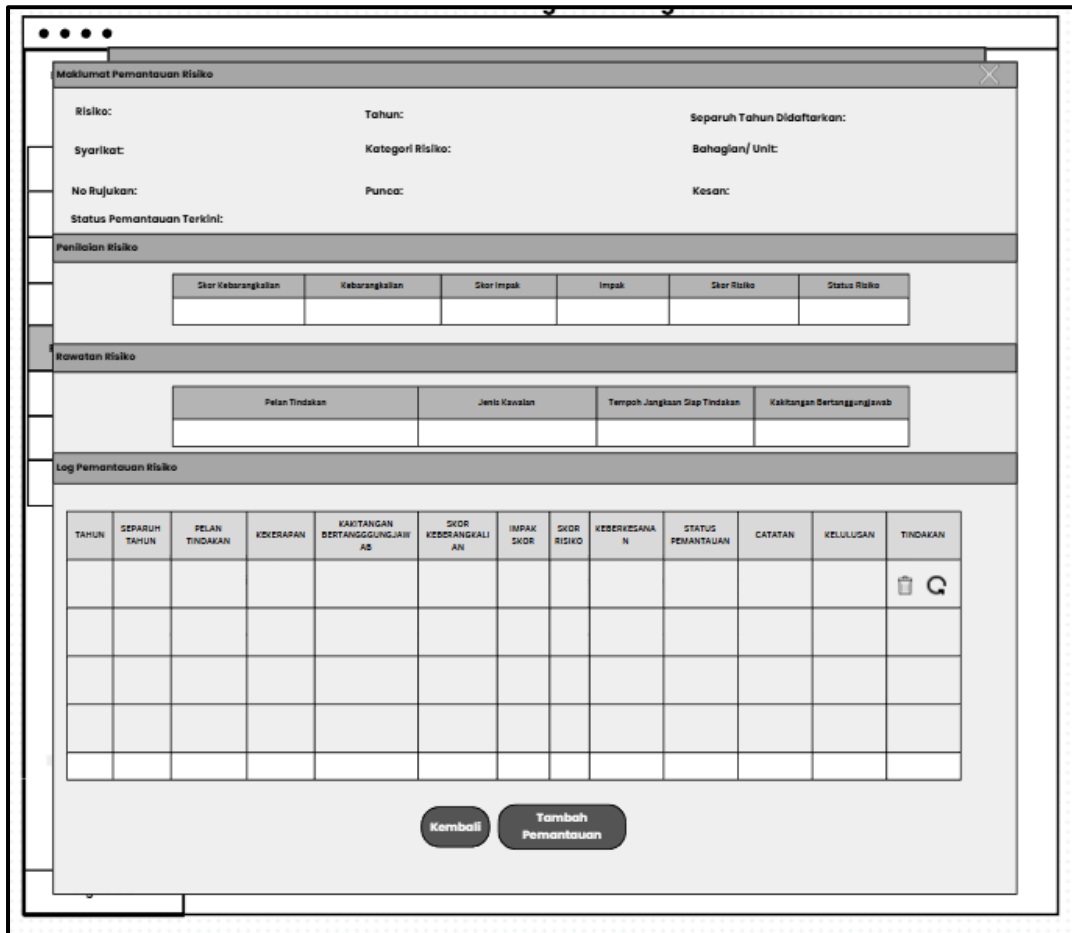
The main data table is titled "Senarai Pemantauan Risiko" and has the following columns: No Rujukan, Tahun, Separuh Tahun Didaftarkan, Nama Syarikat, Kategori Risiko, Risiko, Rawatan Risiko, Pelan Tindakan Pemantauan Risiko, Status Pemantauan Terkini, Skor Risiko Sebelum Terkini, and Skor Risiko Terkini. The table contains 10 rows of data.

No Rujukan	Tahun	Separuh Tahun Didaftarkan	Nama Syarikat	Kategori Risiko	Risiko	Rawatan Risiko	Pelan Tindakan Pemantauan Risiko	Status Pemantauan Terkini	Skor Risiko Sebelum Terkini	Skor Risiko Terkini

Figure 6.9: Design of Risk Monitoring Page

Figure 6.9 shows the interfaces of the monitoring page which also call "Pemantauan Risiko". In this pages all the user can see all the risk monitoring status whether it opened, closed, been implemented and been monitored.

6.2.10 Risk Monitoring Detail Modal



The modal is titled "Maklumat Pemantauan Risiko" and contains the following sections:

- Metadata:**
 - Risiko: _____ Tahun: _____ Separuh Tahun Didaftarkan: _____
 - Syarikat: _____ Kategori Risiko: _____ Bahagian/ Unit: _____
 - No Rujukan: _____ Punca: _____ Kesan: _____
 - Status Pemantauan Terkini: _____
- Penilaian Risiko:**

Skor Kebarangkalian	Kebarangkalian	Skor Impak	Impak	Skor Risiko	Status Risiko
- Rawatan Risiko:**

Pelan Tindakan	Jenis Kawalan	Tempoh Jangkaan Siap Tindakan	Kakitangan Bertanggungjawab
- Log Pemantauan Risiko:**

TAHUN	SEPARUH TAHUN	PELAN TINDAKAN	KEKERAPAN	KAKITANGAN BERTANGGUNGJAWAB	SKOR KESERANGKALAN	IMPAK SKOR	SKOR RISKI	KESERKESANAAN	STATUS PEMANTAUAN	CATATAN	KELULUSAN	TINDAKAN

At the bottom, there are two buttons: "Kembali" and "Tambah Pemantauan".

Figure 6.10: Design of Risk Monitoring Detail Modal

Figure 6.10 shows the interface of risk monitoring detail modal. All the user can click at the risk in monitoring page to open a detail for the risk but only admin and executive can add the monitoring. All information about the risk were been put in this modal to make the users easy to see the data.

6.2.11 Amendment Page

Risk Management System
 Nama User: Admin

Pindaan

Pilih Syarikat ▼ Tahun ▼ Status Pindaan ▼

Senarai Pindaan

Bil	No Rujukan	Tahun	Separuh Tahun Didaftarkan	Nama Syarikat	Kategori Risiko	Risiko	Pemohon	Status Pindaan	Tindakan

Log Aktiviti

Log Keluar

Figure 6.11: Design of Amendment Page

Figure 6.11 show the interface of the amendment pages. Amendment page which called “Pindaan” in this system are features specifically for admin and executive. Executive need to request to do amendment to the risk scoring in risk assessment or risk scoring for effectiveness.

6.2.12 Amendments Details Modal

Risk Management System

Permohonan Pindaan

Nama User: Super Admin

Maklumat Risiko

No Rujukan: Tahun: Separuh Tahun Didaftarkan: Bahagian/ Unit:

Syarikat: Risiko: Kategori Risiko:

Punca: Kesan:

Penilaian Risiko

Skor Kebarangkalian	Kebarangkalian	Skor Impak	Impak	Skor Risiko	Status Risiko

Permohonan Pindaan

Pemohon:

Skor Kebarangkalian	Kebarangkalian	Skor Impak	Impak	Skor Risiko	Catatan Pindaan

Kembali Terima Tolak

Log Keluar

Figure 6.12: Design of Amendments Details Modal

Figure 6.12 shows the interface for the amendments detail modal which call in this modal as “Permohonan Pindaan”. In this modal, admin need to accept or reject for amendment that been request by the executive.

6.2.13 Report Page

Bil	No Rujukan	Tahun	Separuh Tahun Didaftarkan	Nama Syarikat	Kategori Risiko	Risiko	Status Pemantauan

Figure 6.13: Design for Report Page

Figure 6.13 shows the interface for report page which called as “Laporan”. In this page only admin have access for this page. Admin can click at the risk for open the risk detail to print the report of the risk.

6.2.14 Report Modal

UKM HOLDINGS
Logo

PENYETIAHAN & PENGUKURAN RISIKO

NAMA SYARIKAT:			
TAHUN:		SEPARUH DIDaftarkan:	
BAHAGIAN/UNIT:		NO RUJUKAN:	
KATEGORI RISIKO:		KELULUSAN:	

1. PENGENALPASTIAN RISIKO			2. PENILAIAN RISIKO				
RISIKO	PUNCA	KESAN	SKOR KEBARANGKALIAN RISIKO	KEBARANGKALIAN	SKOR IMPAK RISIKO	SKOR RISIKO	STATUS RISIKO

3. BAWATAN KE ATAS RISIKO			
PELAN TINDAKAN	JENIS KAWALAN	TEMPOH JANGKAAN SIAP TINDAKAN	KAKITANGAN BERTANGGUNGJAWAB

4. PEMANTAUAN RISIKO							
SEPARUH TAHUN							
KELULUSAN:							
PEMANTAUAN RISIKO:	PELAN TINDAKAN PEMANTAUAN RISIKO				KEKERAPAN	KAKITANGAN BERTANGGUNGJAWAB	
PEMANTAUAN RISIKO:	SKOR KEBARANGKALIAN	KEBARANGKALIAN	IMPAK SKOR	IMPAK	SKOR RISIKO	SKOR RISIKO	STATUS PEMANTAUAN

CATATAN:	
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Kembali
Cetak

Figure 6.14: Design of Report Modal

Figure 6.14 shows the design of report modal. After click at risk at report page, the modal will pop up to show the detail of the risk and admin can print which called “cetak” to print for the report of the risk.

The image shows a web application interface for managing users. On the left is a sidebar with the following menu items: 'Risk Management System' (with a user icon and 'Nama User Super Admin'), 'Paparan Utama', 'Senarai Risiko', 'Daftar Risiko', 'Rawatan Risiko', 'Pemantauan Risiko', 'Pindaan', 'Laporan', 'Urus Pengguna' (highlighted), 'Log Aktiviti', and 'Log Keluar'. The main content area is titled 'Urus Pengguna'. It contains two dropdown menus: 'Peranan' and 'Pilih Syarikat'. A 'Tambah Pengguna' button is located in the top right. Below these is a table titled 'Senarai Pengguna' with the following columns: 'Nama', 'Peranan', 'Nama Syarikat', 'ID Pekerja', 'Password', and 'Tindakan'. The table has 7 empty rows.

Figure 6.15: Design of Manage User Page

Figure 6.15 shows the interface of manage user which called as “Urus Pengguna”. This page only can be accessed by admin because admin only can manage the user. The admin can click at “Tambah Pengguna” button to add the new user.

6.2.16 Add User Modal

The image shows the 'Add User Modal' overlaid on the 'Urus Pengguna' page. The modal is titled 'Tambah Pengguna' and has a close button (X) in the top right. It contains the following fields: 'Nama Penuh:' (text input), 'ID Pekerja:' (text input), 'Password:' (text input), 'Role:' (dropdown menu), and 'Syarikat:' (dropdown menu). A 'Tambah Pengguna' button is located in the bottom right corner of the modal. The background page shows the 'Urus Pengguna' title, the 'Pilih Syarikat' dropdown, and the 'Tambah Pengguna' button.

Figure 6.16: Design of Add User Modal

Figure 6.16 shows the interface in adding new user by using the modal. Admin need to fill all the information and assign the roles and subsidiary to the new users.

6.2.17 Activity Log Page

The interface for the Activity Log Page (Log Aktiviti) consists of a sidebar menu on the left and a main content area on the right. The sidebar menu includes the following items: Risk Management System, Nama User Super Admin, Paparan Utama, Senarai Risiko, Daftar Risiko, Rawatan Risiko, Pemantauan Risiko, Pindaan, Laporan, Urus Pengguna, Log Aktiviti (highlighted), and Log Keluar. The main content area has a header 'Log Aktiviti' and a 'Filter' button. Below the filter is a table with the following columns: Nama, Peranan, Syarikat, Aktiviti, and Time Stamp. The table contains 7 empty rows for data entry.

Nama	Peranan	Syarikat	Aktiviti	Time Stamp

Figure 6.17: Design of Activity Log Page

Figure 6.17 shows the interface of an activity log page which called “Log Aktiviti”. In this page only admin can access the page to see all user’s activity and the time stamp of their activities. Filter button to filter according the subsidiary or date or roles.

6.3 Database Design

The database structure used for planning, storing, and managing information is defined by this database design. Data accuracy is only possible if a database is intended to store only valuable and necessary information. This well-designed database is important for ensuring information consistency, removing unnecessary data, efficiently performing queries and enhancing database speed in retrieving the data. Creating this database meticulously saves user time and frustration during the database development phase. A smart database design also makes it simple to access and retrieve data as needed. (Liang, 2024)

6.3.1 Data Dictionary

Data dictionary provides all the information and references for all tables, fields, data types and constraints that been used in develop Risk Management System databases. This section shows the database documentation for the detail for each table to ensure consistency through development and future maintenance.

I. Data dictionary outlining a database of user “pengguna”.

Table 6.1: Table of Data Dictionary of user “pengguna”

Field Name	Data Type	Field Size	Description	Example
pengguna_id (PK)	Integer	-	Auto-generated	16
staff_id	Varchar	100	User staff id	UKMH112
nama_penuh	Varchar	100	User full name	Akmal bin Rasydan
katalaluan	text	-	User password	confidential
Subsidiari_id (FK)	Integer	-	Take from primary key table subsidiari	1
Peranan_id	Integer	-	Take from primary key table peranan	2
Tarikh_dibuat	timestamp	255	Timestamp of user been created	2025-09-22 12:35:40.349705
Gambar_profil	bytea	-	User profile picture	
Tarikh_dikemaskini	timestamp	30	timestamp of user been edited	2025-09-22 02:13:00.805236

The data dictionary of the user (pengguna) database is displayed in Table 6.1. User ID (pengguna_id), Staff ID (staff_id), Full Name (nama_penuh), Password (katalaluan), Subsidiary ID (Subsidiari_id), Role ID (Peranan_id), Date Created (Tarikh_dibuat), Profile Picture (Gambar_profil), and Date Updated (Tarikh_dikemaskini). The data types used are Integer for the ID fields, Varchar for the staff and name fields, text for the password, timestamp for the date fields, and bytea for the profile picture.

II. Data dictionary outlining a database of roles “peranan”.

Table 6.2: Table of Data Dictionary of roles “peranan”

Field Name	Data Type	Field Size	Description	Example
peranan_id (PK)	Integer	-	Auto-generated (5 roles 5 peranan_id)	1,2,3,4,5
Nama_peranan	Varchar	50	User roles	Admin, Executive, Staff, Head of Subsidiary, Viewer

The data dictionary of the roles (peranan) database is outlined in Table 6.2. This table contains two fields: Role ID (peranan_id) and Role Name (Nama_peranan). The Role ID field is the Primary Key (PK) and uses the Integer data type. The Role Name field uses the Varchar data type with a field size of 50.

III. Data dictionary outlining a database of subsidiary “subsidiari”.

Table 6.3: Table of Data Dictionary of subsidiary “subsidiari”

Field Name	Data Type	Field Size	Description	Example
subsidiari_id (PK)	Integer	-	Auto-generated	8
Nama_subsidiari	Varchar	100	Name of subsidiary	UKM Medicare
Light_logo_url	Varchar	255	For light background for subsidiary logo	src/assets/images/Light Background/UKMM_light.png
Dark_logo_url	Varchar	255	For dark background subsidiary logo	src/assets/images/Dark Background/UKMM_dark.png

singkatan	Varchar	20	Shortform for subsidiary	UKMM
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The data dictionary of the subsidiary (subsidiari) database is presented in Table 6.3. This table consists of five fields: Subsidiary ID (subsidiari_id), Subsidiary Name (Nama_subsidiari), Light Logo URL (Light_logo_url), Dark Logo URL (Dark_logo_url), and Abbreviation (singkatan). The Subsidiary ID field is the Primary Key (PK) and uses the Integer data type. The Subsidiary Name and the two Logo URL fields use the Varchar data type with a field size of 100 and 255 respectively, while the Abbreviation field also uses Varchar but with a field size of 20.

IV. Data dictionary outlining a database of risk “risiko”.

Table 6.4: Table of Data Dictionary of risk “risiko”

Field Name	Data Type	Field Size	Description	Example
risiko_id (PK)	Integer	-	Auto-generated	75
No_rujukan	Varchar	50	Reference number of risk	UKMM0125/05
tahun	integer	-	Year	2025
Separuh_tahun	integer	-	Half of year (1= first half, 2= second half)	1
Subsidiari (FK)	integer	-	Taken from table subsidiary “subsidiary”	2
kategori	Varchar	50	Categories of risk	Kewangan
bahagian	text	-	Units or department	Unit Kewangan
risiko	text	-	The detail of risk	Risiko mata wang asing
Skor_kebarangkalian	integer	-	Score of likelihood (1-5)	5
Skor_impak	integer	-	Score of impact (1-5)	5
Skor_risiko	integer	-	The shortform level of risk	ST

Status_risiko	Varchar	10	Status of risk (Ya = need immediate action , tidak = not immediate action)	Ya
Created_at (FK)	timestamp	-	Timestamp of risk been register	2025-11-13 04:34:09.173938
Updated_at (FK)	timestamp	-	Timestamp of risk been updated	2025-11-13 04:38:13.690839
Created_by (FK)	integer	-	Created by user (pengguna_id)	1
Updated_by (FK)	integer	-	Updated by user (pengguna_id)	2
Justifikasi_pindaan_penilaian	text	-	Reasoning for amendments	Pindaan skor 5:3 kepada 3:3

The data dictionary of the risk (risiko) database is presented in Table 6.4. This comprehensive table consists of seventeen fields: Risk ID (PK) (risiko_id), Reference Number (No_rujukan), Year (tahun), Half Year (Separuh_tahun), Subsidiary (FK) (Subsidiary), Category (kategori), Unit/Department (bahagian), Risk Detail (risiko), Likelihood Score (Skor_kebarangkalian), Impact Score (Skor_impak), Risk Score (Skor_risiko), Risk Status (Status_risiko), Created At (FK) (Created_at), Updated At (FK) (Updated_at), Created By (FK) (Created_by), Updated By (FK) (Updated_by), and Reasoning for Amendment (Justifikasi_pindaan_penilaian). The data types are primarily Integer for IDs and scores, Varchar for the reference number, category, and status, text for detailed descriptions (unit/department, risk detail, and justification), and timestamp for the creation and update tracking fields.

V. Data dictionary outlining a database of risk treatments “rawatan_risiko”.

Table 6.5: Table of Data Dictionary of risk treatments “rawatan_risiko”

Field Name	Data Type	Field Size	Description	Example
Rawatan_id (PK)	Integer	-	Auto-generated	13
Risiko_id (FK)	Integer	-	Reference from table risk “risiko”	27
Jenis_kawalan	Varchar	20	Types of control action	Kurang
Tempoh_siap	Varchar	100	Duration for plan mitigation finished	6 bulan

Created_at	timestamp	-	The treatment created at	2025-11-09 22:36:14.627507
Updated_at	timestamp	-	The treatment updated at	2025-11-13 04:42:20.679346

The data dictionary of the risk treatments (rawatan_risiko) database is outlined in Table 6.5. This table comprises six fields: Treatment ID (PK) (Rawatan_id), Risk ID (FK) (Risiko_id), Control Type (Jenis_kawalan), Completion Duration (Tempoh_siap), Created At (Created_at), and Updated At (Updated_at). Both ID fields use the Integer data type. The Control Type and Completion Duration fields use the Varchar data type with sizes of 20 and 100, respectively. Finally, the tracking fields, Created At and Updated At use the timestamp data type.

VI. Data dictionary outlining a database monitoring log “logpemantauan”.

Table 6.6: Table of Data Dictionary of monitoring log “logpemantauan”

Field Name	Data Type	Field Size	Description	Example
log_id (PK)	Integer	-	Auto-generated	78
Risiko_id (FK)	Integer	-	Reference from table risk “risiko”	27
Tarikh_pemantauan	date	-	Date of monitoring	2025-11-13
Tahun_pemantauan	integer	-	Year of monitoring	2025
Separuh_tahun_pemantauan	integer	-	Half of year (1= first half, 2= second half)	2
Skor_kebarangkalian_keberkesanan	integer	-	Score Likelihood effectiveness after mitigation	3
Skor_impak_keberkesanan	integer	-	Score Impact effectiveness after mitigation	1
Skor_risiko_pemantauan	Varchar	20	The shortform of level of risk (R= rendah)	R
Kekerapan_pemantauan	varchar	50	Monitoring frequency	2 bulan
keberkesanan	varchar	100	Effectiveness (Ya=effective, tidak= not effective)	Ya

Status_pemantauan	varchar	100	The monitoring status	Sedang dilaksanakan
catatan	text	-	The notes of monitoring	Pemantauan sedang dilaksanakan oleh Encik Abu
No_bil_kelulusan	varchar		Number of bil approval	MJPBR/11/2025
Created_at	timestamp	-	Monitoring created at	2025-11-13 04:20:57.238855+08
Updated_at	timestamp	-	Updated monitoring at	2025-11-13 04:31:15.560725+08
Justifikasi_pindaan_pemantauan	text	-	Reason for amendments for score effectiveness	Pindaan 3:3 kepada 2:1

The data dictionary of the monitoring log (logpemantauan) database is outlined in Table 6.6. This table contains sixteen fields, primarily tracking risk mitigation effectiveness. The fields are: Log ID (PK) (log_id), Risk ID (FK) (Risiko_id), Monitoring Date (Tarikh_pemantauan), Monitoring Year (Tahun_pemantauan), Monitoring Half Year (Separuh_tahun_pemantauan), Likelihood Effectiveness Score (Skor_kebarangkalian_keberkesanan), Impact Effectiveness Score (Skor_impak_keberkesanan), Monitoring Risk Score (Skor_risiko_pemantauan), Monitoring Frequency (Kekerapan_pemantauan), Effectiveness (keberkesanan), Monitoring Status (Status_pemantauan), Notes (catatan), Approval Bill Number (No_bil_kelulusan), Created At (Created_at), Updated At (Updated_at), and Monitoring Amendment Justification (Justifikasi_pindaan_pemantauan). The majority of the fields are Integer (IDs, year, half year, and effectiveness scores), while tracking dates use the date and timestamp data types. Descriptive fields such as score short-form, frequency, effectiveness status, and approval number use Varchar and detailed descriptions (notes and justification) use the text data type.

VII. Data dictionary outlining a database mitigation monitoring plan “pelantindakanpemantauan”.

Table 6.7: Table of Data Dictionary mitigation monitoring plan “pelantindakanpemantauan”.

Field Name	Data Type	Field Size	Description	Example
Pelan_tindakan_id (PK)	Integer	-	Auto-generated	13
log_id (FK)	Integer	-	Reference from table monitoring log “logpemantauan”	27
Butiran_aktiviti	text	-	Monitoring mitigation plan	Melantik pakar perubatan

The data dictionary of the mitigation monitoring plan (pelantindakanpemantauan) database is outlined in Table 6.7. This table contains three fields: Action Plan ID (PK) (Pelan_tindakan_id), Log ID (FK) (log_id), and Activity Details (Butiran_aktiviti). Both ID fields use the Integer data type. The Activity Details field, which stores the monitoring mitigation plan information uses the text data type.

VIII. Data dictionary outlining a database staff treatments “kakitangan_rawatan”.

Table 6.8: Table of Data Dictionary staff treatments “kakitangan_rawatan”.

Field Name	Data Type	Field Size	Description	Example
kakitangan_id (PK)	Integer	-	Auto-generated	13
Rawatan_id (FK)	Integer	-	Reference from table risk treatments (rawatan_risiko)	27
Nama_kakitangan	varchar	255	Staff that responsible for treatments	Encik Abu

The data dictionary of the staff treatments (kakitangan_rawatan) database is presented in Table 6.8. This table consists of three fields: Staff ID (PK) (kakitangan_id), Treatment ID (FK) (Rawatan_id), and Staff Name (Nama_kakitangan). Both ID fields use the Integer data type. The Staff Name field, which stores the name of the staff responsible for treatments, uses the Varchar data type with a field size of 255.

IX. Data dictionary outlining a database risk effect “kesan_risiko”.

Table 6.9: Table of Data Dictionary risk effect “kesan_risiko”.

Field Name	Data Type	Field Size	Description	Example
kesan_id (PK)	Integer	-	Auto-generated	92
Risiko_id (FK)	Integer	-	Reference from table risk (risiko)	57
Kesan	text	-	Effect of the risk	Penurunan keuntungan

The data dictionary of the risk effect (kesan_risiko) database is presented in Table 6.9. This table consists of three fields: Effect ID (PK) (kesan_id), Risk ID (FK) (Risiko_id), and Effect (Kesan). Both ID fields use the Integer data type. The Effect field, which stores the detailed effect of the risk uses the text data type.

X. Data dictionary outlining a database risk cause “punca_risiko”

Table 6.10: Table of Data Dictionary risk causes “punca_risiko”.

Field Name	Data Type	Field Size	Description	Example
punca_id (PK)	Integer	-	Auto-generated	32
Risiko_id (FK)	Integer	-	Reference from table risk (risiko)	57
punca	text	-	Causes of the risk	Gagal menyesuaikan diri dengan perubahan teknologi

The data dictionary of the risk causes (punca_risiko) database is presented in Table 6.10. This table consists of three fields: Cause ID (PK) (punca_id), Risk ID (FK) (Risiko_id), and Cause (punca). Both ID fields use the Integer data type. The Cause field, which stores the detailed causes of the risk, uses the text data type.

XI. Data dictionary outlining a database treatments plan action “pelan_tindakan_rawatan”.

Table 6.11: Table of Data Dictionary treatments plan action “pelan_tindakan_rawatan”.

Field Name	Data Type	Field Size	Description	Example
pelan_id (PK)	Integer	-	Auto-generated	22
Rawatan_id (FK)	Integer	-	Reference from table risk treatments (rawatan_risiko)	17
Pelan_tindakan	text	-	treatments plan action	Melantik pakar keselamatan IT

The data dictionary of the treatments plan action (pelan_tindakan_rawatan) database is presented in Table 6.11. This table consists of three fields: Plan ID (PK) (pelan_id), Treatment ID (FK) (Rawatan_id), and Treatment Plan (Pelan_tindakan). Both ID fields use the Integer data type. The Treatment Plan field, which stores the treatments plan action details, uses the text data type.

XII. Data dictionary outlining a database monitoring staff “kakitanganpemantauan”.

Table 6.12: Table of Data Dictionary monitoring staff “kakitanganpemantauan”.

Field Name	Data Type	Field Size	Description	Example
kakitangan_id (PK)	Integer	-	Auto-generated	33
Log_id	Integer	-	Reference from table monitoring log (log_pemantauan)	42
Butiran_kakitangan	varchar	255	Staff monitoring details	Encik Abu

The data dictionary of the monitoring staff (kakitanganpemantauan) database is presented in Table 6.12. This table consists of three fields: Staff ID (PK) (kakitangan_id), Log ID (FK) (Log_id), and Staff Details (Butiran_kakitangan). Both ID fields use the Integer data type. The Staff Details field, which stores the staff monitoring details, uses the Varchar data type with a field size of 255.

XIII. Data dictionary outlining a database amendment application “permohonan_pindaan”.

Table 6.13: Table of Data Dictionary amendment application “permohonan_pindaan”.

Field Name	Data Type	Field Size	Description	Example
pindaan_id (PK)	Integer	-	Auto-generated	22
risiko_id	Integer	-	Reference from table risk (risiko)	31
Pengguna_id_pemohon	integer	-	User that request's the amendments	3
Data_sebelum	jsonb	-	The data before do the amendments	{ "skor_impak_selepas": null, "skor_risiko_keberkesanan": "-", "skor_kebarangkalian_selepas": null }
Data_selepas	jsonb	-	The data after amendments been done	{ "skor_impak_selepas": "4", "skor_risiko_keberkesanan": "T", "skor_kebarangkalian_selepas": "4" }
Justifikasi_keberkesanan	text	-	The reason of the amendments for assessing been made	Mesyuarat menyuarakan pindaan 4:3 kepada 3:2
Justifikasi_penilaian	text	-	The reason of the amendments for effectiveness been made	Mesyuarat menyuarakan pindaan 2:2 kepada 1:1
Pengguna_id_pelulus	integer	-	User id that approved the amendments (admin)	1
Tarikh_diproses	timestamp	-	Timestamp of the amendments been accepted or rejected	2025-11-12 12:35:45.781043+08
Sebab_ditolak	varchar	150	Reason amendments been rejected	Perlu berbincang dengan semua atasan untuk pindaan baru.

The data dictionary of the amendment application (permohonan_pindaan) database is outlined in Table 6.13. This table contains ten fields: Amendment ID (PK) (pindaan_id), Risk ID (risiko_id), Applicant User ID (Pengguna_id_pemohon), Data Before (Data_sebelum), Data After

(Data_selepas), Effectiveness Justification (Justifikasi_keberkesanan), Assessment Justification (Justifikasi_penilaian), Approver User ID (Pengguna_id_pelulus), Processing Date (Tarikh_diproses), and Reason for Rejection (Sebab_ditolak). The ID fields, along with the applicant and approver IDs, use the Integer data type. The before and after data snapshots use the jsonb data type. Detailed justifications are stored as text, the processing time uses timestamp, and the reason for rejection uses Varchar with a size of 150.

XIV. Data dictionary outlining a database activity log “log_aktiviti”.

Table 6.14: Table of Data Dictionary activity log “log_aktiviti”

Field Name	Data Type	Field Size	Description	Example
Aktiviti_id (PK)	Integer	-	Auto-generated	2
Pengguna_id	Integer	-	Reference from table user (pengguna)	3
aktiviti	varchar	50	Log activity	Padam Risiko
perincian	text	-	Log activity details	Ahmad bin Ali (ID Staf: UKMH001) telah memadam risiko dengan No. Rujukan: UNIQ/006/2025.
Tarikh_masa	timestamp	-	Time stamp of the activity	2025-11-10 06:18:50.523668
ringkasan	varchar	255	Summary of the activity	Memadam risiko: UNIQ/006/2025.

The data dictionary of the activity log (log_aktiviti) database is presented in Table 6.14. This table consists of six fields: Activity ID (PK) (Aktiviti_id), User ID (Pengguna_id), Activity (aktiviti), Details (perincian), Timestamp (Tarikh_masa), and Summary (ringkasan). Both ID fields use the Integer data type. The Activity field uses Varchar with a size of 50, while the Details field uses text for detailed log information. The Timestamp field uses the timestamp data type, and the Summary field uses Varchar with a size of 255.

6.3.2 Entity Relational Diagram (ERD)

An entity-relationship diagram, often known as an ER diagram, is required for modelling data stored in a database. It is the foundation on which a database is created. ER diagrams define the types of data that will be stored, entities and their characteristics. They also demonstrate how entities are related to one another. Another advantage of ERDs is that they graphically portray the database of the system. This makes it easy for business people to comprehend the databases (Liang, 2024).

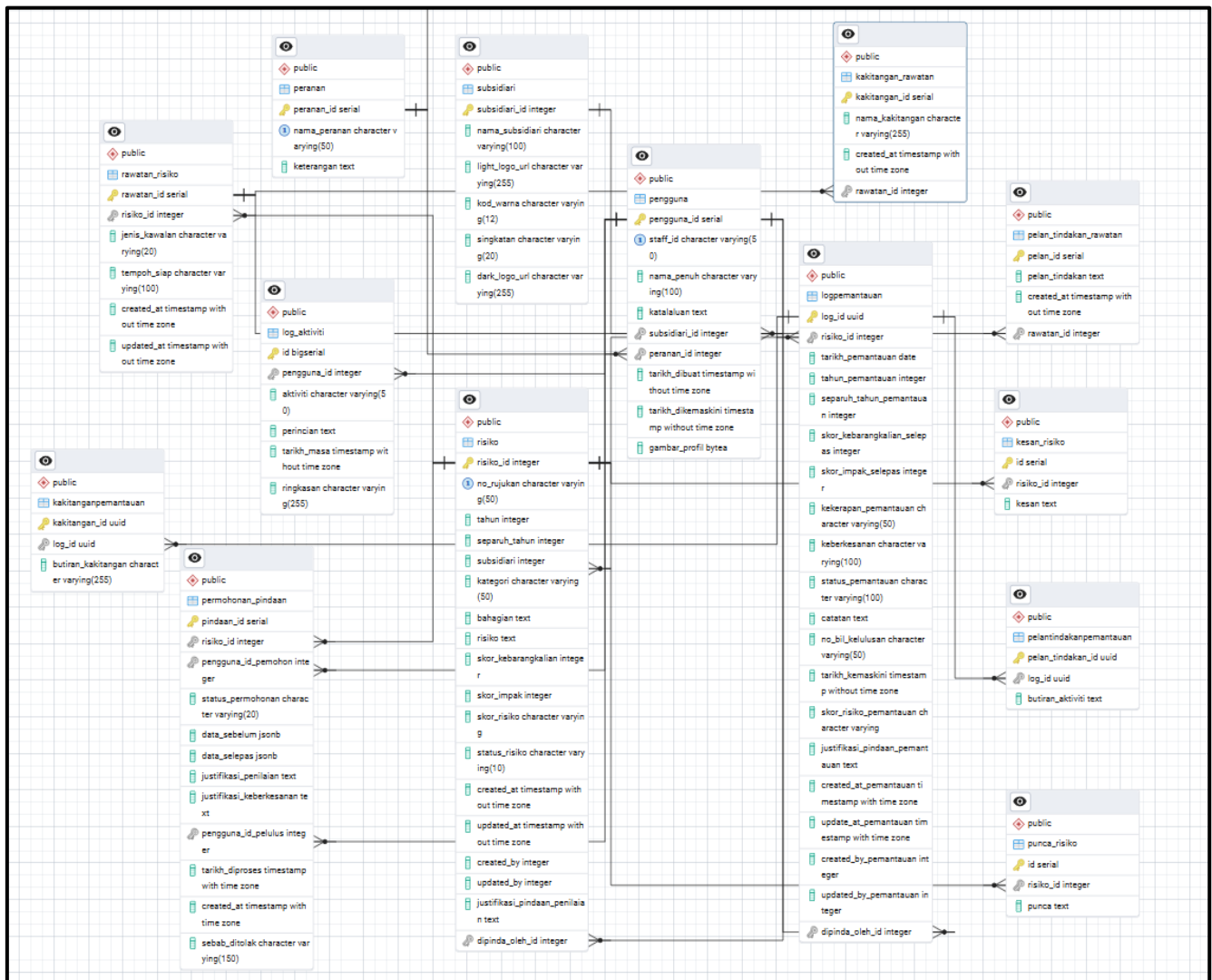


Figure 6.18: Entity Relationship Diagram of the system

Figure 6.18 shows the overall of the system's ERD. The common relationships in this system usually are One-to-Many (1:N) structure that means that parent table can be linked with multiple record in child table. The structure of this system is built around risk (risiko) table entity because the risk table are linked with risk treatment (rawatan_risiko) table, monitoring log (logpemantauan) table, amendments (pindaan) table. Subsidiary (subsidiary) tables are associates with user (pengguna) table and roles (peranan) tables through one-to-many relationships. Furthermore, a single Risk can be detailed by multiple Risk Effects (kesan risiko) and multiple Risk Causes (punca risiko) that establish two more 1:N relationships. For

treatments and monitoring, one risk can have multiple record of treatments and monitoring log by maintaining one-to-many structure through all the table that linked to risk table. Finally, the system also includes auditing and log activities tables to track user actions and also amendments that can be requested by executive to edit data related to risk table and monitoring log tables.

6.3.3 Data Flow Diagram (DFD)

One of the most important things a developer can do while developing any form of web-based system, from a basic command-line game to an intricate operating system, is to create a data flow diagram. Though it may be tedious, developing a data flow diagram will allow the programmer to create a program with minimum discomfort in programming the actual code to increase the developer's productivity (Setiyawan et al. 2023).

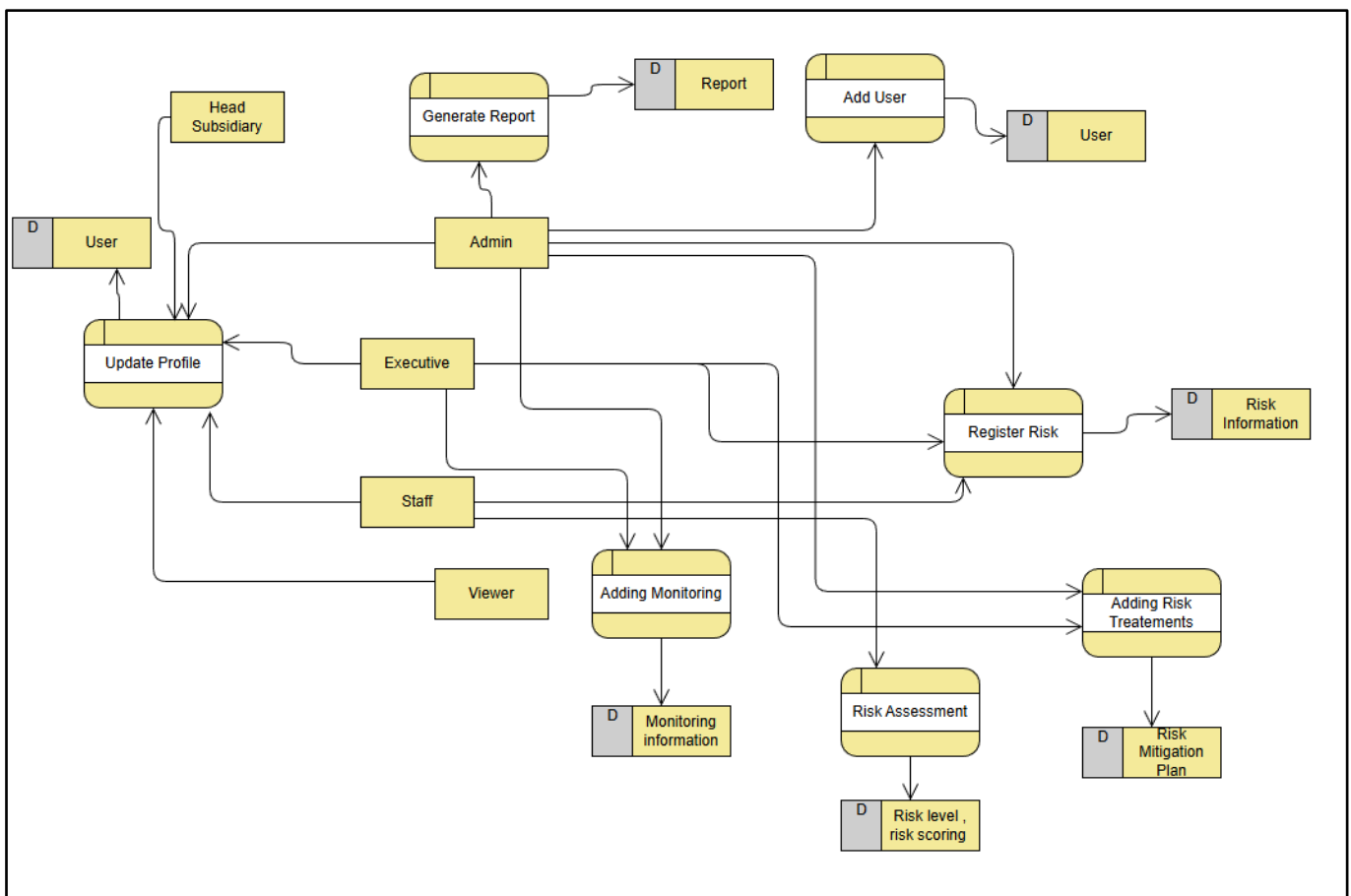


Figure 6.19: Data Flow Diagram of the system

The data flow diagram for the system is shown in Figure 6.19. This data flow diagram depicts four processes: which is risk identification, risk control, risk evaluation and risk monitoring. All processes involved will be stored in separate data tables.

6.4 Flow of the System

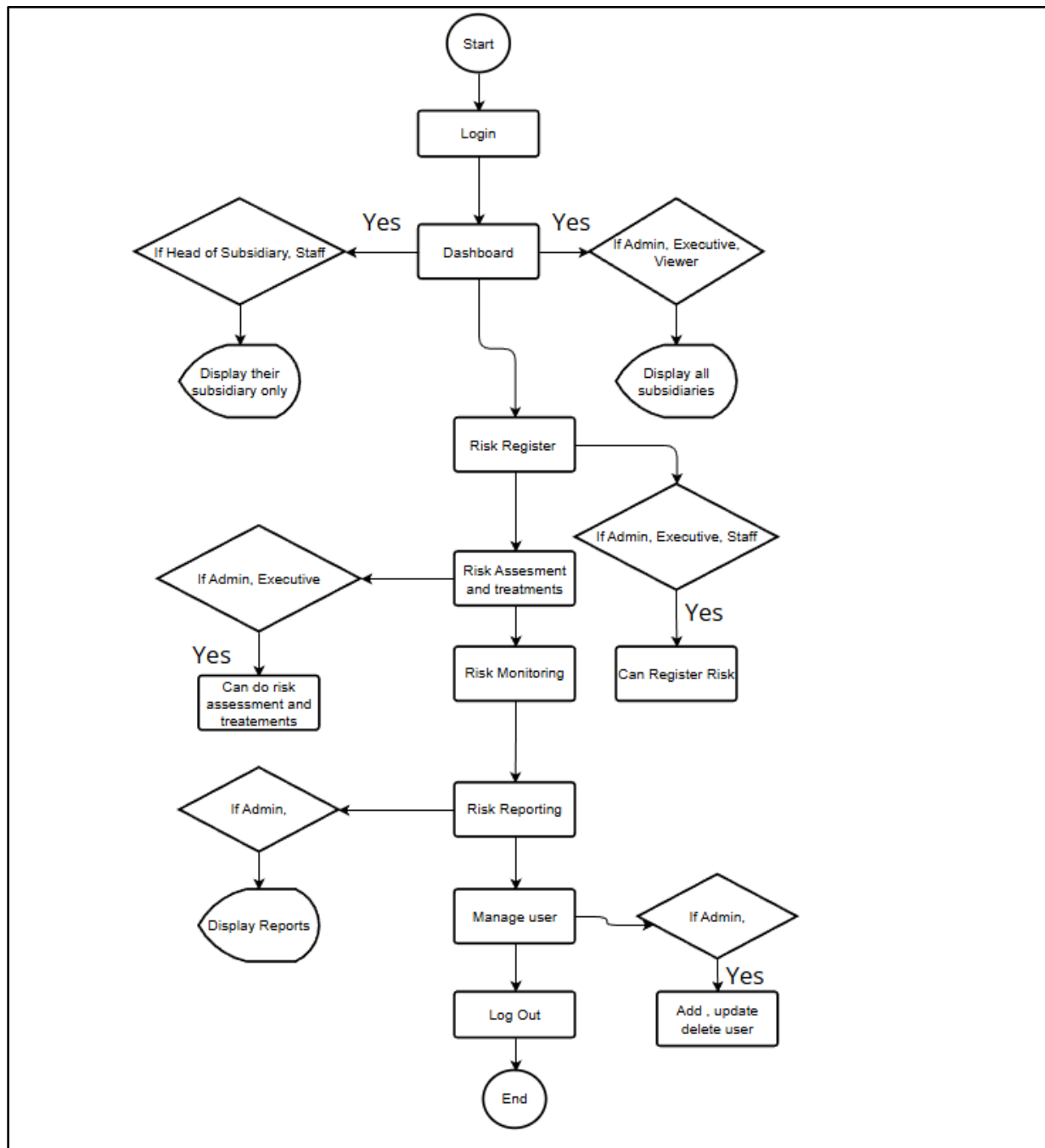


Figure 6.2: Flow of Risk Management System

From figure above, figure above illustrates the operational flow of the Risk Management System, which is highly dependent on the user's role. The process begins with a standard Login which directs the user to the Dashboard. Access to information on the dashboard is role-based: Head of Subsidiary and Staff can only view data relevant to their own subsidiary, while Admin, Executive, and Viewer roles can see all subsidiaries. The core of the system is the Risk Register, from which the flow diverges based on permissions. Users with the Admin, Executive, or Staff roles can proceed to Register Risk. The Admin and Executive roles have elevated permissions, allowing them to conduct Risk

Assessment and Treatments. Following this is the continuous Risk Monitoring phase. The system then moves to Risk Reporting, where only the Admin role is permitted to Display Reports. The final management functionality is Manage User, which is exclusively accessible by the Admin to Add, update, or delete users before the session concludes with Log Out and End.

6.5 Conclusion

In summary, this chapter discussed about the interface design and database design of risk management system. For this interface design involve different page interfaces in order to instructs the user on how to browse the system and search through each page of information, while clearly showing key calls-to action so that decisions are simple and uncomplicated. The interface design followed the user requirement and the system is a user-friendly system that easy to use and also has HCI process.

For database design, used for planning, storing, and managing information efficiently. As a result of this chapter, all system design is clearly established. This system designs are to make system development easier and to eliminate any misconception about the system's flow. Furthermore, it will assist developer in designing the interface for the real system and ensuring that the system development runs easily and successfully.

7 IMPLEMENTATION

Implementation is the process that actually yields the lowest-level system elements in the system hierarchy (system breakdown structure). System elements are made or reused. Production involves the hardware fabrication processes of forming, removing, joining and finishing the software realization processes of coding and testing or the operational procedures development processes for operator's roles. If implementation involves a production process which is a manufacturing system which uses the established technical and management processes may be required (Farhan, 2024).

7.1 Introduction

This chapter will go over the system's implementation in more detail. The implementation scope includes demonstrating on how the framework will be implemented and also ensure that framework is going to operate and meet quality standards of system and fulfil client requirements. The risk management system execution procedure which are been developed after the planning phases. The development process such as creating interfaces, databases and design documentation are been works. The project framework is ready to build by referring the designing phases from previous chapter. Software development and design implementation are the two types implementation that been used.

7.2 Execution Platform

The execution platform represents the technical infrastructure and runtime environment where the implemented system will being deploy and execute. This platform provides essential resources or services to make sure the system operations can fulfil the client needs and systems operates functionally.

I. Windows 10



Figure 7.1: Windows 10 Logo

Figure 7.1 shows the Windows 10 logo. The system is deployed on Windows 10 which is the operating system that developed by Microsoft that can provides stable and secure execution platform. Windows 10 support for modern development frameworks ana a reliable platform for system implementation. Its friendly-user-interfaces made the developers become more easier to implementing the system at the platform and do the maintenance.

7.3 Implementation Tools

Implementation tools are crucial in the development of a web-based system. It includes software specifications, programming languages and hardware specifications.

7.3.1 Software

I. Visual Studio Code (VS Code)

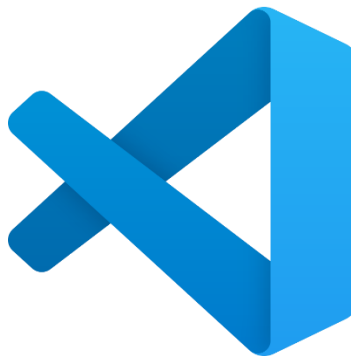


Figure 7.2: Visual Studio Code (VS Code) Logo

Figure 7.2 shows the Visual Studio Code (VS Code) logo. VS Code serves as the central development hub or code editor for entire project. VS Code can manage all source code file such as JavaScript, React.js components, Node.js, CSS stylesheets and configuration files by installing these all code from the extension in VS Code. Integrated terminal in VS Code helps in running the Node.js development server and push the Git command to ensure file version control in the GitHub.

II. pgAdmin4



Figure 7.3: pgAdmin 4 Logo

Figure 7.3 shows the pgAdmin4 logo. pgAdmin4 is graphical administration and development platform for PostgreSQL which are the one of the most advanced open-source relational databases. pgAdmin4 used to interact with the PostgreSQL database throughout the implementation phases. During implementation, pgAdmin4 been used to create database by defining relationship between the tables and through the foreign key. It also has query tools that helps in executing CRUD operations which is create, read, update and delete during development and testing (Saleh et al., 2023).

pgAdmin4 also be used to monitor database performance and view all the query execution plans. pgAdmin also have the visualization features that can helps developers to understand the table relationships and data structure. Furthermore. pgAdmin4 allows inspection during debugging to inspect the table contents and verify the backend API operations are works.

III. Git



Figure 7.4: git Logo

Logo of git have been shows in figure 7.4. In the implementation, git serve as local version control system that can tracks all the changes to the project sources code. By utilizing Git's command-line interface to perform commits to ensure each documentation of code are been put with descriptive message. This local version control system helps in implementation by enabling

developers to easily revert mistakes, make a new approach features to the system and maintain a detailed record of the project in consistent (Jia et al., 2023).

IV. GitHub



Figure 7.5: GitHub Logo

Figure 7.5 shows the GitHub logo. GitHub is leading cloud-based hosting that specifically built for developers to manage Git repositories. It offers Pull Request (PR) structured process to merge with changes at main branch. GitHub also helps in implementation by serving as central hub for sharing code and for the project storage for the backup option if the project in the existing local storage were corrupted.

V. Postman



Figure 7.6: Postman Logo

Postman logo is visualised in figure 7.6. Postman acts as a powerful API client that allows the developers to interact and test with the system backend. Postman serves as the platform for real-time testing, validation and documentation for testing the API integrations (Kore et al. 2022). In implementation, by utilizing Postman it will help in testing and handling the user authentication especially our system is implementing the Role Based Access Control (RBAC) that will help in testing each user role and each API backend integrations. By inserting the correct HTTP status code, it will help in system implementation by verifying required JSON field that were represented in payload and also checking the data integrity in the backend.

VI. Chrome Developer Tools (DevTools)

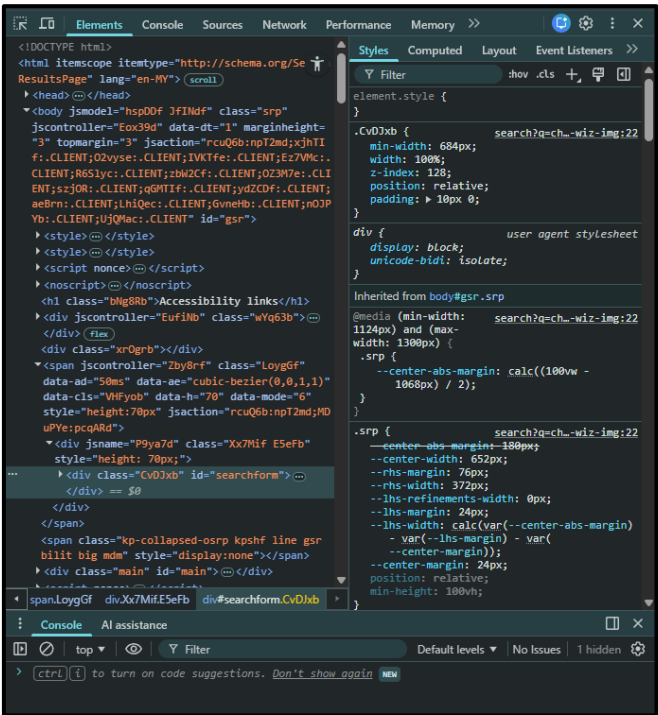


Figure 7.7: Chrome Developer Tools (DevTools)

Figure 7.7 shows the chrome developer tools (DevTools). Chrome developer tools (DevTools) are important to maintain our front-end quality and helps in debugging process for the system. Elements panel at DevTools are crucial to inspect Documented Object Model (DOM) especially our system is using react.js for front-end implementations that constantly uses a Virtual Dom to efficiently apply the changed (Sitio et al., 2023). By using these tools, all the HTML structures and CSS properties can be inspected immediately. This real-time inspection will help in implementation of the systems for resolving visual errors and making time to fix the bug become faster because of these features of the tools.

7.3.2 Programming Language

I. Cascading Style Sheets (CSS)



Figure 7.8: Cascading Style Sheets (CSS) Logo

Figure 7.8 shows the Cascading Style Sheets (CSS) logo. Cascading Style Sheets (CSS) is fundamental to our implementation that serves as visual hierarchy through standardized typography, colour palettes and spacing across all the system components. Our system implementation relies on the flexbox and grid layouts to achieve full responsive design to make sure the system provide friendly user experience (UX). CSS also implement the global layout to make sure all the system interfaces have same colour palettes, fonts and theme to make sure the overall system's interface are consistent.

II. JavaScript



Figure 7.9: JavaScript Logo

Figure 7.9 shows the JavaScript logo. JavaScript is the fundamental of the programming language to built the entire system whether the front-end side or back-end side. JavaScript in this system are used to managed the overall application state which handle all the user interactions such as button, form submission and modal. Also, JavaScript been used for the interaction with back-end side which is API client side. Utilizing JavaScript into these systems makes the overall user interface been updates dynamically without requiring to reload full pages which means it will ensure the system performance are faster when fetch the data from the database or reloading the interfaces.

III. React.js



Figure 7.10: React.js Logo

Figure 7.10 shows the React.js logo. React.js is the library from the JavaScript that specifically only for front-end. React.js utilized specifically to create a high performance and more maintainable user interfaces. React.js by break down the system interfaces into small components that can be reuse such as modal, button, chart and DataGrid. By reusing the same

components, it will help accelerates the development time for develop this system and ensure the interfaces of the system are consistent.

React.js use the Virtual DOM that allows the system to reload the pages faster because only reloading the small components that changed without needs to reload for the full pages (Sitio et al., 2023).

IV. Node.js



Figure 7.11: Node.js Logo

Node.js logo is been visualised in figure 7.11. Node.js functions as the server-side runtime environment that allows us to execute the JavaScript outside the browser. Basically, Node.js ensures that our systems can handle large volume of API request without being disrupt by time-consuming operations like database queries. Leveraging Node.js to host the Express.js which is the API server for our systems. Using Node.js it will help in managing all logic, routing and connections to the databases. Node.js significantly accelerating the entire development cycle because it allows for sharing common utilities and validation logic.

7.3.3 Hardware Specification

Table 7.1: Hardware Specification

Device	HP 15-FC0105AU
Processor	AMD Athlon Silver 3050U with Radeon Graphics
Memory (RAM)	16 GB DDR 4
System Type	64-bit operating system

7.4 System Interface

7.4.1 Login Page

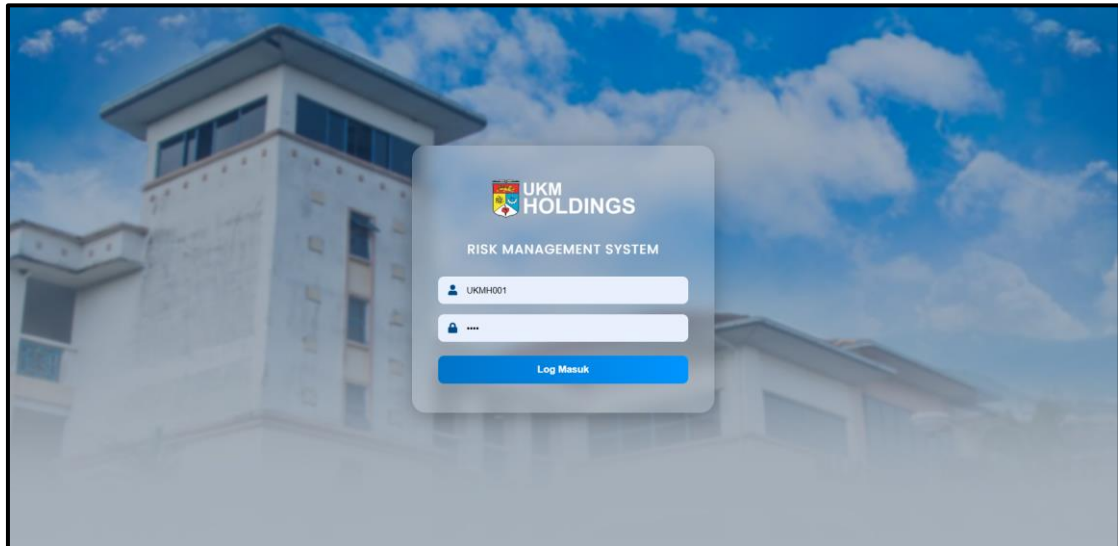


Figure 7.12: Login Page

Based on the figure above, the figure shows the Login page for Risk Management System. The user's which are admin, executive, head of subsidiary, staff and viewer will login into the system using the staff id and password that been provided by the admin. Admin are the one that responsible to add all the user's that using this system.

7.4.2 Dashboard Page

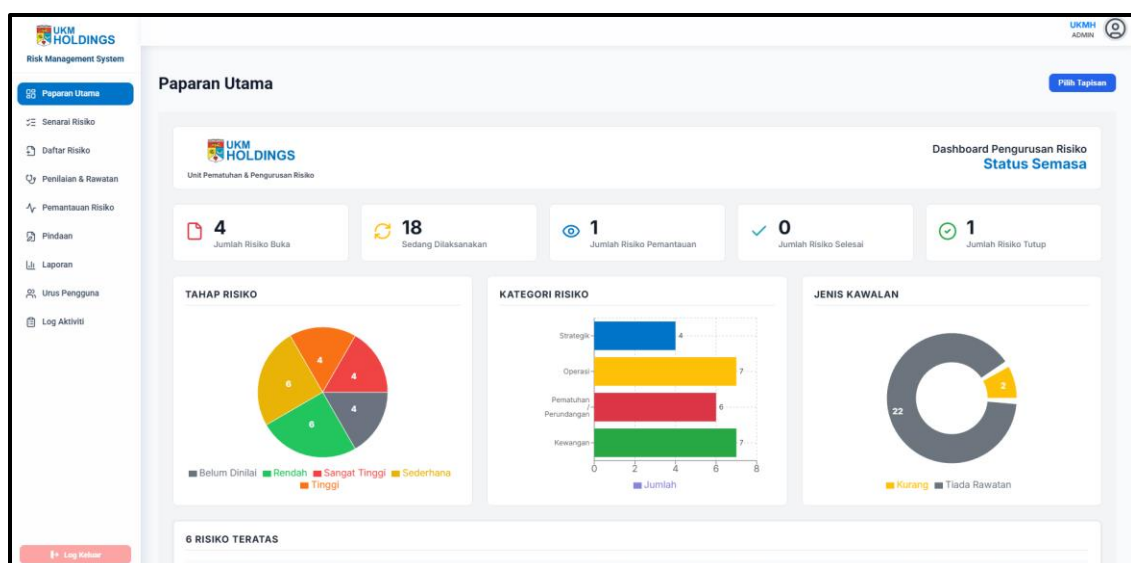


Figure 7.13: Dashboard Page

The figure above shows the dashboard page for the users. Three users which are admin, executive and viewer will have full access for the dashboard that means they can see other’s subsidiary when they click at filter button to choose the subsidiary. Meanwhile, staff and head of subsidiary only can see their subsidiary dashboard only.

7.4.3 Risk List Page

UKM HOLDINGS

Risk Management System

Utama

Paparan Utama

Senarai Risiko

Daftar Risiko

Penilaian & Rawatan

Pindaan

Laporan

Utus Pengguna

Log Aktiviti

Ek Log Keluar

UKM HOLDINGS

ADMIN

UKM HOLDINGS

ADMIN

Senarai Risiko

Carli No Rujukan...

-- Semua Syarikat --

-- Semua Tahun --

-- Semua Separuh Tahun --

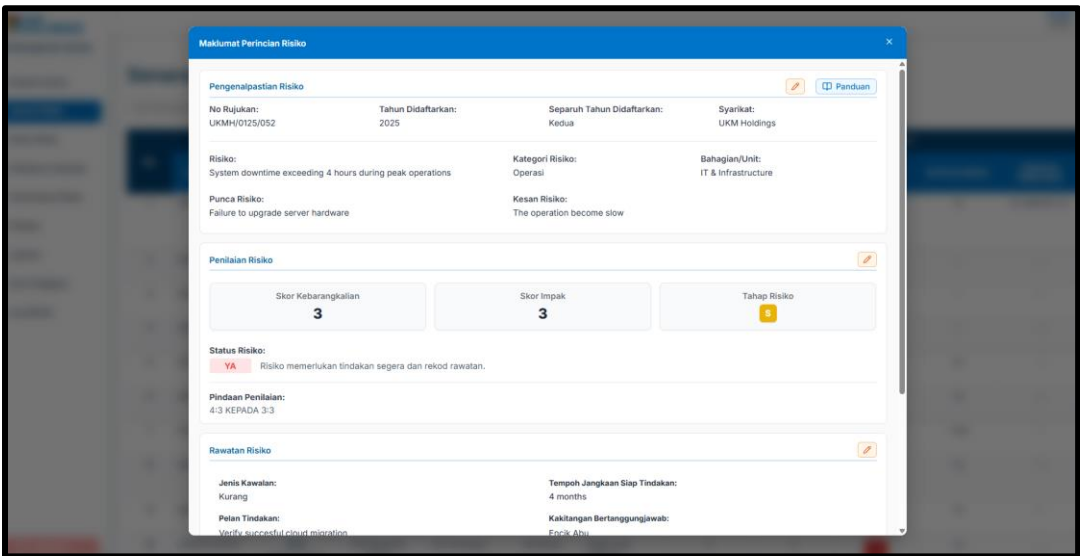
-- Semua Kategori --

PENGENALPASTIAN RISIKO							PENILAIAN RISIKO					
BIL.	NO RUJUKAN	TAHUN & SEPAPUH TAHUN DAFTAR	NAMA SYARIKAT	BAHAGIAN / UNIT	KATEGORI RISIKO	RISIKO	SKOR KEBARANGKALIAN	SKOR IMPAK	TAHAP RISIKO	STATUS RISIKO	PINDAAN PENILAIAN	P
1	UKMH/0125/052	2025 Separuh Kedua	UKM Holdings	IT & Infrastructure	Operasi	System downtime exceeding 4 hours during peak operations	3	3	5	Ya	4:3 KEPADA 3:3	Verify cloud migration
2	UKMP0125/01	2025 Separuh Pertama	UKM Pakarunding	Unit Kewangan	Kewangan	Risiko mata wang asing	-	-	-	---	---	---
3	UKMM0125/05	2025 Separuh Pertama	UKM Medicare	Unit Pematuhan	Pematuhan / Perundangan	Pelanggaran Akta SPRM	-	-	-	---	---	---
4	UKMM0125/04	2025 Separuh Pertama	UKM Medicare	Unit perancangan	Pematuhan / Perundangan	Kemeseletan ekonomi	-	-	-	---	---	---
5	UKMM0125/03	2025 Separuh Pertama	UKM Medicare	Unit Operasi	Operasi	Kematangan di tempat kerja	3	2	5	Ya	---	---
6	UKMM0125/02	2025 Separuh Pertama	UKM Medicare	Unit Kewangan	Kewangan	Ralat dalam penyata kewangan	1	3	5	Ya	---	---
7	UKMM0125/01	2025 Separuh Pertama	UKM Medicare	Unit Kewangan	Pematuhan / Perundangan	Audit cukai yang ketat	3	1	4	Tidak	---	---
8	UKMSC/0125/07	2025 Separuh Pertama	UKM Specialist Centre	Unit Pembangunan Pemliagaan	Strategik	Gagal membangunkan produk baharu	5	5	5	Ya	---	---
9	UKMSC/0125/06	2025 Separuh Pertama	UKM Specialist Centre	Bahagian Logistic	Operasi	Kelawatan penghantaran	5	5	5	Ya	---	---
10	UKMSC/0125/05	2025	UKM Specialist	Unit Kewangan	Kewangan	Gagal bayar	5	5	5	Ya	---	---

Figure 7.14: Risk List Page

The figure above shows the risk list pages. These pages show the table of the risk that have detailed such as risk identifying, risk assessment, risk treatment and risk monitoring. Admin, executive and viewer can select at filter for selecting the companies which are subsidiary but other user such as staff and head of subsidiary only can see their subsidiary risk-related data only.

7.4.4 Risk Detail Modal



Maklumat Perincian Risiko

Pengenalpastian Risiko

No Rujukan: UKMH/0125/052 Tahun Didaftarkan: 2025 Separuh Tahun Didaftarkan: Kedua Syarikat: UKM Holdings

Risiko: System downtime exceeding 4 hours during peak operations Kategori Risiko: Operasi Bahagian/Unit: IT & Infrastructure

Punca Risiko: Failure to upgrade server hardware Kesan Risiko: The operation become slow

Penilaian Risiko

Skor Kebarangkalian: 3 Skor Impak: 3 Tahap Risiko: 5

Status Risiko: **YA** Risiko memerlukan tindakan segera dan rekod rawatan.

Pindaan Penilaian: 4:3 KEPADA 3:3

Rawatan Risiko

Jenis Kawalan: Kurang Tempoh Jangkaan Slap Tindakan: 4 months

Pelan Tindakan: Verify successful cloud migration Kaitan/Bertanggungjawab: Enck Abu

Figure 7.15: Risk Detail Modal

The figure above shows the risk detail modal which are the detail of the risk. The detail will be pop up after the user's click at the risk in risk list page. The details of risk show the risk-related data such as risk assessment, risk treatments and risk monitoring. All users can see the details of the risk data but only admin can click at pencil icon to edit the data.

7.4.5 Risk Registration Page

Daftar Risiko

Pengenalpastian Risiko

No Rujukan: Contoh: UKM/H-001/2025 Tahun: Masukkan Tahun Separuh Tahun: -- Pilih --

Syarikat: -- Pilih --

Kategori Risiko: -- Pilih -- Bahagian/Unit: Masukkan bahagian/unit

Risiko: Masukkan risiko

Punca: Punca 1 +

Kesan: Kesan 1 +

Daftar Risiko

Figure 7.16: Risk Registration Page

The figure above shows the risk registration page. This page shows the form for three users that register the risk which are admin, executive and staff. The user's need to fill all the information about the risk to register the risk.

7.4.6 Risk Instruction Modal

Panduan Pengisian & Penilaian Risiko

Jadual 4: Matriks Penilaian Risiko

KEBARANGKALIAN		IMPAK				
		TIDAK KETARA 1	BOLEH DIUKUR 2	KETARA 3	BESAR 4	SANGAT BESAR 5
HAMPIR PASTI	5	SEDERHANA	TINGGI	TINGGI	SANGAT TINGGI	SANGAT TINGGI
KEMUNGKINAN TINGGI	4	SEDERHANA	SEDERHANA	TINGGI	TINGGI	SANGAT TINGGI
BERPELUANG UNTUK BERLAKU	3	RENDAH	SEDERHANA	SEDERHANA	TINGGI	TINGGI
KEMUNGKINAN RENDAH	2	RENDAH	RENDAH	SEDERHANA	SEDERHANA	TINGGI
HAMPIR TIADA KEMUNGKINAN	1	RENDAH	RENDAH	SEDERHANA	SEDERHANA	TINGGI

Jadual 5: Tahap Risiko dan Kod Warna

TAHAP RISIKO	KOD WARNA	PENERANGAN RISIKO
SANGAT TINGGI	■	Very Significant Risk: Tindakan segera diperlukan untuk mengurangkan risiko
TINGGI	■	High Risk: Tindakan perlu diambil untuk mengimbangi risiko
SEDERHANA	■	Moderate Risk: Tindakan perlu diambil berhati-hati dengan risiko & memantau risiko

Tutup Panduan

Figure 7.17: Risk Instruction Modal

The figure above shows the risk instruction modals. This modal provides the instruction about risk assessment, risk mitigation, risk level, risk matrix, risk categories and all the instructions needed for user to do the risk management.

7.4.7 Risk Assessment and Treatment Page

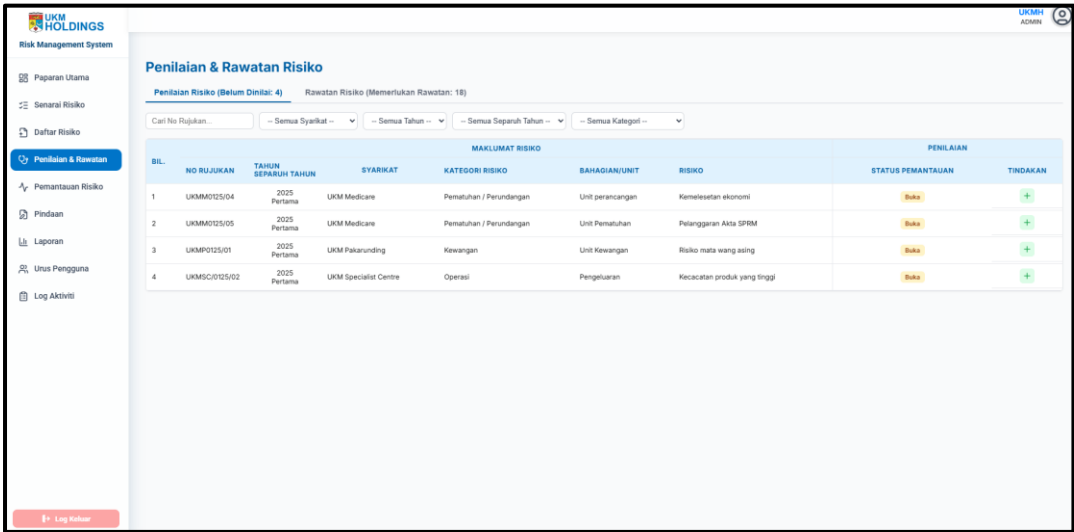


Figure 7.18: Risk Assessment and Treatment Page

The figure above shows the risk assessment and treatment page. In these pages, there are two tab which are risk assessment and risk treatments. Only admin and executive that have access to open this page. Risk that not yet been assessing are been display in risk assessment tab and also risk that doesn't have the treatment will be displayed in table of risk at the risk treatment tab.

7.4.8 Risk Assessment Modal

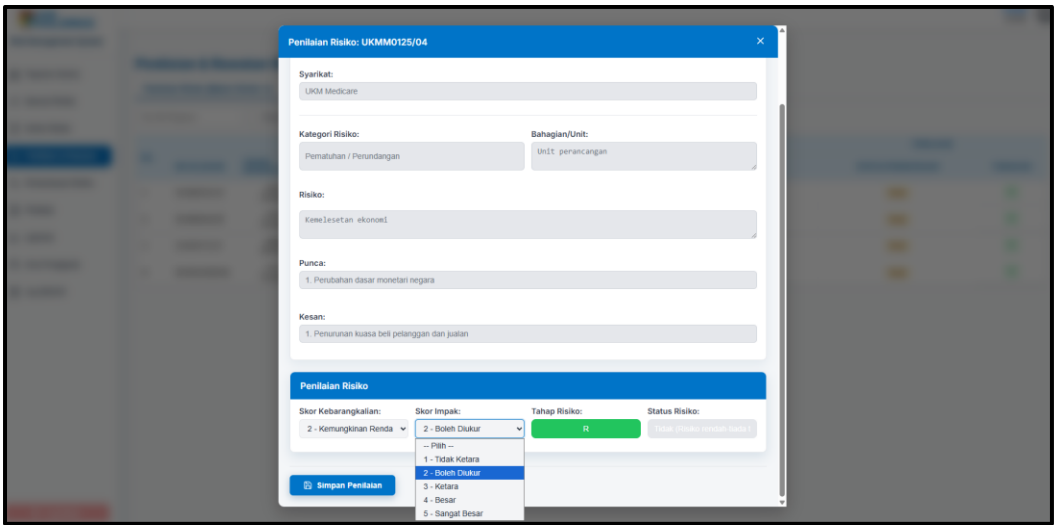


Figure 7.19: Risk Assessment Modal

Figure above shows the risk assessment modal. In this modal, admin and executive can see the details of risk and to do the assessment they need to choose the likelihood score and impact score and the system will automatically calculate and determined the level of the risk and status of the risk.

7.4.9 Risk Treatments Modal

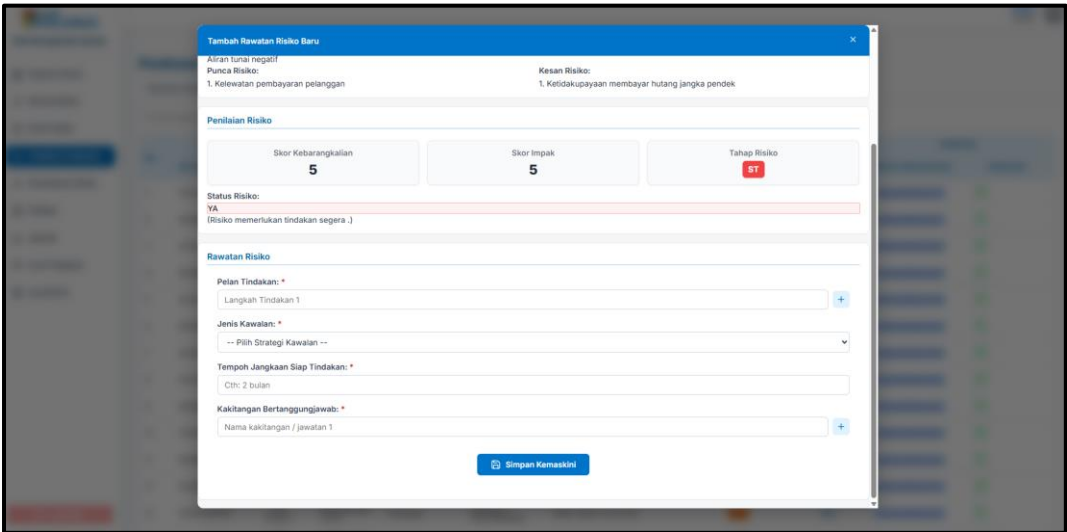


Figure 7.20: Risk Treatment Modal

Figure above shows the risk treatment modal. In this modal, admin and executive can see the risk assessment score and the level of risk for their references to fill the treatment of risk. They need to fill the action plan, mitigation types which are accept, reduce, avoid and move the risk. Thy also need to fill the duration for the mitigation complete and the staff that responsible for this treatment.

7.4.10 Risk Monitoring Page

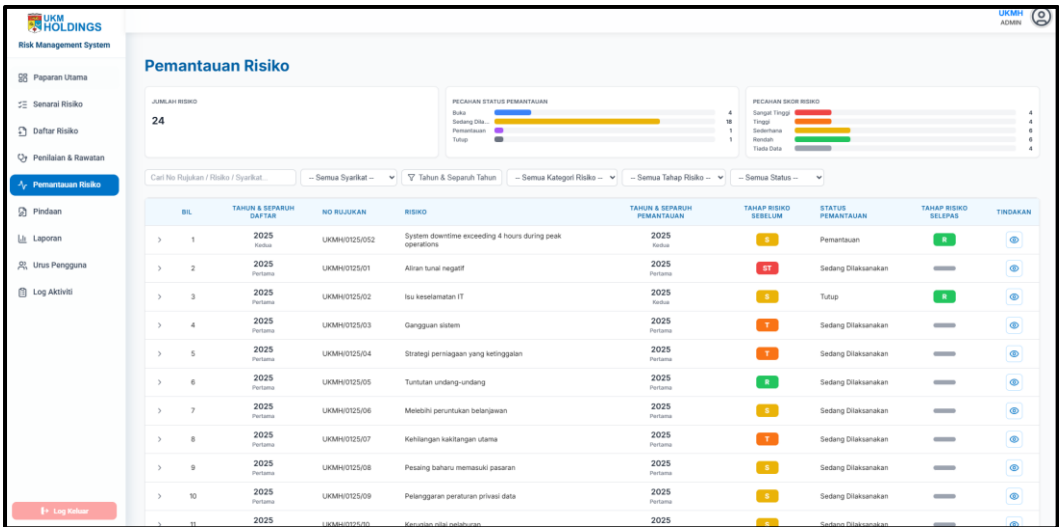


Figure 7.21: Risk Monitoring Page

Figure above shows the risk monitoring page, this page are specifically for the admin, executive and staff. They can see risk according to the monitoring status. There also the visualization of the number of monitoring status and level of risk.

7.4.11 Risk Monitoring Detail Modal

Maklumat Pemantauan

Penilaian Risiko

Skor Kebarangkalian: 3

Skor Impak: 3

Tahap Risiko: 8

Status Risiko:
YA Risiko memerlukan tindakan segera

Pindaan Penilaian:
4-3 KEPADA 3-3

Rawatan Risiko

Jenis Kawalan: Kurang

Pelan Tindakan: 1. Verify succesful cloud migration

Tempoh Jangkaan Siap Tindakan: 4 months

Kakitangan Bertanggungjawab: 1. Enckik Abu

Pemantauan Risiko

TAHUN	SEPARUH TAHUN	PELAN TINDAKAN	KEKERAPAN PEMANTAUAN	KAKITANGAN BERTANGGUNGJAWAB	SKOR KEBARANGKALIAN	SKOR IMPAK	TAHAP RISIKO	KEBERKESANAN	STATUS PEMANTAU
2025	Kedua	-	-	-	1	1	8	Ya	Pemantauan

[Tambah Pemantauan](#)

Figure 7.22: Risk Monitoring Detail Modal

Figure above shows the risk monitoring detail modal, this modal are specifically for the admin, executive and staff. They can see risk detail and all the monitoring detail in this modal. Only admin and executive can add the monitoring by clicking the button of add monitoring.

7.4.12 Add Monitoring Modal

Maklumat Pemantauan

Tambah Pemantauan Baharu

Tahun Pemantauan: 2025

Separuh Tahun Pemantauan: Pertama

Kelulusan: [Panduan](#)

✗ Tahun/separuh tahun pemantauan tidak boleh lebih awal daripada risiko asal (Tahun: 2025, Separuh: 2).

Pelan Tindakan Pemantauan:
Butiran Pelan Tindakan 1: [+](#)

Kakitangan Bertanggungjawab:
Kakitangan Bertanggungjawab 1: [+](#)

Kekerapan:
Contoh: 3 Bulan / Tahunan

Keberkesanan Tindakan

Skor Kebarangkalian: [-](#) Sila Pilih [+](#)

Skor Impak: [-](#) Sila Pilih [+](#)

Tahap Risiko: [-](#) Sila Pilih [+](#)

Keberkesanan: [-](#)

Status Pemantauan

Status Pemantauan Semasa: [-](#) Sila Pilih [+](#)

[Buka](#)
[Sedang Dilaksanakan](#)
[Pemantauan](#)
[Seleksi](#)
[Tutup](#)

Figure 7.23: Add Monitoring Modal

Figure above shows the add monitoring modal, this modal are specifically for the admin and executive. They need to fill all the detail of the monitoring and select the likelihood score and impact score to determine the effectiveness of the plan action and they also need to choose the monitoring status.

7.4.13 Amendment Page

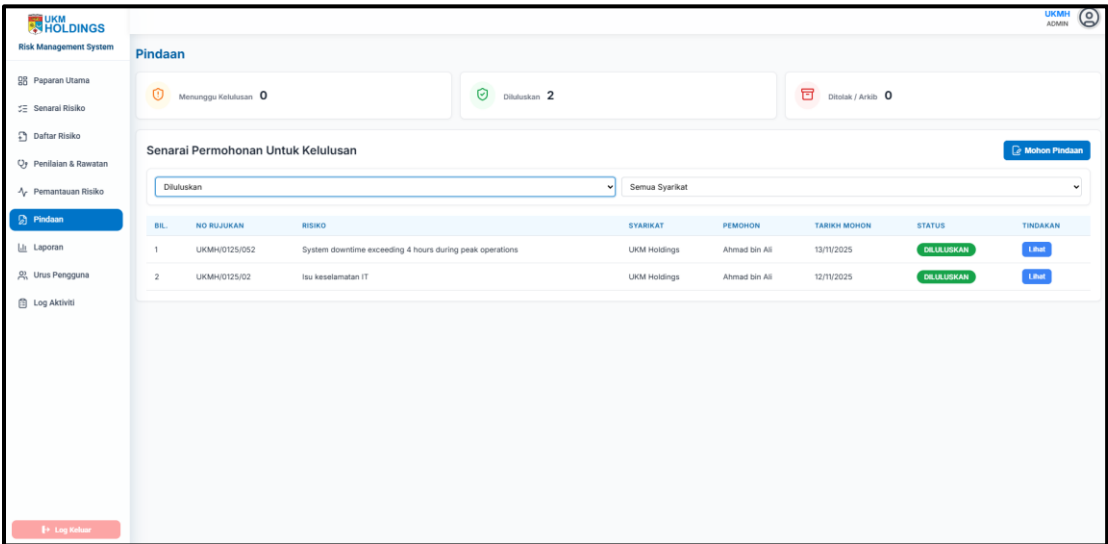


Figure 7.24: Amendment Page

Figure above shows the amendment page. This amendment are pages specifically for the admin and executive. Admin and executive can do the amendments to change the score of likelihood and impact and also level of risk for risk assessment and risk effectiveness. Admin can do the amendments without they need to approve the request but executive need to wait for admin to approve or reject.

7.4.14 Amendment Request Modal

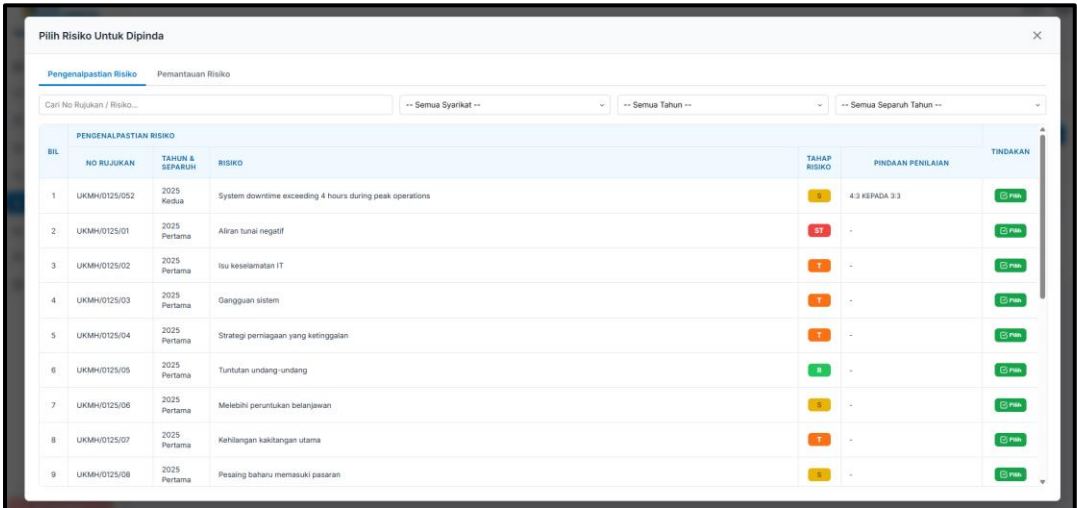


Figure 7.25: Amendment Request Modal

Figure above shows the amendment request modal. This modal contains two tab which represents two types of amendments which are risk assessment and risk effectiveness. Admin and executive can select which risk that they want to do the amendments.

7.4.15 Amendment Form Modal

The screenshot shows a modal window titled "Borang Pindaan: UKMH/0125/052". It contains two main sections:

- Pindaan Penilaian Risiko:** This section includes a risk description "Risiko: System downtime exceeding 4 hours during peak operations" and a company name "Syarikat: UKM Holdings". It features input fields for "Data Rujukan" (3), "Skor Kebarangkalian" (3), "Skor Impak" (3), and "Tahap Risiko" (5). Below these are dropdown menus for "Skor Kebarangkalian (Baru)" (3 - Berpeluang Untuk) and "Skor Impak (Baru)" (3 - Ketara), and a "Tahap Risiko (Baru)" dropdown (5). A justification text area is also present.
- Pindaan Keberkesanan Tindakan:** This section includes a "Tahun Pemantauan" (2025) and "Separuh Tahun" (Kedua) dropdowns. It features input fields for "Data Rujukan" (1), "Skor Kebarangkalian" (1), "Skor Impak" (1), and "Tahap Risiko" (N). Below these are dropdown menus for "Skor Kebarangkalian (Baru)" (1 - Hampir Tiada Kem) and "Skor Impak (Baru)" (1 - Tidak Ketara), and a "Tahap Risiko (Baru)" dropdown (N).

Figure 7.26: Amendment Form Modal

Figure above shows the amendment form modal. This modal contains two types of amendments which are risk assessment and risk effectiveness. Admin and executive can select whether risk assessment or effectiveness of action by selecting the new likelihood or impact score and fill the justification for the amendments they choose.

7.4.16 Amendment Comparison Modal

The screenshot shows a modal window titled "Sahkan Perubahan". It contains a table comparing "SEBELUM" and "SELEPAS" values for "PERKARA".

PERKARA	SEBELUM	SELEPAS
Skor Kebarangkalian (Keberkesanan)	1	4
Skor Impak (Keberkesanan)	1	4

At the bottom of the modal, there are buttons for "Batal" and "Sahkan & Hantar".

Figure 7.27: Amendment Comparison Modal

Figure above shows the amendment comparison modal. This modal shows the features of the system that compare the old data and new data about what change that have been done by admin and executive.

7.4.17 Amendment Accept and Reject Modal

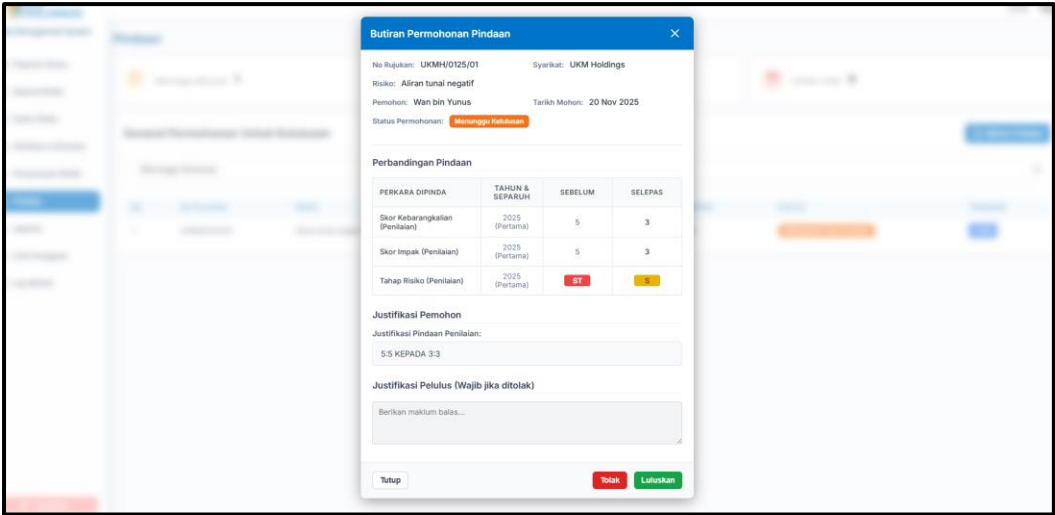


Figure 7.28: Amendment Accept and Reject Modal

Figure above shows the amendment accept and reject modal. This modal is display for the admin to approve or reject the amendments request by executive. If admin reject, admin need to fill the justification why the amendments been rejected.

7.4.18 Report Page

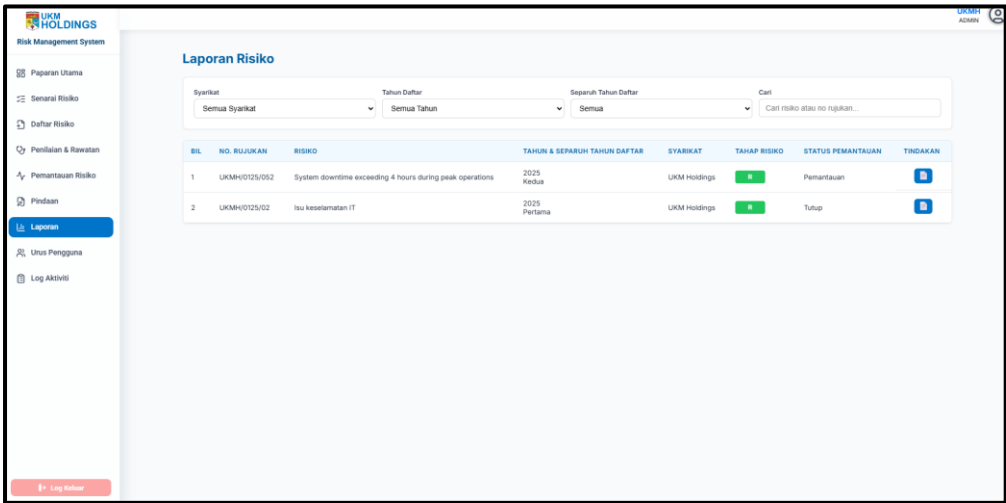


Figure 7.29: Report Page

Figure above shows the report page. This report page only displayed the risk that have been assessed and been given treatments and been monitored. This page displayed for admin only for do the risk documentation and reporting.

7.4.19 Report Option Modal

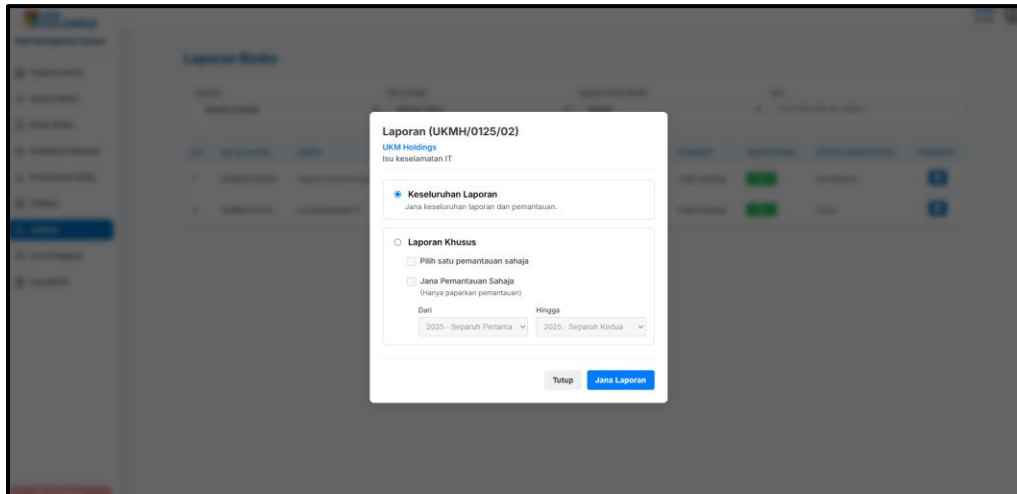


Figure 7.30: Report Option Modal

Figure above shows report option modal. This modal show to the admin the option whether the admin can generates overall report or report with specific monitoring.

7.4.20 Report View Modal

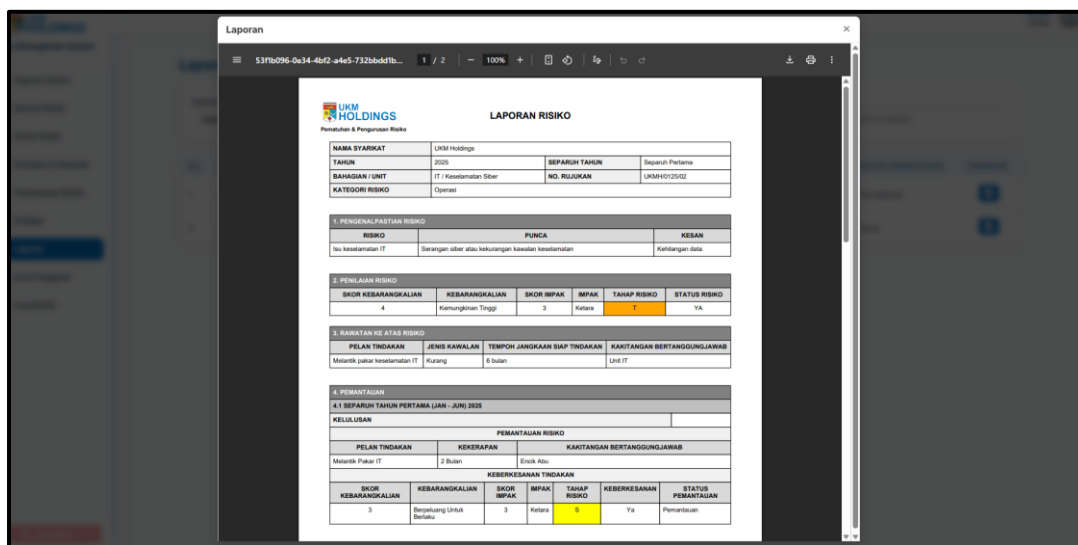


Figure 7.31: Report View Modal

Figure above shows report view modal. This modal shows the report that have been converted into pdf. Admin can print or download the pdf to been stored in local file in admin laptop or pc.

7.4.21 Manage User Page

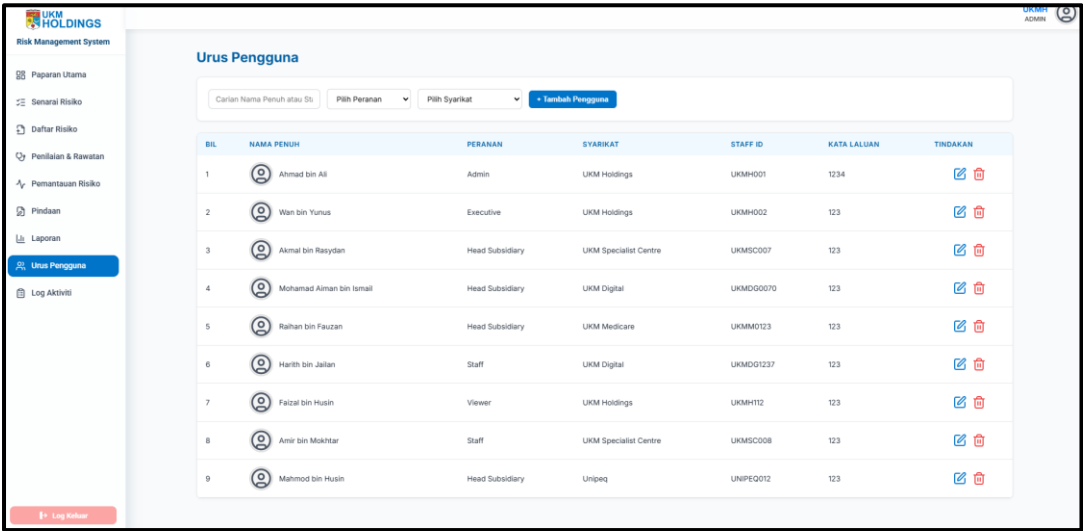


Figure 7.32: Manage User Page

Figure above shows manage user page. This page specifically for admin to add the new user by assigning the roles and the subsidiary. Admin can delete and edit the users in these pages.

7.4.22 Activity Log Page

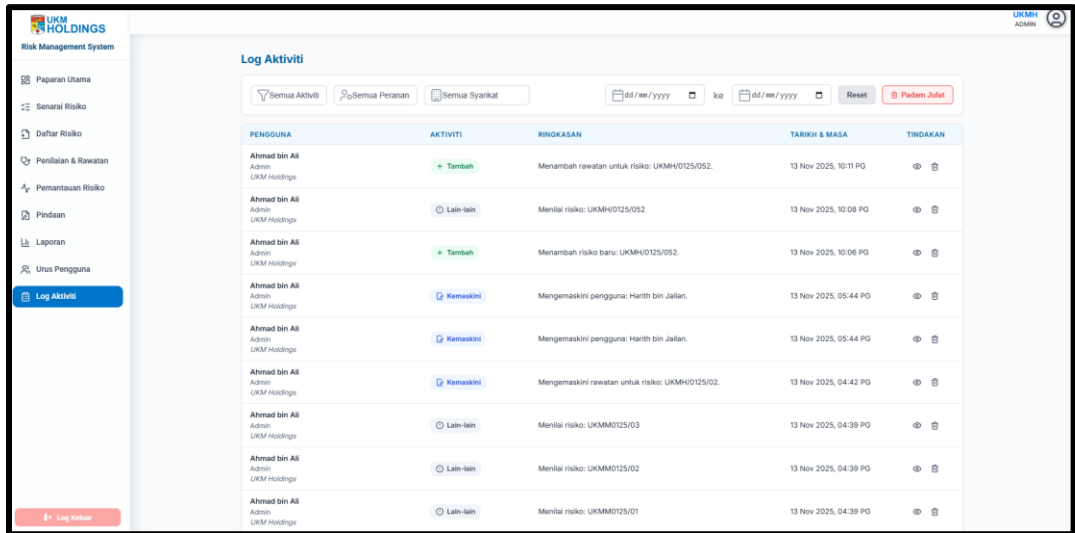


Figure 7.33: Activity Log Page

Figure above shows activity log pages. This page specifically for admin to monitor the activity of every user that related with adding, updating and deleting risk-related data. Admin can select the duration date from date to another date to monitor every activity.

7.4.23 Edit User Component

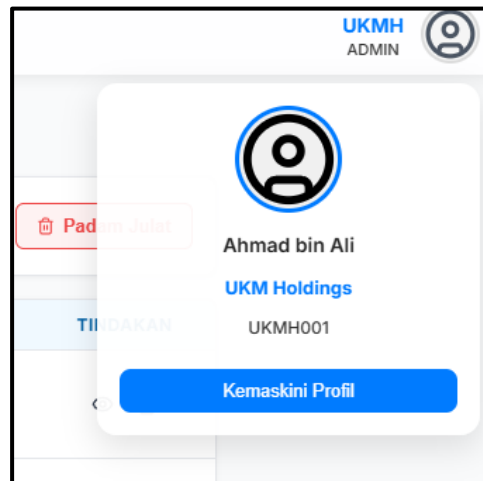


Figure 7.34: Edit User Component

Figure above shows edit user component. This component can be assessed by every user. Every user can manage their profile by changing the profile picture and password.

7.5 Significant Function

7.5.1 Role-Based Access Control Authentication

```

JS dashboard.js JS authController.js x PenilaianRawatan.css PemantauanRisiko.css ReportOptionsModal.css
risk_backend > controllers > JS authController.js > login > token
You, 2 weeks ago | 1 author (You)
1 import pool from "../config/db.js";
2 import jwt from "jsonwebtoken";
3
4 export const login = async (req, res) => {
5   const { staff_id, katalaluan } = req.body;
6
7   try {
8     const { rows } = await pool.query(
9       `SELECT u.pengguna_id, u.staff_id, u.nama_penuh, u.katalaluan,
10        u.peranan_id, u.subsidiari_id, p.nama_peranan
11       FROM pengguna u
12        JOIN peranan p ON u.peranan_id = p.peranan_id
13        WHERE u.staff_id = ? AND u.katalaluan = ?`,
14       [staff_id, katalaluan]
15     );
16
17     const user = rows[0];
18     if (!user) return res.status(401).json({ error: "Invalid Staff ID or password" });
19
20     // Plain text check
21     if (katalaluan !== user.katalaluan)
22       return res.status(401).json({ error: "Invalid Staff ID or password" });
23
24     const token = jwt.sign(
25       {
26         pengguna_id: user.pengguna_id,
27         staff_id: user.staff_id,
28         peranan_id: user.peranan_id,
29         nama_peranan: user.nama_peranan,
30         subsidiari_id: user.subsidiari_id,
31       },
32       process.env.JWT_SECRET,
33       { expiresIn: "5d" }
34     );
35
36     res.json({ token, user: { nama: user.nama_penuh, peranan: user.nama_peranan } });
37   } catch (err) {
38     console.error("Login error:", err.message); // log actual error
39     res.status(500).json({ error: "Server error", details: err.message });
40   }
41 };
42

```

Figure 7.35: RBAC Auth Controller

Based on the figure above, the figure shows the RBAC auth controller. Risk Management System used the Role Based Access Control (RBAC) to display the interfaces, hide the interfaces and give permissions for every each of user. The system will given full access to the admin but other users have didn't have access for certain interfaces and permission to edit the data or view other subsidiary data. Using staff id and password for authentication when the user login and the system will check the staff id for the roles and permission for that user.

7.5.2 Calculation of Risk Level by Risk Matrix

```

10  const router = express.Router();
11
12  // =====
13  // ★ LOGIK RISK MATRIX ★
14  // =====
15  const riskMatrix = {
16    1: {1:{label:"R"}, 2:{label:"R"}, 3:{label:"S"}, 4:{label:"S"}, 5:{label:"T"}},
17    2: {1:{label:"R"}, 2:{label:"R"}, 3:{label:"S"}, 4:{label:"S"}, 5:{label:"T"}},
18    3: {1:{label:"R"}, 2:{label:"S"}, 3:{label:"S"}, 4:{label:"T"}, 5:{label:"T"}},
19    4: {1:{label:"S"}, 2:{label:"S"}, 3:{label:"T"}, 4:{label:"T"}, 5:{label:"ST"}},
20    5: {1:{label:"S"}, 2:{label:"T"}, 3:{label:"T"}, 4:{label:"ST"}, 5:{label:"ST"}},
21  };
22
23  /**
24   * Mengira tahap risiko (ST, T, S, R) berdasarkan skor.
25   * @param {number | string} k - Skor Kebarangkalian
26   * @param {number | string} i - Skor Impak
27   * @returns {string | null} - Mengembalikan label (cth: "ST") atau null
28   */
29  const getRiskLevel = (k, i) => {
30    const kk = parseInt(k);
31    const ii = parseInt(i);
32
33    if (kk >= 1 && kk <= 5 && ii >= 1 && ii <= 5) {
34      return riskMatrix[kk][ii].label;
35    }
36    return null;
37  };

```

Figure 7.36: Risk Matrix Controller

Based on the figure above, the code above are the risk level calculations by using risk matrix in the backend. The code shows that calculation of risk matrix will get the risk level and the risk level will be display in shortform for every level of risk. The risk level been generated by the score of risk score of likelihood and risk score of impact and the system will determine the level of the risk according the risk matrix code snippet in the figure above. The risk calculations contain 1-5 for score of likelihood and impacts.

7.5.3 Amendment Comparison

```

214 if (hasPenilaianInputChange) {
215   const beforeScore = getRiskShortLabelFromMatrix(completeOriginalData.skor_kebarangkalian, completeOriginalData.skor_impak, riskMatrixDetails);
216   const afterScore = getRiskShortLabelFromMatrix(completeFinalData.skor_kebarangkalian, completeFinalData.skor_impak, riskMatrixDetails);
217   if (beforeScore !== afterScore || ('skor_kebarangkalian' in data_selepas) || ('skor_impak' in data_selepas)) {
218     data_sebelum.skor_risiko_penilaian = beforeScore;
219     data_selepas.skor_risiko_penilaian = afterScore;
220   }
221 }
222 if (hasKeberkesananInputChange) {
223   const beforeScore = getRiskShortLabelFromMatrix(completeOriginalData.skor_kebarangkalian_selepas, completeOriginalData.skor_impak_selepas, riskMatrixDetails);
224   const afterScore = getRiskShortLabelFromMatrix(completeFinalData.skor_kebarangkalian_selepas, completeFinalData.skor_impak_selepas, riskMatrixDetails);
225   if (beforeScore !== afterScore || ('skor_kebarangkalian_selepas' in data_selepas) || ('skor_impak_selepas' in data_selepas)) {
226     data_sebelum.skor_risiko_keberkesanan = beforeScore;
227     data_selepas.skor_risiko_keberkesanan = afterScore;
228   }
229 }
230
231 if (nama_peranan === "Admin") {
232   status_permohonan = "Diluluskan";
233   pengguna_id_pelulus = userIntegerId;
234   tarikh_diproses = new Date();
235
236   let hasRisikoChanges = hasPenilaianInputChange || penilaian;
237   let hasLogChanges = hasKeberkesananInputChange || keberkesanan;
238
239   const risikoUpdates = {};
240   const logUpdates = {};
241
242   if (hasRisikoChanges) {
243     if ('skor_kebarangkalian' in data_selepas) risikoUpdates.skor_kebarangkalian = data_selepas.skor_kebarangkalian;
244     if ('skor_impak' in data_selepas) risikoUpdates.skor_impak = data_selepas.skor_impak;
245     if ('skor_risiko_penilaian' in data_selepas) {
246       risikoUpdates.skor_risiko = data_selepas.skor_risiko_penilaian !== '-' ? data_selepas.skor_risiko_penilaian : null;
247     }
248   }
249   if (penilaian) {
250     risikoUpdates.justifikasi_pindaan_penilaian = penilaian;
251   }
252
253   if (hasLogChanges) {
254     if ('skor_kebarangkalian_selepas' in data_selepas) logUpdates.skor_kebarangkalian_selepas = data_selepas.skor_kebarangkalian_selepas;
255     if ('skor_impak_selepas' in data_selepas) logUpdates.skor_impak_selepas = data_selepas.skor_impak_selepas;
256     if ('skor_risiko_keberkesanan' in data_selepas) {
257       logUpdates.skor_risiko_pemantauan = data_selepas.skor_risiko_keberkesanan !== '-' ? data_selepas.skor_risiko_keberkesanan : null;
258     }
259   }

```

Figure 7.37: Amendment Controller

Based on the figure above, the code above is the process for comparison old data before amendments and new data after amendments been requested. The system will do the comparison using the old data and new data which is likelihood score, impact score and level of risk to determine is there any changes that been requested by executive that request the amendments. The output will be displayed in front end in the comparison modal for comparison of the data.

7.5.4 Report Generation

```

export default function ReportOptionsModal({
  const [fromValue, setFromValue] = useState('');
  const [toValue, setToValue] = useState('');

  useEffect(() => {
    if (logOptions.length > 0) {
      setFromValue(logOptions[0].value);
      setToValue(logOptions[logOptions.length - 1].value);
      setSingleValue(logOptions[logOptions.length - 1].value);
    }
  }, [logOptions]);

  function handleGenerateClick() {
    const range = {
      reportType,
      isSingleLog: reportType === 'range' && isSingleLogMode,
      fromValue: isSingleLogMode ? singleValue : fromValue,
      toValue: isSingleLogMode ? singleValue : toValue,
      fromLabel: logOptions.find(o => o.value === (isSingleLogMode ? singleValue : fromValue)).label,
      toLabel: logOptions.find(o => o.value === (isSingleLogMode ? singleValue : toValue)).label,
      isLogOnly: reportType === 'range' && isLogOnlyMode
    };
    onShowPreview(risk, range);
  }

  const hasLogs = logs.length > 0;

  return (
    <div className="report-modal-overlay" onClick={onClose}>
      <div className="report-modal-container" onClick={e => e.stopPropagation()}>
        <h3>Laporan ({risk.no_rujukan})</h3>
        <div className="report-modal-risk-details">
          <p className="report-modal-subsiadiary">{risk.subsidiary}</p>
          <p className="report-modal-risk-title">{risk.title}</p>
        </div>
        <div className="report-modal-content">
          <div className="report-modal-option">
            <input
              type="radio"
              id="report-all"
              name="reportType"
              value="all"
              checked={reportType === 'all'}
              onChange={() => {
                setReportType('all');
                setIsLogOnlyMode(false);
              }}
            />

```

Figure 7.38: Report Generation to Pdf

Based on the figure above, the code above is the process for report generates into pdf. The system will generated reports after the risk have been given the treatments and monitored for documentation by the admin. This system function will help in risk reporting by generating the risk report into the pdf. This output of the code will be shows in front-end in generate report page.

7.6 Conclusion

In conclusion, Risk Management System project development was successfully been implemented to achieve the objective of this project. The project is been develop by a complex stage and a more detailed of comprehensive development phases. The development of this project is been documented with a documentation in code snippet and been going a lot of automation and some features that will helps the users of these systems to use these systems. Displaying all the interfaces in order for the user will helps in risk management process. Designing the interfaces of this system become more important because the organization have a lot of data and been a challenge for developers to choose the software that suitable for the system especially the system that have a lot of SQL queries like Risk Management System. By implementing all the software and hardware it helps in developing a robust Risk Management System and develop a system that interactive and easy-to-use for all the users.

8 TESTING

8.1 Introduction

In this chapter, all the testing process will be explained in testing the Risk Management System to make sure the system works. The system will be undergoing with testing phases such as unit testing, integration testing, functional and non-functional requirements in system testing. All this system will be conducted by the developer that developed this project to ensure the system works according to the system flow. After the system has been tested, the developer will do the user acceptance testing to ensure the system is working with the real users and evaluate by doing an interview session with users.

8.2 Functional Testing

8.2.1 Unit Testing

Table 8.1: Unit Testing Tables

Bil	Unit/Function	Description	Input	Output	Error Handling	Status
1.	Generate risk report	Admin should be able to generate report into pdf	No input, admin just selected at risk to generate reports.	The output will show the report of risk-related data in pdf.	The system will show the alert message if report can't be generated	Pass
2.	Register the risk	Admin, executive and staff should be able to register new risk.	Admin, executive and staff enter the data in risk registration form	The output will show the alert message that the risk has been registered	The system will show the alert message that the risk is failed to register	Pass
3.	Risk Assessment	Admin and executive should be able to do the risk assessment by selecting the likelihood score and impact score to generate level of risk	Likelihood score, impact score	The output will show the risk assessment are successful to be done	The system will show the alert message that the risk assessment is failed to be added.	Pass
4.	Dashboard filter	Admin, executive and viewer should be able to filter the dashboard according to the	No input, Admin, executive and viewer choose the subsidiary from dropdown	The output will show that the dashboard is successful to display	The system will show the alert message that shows that dashboard	Pass

		subsidiary selections		according the filter selections	can't be generated	
5.	Monitoring Log	Admin and executive should be able to add the monitoring log	Admin and executive fill all the data in the form of monitoring	The output will show that monitoring successful be added	The system will show alert message shows that monitoring failed to be added	Pass
6.	Updating risk related data	Admin should be able to edit risk related data	Admin edit the part of identifying the risk, risk assessment, treatment and monitoring	The output will show that the editing for all risk related data are successful	The system will show error message that show saving the edit data are failed	Pass
7.	Display risk details	All the users should be able to view the risk details	Risk_id (risiko_id)	The output will show the risk detail and other detail that related to the risk	The system will show error message if failed to display the detail of risk	Pass
8.	Display only subsidiary data	Head of subsidiary and staff should only able to see their subsidiary risk-related data only.	No input, it will be based on user roles and user auth.	The output will show only the subsidiary data for staff and head of subsidiary	The system will show the error message if roles permission is having a problem	Pass
9.	Accept and Reject Amendments	Admin should be able to accept and reject the amendments that been requested by executive	Amendments_id (pindaan_id)	The output will show the amendments are successful be approve or reject	The system will show the error message if the approve and reject failed	Pass
10.	Logout	All the users should be able to logout after the token for the authentication are cleared	JSON Web Token	The output will show the message successful to logout	The system will show the alert message if the user failed to logout	Pass
11.	Add users	Admin should be able to add new user according to their roles and subsidiary.	Admin enters the staff id, fullname, password, subsidiary and roles.	The output will show the message that the new user has successfully been added	The system will show the alert messages if the adding user are failed	Pass
12.	Manage profile	All user should be able to change	Profile pictures, password.	The output will show that	The system will show the	Pass

		password and profile pictures.		the user successful editing the profile	alert message if the editing the profile are failed	
13.	Request amendments	Executive should be able to request for the amendments	Amendments justifications, likelihood and impact score.	The output will show that executive successful in request amendments	The system will show the alert messages that show the amendments request is fail	Pass

8.2.2 Integration Testing

Table 8.2: Integration Testing Tables

Bil	Unit/Function	Description	Input	Output	Error Handling	Status
1.	Display list of risk	The list of risk should be able to display for all the users.	Risk related tables in databases (risiko_id)	List of risk will be display	The alert messages that show the system failed to display the list of risk.	Pass
2.	Display dashboard	The user should be able to view the dashboard	Risk related tables in databases (risiko_id)	Dashboard will be display	Alert messages will be display that indicates that dashboard failed to display	Pass
3.	Display the report	Admin should be able to see reports in pdf	Admin choose the risk id (risiko_id) from the list reports	Reports will be displayed in pdf	Alert messages will be display that indicates that reports failed been display	Pass

8.2.3 System Testing

Table 8.3: Functional Testing Tables

Bil	Unit/Function	Description	Input	Output	Error Handling	Status
1.	Dropdown filter	All the user should be able to filter the list of risk.	User selected dropdown for categories	The list display according to the filter	The message output in console will show the alert if list didn't show according the filter	Pass
2.	Risk Register Form Validation	Attempt to submit a registration form leaving a mandatory field	User attempt to register the risk without file the cause of risk	The risk register can't be submit.	Alert messages will be display that notifies the user to fill all the information.	Pass
3.	Automatic risk level calculations	The system should be able to calculates the risk level according the risk likelihood and impact score.	Choose the likelihood and impact score.	The level of risk will be automated been calculated.	Alert message in console log will be display if the calculation of risk is failed.	Pass

8.3 Non-Functional Testing

Table 8.4: Non-Functional Testing Tables

Bil	Non-Functional Test	Expected Result	Actual Result	Status
1.	Performance testing	The system should be able to display the risk data from database in 3 seconds	The risk data display less than 3 seconds	Pass
2.	Security testing	The user only can see the data according their roles and permissions	The staff and head of subsidiary only can see their subsidiary data only.	Pass
3.	Usability testing	The system should be able interacts with user in doing risk management task.	The system interfaces is easy to interact with the users and all the modal can be view the detail of risk.	Pass

8.4 Acceptance Testing

User Acceptance Testing (UAT) is a sort of testing conducted to the end user or client to verify the system meet the user expectations and whether the system helps the end user in managing the risk in real environment. The interviews been conduct to the head of risk at UKM Holdings which is the admin for the system. Implementing Role Based Access Control for this system which means all the users are using same interfaces design but the user has different access according to their roles. The interview been made for the head of risk which is admin for this system. Only admin that been interview because admin have a fill access to the system.

8.4.1 Client Testing and Results



Figure 8.1: Interviewee Picture

Interviewee Name: Siti Fatimah binti Othman

Position: Head of Compliance & Risk Management

Location: Blok B1 - Plasma, Universiti Kebangsaan Malaysia, UKM-MTDC Technology Centre, UKM Holdings Sdn Bhd, 43600 Bangi, Selangor

Date: 3 November 2025

8.4.2 Testing and Result- Functionality Feedback

Table 8.5: Question 1 Functionality Feedback Analysis

Question 1	Does the system make it easier to record and update risk information compared to manual work?
Answer 1	Yes, users can record and update risks digitally without the excels spreadsheets.
Feedback 1	The feedback received from interviewees indicates that the system successfully helps user to reduce manual work in recording and updating the risk information.

Based on the table above, interviewees indicates that the system successfully helps user to reduce manual work in recording and updating the risk information. This remarks that the system successful in reducing manual works when doing the risk management.

Table 8.6: Question 2 Functionality Feedback Analysis

Question 2	Can users complete risk assessment and monitoring faster than before?
Answer 2	Yes, processing time is significantly reduced due to automated features in risk assessment and monitoring.
Feedback 2	The feedback received from interviewees indicates that the system successfully reduce time for the users to do the risk assessment and risk monitoring.

Based on the table above, interviewees indicates that the system successfully reduce time for user to do the risk assessments and monitoring. This remarks that the system successful in reducing time when using the system to do the risk assessments and risk monitoring.

Table 8.7: Question 3 Functionality Feedback Analysis

Question 3	Are repetitive manual tasks such as do a reporting are minimized?
Answer 3	Yes, the system provides report generation and the reports also can be printed and download as pdf
Feedback 3	The feedback received from interviewees indicates that the system successfully reducing the repetitive tasks which also reducing manual works and implementing automates report generations.

Based on the table above, interviewees indicates that the system successfully reducing the repetitive tasks which also reducing manual works and implementing automates report generations. This remarks that the system successful in reducing manual works in doing reports.

Table 8.8: Question 4 Functionality Feedback Analysis

Question 4	Can all subsidiaries access updated risk information in real time?
Answer 4	Yes, all subsidiaries can view the latest data simultaneously.
Feedback 4	The feedback received from interviewees indicates that the system successfully been a centralized platform for the UKM Holdings and its subsidiaries

Based on the table above, interviewees indicates that the system successfully been a centralized platform for the UKM Holdings and its subsidiaries that meets our project objectives which to provide a centralized platform.

Table 8.9: Question 5 Functionality Feedback Analysis

Question 5	Are access controls working correctly for each subsidiary?
Answer 5	Yes, users can only access data relevant to their subsidiary.
Feedback 5	The feedback received from interviewees indicates that the system successfully implementing access control according to the roles of user.

Based on the table above, interviewees indicates that the system successfully implementing access control according to the roles of user. Before this, the client using the excels spreadsheets in doing risk management all the subsidiary can access every subsidiary risk related-data. After developing the system, access controls feature only give access for staff and head of subsidiary to access their subsidiary data only.

Table 8.10: Question 6 Functionality Feedback Analysis

Question 6	Does the dashboard accurately show real-time risk data?
Answer 6	Yes, data updates are reflected instantly on the dashboard.
Feedback 6	The feedback received from interviewees indicates that the system successfully provides the real-time dashboard.

Based on the table above, interviewees indicates that the system successfully providing a real-time dashboard for the clients. This remarks that the system successful in providing a real-time dashboard to helps in risk visualizations.

Table 8.11: Question 7 Functionality Feedback Analysis

Question 7	Do visual dashboards help management make faster decisions?
Answer 7	Yes, users found the visuals clear and decision-making easier.
Feedback 7	The feedback received from interviewees indicates that the system helps in providing the dashboard to give faster and better decision making to manage risk.

Based on the table above, interviewees indicates that the system successfully providing a real-time dashboard for the clients. This remarks that the system successful in providing a real-time dashboard to helps management in UKM Holdings to make a faster and better decision making in manage the risk.

8.4.3 Testing and Result- Usability Feedback

Table 8.12: Question 1 Usability Feedback Analysis

Question 1	Is the system interface easy to use and navigate?
Answer 1	Yes, the layout is clear and menus are easy to understand for all users.
Feedback 1	The feedback received from interviewees indicates that the system interfaces are easy to use and understand by the all users. This shows that system have clear design interfaces.

Based on the table above, interviewees indicates that the system interfaces are easy to use and understand by the all users. This shows that system have clear design interface. These remarks that the system successful in providing friendly and give better user experience for the users to use the system.

Table 8.12: Question 2 Usability Feedback Analysis

Question 2	Are the data entry forms simple and efficient?
Answer 2	Yes, users can input and update data quickly with minimal errors.
Feedback 2	The feedback received from interviewees indicates that the entry form in this system is simple and efficient because of the form have a dropdown feature that made data entry become more efficient.

Based on the table above, interviewees indicates that the entry form in this system is simple and efficient because of the form have a dropdown feature that made data entry become more efficient. These indicates that system data entry form is easy to use by users and they can minimize errors when filling the risk data.

8.4.4 Testing and Result- General Feedback

Table 8.13: Question 1 General Feedback Analysis

Question 1	Does the role-based access control function as expected?
Answer 1	Yes, users can only access data for their respective subsidiaries.
Feedback 1	The feedback received from interviewees indicates that the system has an authorization control for each user, which give the user the permission in this system according their roles.

Based on the table above, interviewees indicates that the system has an authorization control for each user, which give the user the permission in this system according their roles. This indicates that system successful in implementing roles permission for user when the use the system that according to their roles.

Table 8.14: Question 2 General Feedback Analysis

Question 2	Are the generated reports accurate and useful for decision-making?
Answer 2	Yes, reports are accurate, well-structured and help management in analysis.
Feedback 2	The feedback received from interviewees indicates that the system able to generate risk reports that can helps in decision making.

Based on the table above, indicates that the system able to generate risk reports that can helps in decision making. Before these the management for UKM Holdings need to do manual reporting but with the system that can generate reports that will help in risk reporting.

8.5 Conclusion

In conclusion, based on the feedback that been collected such as functionality feedback, usability feedback and general feedback by doing the User Acceptance Testing (UAT) which is interviews, it indicates that the system has been given the positive feedbacks that been concluded that the system meets the project objectives and user requirements. The findings from the functionality feedback, the system can reduce processing time in doing risk management activities by the automation features such as risk level calculations, generation of the reports and dashboard. The systems also successfully operate as a centralized platform for UKM Holdings and its subsidiaries in doing risk management. This system provides a real-time dashboard that been indicates by interviewees that it will helps in reflects the risk-related for a data visualization for UKM Holding and across its subsidiaries to make sure a fast and better decision-making. Interviewees also confirm that the access control is working correctly for each of the roles to ensure the users can access the system according into their roles access. The findings from the usability feedback indicates that the system is usable and displaying a clear and understandable User Interfaces (UI) that helps the users are using the system to do the risk identifying, risk assessment, risk treatments and risk monitoring. The findings from the general feedback by the interviewee, it indicates that the all the system interfaces and system automation are functioning according to the system. The risk data are consistent when the user updating or adding data when doing the risk management process. All the feedback from the interviewee gives the positive feedbacks that indicates the system meets the project objectives.

9 PROJECT MANAGEMENT

9.1 Introduction

This chapter will explain the timelines of this project from beginning until the finishing of the project which is schedule for completing this Risk Management System. Project management that's effective is important to ensures all process in project such as managing the resources, designing the system, building the system and other requirements are been manage to ensure project finish been developed within the timelines that been planned. This chapter will explain the project scheduling that covers the Work Breakdown Structure (WBS) and Gantt chart. This chapter also will explain risk management that explains risk that been identified and how the risk been mitigate during the project.

9.2 Project Scheduling

Project Scheduling is a procedure that specifies what work should be done, which elements of the project will carry out the work and when the work should be completed. It describes of the project's period and usually includes a planned start and finish date as well as a list of all objectives, actions and deliverables required for the project. As a result, the developer will build a timeline that is acceptable for this project.

The project scheduling been organized using a Work Breakdown Structure (WBS) and a Gantt Chart. The Work Breakdown Structure (WBS) is used to verify that developers have designed the system by the project life cycle phase. The Gantt Chart will be designed so that developers may refer to the duration of the project procedures. As a result, both models will make it easier for developers to track their progress as the system is developed.

9.2.1 Work Breakdown Structure

Work Breakdown Structure (WBS) in project management is a strategy for accomplishing a large, multistep project. It is a method of dividing and conquering enormous projects in order to complete project faster and more efficiently. The Work Breakdown Structure (WBS) specifies all of the actions that the developer must complete. Arranges them into steps and displays them graphically Its purpose is to establish a clear knowledge of the project's scope. The structure of the activities defined in the Work Breakdown Structure (WBS) must be fulfilled in order to achieve the protected deliverables

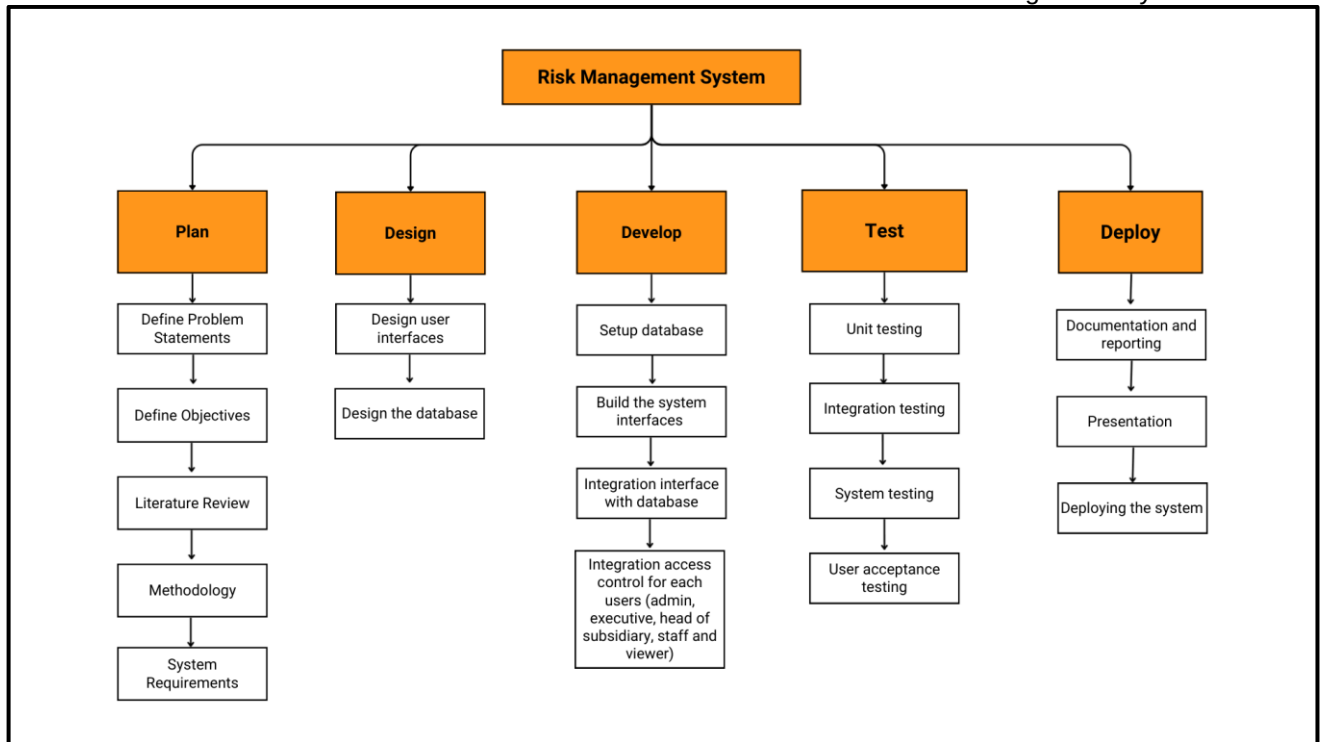


Figure 9.1: Work Breakdown Structure (WBS)

Figure 9.1 shows the Risk Management System's Work Breakdown Structure (WBS). The entire project been divided into five phases which are plan, design, develop, test, and deploy. The first phase which is plan start with defining the problem statements for this project and then defining the project objectives according to the problem statements. In this phase also, the review for project literature to and choosing the suitable methodology for this project which is Agile is been choose. Followed by the defining system requirements in developing this project. The second phase which is design been start with designing the system interfaces and further with the designing the database that including data dictionary, Entity Relationship Diagram (ERD) and Data Flow Diagram (DFD). The third phase is developing the system, this phase start with implementation of the database for data storage and been followed with implementation of the system interfaces. After build the system interfaces, integrating interfaces with the databases by using the API clients are been made and lastly for this phase are integration access control for each user according to their roles. The fourth phase is testing the system, this testing phase start with unit testing then the integration testing then followed by system testing and finally followed by user acceptance testing that been made with clients to test the system. The last phase is deploying the system, in this deploying phase, the documentation and reports been made and then followed by presentation of the project and lastly for this phase is deploying the system.

9.2.2 Gantt Chart



Figure 9.2: Gantt Chart of Risk Management System

Figure 9.2 shows the Gantt chart for Risk Management System. This project timeline contains a duration of 14 weeks that covers five phases which are planning, designing, developing, testing and deploying. The phase for planning start from week 1 to week 2 that covers defining a problem statement, objectives, project scope, doing the literature review, collecting user requirements and choosing the methodology for this project. Next phase which is designing phase starts from week 2 to week 5. This phase cover designing the wireframes and interfaces of the system and designing the database structure. Next phase is development phase that have a duration from week 4 to week 11. This phase is a longest duration which is eight weeks because this phase cover in developing the database, developing the user interfaces, integrates the interfaces to the databases and integrates user access control according permission based by the roles. Next is test phases, in this phase a unit testing, integration testing, system testing and User Acceptance Testing (UAT) are going to do from week 11 to week 12 which are two weeks. Lastly, deploying the system is the last phase in this project

that been scheduled for week 9 to week 14 which are six weeks. The documentation and reporting will start early at week 9 until week 14 because the documentation and reporting process take a lot of works and time for improvements meanwhile the presentation will be done at week 14 and the deployment of the system will be done from week 13 to week 14 to ensure system are function correctly before presentation.

9.3 Risk Management

Risk management is the process of minimizing any accident and difficulty that can affect the project's timeline and objectives. Risk refers to any unanticipated incident that may have an impact on the people, procedures, technology and resources involved in a project. Unlike the problems which are unavoidable, risks are occurrences that may or may not occur and the developer may be able or not be able to predict when the risk will occur. Because of this uncertainty, project risk management's planning has been done in order to manage risk effectively. To properly manage risk, developers must identify the risk and do the analysis for the risk before coming up with the mitigation plan to mitigate the risk.

Table 9.1: Risk Management

Risk identification	Analysis risk	Mitigation plan
1. Lack of knowledge for the implementation of the system.	The developer lacked the necessary knowledge to develop the system. The developer is unable to locate any materials or sources utilized as a reference to design the system due to the complexity of the system especially implementing Role Based Access Control (RBAC). This risk may prevent the project from achieving its objective.	The developer must conduct early study on the knowledge and material linked to the project. Developer must get advice and assistance from the expertized that expert in developing the role-based access system.
2. Time constraint to complete the project.	During system development, the developer may encounter challenges such as building the interfaces, databases and integrates the system to the databases. It will result time duration for this project is not been completed according to the duration that have been decided. This will affect the project duration to finish the project.	The developer must adhere to the project management that has been established. Developers must also collect project-related data while adhering to the time constraints that have been outlined in the project timeline. This will ensure that the developer completes the project according to schedule.

3. Software errors (suddenly not functioning well)	The software especially code editor such as Visual Studio Code (VS Code) sometimes can't working as usual because software needs to be updated to the newest version. This will resulted delay during the development phase.	The developer must always check the software version and make sure the software version is the latest version of software.
4. Data lost	Project's code lost after some tragedy such as device can't be on or the file of the code is missing after the developer do the updates. This issue will affect the project to be fail because developer lost the file or data of the development projects that resulted developer need to rebuild all the project from scratch.	The developer must use Git and GitHub for file retrieved the current or old code versions and do the backups for the all files and codes to the cloud storage which is GitHub. This will helped developer to ensures that they have a backup file for the projects if the file is lost or corrupted.

Table 9.1 shows risk management table that contains risk identification, risk analysis and mitigation plan. There are four risk that could occurred during project's development such as lack of knowledge for the implementation of the system, time constraint to complete the project, software errors and data lost. Analysis of the risk and mitigation plan are discussed to prevent all this risk to affect the objective of this project and affect duration for develop this project. This risk management will ensure that the all the risk can be mitigate by doing the mitigation plan that have been discussed in table 9.1.

9.4 Conclusion

In conclusion, the development of Risk Management System is guided by project scheduling plan that use Work Breakdown Structure and Gantt chart. Work Breakdown Structure is divided into 5 phases which are plan, design, develop, test and deploy in order to make sure the project duration to been finished is fast. Gantt chart helps in monitoring the timeline for this project and ensures all the task are completed according to the chart that have been constructed. Furthermore, this project management also helps in manage the risk that likely occurred during developing the project. All the risk that been identified are been analyse to helps in making a mitigation plan to manage the risk that likely occurred when developing the projects. This will help in achieving the objectives of this project and ensures all the project are been completed according to the timelines.

10 CONCLUSION

10.1 Introduction

In this chapter which is final chapter of this project will provide a summary and conclusion for Risk Management System project. This chapter highlights the accomplishments of the project such as solve all the problems that have been identified and achieve all the objectives. This chapter also explain limitation in develop this project and also highlights the future works and recommendation for further development in future.

10.2 Achievement

This project achievements are that this project which is Risk Management System successfully solves all the problems that been identified in introduction chapter and meet all its objectives. This project solves all three problems which are high manual workload in risk management process, risk data distribution across its subsidiaries is inconsistent and also excel dashboard and reports are static and lack of real time analysis. This achievements in solving these problems lead to achievements in achieving all the project objectives.

10.2.1 To reduce manual work in risk management process

Risk Management System helps in reducing repetitive manual works in doing risk management process which are identify the risk, assessing the risk, risk treatments, risk monitoring and risk reporting. Risk Management system reduces these manual works by providing the automation function in this system such as automation in calculating the risk level based on likelihood score and impact score, automation to determine risk mitigation are effective based on previous level, automation in generating the dashboard and reports.

Figure 10.1: Automation in Determine the Level of Risk

Based on the figure 10.1, the figure shows one of the automate features in Risk Management System which is automation in determine the level of risk based on likelihood score and impact score. This automation helps the user to reduce manual work in doing risk management process and resulted overall risk management process become faster.

10.2.2 To enable consistent and real-time risk data sharing across all subsidiaries

Risk Management System is a centralized platform that ensures UKM Holdings and its subsidiaries can record and access all risk-related information in real time. Previously, risk management process been carried out using the Excel spreadsheets that caused the problem to the UKM Holdings and its subsidiaries because using that method it leads to duplication of the file because the file have many file versions. It also leads to difficulties to sharing the risk data across the subsidiaries which resulted delay for risk compliance department to mitigate the risk. With the implementation of the centralized digital platform, all the users can used the Risk Management System to recorded the data, stored the data and updated the data in real time without any delays. This ensures the risk-related data are consistent and can be access in real-time through the implementation of this system.

BIL	NO RUJUKAN	SYARIKAT	BAHAGIAN / UNIT	KATEGORI RISIKO	RISIKO	SKOR KEABANGKALIAN	SKOR IMPAK	TAHAP RISIKO	STATUS RISIKO	PINDAAN PENILAIAN	TAMBAH
1	UKMH/0125/052	UKM Holdings	IT & Infrastructure	Operasi	System downtime exceeding 4 hours during peak operations	3	3	S	Ya	4:3 KEPADA 3:3	Verify cloud
2	UKMP0125/01	2025 Separuh Pertama	UKM Pakarunding	Unit Kewangan	Kewangan	-	-	-	---	---	---
3	UKMM0125/05	2025 Separuh Pertama	UKM Medicare	Unit Pematuhan	Pematuhan / Perundangan	-	-	-	---	---	---
4	UKMM0125/04	2025 Separuh Pertama	UKM Medicare	Unit perancangan	Pematuhan / Perundangan	-	-	-	---	---	---
5	UKMM0125/03	2025 Separuh Pertama	UKM Medicare	Unit Operasi	Operasi	3	2	S	Ya	---	---
6	UKMM0125/02	2025 Separuh Pertama	UKM Medicare	Unit Kewangan	Kewangan	1	3	S	Ya	---	---
7	UKMM0125/01	2025 Separuh Pertama	UKM Medicare	Unit Kewangan	Pematuhan / Perundangan	3	1	R	Tidak	---	---
8	UKMSC/0125/07	2025 Separuh Pertama	UKM Specialist Centre	Unit Pembangunan Perniagaan	Strategik	5	5	ST	Ya	---	---
9	UKMSC/0125/06	2025 Separuh Pertama	UKM Specialist Centre	Bahagian Logistic	Operasi	5	5	ST	Ya	---	---
10	UKMSC/0125/05	2025 Separuh Pertama	UKM Specialist Centre	Unit Kewangan	Kewangan	5	5	ST	Ya	---	---

Figure 10.2: List of Risk Page

The figure 10.2 show the list of risk page. This page illustrates how risk-related data information from various subsidiaries been implement into single digitalized platforms. This ensures the risk-related data are consistent and can be access in real-time through the implementation of this system. Filter dropdown for selecting the companies were been showed in this page to show that user can filter the risk-related data according to the subsidiary that need to be illustrates. This page also a real-

time data which is the risk-related data that newest been updated and added that will helps the management to perform a risk management process.

10.2.3 To provide real-time dashboard and automated reports

The Risk Management System successfully in proving a real-time dashboard and automated reports. Previously, risk reporting and dashboard are need to be manual updated and build every time there are new risk-related information that causes the dashboard and risk reporting become hard and using the outdated risk-related information. Implementation of Risk Management System will help in data visualization and reporting because the system provided the real-time dashboard and automated report generation into Pdf. The system using the latest risk-related information in generating the dashboard and report to make sure all the manual updates are been avoided to reduced manual works and burden in risk management process.

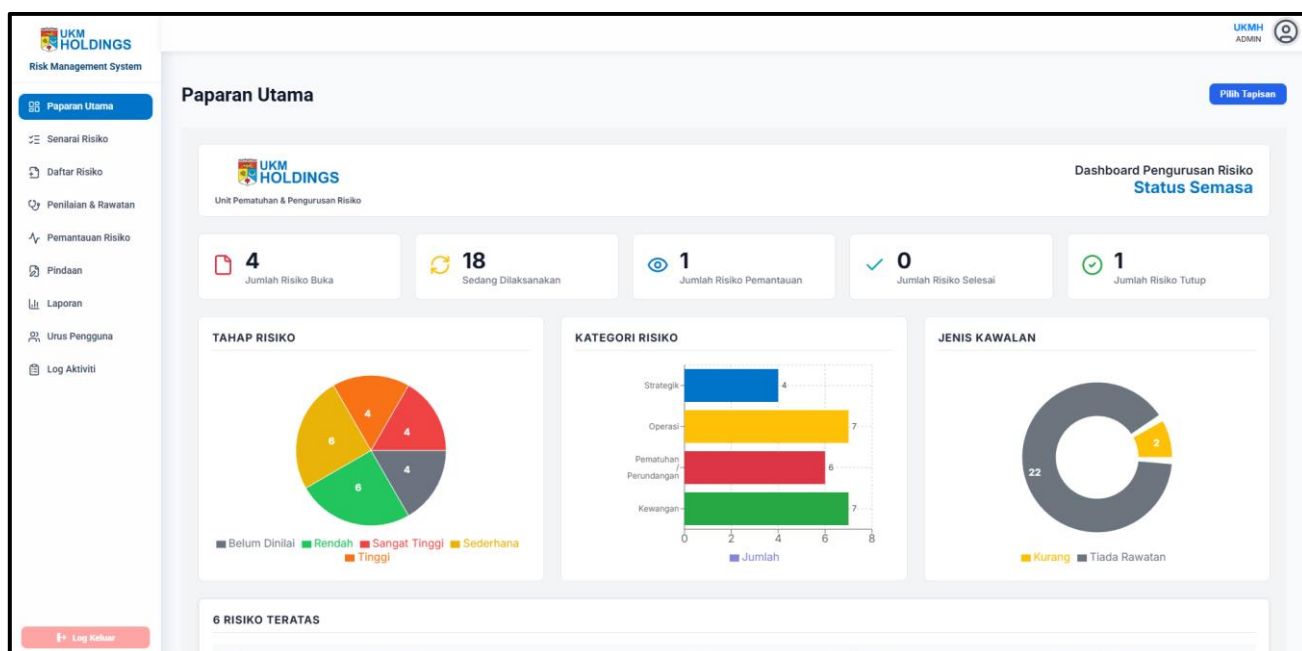


Figure 10.3: Dashboard Page

Figure 10.3 shows the dashboard page of Risk Management System. The system successfully providing real-time dashboard to achieve the objective of this project. This dashboard illustrates all the risk data into chart for visualization and also provide the filter to select different dashboard according to the subsidiaries. It helps users and managements of UKM Holding in monitor current risk by monitor the chart.

Laporan

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Figure 10.4: Report Generation to PDF

Figure 10.4 shows the report generation to PDF in Risk Management System. This system successfully provide automation in generate the report according the risk data that been added and updated by the users. It achieved the objective in providing an automated reports to helps in risk reporting and documentation.

10.3 Constraint and Limitation

The development of the Risk Management System faced and encountered several constraint and limitations. Firstly, limited time for the system development that been scheduled for 14 weeks have limited certain features to be added to the system especially our system contains many risks related data information and features such as reporting and dashboard visualization. Developing the dashboard taking a lot of time because the developer needs to create and setup every chart according data analysis that system want to visualize especially comparison chart between subsidiaries. Secondly, the Risk Management System was developed and tested on developer personal hardware and local files. This limited the developer to test the system in high traffic condition because only using one hardware which is laptop that limited to test the system whether it works at other laptops. Thirdly, user interface for Risk Management System even though it fulfils all functional requirements but due to the limited time in system development, developer didn't have enough time to improve user interfaces especially this system contains columns for table of risk. All this limitation limited the system development in develop system within time and develop system that have many features and automation.

10.4 Future Works and Recommendation

The developer plans to continue enhancing the Risk Management System in the future to ensure its continuous improvement and relevance. Future updates will aim to introduce new features, strengthen system security, and improve user experience. These enhancements are important to meet evolving user needs and foster better engagement between users and the system.

10.4.1 Provide Further Automations

Further automation will be focus in future works for Risk Management System. Further automation such as automates risk references number when risk registration will be crucial because the references number need to be streamlined to ensure it meets the number referencing standard that been used by UKM Holdings. This works can't be done in current development because lack of time in developing the system.

10.4.2 Enhance Dashboard Analytic

Enhancing dashboard with more analytical data visualization will be future work in further development for Risk Management System. It focusing in upgrading current dashboard with more analytical visualization such as comparison risk from years or analysis of mitigate plan that been planned for current half years. This enhancing process takes a lot of time to been develop because it needs the analytical knowledge to know what analysis need to be implement to the chart in dashboard. This will help the management to overview more about the risk analysis or trends form further enhances dashboard analytics.

10.4.3 Provide Responsive System Interfaces

Risk Management System interfaces currently only can be adapted to the layout of the laptop or bigger media such as monitor. For future works, providing the responsive system interfaces than can be adapted to every layout of media such as tablets and smartphone will helps users of Risk Management System. Users that need to view only the data such as CEO and head of subsidiary will be easier to access the system from anywhere because they can access the system using the smartphone or tables. This development process will taking a lot of time because need to be tested at every media and need to change the user interfaces that adapt to every layout.

10.5 Conclusion

In conclusion, the development of the Risk Management System successfully meets all the objectives that been defined in introduction chapter. Developing this system as a student was a challenging also give a good experience in development of the system and deal with the real client. It required extensive research, consistent practice and a deep understanding of both technical and non-technical aspects to ensure the system delivered the intended functionality. This project might not have achieved its goals without the ability to make thoughtful decisions and effectively manage constraints that arose during the development phase.

The guidance and support provided by the supervisor, friends, and members of the social and academic community played a crucial role in helping the developer navigate these challenges and complete the project successfully. Moving forward, the system will continue to be enhanced and updated to remain relevant and beneficial for users. The goal is for the Risk Management System is to be a centralized platform for doing the risk management that helps UKM Holdings and its subsidiaries to manage risk effectively.

Lastly, Risk Management System implementations and documentation are been documented in this report within chapter 1 to chapter 10. The system development shows the significant success to be a future for risk management that covers all the process, with this system all the process in risk management will be simplified and become easier due to the implementation of centralized Risk Management System.

Appendix A – Requirements Specification Document

User Feedback Survey: Risk Management System for UKM Holdings Sdn. Bhd.

Assalamualaikum, Welcome everyone!

My name is Mohamad Aiman bin Ismail, a final year student at Universiti Poly-Tech Malaysia (UPTM). I am now studying for a Bachelor Information Technology (Honours) in Business Computing.

I am conducting this survey as part of my Final Year Project to collect data for the development of the Risk Management System. This survey is part of a Final Year Project to develop a Risk Management System for UKM Holdings Sdn. Bhd.

The system aims to achieve following objectives:

1. To reduce manual work in the risk management process.
2. To enable consistent and real-time risk data sharing across all subsidiaries.
3. To provide real-time dashboards and automated reports for timely risk monitoring.

Thank you for participating in this survey! Your feedback will help in developing the Risk Management System. This survey will take around 3-5 minutes to complete . All responses are anonymous.

ki2211012916@student.kuptm.edu.my [Switch account](#)

 Not shared

* Indicates required question

1. What is your age group? *

☐ Under 20

☐ 21-30

☐ 31-40

☐ 41-50

☐ 51- above

2. What is your role in the organization? *

☐ Project Manager

☐ Risk Officer

☐ Admin Staff

☐ Other: _____

3. How often are you involved in risk tracking or risk reporting? *

☐ Daily

☐ Weekly

☐ Monthly

☐ Rarely

4. How do you currently manage risk in your organization? *

☐ Excel

☐ Manual Processes (e.g., Paper-based)

☐ Project Management Platforms

☐ Other: _____

5. How would you rate the difficulty of managing risks using Excel? *

☐ Very Difficult

☐ Difficult

☐ Easy

☐ Very Easy

6. Have you encountered any data errors or inconsistencies when using Excel for risk management? *

☐ Frequently

☐ Sometimes

☐ Rarely

☐ Never

7. How long does it typically take to update and share risk data using Excel? *

- ☐ Less than 1 hour
- ☐ 1–2 hours
- ☐ Half a day
- ☐ Full day or more

8. How confident are you that all subsidiaries receive the correct and updated risk data? *

- ☐ Not confident
- ☐ Slightly confident
- ☐ Confident
- ☐ Very confident

9. Have you experienced delays or miscommunication due to inconsistent Excel files among subsidiaries? *

- ☐ Yes
- ☐ No

10. How satisfied are you with the current communication regarding risk management updates? *

- ☐ Very dissatisfied
- ☐ Dissatisfied
- ☐ Satisfied
- ☐ Very satisfied

11. How comfortable are you with entering risk data manually in a digital system? *

- ☐ Very Uncomfortable
- ☐ Uncomfortable
- ☐ Comfortable
- ☐ Very Comfortable

12. How important is real-time risk visibility for your management decision-making? *

☐ Not important

☐ Slightly important

☐ Moderately important

☐ Very important

☐ Critical

13. Would dynamic dashboards that auto-update help improve your risk monitoring? *

☐ Yes

☐ No

14. Would a centralized system accessible by all subsidiaries solve your current data sharing issues? *

☐ Yes

☐ No

15. What features would you like in the new Risk Management System? (Select all that apply) *

☐ Subsidiary-specific views

☐ User role control

☐ Automated dashboards

☐ Risk input forms

☐ Print Report

☐ Other: _____

Submit

Clear form

Appendix B

– User Manual

USER MANUAL

RISK MANAGEMENT SYSTEM



BY MOHAMAD AIMAN BIN ISMAIL

RISK MANAGEMENT SYSTEM

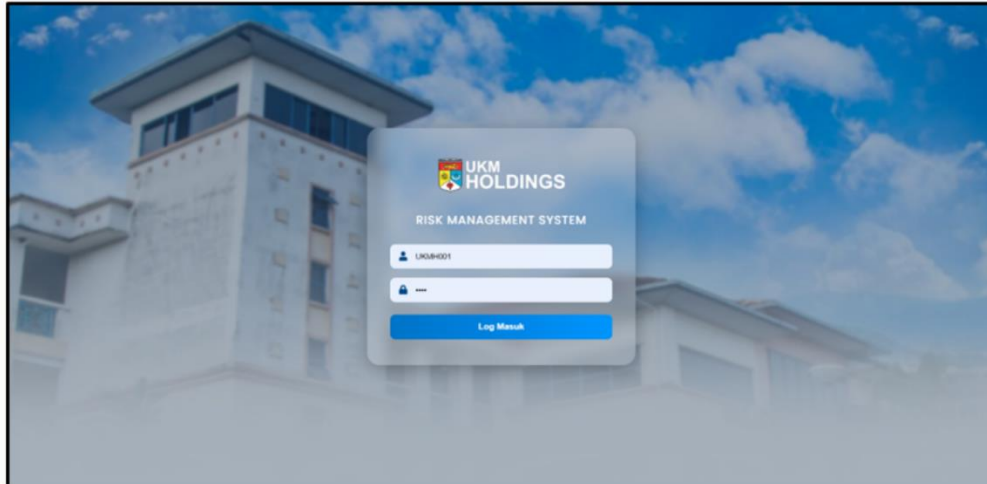
Instruction Contents



- 1.Login
- 2.Risk Register
- 3.Risk Assessment and Treatments (Admin and Executive only)
- 4.Risk Monitoring (Admin, Executive and Staff)
- 5.Editing Risk Assessment, Treatments and Monitoring (Admin Only)
- 6.Making Amendments (Admin & Executive)
- 7.Accepting or Rejecting Amendments Request (Admin)
- 8.Risk Report Generation (Admin)
- 9.Manage User (Add, Delete and Update) (Admin)

RISK MANAGEMENT SYSTEM

1.Login



1.All users which are Admin, Executive, Head of Subsidiary, Staff and Viewer required to enter the staff id and password that have been provided by head of risk.

RISK MANAGEMENT SYSTEM

2. Risk Register



1. Risk register only can be done by admin , executive and staff
2. All the forms need to be filled to register the risk
3. Click the “daftar risiko” button to register the risk

Risk instruction are been displayed when user click at “panduan” button

RISK MANAGEMENT SYSTEM

3. Risk Assessment and Treatments (Admin and Executive only)

Penilaian & Rawatan Risiko

Penilaian Risiko (Belum Dintai: 4) Rawatan Risiko (Memerlukan Rawatan: 18)

Car No. Risiko: --> Semua Syarikat --> --> Semua Tahun --> --> Semua Separuh Tahun --> --> Semua Kategori -->

SL	NO RUJUKAN	TARIKH SELESAI TAHUN	SYARAT	KATEGORI RISK	BAHAGIAN/UNIT	RISK	PENILAIAN	
							STATUS PENANTAUAN	TINDAKAN
1	UMM000004	2025 Pertama	UMM Medium	Pematuhan / Perundangan	Unit perancangan	Kemungkinan ekonomi	Sedang	+
2	UMM000005	2025 Pertama	UMM Medium	Pematuhan / Perundangan	Unit Pematuhan	Perancangan Akta SPBM	Sedang	+
3	UMM000008	2025 Pertama	UMM Perundangan	Kewangan	Unit Kewangan	Risiko mata wang asing	Sedang	+
4	UMM0000002	2025 Pertama	UMM Specialist Centre	Operasi	Pengeluaran	Revolusi produk yang tinggi	Sedang	+

There are 2 tabs which are "Penilaian Risiko" and "Rawatan Risiko"

Risiko:

1. Penentuan kuasa beli pelanggan dan jualan

Penilaian Risiko

Skor Kebimbangan: 2 - Kemungkinan Rendah

Skor Impak: 2 - Sedikit Dikawatirkan

Tahap Risiko: 4

Status Risiko: 4 - Sedikit Dikawatirkan

Simpan Penilaian

At "Rawatan risiko " tab, risk that have been register need to be assessed first by selecting the likelihood score and impact score to determine level of risk

(Risiko memerlukan tindakan segera)

Rawatan Risiko

Pelan Tindakan:

Langkah Tindakan 1:

Jenis Kawalan:

Pilih Strategi Kawalan:

Tempoh Jangkaan Sisa Tindakan:

Cikr: 2 bulan

Katagori Bertanggungjawab:

Nama sahaja / jawatan 1:

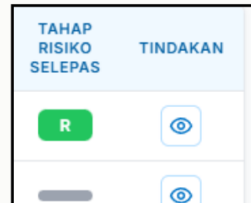
Simpan Rawatan

User needs to click at icon at column "tindakan" at "Rawatan Risiko" tab to open the treatments of risk form. This is after risk that been assessed and need to give the treatments by filling all the forms. Lastly click at button to save the treatments.

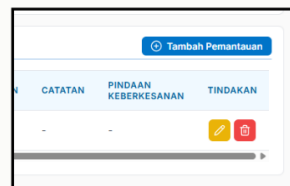
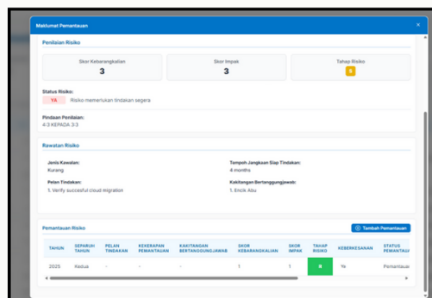
RISK MANAGEMENT SYSTEM

4. Risk Monitoring (Admin, Executive and Staff)

ID	Nama Risiko	Status	Aksi
1	Risiko 1	High	[Icon]
2	Risiko 2	Medium	[Icon]
3	Risiko 3	Low	[Icon]
4	Risiko 4	High	[Icon]
5	Risiko 5	Medium	[Icon]
6	Risiko 6	Low	[Icon]
7	Risiko 7	High	[Icon]
8	Risiko 8	Medium	[Icon]
9	Risiko 9	Low	[Icon]
10	Risiko 10	High	[Icon]



- At monitoring page, the users need to click at icon to open the risk detail



- after click at the icon , the modal that shows all the risk related data will be show.
- users need to scroll right at monitoring risk "pemantauan risiko" to see the edit button and delete that only can be access by admin

- To add monitoring just click at "tambah pemantauan " button to open form and user need to fill all the form before submitting.

RISK MANAGEMENT SYSTEM

5. Editing Risk Assessment, Treatments and Monitoring (Admin Only)

ID	NO RUJUKAN	TAHUN & SEPATUTAN TAHUN DAFTAR	NAMA SYARIKAT	BAHAGIAN / UNIT	KATEGORI RISIKO	RISIKO
1	UKM/0125/002	2025	UKM Holdings	IT & Infrastructure	Operasi	System downtime exceeding 4 hours during peak operations
2	UKM/0125/001	2025	UKM Pakarunding	Unit Kewangan	Kewangan	Risiko mading
3	UKM/0125/005	2025	UKM Medicare	Unit Pematuhan	Pematuhan / Perundangan	Pelangsing
4	UKM/0125/004	2025	UKM Medicare	Unit perancangan	Pematuhan / Perundangan	Kemam ekonome

- To edit the risk data, admin needs to open list of risk page and hover the mouse to the risk and click to open the risk detail

Maklumat Perincian Risiko

Pengenalpastian Risiko

No Rujukan: UKM/0125/002 | Tahun Didaftarkan: 2025 | Sepatutan Tahun Didaftarkan: | Syarikat: UKM Holdings

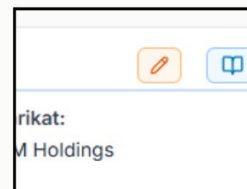
Risiko: System downtime exceeding 4 hours during peak operations | Kategori Risiko: Operasi | Bahagian/Unit: IT & Infrastructure

Punca Risiko: Failure to upgrade server hardware | Kesan Risiko: The operation becomes slow

Penilaian Risiko

Skor Kebangkitan: 3 | Skor Impak: 3 | Tahap Risiko: 4

Status Risiko:



- The risk detail modal will pop up and admin need to click at the pencil icon according what they want to edit.

Remaska Perincian Risiko: UKM/0125/002

Pembaikan Risiko

Skor Kebangkitan: 3 - Berpeluang Untuk B | Skor Impak: 3 - Ketara | Tahap Risiko: 4 | Status Risiko: Beres

Simpan Pembaikan

- If admin want to edit risk assessment just click pencil icon at risk assessment section and editing form will appear to edit the assessment.

RISK MANAGEMENT SYSTEM

6. Making Amendments (Admin & Executive)

- At the amendments page, admin and executive need to click at "mohon pindaan" to do the amendments

- the list of risk will appear and admin or executive needs to click at "pilih" to select risk that they want to do amendment.

- The amendments for will be popup and admin or executive needs to select new likelihood score and impact score .
- after that they need to fill the justification of the amendments that they want to do

- after they send the form, the comparison modal will popup and they need to click at "sahkan & hantar"
- admin will be automatically been approved but executive need to wait for approval from admin to do amendments

- admin will get message like this after they do the amendments that proof the amendments are successful

RISK MANAGEMENT SYSTEM

7. Accepting or Rejecting Amendments Request (Admin)

- At the amendments page, admin need to click at "lihat" button that status "menunggu kelulusan"

PERKARA DIPINDA	TAHUN & SEPARUH	SEBELUM	SELEPAS
Skor Keberangkatan (Penilaian)	2025 (Pertama)	5	3
Skor Impak (Penilaian)	2025 (Pertama)	5	3
Tahap Risiko (Penilaian)	2025 (Pertama)	BT	BT

- The detail of amendments request will be popup and admin can see all the detail of the amendments
- if admin want to approve just click at "Luluskan" button

- But if admin want to reject, admin should fill the justification and fill the reason why the amendments been rejected

RISK MANAGEMENT SYSTEM

8. Risk Report Generation (Admin)

Laporan Risiko

Syarat: Semua Syarat Tahun Daftar: Semua Tahun Separuh Tahun Daftar: Semua Cari: Cari risiko atau no rujukan...

ID	NO RUJUKAN	RISEKO	TAHUN & SEPARUH TAHUN DAFTAR	SYARIKAT	TAHAP RISEKO	STATUS PEMANTAUAN	TINDAKAN
1	UKM/0125/02	System downtime exceeding 4 hours during peak operations	2025 Kedua	UKM Holdings	4	Pemantauan	
2	UKM/0125/02	Issu keselamatan IT	2025 Pertama	UKM Holdings	4	Tutup	

- At risk report "laporan risiko" page admin can choose which risk that they want to do the report

- Admin need click to icon at "tindakan" to generate report

Laporan (UKMSC/0125/01)
UKM Specialist Centre
System downtime exceeding 4 hours during peak operations

☒ Keseluruhan Laporan
Jana keseluruhan laporan dan perincian.

☐ Laporan Khusus
Pilih satu pemantauan sahaja
☐ Jala Pemantauan Sahaja
(Banyak paparan pemantauan)

Daftar: 2025 - Separuh Pertama 2025 - Separuh Kedua

- Admin to select whether want to overall report or customized special report

Laporan

7070615e-96db-4a07-a762-4d27f3c52... 1 of 1 100% +

UKM HOLDINGS

LAPORAN RISIKO

Pemantau & Pemantau Risiko

NO. SYARIKAT	TAHUN	SEPARUH TAHUN	RISEKO
UKM Specialist Centre	2025	Separuh Pertama	UKM/0125/01

BARANGAN UNIT: IT NO RUJUKAN: UKMSC/0125/01

KATEGORI RISEKO: Operasi

1. PERSONAL FAKSI RISEKO

RISEKO	PUNCA	KESAN
System downtime exceeding 4 hours during peak operations	Failure to upgrade legacy server hardware	Operation of the business become slow

2. PEMANTAUAN RISEKO

RISEKO	KEMERANGAN RISEKO	RISEKO RIFAK	TAHAP RISEKO	STATUS RISEKO
4	Memangkin Tinggi	4	Sever	Ya

PRELAKS PERILAKU: The level is 3 (3.3/4.4)

3. PEMANTAUAN IT RISEKO

PELAKS TINDAKAN	JENIS KANDUNGAN	TEMPOR JANGKAAN RIFAK TINDAKAN	KANTANGAN RIFAK TINDAKAN
Implementation of data server migration to a cloud based backup	Penyakit	2 months	90.45

4. PEMANTAUAN

4.1 SEPANJUTAN PERILAKU RISEKO - JUNI 2025

PELAKS TINDAKAN	KEMERANGAN RISEKO	KANTANGAN RIFAK TINDAKAN

5. KEMERANGAN RISEKO

RISEKO	KEMERANGAN RISEKO	RISEKO RIFAK	TAHAP RISEKO	STATUS RISEKO
4	Memangkin Tinggi	4	Sever	Ya

- report preview will popup and admin can print and download by clicking button print or download as PDF

RISK MANAGEMENT SYSTEM

9. Manage User (Add, Delete and Update) (Admin)

- At urus pengguna page, to add the new user, admin to click at tambah pengguna button

- admin to fill the staff id , full name and password.
- admin need to choose roles (peranan) and company (syarikat) for the new user
- admin can add the profile picture this is optional after that to add new user just click at "simpan" button to add new user

BIL	NAMA PENUH	PERANAN	SYARIKAT	STAFF ID	KATA LALUAN	TINDAKAN
1	Ahmad bin Ali	Admin	UKM Holdings	UKMH001	1234	
2	Wan bin Yunus	Executive	UKM Holdings	UKMH002	123	
3	Akmal bin Nasydan	Head Subsidiary	UKM Specialist Centre	UKMSC007	123	
4	Mohamad Aiman bin Ismail	Head Subsidiary	UKM Digital	UKMD00070	123	

- to edit and delete just click at the icon delete and icon pencil at the user

– **GitHub**

<https://github.com/aimaniss/RiskManagementSystem.git>

– **Video Demo**

<https://youtu.be/h4WChkRhTFg>

Appendix C – Turnitin Result

Plagiarism Result



Page 2 of 129 - AI Writing Overview

Submission ID trncoid::3618:122504521

*% detected as AI

AI detection includes the possibility of false positives. Although some text in this submission is likely AI generated, scores below the 20% threshold are not surfaced because they have a higher likelihood of false positives.

Caution: Review required.

It is essential to understand the limitations of AI detection before making decisions about a student's work. We encourage you to learn more about Turnitin's AI detection capabilities before using the tool.

Disclaimer

Our AI writing assessment is designed to help educators identify text that might be prepared by a generative AI tool. Our AI writing assessment may not always be accurate (it may misidentify writing that is likely AI generated as AI generated and AI paraphrased or likely AI generated and AI paraphrased writing as only AI generated) so it should not be used as the sole basis for adverse actions against a student. It takes further scrutiny and human judgment in conjunction with an organization's application of its specific academic policies to determine whether any academic misconduct has occurred.

Frequently Asked Questions

How should I interpret Turnitin's AI writing percentage and false positives?

The percentage shown in the AI writing report is the amount of qualifying text within the submission that Turnitin's AI writing detection model determines was either likely AI-generated text from a large-language model or likely AI-generated text that was likely revised using an AI paraphrase tool or word spinner.

False positives (incorrectly flagging human-written text as AI-generated) are a possibility in AI models.

AI detection scores under 20%, which we do not surface in new reports, have a higher likelihood of false positives. To reduce the likelihood of misinterpretation, no score or highlights are attributed and are indicated with an asterisk in the report (*%).

The AI writing percentage should not be the sole basis to determine whether misconduct has occurred. The reviewer/instructor should use the percentage as a means to start a formative conversation with their student and/or use it to examine the submitted assignment in accordance with their school's policies.

What does 'qualifying text' mean?

Our model only processes qualifying text in the form of long-form writing. Long-form writing means individual sentences contained in paragraphs that make up a longer piece of written work, such as an essay, a dissertation, or an article, etc. Qualifying text that has been determined to be likely AI-generated will be highlighted in cyan in the submission, and likely AI-generated and then likely AI-paraphrased will be highlighted purple.

Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.



18% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Match Groups

-  **150 Not Cited or Quoted 17%**
Matches with neither in-text citation nor quotation marks
-  **13 Missing Quotations 1%**
Matches that are still very similar to source material
-  **0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
-  **0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 9%  Internet sources
- 5%  Publications
- 17%  Submitted works (Student Papers)

Appendix D – Log Book

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING



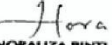
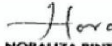
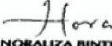
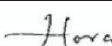
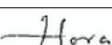
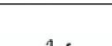
FACULTY OF COMPUTING & MULTIMEDIA (FCOM)

BUSINESS COMPUTING PROJECT 1
(FYP4094)

LOG BOOK

STUDENT'S NAME : MOHAMAD AIMAN BIN ISMAIL
ID NO. : AM2211012916
SUPERVISOR : PUAN NORALIZA BINTI AZIZAN
PROJECT TITLE : RISK MANAGEMENT SYSTEM

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

Date/ Week		Agenda	Next Agenda	Signature (Supervisor / Coordinator)
21/5/2025	1	Find potential Supervisors	Finalize topic and title with SV	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
27/5/2025	2	Discuss the topic and title with SV and find the client for project	Finalize the problem statement and objective for the project	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
4/6/2025	3	Meet with the client to identify the problem client faced	Finalize research method and questionnaire	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
11/6/2025	4	Discuss all the 15 question for questionnaire and research method	Prepare draft report chapter 1-3	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
19/6/2025	5	Complete draft chapter 1-3	Prepare draft report chapter 4 and 5	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
26/6/2025	6	Prepare draft report chapter 4 and 5	FYP 1 Presentation with supervisor and examiner	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
2/7/2025	7	Presentation FYP 1	Report and slide presentation submission	 NORALIZA BINTI AZEAN Koordinator Projek Tahun Akhir Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING



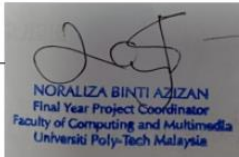
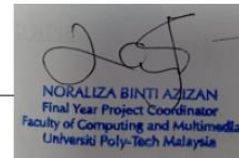
FACULTY OF COMPUTING & MULTIMEDIA (FCOM)

BUSINESS COMPUTING PROJECT 2
(FYP4105)

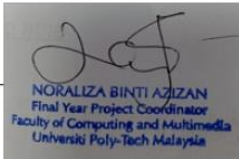
LOG BOOK

STUDENT'S NAME : MOHAMAD AIMAN BIN ISMAIL
ID NO. : AM2211012916
SUPERVISOR : PUAN NORALIZA BINTI AZIZAN
PROJECT TITLE : RISK MANAGEMENT SYSTEM

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

Date/ Week		Agenda	Next Agenda	Signature (Supervisor / Coordinator)
4/8/2025	1	Discussed FYP 1 problem and refined the chapter 2-5	Design the system wireframe	Noorh
11/8/2025	2	Reviewed wireframe draft	Refine wireframe for finalization	Noorh
20/8/2025	3	Presented refined wireframe	Finalize wireframe and start database design	Noorh
25/8/2025	4	Reviewed database design and discussed suitable database for the system	Finalize database and begin building system interfaces	Noorh
3/9/2025	5	Started building system interfaces	Continue building the interfaces and refining	Noorh
8/9/2025	6	Continued building system interfaces and reviewed usability with supervisor	Finalize interfaces and begin system integration with database	Noorh
23/9/2025	7	Continued with system integration with database	Continued with system integration with database and do the minor adjustment to interfaces	 NORALIZA BINTI AZIZAN Final Year Project Coordinator Faculty of Computing and Multimedia Universiti Poly-Tech Malaysia
1/10/2025	8	Building the dashboard and reports and also some automation features to the system	Finalize the system and do the unit testing	
7/10/2025	9	Do the unit testing and do some documentation about the system bug.	Fix the system bug and do another final unit testing and add dummy data to the system	 NORALIZA BINTI AZIZAN Final Year Project Coordinator Faculty of Computing and Multimedia Universiti Poly-Tech Malaysia
14/10/2025	10	Adding the dummy data to the system and start do the question for user acceptance testing	Do the user acceptance testing with Mrs Fatimah and Mr Saiful at UKM Holdings.	
21/10/2025	11	Do the user acceptance testing with Mrs Fatimah and Mr Saiful at UKM Holdings and discuss the system need improvement or not	Improve the system and do the reports from chapter 7-9	 NORALIZA BINTI AZIZAN Final Year Project Coordinator Faculty of Computing and Multimedia Universiti Poly-Tech Malaysia
27/10/2025	12	Continue with improving the system and report chapter 7-9	Do the chapter 10 to wrap up findings and suggest future improvements	

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

13	4/11/2025	Final formatting of report and start making slide and poster for final presentation	Do the final preparation such as doing slides poster and checking for the system	 NORALIZA BINTI AZIZAN Final Year Project Coordinator Faculty of Computing and Multimedia Universiti Poly-Tech Malaysia
14	10/11/2025	Final prep for presentation.	Ensure all slide, poster and system are ready for final presentation.	

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