FACULTY COMPUTING AND INFORMATIC

TIS 2101
IT PROJECT MANAGEMENT

Assignment

BAKERY ORDERING SYSTEM

LECTURE SECTION:TC1L
TUTORIAL SECTION:TT1L

GROUP NO:TT1L-G9

BY

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Task Distribution

	Assigned	Deadline	Status
Overview of Project Management Plan	Jp, M	21/04/23	Done
Detail Cost Estimate	Jp, Jx	28/04/23	Done
Cash Flow Budget for 5 Years (Yearly Basis)	Jp, Jx, M	17/05/23	Done
Capital Budgeting	Ch, Jp, M	24/05/23	Done
Risk Identification	Ch, Jp, M	07/05/23	Done
Risk Response	Jp	17/05/23	Done
Work Breakdown Structure (WBS)	Ch, Jp	10/05/23	Done
Schedule Management	Ch, Jp, Jx	31/05/23	Done

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Chapter 1: Overview of Project Management Plan

In the conventional approach to cake orders, customers would typically visit a bakery in person and interact with the staff to place an order. The staff would then manually record the order, and payments could be made in cash, through credit cards, or e-wallet transactions. While some bakeries have shifted to using social media platforms such as Instagram and Facebook to promote their business and accept orders online, the ordering process still largely relies on online conversations and is not fully automated. Many businesses lack a dedicated platform for systematically automating the ordering process.

The traditional method of processing cake orders is time-consuming, prone to human error, and labor-intensive, with the added drawback of not providing real-time order status updates. Continuing to rely on this approach can result in limitations such as reduced efficiency and accuracy, inadequate data for business analysis, and subpar customer experiences, which the online bakery ordering system project aims to address by leveraging technology for greater efficiency, accuracy, convenience, data analysis, and enhanced customer experience.

By implementing this project, the online bakery ordering system automates the order-taking process and eliminates the need for manually recording orders. Additionally, the system also provides real-time visibility of the order status, making it easier to track the progress of orders. Overall, this project is expected to contribute to time efficiency and cost-saving and offer convenience to the end user and their customers.

1.1 Purpose

As online shopping is more prevalent, ordering baked goods online instead of walk-in is in dire need. The purpose of this project is to deliver an easy-to-navigate online bakery ordering system to the end-user that simplifies the process of managing incoming orders, tracking order status, and updating order information which results in operational efficiency, enhancement of collaboration among the customer's team, and reduction of manual effort.

1.2 Objectives

In order to reach the project purpose, these are the objectives listed to be fulfilled throughout the project:

1.   To replace the existing manual ordering system with a web server and software within the project timelines and eliminate 80% of manual order-taking and processing work

2.   To achieve a 70% reduction in order errors from manual order processing

3.   To increase the website traffic by 20% within the first year of system implementation

4.   To achieve a 20% increase in the number of orders from new customers through the online platform

5.   To complete the project with all features and functions within a budget of RM1,455,037.73 in 5 years as per the agreed-upon scope and quality standards to the satisfaction of the stakeholders

1.3 Scopes

This section discusses the scope in terms of inclusions, exclusions, and assumptions of the project. The project manager and the team members will work together to deliver an online bakery ordering system with an estimated cost of RM1,455,037.73 within 1825 days as per the agreed-upon timeline to assist the end user in processing orders.

1.3.1 Project Inclusions

This section describes the tasks and items specifically included in the scope that will be delivered to the end user. The inclusions of this project are as follows:

1.   A dynamic website with the functionality of login, browsing menu, placing orders, making payments, and tracking orders in real-time

2.   A database and backend system that manages the customer profile, customer orders, and menu items

3.   Social media integration such as Instagram and Facebook

4.   ipay88 payment gateway

5.   System security protection

6.   Free of charge software maintenance and upgrade for one year

This project includes a dynamic website with functionality such as login, browsing menu, placing orders, making payments, and tracking orders in real-time and a database and backend system that manages the customer profile, customer orders, and menu items. The project also includes the integration of the bakery's social media with the website so the customer can be directed to the bakery's social media through the links on the website. Other than that, integration of ipay88 payment gateway is also included. Moreover, this project also covers system security protection and provides system maintenance and upgrades for 1 year.

1.3.2 Project Exclusions

This section describes the exclusions such as the task and works not included in the project scope. The exclusions of this project are as follows:

1.   Source code of the bakery ordering system

2.   Mobile application of the bakery ordering system

2.   Data migration from the existing manual ordering system or source to the bakery ordering system

3.   Adding new plugins, functionality, customization, or enhancement requests that arise after project completion

4.   Localization and functionality of multiple languages translation for the website

To clarify, the source code of the online bakery ordering system will remain as the proprietary intellectual property of the organization and shall not be shared with the end user. Other than that, a mobile application of the bakery system is not included as a part of the deliverables. The work of migrating data from the existing manual ordering system or source to the backend of the bakery ordering system is also excluded. In addition, adding new plugins, functionality, customization, or enhancement requests that arise after project completion are not included in the project scope. Changes that fall outside the initial scope of the project would need to be addressed through change requests as per the agreed-upon project charter. Moreover, localization is excluded in this project; hence the translation of the website into multiple languages is not supported.

1.3.3 Project Assumptions

This section discusses the events estimated to happen to the project. To outline, the project is expected to finish within 1825 days and is fully supported by the sponsor in financial terms. Moreover, the end user's existing IT infrastructure is assumed to meet the technical specifications of the bakery ordering system. In addition, all stakeholders are expected to present as needed for project activities. The working devices are also assumed to be in good working order throughout the project. Table 1.1 discussed the project assumptions with detailed descriptions such as the respective reasons and impacts on the project if the assumptions are incorrect.

Table 1.1: Assumptions Log

Assumption #	Description	Reason for assumption	Impact if incorrect
[A-1]	The project will be completed within 1825 days	Project schedule is feasible and aligned with stakeholder's expectations	Delays or changes to the schedule may require adjustments to the project timeline
[A-2]	The project is fully financially supported by the sponsor	The sponsor is verified to be financially stable and the project budget is reasonable and approved by the sponsor	1. Budget constraints 2. Gaps in project execution 3. Compromising in project deliverables
[A-3]	The end user's existing IT infrastructure is compatible and meets the minimum requirement to support the implementation and	The end user's IT infrastructure has been assessed to meet the technical specifications and requirements of the bakery ordering system	1. Project delays and requires additional time to integrate with the new system 2. Scope changes to align with the available

	deployment of the bakery ordering system		infrastructure
[A-4]	All stakeholders will be present and engaged as needed for project activities such as meetings, reviews, and approvals	Availability of stakeholders is accessed in advance and incorporated into the project schedule	1. Delays in decision-making 2. Project progress 3. Project schedule
[A-5]	The working devices are in good working order	The working device undergoes maintenance regularly	Increased project cost to purchase new equipment

1.4 Estimated Cost

Table 1.1 illustrates the structure of the project's estimated cost. The bottom-up estimates approach is applied in order to acquire an accurate total estimated cost. The project is decomposed into individual items for budget estimation before summing up the total cost of the project. The items include the project management cost, purchased cost of hardware and software, cost of software testing, cost of training, and reserves for emergencies. The total estimated cost is RM1,455,037.73. Table 1.2 summarizes the project cost in terms of project items. A detailed description of each item is included in Chapter 2.

Table 1.2: Estimated Cost

No.	Items	Budget (RM)
1.	Project Management (project manager, project team members)	1,014,000
2.	Hardware (working device)	24,283.90
3.	Software (licensed software)	124,657.4

4.	Testing (10% of total hardware and software cost)	14,845.33
5.	Training and Support (product trainer, workshop, training)	5000.00
6.	Reserves (20% of total estimate)	272,251.10
	Total (RM)	**1,455,037.73**

1.5 Estimated Duration

The project is estimated to take approximately 5 years or 60 months to complete, which is equivalent to 1825 days. Each task in the project is to be completed within the allocated duration. Public holidays and time buffers as leeway for unplanned situations are taken into consideration. To clarify, project monitoring and controlling and product maintenance are not limited to a specific duration. Monitoring and controlling processes are an ongoing process to keep the project on track. Meanwhile, maintenance is expected to be carried out regularly or whenever a problem exists in the system. Table 1.3 depicts the duration taken by each activity in WBS with descriptions.

Table 1.3: Estimated duration of activities

Task	Activity	Duration (Days)
Project Pre-Initiation	-Conduct feasibility analysis -Develop a business case	90
Project Initiation	-Appoint the most qualified project manager -Identify the project sponsor -Identify stakeholders -Develop project charter -Hold a kick-off meeting with the stakeholders to discuss requirements, goals, and future plans of the project and obtain approval	160
Project Planning	-Develop project management plan -Collect requirements and develop requirement	150

	traceability matrix -Develop project scope statement -Estimate project cost and determine the budget -Construct Work Breakdown Structure -Estimate activity duration to develop a project schedule -Plan stakeholders communication management -Identify and analyze risks to plan risk response -Develop change management plan	
Project Execution: Product Development	-Direct and manage project execution -Design and implement the product -Build prototype -Perform quality assurance -Create a user guideline manual -Update milestone report	1095
Project Execution: Product Testing	-Acquire test case report from contractor to evaluate the functional and usability of the product -Implement beta testing and acquire feedback from beta-users -Debug issues and refine product design based on product testing	210
Project Monitoring and Controlling	-Monitor and control variances against the plan -Control scope, schedule, cost, and quality -Perform integrated change control -Process change request -Update organization process assets -Document performance report	-
Project Closing	-Finalize all outstanding task -Acquire official approval and acceptance from stakeholders	120

	-Create final project documentation and lessons-learned reports	
Product Maintenance	-Fix bugs or perform system upgrade as needed	-
	Total (Days)	1825

1.6 Project Deliverables

This section discusses the deliverables of the project as per the agreed-upon initial project scope. When the main deliverable of the project is accomplished, it marks the completion of this project. The main deliverable is a bakery ordering system with third-party integrations. The system consists of a website for end users to log in, browse the menu, place orders, make payments, and track their orders in real time. It also includes a robust and secure database and backend system that manages the customer profile, customer orders, and menu items. Training is also provided to the end user which includes training sessions and workshops.

Other than that, there are also subsidiary deliverables including user documentation. Comprehensive user documentation with instructions on how to use the online bakery ordering system will be provided to the end user. It may include a user manual and Frequently Asked Question (FAQ). Moreover, the test report that demonstrates the test cases and testing conducted will be delivered as evidence. Project Documentation such as project plan, project charter, progress report, project report, and evaluation report are part of the subsidiary deliverables. In addition, project closure documentation such as quality control and audit report, performance report, final report, and lesson learned reports will be delivered as proof of closing the project. Other than that, the maintenance and support agreement which consists of the terms and conditions for ongoing maintenance and support of the online bakery ordering system after project completion is also one of the subsidiary deliverables. Table 1.4 summarizes the project deliverables.

Table 1.4: Summary of deliverables

Deliverable	Description
Bakery ordering system with third-party integrations	1. Dynamic website with features including login, browsing menu, placing orders, making payments, and tracking orders in real-time. 2. Secured database and backend system that manages the customer profile, customer orders, and menu items.
Training	Training sessions and workshop
User Documentation	User documentation with instructions on how to use the system.
Test Report	Test report that demonstrates the test cases conducted.
Project Documentation	1. Project charter 2. Project plan 3. Progress report 4. Project report 5. Evaluation report
Project Closure Documentation	1. Quality control and audit report 2. Performance report 3. Final report 4. Lesson learned reports
Maintenance and Support Agreement	Terms and conditions for ongoing maintenance and post-implementation system support.

Chapter 2: Detail Cost Estimate

This section covers the detailed cost estimation. The cost estimates contain items originally priced in USD. All cost calculations will be finalized in MYR using the conversion rate of 1 USD = 4.45 MYR (as of 18 April 2023)

2.1 Project Management

The cost estimation of project management focuses on the salary of project members broken down into wages. The project team members comprise of:

1.   Project manager
2.   Project member 1
3.   Project member 2
4.   Project member 3

The monthly salary of the project team members is calculated using Equation 2.1:

$$Salary = Hourly\ wages\ (RM)\ x\ 8\ hours\ (total\ hours\ of\ working\ per\ day)$$
$$x\ 5\ days\ (total\ working\ days\ per\ week)$$
$$x\ 4\ weeks\ (total\ weeks\ per\ month) \tag{2.1}$$

The project manager is paid RM150 per hour, while project member 1 and project member 2 as junior backend developers are paid RM92.50 per hour. Project member 3 (junior frontend developer) is paid RM87.50 per hour. The difference between the pay gap is due to the workload and responsibility of each role and the level of expertise of each position. The project manager is responsible for managing and overseeing the whole project to ensure that the project is progressing towards the project goals and objectives while fulfilling the stakeholders' expectations. In short, he is ultimately accountable for the success or failure of the project; hence, the project manager's salary is usually the highest, which is RM6000 per month. Table 2.1 illustrates the calculation of each project member's salary.

Table 2.1: Breakdown of Project Management Cost

	Hourly Wages (RM)	# of Units per Week	Monthly Cost (RM)	Yearly Cost (RM)
Project Manager	150.00	40	6000.00	72,000.00
Project Member 1 (Junior Backend Developer)	92.50	40	3700.00	44,400.00

Project Member 2 (Junior Backend Developer)	92.50	40	3700.00	44,400.00
Project Member 3 (Junior Frontend Developer)	87.50	40	3500.00	42,000.00
			Subtotal (RM)	202,800.00

2.2 Hardware

This section discusses the cost estimation of the required hardware for this project. The necessary hardware is utilized to perform the project tasks related to the completion of the project deliverables.

2.2.1 Working Device

Working devices are essential hardware that the project team members use throughout the project life cycle to perform project tasks such as updating project documentation and developing software. Each project team member has a dedicated working device. The project manager may use his working device mainly to produce and manage plans and documentation; while other project team members may utilize their devices to develop the ordering system. Four carefully picked laptops with technical specifications that meet the requirements for each of the project team members to carry out tasks that match their roles as well as allowing them to work efficiently on the tasks.

To verify that the system can function across devices with different technical specifications, the system will be simultaneously deployed on the members' Windows-based laptops with processors of Intel i5 and Intel i7. To ensure the system's features and functionalities are also working cross-platform, the extra MacBook is used to test for system deployment in the MacOS environment as it is assumed that the Apple users are accustomed to the Safari browser which is a default browser on Apple devices such as iPhone and MacBook. In addition, it is assumed that the end user may also browse the bakery website using their phone, so the website will be developed as a responsive website; hence the Samsung Galaxy S23 is used for the testing activities of the web page responsiveness to the layout of smartphones. Table 2.2 shows the technical

specifications and the price of the devices. The prices are according to real-world pricing (see Appendix A Figure A1 to Figure A6).

Table 2.2: Breakdown of Hardware Cost

User	Device	Device Specifications	Cost (RM)
Project Manager	Asus ROG STRIX G531GT	Operating System: Windows 11 Home Processor: Intel Core i5-9300H (4-core, 2.40 GHz, up to 4.10 GHz) Memory: 16GB DDR4 Hard Drive: 512GB M.2 SSD, 500GB SATA SSD Graphic card: NVIDIA GeForce GTX1650 4GB	4100.00
Project Member 1	Asus TUF FX504G	Operating System: Windows 11 Home Processor: Intel Core i7-8750H (6-core, 2.20 GHz, up to 4.10 GHz) Memory: 16GB DDR4 Hard Drive: 256GB SSD, 1TB HDD Graphic card: NVIDIA GeForce GTX1050 4GB	4087.90
Project Member 2	Acer Nitro 5 AN515-52	Operating System: Windows 11 Home Processor: Intel Core i5-8300HQ (4-core, 2.30 GHz, up to 4.00 GHz) Memory: 16GB DDR4 Hard Drive: 256GB SSD, 1TB HDD Graphic card: NVIDIA GeForce GTX1050 Ti 4GB	2899.00
Project Member 3	Dell New Inspiron 16	Operating System: Windows 11 Pro Home Processor: Intel Core i7-1360P (12-core, 3.70 GHz, up to 5.00GHz) Memory: 16 GB, LPDDR5	4899.00

		Hard Drive: 512GB SSD	
		Graphic card: NVIDIA GeForce RTX2050 4GB	
	Samsung Galaxy S23	Operating System: Android Processor: Snapdragon® 8 Gen 2 Mobile Platform for Galaxy (Octa-core) Memory: 8GB Storage: 128GB	3899.00
	MacBook Air	Operating System: macOS Processor: M1 Chip (8-core CPU, 7-core GPU, 16-core Neural Engine) Memory: 8 GB Hard Drive: 256GB SSD	4399.00
		Subtotal (RM)	24,283.90

2.3 Software

This section breaks down the necessary software that contributes to the project development. The software that are utilized include Microsoft 365 Business, GanttPRO, Visual Studio Professional, IBM DB2 on Cloud, GitHub Team, and ipay88.

2.3.1 Microsoft 365 Business Standard

Microsoft 365 Business is a cloud-based productivity suite with tools such as Microsoft Word, Excel, PowerPoint, etc. It allows the project team members to create documentation, collaborate, and communicate seamlessly. For instance, Office 365 provides tools such as Skype and Outlook that allow conference meetings and calls to be held anywhere anytime; Microsoft Word is utilized to produce documents; Powerpoint is essential for presentations. Moreover, Office 365 allows centralized collaboration where documents can be accessed, shared, and edited in real time. The files are also secured under two-factor authentication; hence the security and privacy of the files are promised. The Microsoft 365 Business Standard is a good deal as one account is allowed to install applications on up to five PCs, five tablets, or five mobile

devices under one price so each member can access their files across different devices. The monthly subscription price of Microsoft 365 Business Standard per user is RM44.60. Table 2.3 shows the cost of Microsoft 365 Business standard edition.

Table 2.3: Cost of Microsoft 365 Business Standard Edition

	# of Units	Monthly Subscription Cost (RM)	Yearly Subscription Cost (RM)
Microsoft 365 Business Standard	4	(44.60/per user) 178.40	2,140.80

2.3.2 Gantt chart (GanttPRO)

Gantt chart is an utterly important and irreplaceable tool in scheduling management that shall not be compromised. The project manager uses a Gantt chart to visualize the project tasks. It provides a big picture of the progress and deadline of each activity to the stakeholders in real time to keep everyone on the same page. It also guides the team members to adhere to the planned schedule. GanttPRO is an ideal scheduling tool for our project as it is a cloud-based software that eases the project manager's work to schedule projects, and track tasks, dependencies, and resources using a visual interface and pre-built templates. The monthly subscription price of GanttPRO per user is $19.99 which is equivalent to RM88.96. Table 2.4 shows the cost of GanttPRO Business.

Table 2.4: Cost of GanttPRO Business

	# of Units	Monthly Subscription Cost (RM)	Yearly Subscription Cost (RM)
GanttPRO Business	4	(88.96/per user) 355.84	4,270.08

2.3.3 Integrated Development Environment (Visual Studio Professional)

Integrated Development Environment (IDE) combines developer tools such as code editor, compiler, and debugger that helps building software code efficiently. It is a

necessary tool for the development of the system because it increases the developer's productivity and helps the developer code faster. Visual Studio Professional's monthly subscription includes Visual Studio Professional IDE and Azure DevOps basic plan as a collection of services to build applications faster. The monthly subscription price of Visual Studio Pro per user is $45 which is equivalent to RM200.25. Table 2.5 shows the cost of Visual Studio Professional.

Table 2.5: Cost of Visual Studio Professional

	# of Units	Monthly Subscription Cost (RM)	Yearly Subscription Cost (RM)
Visual Studio Professional	3	(200.25/ per user) 600.75	7,209.00

2.3.4 Database (IBM DB2 on Cloud)

Database stores organized collections of data. IBM DB2 on Cloud is utilized as a part of the backend system of the bakery ordering system, and applying the IBM Cloud database brings advantages in terms of reliability due to its single-tenant server that is assigned to one customer and no sharing. It is able to complete more demanding workload than basic cloud infrastructure. By using IBM cloud computing, it allows end-users to monitor data performance such as resource consumption and connections in real-time on the monitoring dashboard. The monthly subscription price of IBM DB2 on Cloud per user is $99 which is equivalent to RM440.55. Table 2.6 shows the cost of IBM DB2 on Cloud.

Table 2.6: Cost of IBM DB2 on Cloud

	# of Units	Monthly Subscription Cost (RM)	Yearly Subscription Cost (RM)
IBM DB2 on Cloud	2	(440.55/ per user) 881.10	10,573.20

2.3.5 GitHub Team

GitHub helps storing and collaboration by making code-hosting easier so that the developers in the team can share their code and collaborate more efficiently. Most importantly, it allows the user to track changes in the code across multiple versions. GitHub Team provides better protection to the code branches and allows restrictions for certain contributors to work on particular code branches. The monthly subscription price of GitHub Team per user is $4 which is equivalent to RM17.80. Table 2.7 shows the cost of GitHub Team.

Table 2.7: Cost of GitHub Team

	# of Units	Monthly Subscription Cost (RM)	Yearly Subscription Cost (RM)
GitHub Team	3	(17.80/ per user) 53.40	640.80

2.3.6 Payment Gateway (ipay88)

As making payment online hassle-free is one of the features of the website of the bakery ordering system, a secured and trustful payment gateway is a cornerstone to meet the stakeholders' expectations. ipay88 is chosen because it is a secured and reliable well-tailored local payment gateway that provides various payment methods including FPX, Malaysia online bank transfer, Visa and MasterCard credit or debit cards, and e-wallets such as TouchnGo, Grabpay, and Boost Wallet. Not only ipay88 supports the currency of local market, but the transactional fee charged by iPay88 is also reasonable and low at 3.5% which makes it cost-saving in the long run. In short, ipay88 is able to provide various reliable payments at a low cost. Table 2.8 shows the setup fee of ipay88.

Table 2.8: Cost of ipay88

	# of Units	Setup Fee (RM)	Annual fee (RM)	Total Cost (RM)
ipay88	1	488.00	-	488.00

2.4 Testing

The purpose of software testing is to verify that the system is performing according to the design features and functionality and do what it supposed to do. It is also to find bugs and improve the system's performance. The software testing of the system in this project will be outsourced to a contractor due to several reasons. Outsourcing provides better access to experts with working experience and apprehensive knowledge that are familiar with requirements since there is no tester in our project team. The cost to hire a tester and purchase infrastructure are reduced and can be allocated for other essential needs. Moreover, this is also a better fit for short-term needs since the tester is not working all year round other than during the project testing phase.

The estimated testing cost is 10% of the total hardware and software cost which is around RM14,845.33. The average rate of paying the contractor is around RM90 where the average hours to write a test is 2 hours providing that the test cases cover at least 70% end-to-end testing (see Appendix A Figure A7). The estimated test coverage and average wages of contractors are calculated using the outsource calculator from (QA Wolf, n.d.)

2.5 Training and Support

Training and support is one of the essential cost items of this project as it contributes to the comprehensive guide that will be received by the end-users. The cost is distributed into the cost of hiring a product trainer on a contractual basis, training charges, and the cost of space rental and catering for the workshop. The purpose of hiring a product trainer is to get the help of a professional trainer to create training material such as a comprehensive user manual that is easy to understand. The product trainer will charge RM250.00 for each training session conducted to the project team members on how to conduct informational training for the end users from non-IT backgrounds. This is essential for the project team members to receive professional training as they will conduct training for the end users in the future. They are the creators of the system which best fit the roles of explaining how to use the system and solve the question from the end users. Other than that, a pre-launch workshop is held for the stakeholders and end users to understand the system from how it works to how it provides a competitive

edge to the users, and how to fully utilize it. Table 2.9 shows the breakdown of the training and support cost.

Table 2.9: Breakdown of Training and Support Cost

	# of Units	Cost per Unit (RM)	Total Cost (RM)
Product Trainer (contractual)	1	2500.00	2500.00
Workshop (space renting, catering)	1	2000.00	2000.00
Training	2	250.00	500.00
		Subtotal (RM)	5000.00

2.6 Reserves

Project reserves are important as they act as the cushion in the estimated budget to act against the project's risks. Table 2.10 shows that the project reserves include contingency reserves and management reserves. The allocated reserves are taken from the sum of the initial cost estimation of item 1 to item 5 in Chapter 1.4. 10% of the total cost estimation is retained as contingency reserves to address known risks that are taken into account during project planning as they are expected to occur during the project, while another 10% of the total cost estimation is kept as management reserves to address risks that arise from unexpected events. While unknown unknowns are hard to identify, there are some examples of known unknowns that are considered during this project such as exchange rate risk, cost miscalculation, IBM DB2 on cloud outage, payment gateway downtime, additional workload, etc.

Table 2.10: Breakdown of Project Reserves

	% of Total	Yearly Cost (RM)
Contingency reserves	10	27,225.11
Management reserves	10	27,225.11

		Subtotal (RM)	54,450.22	

2.7 Total Project Cost Estimated

This section summarizes the total of the project cost estimated in a table. Table 2.11 illustrates the subtotals of each WBS activity and the sum of the project items, and also depicts in percentage of total estimated costs.

Table 2.11: High-level Details of Total Cost Estimate

Item	Unit	Monthly Cost (RM)	Yearly Cost (RM)	Cost in 5 Years (RM)
Project Management				
Project Manager	1	6000.00	72,000.00	360,000
Project Member 1	1	3700.00	44,400.00	222,000
Project Member 2	1	3700.00	44,400.00	222,000
Project Member 3	1	3500.00	42,000.00	210,000
		Subtotal (RM)	**202,800.00**	**1,014,000.00**
Hardware				
Working Devices	6	-	24,283.90	24,283.90
		Subtotal (RM)	**24,283.90**	**24,283.90**
Software				
Microsoft 365 Business Edition	4	178.40	2,140.80	10704.00
Ganttpro	4	355.84	4,270.08	21350.40
Visual Studio Professional	3	600.75	7,209.00	36045.00

IBM DB2 on cloud	2	881.10	10,573.20	52866.00
Github Team	3	53.40	640.80	3204.00
Payment gateway (ipay88)	1	-	488.00	488.00
		Subtotal (RM)	**25,321.88**	**124,657.40**
Testing				
Outsource Contractor	1	-	14,845.33	14,845.33
		Subtotal (RM)	**14,845.33**	**14,845.33**
Training and Support				
Product Trainer	1	-	2500.00	2500.00
Workshop	1	-	2000.00	2000.00
Training	2	-	500.00	500.00
		Subtotal (RM)	**5000.00**	**5000.00**
Reserves				
Contingency reserves (10%)	-	-	27,225.11	136,125.55
Management reserves (10%)	-	-	27,225.11	136,125.55
		Subtotal (RM)	**54,450.22**	**272,251.10**
	Overall total (without reserves) (RM)		**272,251.11**	**1,182,786.63**
	Total (RM)		**326,701.33**	**1,455,037.73**

Chapter 3: Cash Flow Budget for 5 Years (Yearly Basis)

This chapter includes the detail of the cashflow budget and the respective assumptions.

3.1 Detail of Cash Flow Budget

This section discusses the cash flow budget of the project for 5 years. A monthly breakdown of the cash flow budget in the first year is included in Table 3.1.

Table 3.1: Cash Flow Budget from 01/06/2023 to 30/05/2028 (5 years)

Cash Flow	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Beginning Cash Balance	0.00	239,354.10	267,748.88	397,598.88	652,936.88	1,557,638.74
Cash Inflow						
Loan proceeds	300,000.00	-	-	-	-	300,000.00
Grant	50000.00	-	-	-	-	50000.00
Investment from Sponsor	50000.00	50000.00	50000.00	50000.00	-	200,000.00
Investment from Share-holders	250,000.00	-	-	-	-	250,000.00
Cash Sales	0.00	400,000.00	525,000.00	650,000.00	750,000.00	2,275,000.00
Total Cash Inflow	650,000.00	689,354.10	842,748.88	1,097,598.88	1,402,936.88	4,632,638.74
Cash Outflow						
Fixed cost						

Rent	21,600.00	21,600.00	21,600.00	21,600.00	21,600.00	108,000.00
Insurance	761.52.00	761.52	761.52	761.52	761.52	3,807.60
Salary	202,800.00	202,800.00	202,800.00	202,800.00	202,800.00	1,014,000.00
EPF (13%)	26,364.00	26,364.00	26,364.00	26,364.00	26,364.00	131,820.00
SOCSO (1.75%)	3,549.00	3,549.00	3,549.00	3,549.00	3,549.00	17,745.00
Equipment	24,283.90	-	-	-	-	24,283.90
Business License	70.00	70.00	70.00	70.00	70.00	350.00
Loan payment (6.5%)	79,500.00	79,500.00	79,500.00	79,500.00	79,500.00	397,500.00
Corporate Income Taxes	-	35,243.22	58,300.00	58,300.00	75,300.00	227,143.22
Variable cost						
Utilities	14,883.60	14,883.60	14,883.60	14,883.60	14,883.60	74,418.00
Miscellaneous Expenses	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	60,000.00
Software Subscription	24,833.88	24,833.88	25,321.88	24,833.88	24,833.88	124,657.40
Outsourcing	-	-	-	-	14,845.33	14,845.33
Training	-	-	-	-	5,000.00	5,000.00

Total Cash Outflow	410,645.90	421,605.22	445,150.00	444,662.00	481,507.33	2,203,570.45
Ending Balance	239,354.10	267,748.88	397,598.88	652,936.88	921,429.55	2,479,068.29

Table 3.1 illustrates the cash flow budget of the project which consists of the cash inflow and cash outflow from the first to the fifth year. Cash inflow is the income brought into the project. It is contributed by loan proceeds, cash sales, grant, investment from shareholders, and investment from sponsors. A loan with an amount of RM300,000.00 under Alliance Digital SME Express Financing (Alliance Bank Malaysia, n.d.) is applied successfully in the first year. In addition, the project is eligible for the e-commerce grant worth RM50,000.00 under Business Accelerator 3.0 Programme (BAP 3.0) (see Appendix A Figure A8) that is launched by the government (SME Corporation Malaysia, n.d.). Moreover, during the kick-off meeting, the sponsor agreed to provide RM50,000.00 from Year 2 to Year 5 which sums up to RM200,000.00 in 5 years.

Since our company is newly founded, there will be no revenue generated in the first year. The shareholders will invest RM250,000.00 to ensure the project will get enough funding to continue. However, it is expected that during the first year of operation, the company will generate revenue of at least RM250,000.00 through other IT services and small projects. With the amount of sponsorship and cash sales generated and, the shareholders will not provide more investment from the second year. The amount is expected to increase throughout the consequent years especially when there is no investment from the shareholders or sponsor, there is a need to generate higher cash sales to support the project.

On the other hand, cash outflow is the money leaving the project such as fixed costs and variable costs in which some of which will be paid on a one-time basis, monthly basis, or annual basis. Fixed cost is the expenses that are not dependent on the business product, for example, rent, insurance, salary, Employee Provident Fund (EPF), Social Security Organization (SOCSO), equipment, business license, loan payment, and

corporate income taxes. Every month, RM1,800.00 will be spent to rent a small office in Johor Bahru for the employees to carry out their work which made up to RM21,600.00 per year. To protect the company's property, Plan B of A-Essential Business insurance from AIA (see Appendix A Figure A9) with annual premiums of RM761.52 which covers burglary, public liability, fixed glass, signage and signboard, employer's liability, group personal accident, and fidelity will be paid annually. The project team members' salaries cost RM16,900.00 in total. As EPF (13% of salary) and SOCSO (1.75% of salary) must be paid monthly to each employee (Lim, 2023), the total amount of EPF and SOCSO that will be paid over a year will be RM26,364.00 and RM3,549.00, respectively. Notice that there is a cost of equipment (RM24,283.90) in Year 1 as new equipment such as laptops and smartphones are purchased. According to Suruhanjaya Syarikat Malaysia (SSM, n.d), the cost to register a company's trade name is RM60.00. The trade name renewal cost for the subsequent years is also at the same rate. An additional RM10.00 is for retrieval of the business information. Hence, in total, the business license will cost RM70.00 per year.

For loan payments, calculated using the loan calculator provided by Alliance Bank (see Appendix A Figure A10), we need to pay RM6,625.00 per month with an interest rate of 6.5% which is made up to RM79,500.00 every year. According to Lembaga Hasil Dalam Negeri Malaysia (Lembaga Hasil Dalam Negeri Malaysia, 2022), as our company's capital is less than RM2.5 million, the corporate income tax rate is charged at 17% on the first RM600,000.00 made. To cut down expenses, capital allowance is provided by the government at a rate of 20% in the initial year of business operation and 10% in the subsequent years to deduct the tax payment for capital items such as ICT equipment, office equipment, and traveling expenses (PricewaterhouseCoopers, n.d). The capital items that are available for a tax deduction for our business including computers, office equipment, and travel expenses. An amount of RM4,856.78 (20% of equipment expenses) and an amount of RM2,400.00 (20% of office equipment and traveling expenses) will be waived from the business income tax of RM42,500.00 on the initial year. Therefore, the total income tax will be RM35,243.22. The amount of tax deducted for office equipment and traveling expenses is reduced to 10% following the second year.

Other than that, variable cost is one of the cash outflows expenses that change as the volume of the business changes which includes utilities, miscellaneous expenses,

software subscription, training fee, and outsourcing fee. Essential utilities for the office include electricity, water, and internet. As our office is under the low voltage commercial category (see Appendix A Figure A11), the first 200kWh is charged at 43.5sen per kWh while the next kWh onwards is charged at 50.9sen per kWh. We assume that our office will consume approximately 1650 kWh, costing RM886.10 every month calculated using myTNB electric bill calculator (Tenaga Nasional, n.d.) (see Appendix A Figure A12). It is estimated that the monthly water bill costs around RM105.20, and the Unifi Business Plan @ 300Mbps costs RM249.00 every month (see Appendix A Figure A13). The total utilities will cost RM1,240.30 per month which adds up to RM 14,833.60 for 5 years.

For miscellaneous expenses, RM 1,000.00 is allocated every month to buy stationery, pay parking tickets, toll charges, and other expenses. The total amount allocated for miscellaneous expenses adds up to RM12,000.00 per year. Outsourcing costs (RM 14,845.33) are paid to the outsource contractor for software testing at once during the software testing stage. While for the software subscription costs, a detailed breakdown is included in Chapter 2.3. We will spend RM24,833.88 on every year except Year 3 as there is an extra RM488 paid for ipay88 setup fee (see Chapter 2.3.6). Other than that, the cost of training and support (RM5,000.00) is spent in the 5th year. The detailed cost breakdown of this item is explained in Chapter 2.5.

Table 3.2 is the breakdown of the cash flow budget from the 1st month to the 6th month of the first year of the project. From Table 3.2, it shows that the business license and insurance are paid once in the first month of the year. The loan and sponsorship are also received in the first month. Furthermore, the shareholders will provide constant investment every month to support the project.

Table 3.2: Cash Flow Budget from the 1st month to the 6th month of the project

Cash Flow	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Beginning Cash Balance	0.00	313590.37	302,296.16	291,001.95	279,707.74	268,413.53
Cash Inflow						

Loan proceeds	300,000.00	-	-	-	-	-
Grant	-	-	-	-	-	-
Investment from Sponsor	50000.00	-	-	-	-	-
Investment from Share -holder	20,833.33	20,833.33	20,833.33	20,833.33	20,833.33	20,833.33
Cash Sales	-	-	-	-	-	-
Total Cash Inflow	370,833.33	334,423.70	323,129.49	311,835.28	300,541.07	289,246.86
Cash Outflow						
Fixed cost						
Rent	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Insurance	761.52	-	-	-	-	-
EPF (13%)	2,197.00	2,197.00	2,197.00	2,197.00	2,197.00	2,197.00
SOCSO (1.75%)	295.75	295.75	295.75	295.75	295.75	295.75
Salary	16,900.00	16,900.00	16,900.00	16,900.00	16,900.00	16,900.00
Equipment	24,283.90	-	-	-	-	-
Loan payment (6.5%)	6,625.00	6,625.00	6,625.00	6,625.00	6,625.00	6,625.00

Corporate Income Taxes	-	-	-	-	-	-
Business License	70.00	-	-	-	-	-
Variable cost						
Utilities	1,240.30	1,240.30	1,240.30	1,240.30	1,240.30	1,240.30
Miscellaneo-us Expenses	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
Software Subscription	2,069.49	2,069.49	2,069.49	2,069.49	2,069.49	2,069.49
Outsourcing	-	-	-	-	-	-
Training	-	-	-	-	-	-
Total Cash Outflow	57,242.96	32,127.54	32,127.54	32,127.54	32,127.54	32,127.54
Ending Balance	313,590.37	302,296.16	291,001.95	279,707.74	268,413.53	257,119.32

Table 3.3 is the breakdown of the cash flow budget from the 7th month to the 12th month of the first year of the project. From Table 3.3, there is an extra source of cash inflow aside from loans, sponsorship, and shareholders' investment which is the government grant (BAP 3.0) that is received in the 7th month as the grant takes six months for application and processing.

Table 3.3: Cash Flow Budget from the 7th month to the 12th month of the project

Cash Flow	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12

Beginning Cash Balance	257,119.32	295,825.11	284,530.90	273,236.69	261,942.48	250,648.29
Cash Inflow						
Loan proceeds	-	-	-	-	-	-
Grant	50000.00	-	-	-	-	-
Investment from Sponsor	-	-	-	-	-	-
Investment from Shareholder	20,833.33	20,833.33	20,833.33	20,833.33	20,833.35	20,833.35
Cash Sales	-	-	-	-	-	-
Total Cash Inflow	327,952.65	316,658.44	305,364.23	294,070.02	282,775.83	271,481.64
Cash Outflow						
Fixed cost						
Rent	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Insurance	-	-	-	-	-	-
EPF (13%)	2,197.00	2,197.00	2,197.00	2,197.00	2,197.00	2,197.00
SOCSO (1.75%)	295.75	295.75	295.75	295.75	295.75	295.75
Salary	16,900.00	16,900.00	16,900.00	16,900.00	16,900.00	16,900.00

Equipment	-	-	-	-	-	-
Loan payment (6.5%)	6,625.00	6,625.00	6,625.00	6,625.00	6,625.00	6,625.00
Corporate Income Taxes	-	-	-	-	-	-
Business License	-	-	-	-	-	-
Variable cost						
Utilities	1,240.30	1,240.30	1,240.30	1,240.30	1,240.30	1,240.30
Miscellaneo-us Expenses	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
Software Subscription	2,069.49	2,069.49	2,069.49	2,069.49	2,069.49	2,069.49
Outsourcing	-	-	-	-	-	-
Training	-	-	-	-	-	-
Total Cash Outflow	32,127.54	32,127.54	32,127.54	32,127.54	32,127.54	32,127.54
Ending Balance	295,825.11	284,530.90	273,236.69	261,942.48	250,648.29	239,354.10

3.2 Assumptions

This section discusses the assumptions made for the cash flow budget. For cash inflow, it is assumed that our company is able to generate cash sales from the second year from other services provided such as IT services and several other small projects. Moreover,

it is assumed that our company is eligible for the application of Alliance Digital SME Express Financing. Furthermore, it is assumed that BAP 3.0 is open for application now and our company is eligible for the grant of BAP 3.0.

Meanwhile, for cash outflow, we assume that the office we use is a small commercial office space in Johor Bahru that is enough for 4 employees, and the rental will not be raised during the project. It is assumed that an average of 1605kWh of power will be consumed per month. We also expect that the fluctuation of utilities is small and can be covered by the reserves. Other than that, it is assumed that the employees attend their job every working day except on public holidays, and the number of employees remains the same throughout the project with the same number of salaries. Looking at the history (MacroTrends, n.d.), it is assumed that the corporate income tax percentage does not vary much for the subsequent years. We also assume that the capital items of our project that are available for tax deduction only include ICT equipment such as laptops and smartphones, office equipment such as stationery, and traveling expenses. We assume that the business insurance annual premiums will not increase during the project.

Chapter 4: Capital Budgeting

4.1 Net Present Value (NPV)

Considering the prime rate and other economic factors, a 4% discount rate is being determined for this project based on the history of inflation in Malaysia according to the data provided by MacroTrends (MacroTrends, n.d.). The estimation is obtained using the Malaysia Consumer Price Index inflation calculator provided by the Department of Statistics Malaysia (see Appendix A Figure A14). Future cash flows are valued at their present value using a discount rate. Using Equation 4.1, we can calculate the discount factor for each year:

$$Discount\ Factor\ =\ \frac{1}{(1 + Discount\ Rate)^{Period}} \qquad (4.1)$$

Table 4.1 illustrates the discount factor from the initial year until the project within 5 years. Year 1 of the project is indicated as Year 0 because the discount rate is excluded from the initial year of the project.

Table 4.1: Discount Factor for 5 years period

Period (Year)	Discount Factor
0	1
1	0.96
2	0.92
3	0.89
4	0.85

Table 4.2 shows the calculation of NPV of our project. The discounted cost is a factor of the discount factor and the project cost while the discounted benefit is obtained by multiplying the benefits by the discount factor. By subtracting the total discounted cost from the total discounted benefits (see Equation 4.2), we can obtain the NPV of our project. Our project gains a positive NPV which is equal to RM53,044.68.

$$NPV \ = \ Discounted \ Benefits \ (RM) \ - \ Discounted \ Cost \ (RM) \qquad (4.2)$$

Table 4.2: NPV calculation

Discount rate						4%
	Year 0	Year 1	Year 2	Year 3	Year 4	Total
Costs (RM)	410,645.90	421,605.22	445,150.00	444,662.00	481,507.33	2,203,570.45
Discount Factor (RM)	1	0.96	0.92	0.89	0.85	
Discounted Cost (RM)	410,645.90	404,741.01	409,538.00	395,749.18	409,281.23	2,029,954.41
Benefits (RM)	0.00	400,000.00	525,000.00	650,000.00	750,000.00	2,275,000.00
Discount Factor (RM)	1	0.96	0.92	0.89	0.85	
Discounted Benefits (RM)	0.00	240,000.00	322,000.00	311,500.00	382,500.00	1,256,000.00
Discounted Benefits - Discounted Costs	-410,645.90	-20,741.01	73,462.00	182,750.82	185,718.77	53,044.68

(RM)						
NPV (RM)						53,044.68

4.2 Internal Rate of Return (IRR)

Table 4.3 shows the calculation of IRR of our project. IRR is a financial measure that is used to assess the profitability of an investment. It is calculated by finding the discount rate at which the NPV equals zero. The investment is deemed to be more beneficial with a higher IRR. Table 4.2 breaks down the IRR of our project throughout the years. IRR can be calculated using Equation 4.3 where n equals the number of years the project takes to complete.

$$IRR = \frac{Future\ Value}{Present\ Value}^{\frac{1}{n}} - 1 \qquad (4.3)$$

IRR is not available for Year 0 and Year 1 because the project has not reached the break-even point.

Table 4.3: IRR calculation

Year	Costs (RM)	Benefits (RM)	Benefits - Cost (RM)	IRR
0	410,645.90	0.00	-410,645.90	
1	421,605.22	400,000.00	-20,741.01	
2	445,150.00	525,000.00	79,850.00	-58.36%
3	444,662.00	650,000.00	205,338.00	-14.29%
4	481,507.33	750,000.00	268,492.67	7.92%
Total	2,203,570.45	2,325,000.00	121,429.55	13.48%

4.3 Payback Period

The payback period is the amount of time to recover the cost of investment for the project to reach the breakeven point. We need to calculate the cost of investment and average cash flow in the first place as the payback period is calculated by dividing the cost of investment by the average annual cash flow as shown in Equation 4.4.

$$Payback\ period\ =\ Cost\ of\ Investment\ /\ Average\ Annual\ Cash\ Flow \qquad (4.4)$$

According to (Law Insider, n.d), the cost of investment of our project including government grant, financing loan, investment from shareholders and sponsorship which adds up to RM800,000.00. The average annual cash flow can be obtained by dividing the total cash flow by the duration of the project which is 5 years in total which sums up to RM495,813.66. The formula is as follows:

Average annual cash flow = RM2,479,068.29 / 5 years

= RM495,813.66

Henceforth, the payback period of our project is 1.6 years which is approximately one year and seven months.

Payback period = RM800,000.00 / RM495,813.66

= 1.6 years

4.4 Return on Investment (ROI)

ROI is a metric that evaluates the success of a project which helps the stakeholders to understand the amount of profit or loss that the investment has earned in relation to the expenses of the project. Equation 4.5 calculates the ROI while Equation 4.6 calculates the annualized ROI where n equals the number of years the project takes to complete. The purpose of calculating an annualized ROI is because our project lasts longer than a year and ROI makes a difference over time (Indeed Editorial Team, 2023).

$$ROI\ =\ (Net\ Investment\ Gain\ /\ Cost\ of\ Investment) \qquad (4.5)$$

$$Annualized\ ROI\ =\ [(1 + ROI)^{\frac{1}{n}} - 1]\ \times\ 100\% \tag{4.6}$$

To calculate the ROI, we take the ending balance (RM921,429.55) at the final year of our project after the cash outflow is deducted. The cost of investment is RM800,000.00 (see Chapter 4.3). The ROI can be calculated as follows:

ROI = RM921,429.55/ RM800,000.00

    = 1.15

By substituting the ROI into the annualized ROI, the annualized ROI for 5 years of our project is calculated as follows:

ROI = [(1+1.15) ^ (⅕) - 1] x 100%

    = 16.54%

4.5 Analysis and Recommendations

To conclude Chapter 4, the project's NPV is RM53,044.68 after discounting all future cash flow. This indicates that the project is feasible as the NPV value is positive; hence, it is able to generate profit. Furthermore, the project's IRR is 13.48%. As IRR is greater than zero and it is also higher than the discount rate (4%), this means our project should not lose money. Moreover, the payback period is 1.61 years which ensures the initial cost can be recovered quickly. The annualized ROI is 16.54% which is calculated based on the assumption of no drastic fluctuations as we lack the accurate information of future expenses such as interest rates that may change in the future. In short, this project is worth the investment as it brings profit to the company.

Chapter 5: Risk Identification

5.1 Potential Risk and Risk Register

This section discusses the risk events that might arise in the project. Each risk is given an id and rank and is analyzed in terms of its category, the root cause of risk if it occurs, the risk trigger, the person responsible for overseeing the risk, the likelihood of the risk occurrence, and the impact of the risk if it occurs. The respective risk response will be discussed in detail in Chapter 6. The identified risks include:

1. Shift in team roles
2. Cost miscalculation
3. Product being irrelevant by the time it is completed
4. ipay88 security breach
5. IBM DB2 on Cloud outage
6. Test cases are not delivered by the contractor on time
7. Exchange rate
8. Increase in monthly subscription price of licensed software
9. Equipment failure
10. Insufficient test cases coverage

Table 5.1 summarizes the risk of a shift in team roles. A shift in team roles is ranked the highest on the risk register as it brings a direct impact on the progress of the project and is most likely to occur during the 5 years of project development. The operational change happens when a key member resigns from the company and leaves the project team short-staffed. Extra time is required to hire new employees and the existing team member might need to cover the workload of the resigned team member. In the end, the project will be delayed, and the deliverable might not be completed on time.

Table 5.1: Risk register of R1 (Shift in team roles)

Id	R1
Rank	1
Risk Name	Shift in team roles

Description	Key members leaving the project team before the project is finished will cause a direct impact on the project's progress
Category	Operational
Root Cause	1. Team member intends to change the working environment 2. Team member receives a better offer from the other company
Trigger	Team members resign
Risk Owner	Top Management
Probability	High
Impact	1. Short-staffed 2. Knowledge loss 3. Project delays 4. Unable to complete deliverables according to schedule

Table 5.2 discusses the risk ranked 2nd on the risk register which is cost miscalculation. It is ranked second on the risk register as underestimating or overestimating the project cost brings an unrealistic budget which results in wrong resource allocation and ultimately causes the project to fail.

Table 5.2: Risk register of R6 (Cost miscalculation)

Id	R6
Rank	2
Risk Name	Cost miscalculation
Description	Unrealistic budget resulting from cost underestimation or overestimation will cause project failure

Category	Budget
Root Cause	1. Humans are biased toward underestimation 2. Poor cost research on the project's needs 3. Unforeseen expenses 4. Bad cost estimation
Trigger	1. Budget allocated does not adhere to cost baseline 2. Unnecessary spending
Risk Owner	Project manager
Probability	High
Impact	1. Not enough funding to finish the project 2. Not enough budget to pay team members' salaries 3. Project failure

Table 5.3 illustrates the risk ranked 3rd on the risk register. The product (bakery ordering system) being irrelevant by the time it is completed is highly possible as this project takes 5 years to complete. Market change and new technology appear might replace the necessity of implementing the bakery ordering system.

Table 5.3: Risk register of R7 (Product being irrelevant by the time it is completed)

Id	R7
Rank	3
Risk Name	Product being irrelevant by the time it is completed
Description	The bakery ordering system might be irrelevant when it is completed as it takes 5 years to develop
Category	Technology
Root Cause	1. Market change rapidly 2. New technology appears in the future

	3. Project duration is long
Trigger	A new approach to ordering bakery goods appears in the market
Risk Owner	Stakeholders
Probability	Medium
Impact	1. Scope creep (addition of extra features) 2. Project failure

Table 5.4 discusses the risk of ipay88 security breach. This is ranked 4th on the risk register as a cybersecurity incident that happens to the payment gateway may cause the leaking of the user's card data or banking details. Although the probability of the occurrence of ipay88 security breach is considered medium, ipay88 does have a history of cybersecurity breach back in 2022 (The Star, 2022).

Table 5.4: Risk register of R4 (ipay88 security breach)

Id	R4
Rank	4
Risk Name	ipay88 security breach
Description	Malicious activity attacks the payment gateway will threaten the safety of the user's banking or card data when making a payment
Category	Information security
Root Cause	Malware or malicious activity deployed by hacker
Trigger	Bad protection strategies by ipay88
Risk Owner	Third-party contractor
Probability	Medium

| Impact | 1. User's banking details or credit card data breach |
| | 2. Loss of customer confidence in the bakery ordering system |

Table 5.5 discusses the risk of IBM DB2 on cloud outage. IBM DB2 downtime might happen due to malicious attacks, or hardware or software failure. This could cause important data loss or errors in data processing when a customer is placing an order in the system. However, most of the downtime is due to network and security maintenance hence it is ranked 5th on the risk register.

Table 5.5: Risk register of R5 (IBM DB2 on Cloud outage)

Id	R5
Rank	5
Risk Name	IBM DB2 on Cloud outage
Description	IBM DB2 on Cloud downtime will affect the storing and processing of the bakery's data
Category	Information security
Root Cause	IBM DB2 on Cloud is down for network and security maintenance
Trigger	1. Server crashes
	2. Software bugs
	3. Power disruption
	4. Internet connectivity
Risk Owner	Third-party contractor
Probability	Medium
Impact	1. Important data loss
	2. Error in data processing

	3. Loss of customer confidence in the bakery ordering system

Table 5.6 discusses the risk of test cases not being delivered by the contractor on time. Outsourcing software testing to a contractor requires consistent communication and a good chain of command which if fails will cause delays to the project. It is ranked 6th on the risk register as it can be solved by enhancing the communication between the contractor and the project team.

Table 5.6: Risk register of R10 (Test cases are not delivered by the contractor on time)

Id	R10
Rank	6
Risk Name	Test cases are not delivered by the contractor on time
Description	Contractor unable to deliver the agreed-upon test cases on time will cause project delays
Category	Contractor
Root Cause	Lack of communication between the project manager and the contractor
Trigger	1. Not keeping up with the contractor on the progress regularly 2. Contractor not showing progress report regularly
Risk Owner	Project Manager
Probability	Medium
Impact	Project delays

Table 5.7 discusses the exchange rate risk. According to (IG, n.d.), the exchange rate depends on the demand for one currency and the value of owning it. It is ranked 7th on the risk register as the exchange rate is unavoidable as this project requires using

software that charges services in USD. However, the exchange rate risk can be mitigated (see Chapter 6).

Table 5.7: Risk register of R8 (Exchange rate)

Id	R2
Rank	7
Risk Name	Exchange rate
Description	Uncertainty of future currency exchange rates will affect the project cost
Category	Budget
Root Cause	Fluctuation and demand of one currency and the value of owning it
Trigger	Inflation
Risk Owner	Project Manager
Probability	High
Impact	1. Increase in project cost 2. Reduced profitability 3. Reallocation of resources

Table 5.8 discusses the risk of pricing change in licensed software. As the required licensed software are subscribed monthly instead of purchased as lifetime services, pricing change will impact the project cost. The probability of the occurrence of this risk is considered medium as the licensed software company holds the right to adjust the price. It is ranked 8th on the risk register. As long as the software is necessary for our project, we have to adhere to the rules and regulations unless there is a cheaper solution to replace the mentioned software.

Table 5.8: Risk register of R3 (Increase in monthly subscription price of licensed software)

Id	R3
Rank	8
Risk Name	Increase in monthly subscription price of licensed software
Description	The monthly subscription price of licensed software might increase in the future and affect project cost
Category	Budget
Root Cause	1. Price adjustment clause allows the seller to adjust the price of goods and services 2. Inflation
Trigger	Software company adjusts the price of services
Risk Owner	Project Manager
Probability	High
Impact	1. Increase in project cost 2. Discontinue the service of the software

Table 5.9 discusses the equipment failure risk which is ranked 9th on the risk register. This could happen when the working device such as the laptop is not working properly due to failed hardware or faulty power supply which could cause data loss if data is not retrievable from the failed laptop, delays in the project, and increase in project costs as time and cost is required to fix or buy a laptop. However, as all of the smartphone and laptops are brand new so the likelihood of equipment failure is very low.

Table 5.9: Risk register of R8 (Equipment failure)

Id	R8
Rank	9

Risk Name	Equipment failure
Description	Equipment such as laptops and smartphone are not working due to hardware failure
Category	Hardware
Root Cause	Failed hardware, faulty power supply, etc.
Trigger	Equipment not working
Risk Owner	Project Members
Probability	Low
Impact	1. Data loss 2. Project delay 3. Cost increase to fix the equipment or to buy new equipment

Table 5.10 illustrates the details of insufficient test cases risk. The agreed-upon test coverage for the system as per the outsourcing contract with the contractor is 70%. According to (Barua, 2022), the minimum test coverage rate is between 60% to 70% while the ideal test coverage rate is 70% to 80%. Maintaining a 70% test coverage ensures the minimum requirements are met but changes remain for unexpected errors. The stability of the system is not guaranteed as there is a 30% unexplored area that might have bugs that cause technical issues when the system is launched to the public. The risk is ranked 10th on the risk register as the bugs found in the future can be fixed during post-implementation maintenance.

Table 5.10: Risk register of R9 (Insufficient test cases)

Id	R9
Rank	10
Risk Name	Insufficient test cases

Description	Insufficient test cases remain unexplored areas that might exist bugs
Category	Quality
Root Cause	Agreed-upon test coverage is only 70% as per outsourcing contract due to budget constraint
Trigger	Insufficient budget allocated to software testing
Risk Owner	Project Manager
Probability	Low
Impact	1. Unpromising stability of the system 2. Limited bugs found will cause technical issues 3. Customers will have bad experiences when using the system

5.2 Probability/ Impact Matrix

This section summarizes the probability and impact of each risk in a Probability/ Impact Matrix. Figure 5.1 shows that risk R1 (shift in team roles) is the most likely to occur and will bring a high impact on the project if it occurs. This is because our project team is very small with only 4 members, and a short-staffed team is unable to deliver the product on time which will subsequently cause project delays and a rise in project cost; hence, this risk is prioritized to be addressed.

Risks R4 (ipay88 security breach), R5 (IBM DB2 on Cloud outage), and R10 (test cases are not delivered by the contractor on time) have a medium probability of occurrence and will bring a medium impact if they occur. These three risks are associated with two third-party vendors and a contractor. Although there are feasible ways to handle the vendor and contractor relationship, they are not our company employees; hence, the risks are not completely avoidable. It is noteworthy that risks R6 (cost miscalculation) and R7 (product being irrelevant by the time it is completed) have a medium probability to occur and brings a high impact if it occurs. The probability of the occurrence of these risks is not high but if not addressed properly will contribute to the failure of the project.

Although risks R2 (Exchange rate) and R3 (increase in monthly subscription price of licensed software) have high chances of occurrence, they only bring a low impact on the project if they occur. Risk R8 (equipment failure) will bring a medium impact if it occurs but it only has a low chance of occurrence. Lastly, risk R9 (insufficient test cases) only has a low chance of occurrence, not to mention it only brings a low impact if occurs. In short, exclusive risk responses must be developed dedicated to each risk so the team will be ready to address the risks if they occur. The respective risk responses are discussed in Chapter 6.
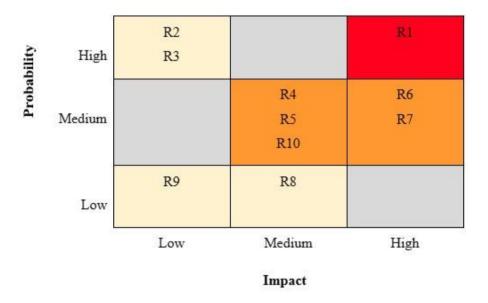

Figure 5.1: Probability/ Impact Matrix

Chapter 6: Risk Response

The potential risks that might happen to our project have been identified in Chapter 5. These risks have a certain impact on the project; hence, they must be managed and controlled carefully with a contingency plan in case of occurrence to ensure the project is progressing towards the goal smoothly.

6.1 Response Strategies

This section explores the specific response strategies formulated for each risk.

6.1.1 Risk Avoidance

Risk avoidance seeks to completely eliminate the potential impact by modifying the project management plan. This approach is typically employed for risks that pose a significant threat to the project's feasibility, such as risk R7 in our project. If the completed deliverable may lose relevance over time, the project scope shall be altered and the project team member will have to include attractive features or functions that align with the latest trends. This ensures that the project remains worthwhile and avoids waste of time and resources. However, it is important to acknowledge that changing the product direction in response to the risk may potentially jeopardize sponsorship and stakeholders' satisfaction. Table 6.1 shows the risk avoidance response, secondary risk, and residual risk of respective risk.

Table 6.1: Risk Avoidance

Risk ID	Risk Response	Secondary Risk	Residual Risk
R7	Enlarge the project scope to add features and functions that match the current technology and trend	1. Increase in cost and time 2. Change in product direction 3. Expose to unknown bugs	1. Stakeholders are not satisfied with the final product 2. Loss of sponsorship due to change in product direction

6.1.2 Risk Acceptance

Risk acceptance is a strategy that acknowledges the existence of a risk but does not involve taking proactive measures until the risk actually materializes. This approach can be either active or passive, and for this project, passive acceptance is being implemented. For risks related to project cost which have a low possibility of occurrence and low to medium impacts, such as risk R2 (exchange rate) and risk R3 (increase in monthly subscription price of licensed software), a contingency reserve has been established to address them if they occur. Furthermore, the working device will only be sent for repair in case of equipment failure (risk R8). However, there is a possibility that the device may be beyond repair and would require the purchase of new equipment. In the event of insufficient test cases (risk R9), the project team member should be prepared to fix bugs discovered after the system is launched to the public. Table 6.2 shows the risk acceptance response, secondary risk, and residual risk of respective risks.

Table 6.2: Risk Acceptance

Risk ID	Risk Response	Secondary Risk	Residual Risk
R2	Reserve additional funds to face the increased value of USD	Insufficient reserve funds to cover the additional cost in other aspects	-
R3	Reserve additional funds to cover the increase in licensed software pricing	Insufficient reserve funds to cover the additional cost in other aspects	-
R8	Prepare to send the devices for repair service	Increase in cost	Device condition is not reversible
R9	Prepare to fix bugs after the system is launched	Increase in cost and time	

6.1.3 Risk Transference

Risk transference involves transferring the responsibility or impact of a risk to a third party through means such as consulting, outsourcing, and insurance, to distribute the burden of risk. For example, to minimize the risk of cost miscalculation (risk R6), the management can engage the services of a financial advisor on contractual agreements to provide guidance on financial matters and explore methods for cost-effective operations. If an outsourced contractor fails to deliver the test report within the agreed-upon schedule (risk R10), the project manager should seek an alternative contractor to take over the software testing, as the initial contractor has breached the contract. Table 6.3 shows the risk transference response, secondary risk, and residual risk of respective risks.

Table 6.3: Risk Transference

Risk ID	Risk Response	Secondary Risk	Residual Risk
R6	Consult a financial advisor to ensure the financial plan is workable and seek methods for low-cost operation	Increase in cost to pay the consultancy	-
R10	Choose another outsourcing contractor	Increase in project time	-

6.1.4 Risk Mitigation

Risk mitigation is a risk response strategy that takes action to decrease the likelihood of risk occurrence or minimize the impact of the risk to an acceptable threshold, without completely eliminating the threat. For instance, when risk R3 (increase in monthly subscription price of licensed software) arises, the project manager can consider using alternative software that performs similar functions to avoid incurring additional costs. In the event of ipay88 being unavailable (risk R4), customers should be given the option to make payments in cash. When faced with the possibility of an outage in the IBM DB2 on Cloud database (risk R5), regular data backups should be performed to

safeguard the information. To reduce the probability of cost miscalculations (risk R6), the management can send the project manager for financial management training. Moreover, to prevent delays in receiving test cases from an outsourced contractor (risk R10), the project manager should keep the communication channel with the contractor open and get updates on the test report progress regularly. Table 6.4 shows the risk mitigation response, secondary risk, and residual risk of respective risks.

Table 6.4: Risk Mitigation

Risk ID	Risk Response	Secondary Risk	Residual Risk
R3	Switch to other software that provides the same service at the same or a lower price	Increase in time to get familiar with the new software and decrease in productivity	-
R4	Allow customers to pay in cash	1. Inconvenience in manual processing of the payment 2. Need to update the database manually	-
R5	Back up the latest portion of necessary data to the hard drive regularly	Additional workload for project team members	Loss of data during downtime
R6	Provide financial management training to project manager	1. Increase in cost and time 2. Reduction of budget allocation in other aspects	Project manager still lacks experience and knowledge related to finance
R10	Create a chain of command and communicate regularly	Additional workload for project manager	-

	with the outsourced contractor to get the latest progress of the test report		

6.1.5 Risk Escalation

Risk escalation occurs when the responsibility for managing risk is transferred to a higher authority within the organization. This typically happens when the risk is beyond the control of the project manager or when a decision from a higher authority is needed. In this project, when a shift in team roles (risk R1) arises, the higher authority should take certain actions. They can offer competitive compensation and benefits by adjusting compensation to ensure the employees' salaries are in line with industry standards. Additionally, they can provide attractive perks and incentives such as medication coverage and performance bonus to foster loyalty. Furthermore, the management can explore negotiation options to increase the employees' salaries after evaluating the company's budget. However, it is important to recognize that these strategies may not entirely curb the possibility of employee turnover. Table 6.5 shows the risk escalation response, secondary risk, and residual risk of respective risk.

Table 6.5: Risk Escalation

Risk ID	Risk Response	Secondary Risk	Residual Risk
R1	Offer competitive compensation and benefits	Increase in overhead cost	Employee is still not satisfied with the incentives
R1	Provide attractive perks	Increase in overhead cost	Employee finds the perks valueless
R1	Negotiate an offer	Increase in overhead cost	Employee rejects the offer

Chapter 7: Work Breakdown Structure (WBS)

7.1 WBS Chart

Figure 7.1 illustrates the WBS chart of the project in a hierarchical structure. Level 2 of the WBS includes pre-initiation, initiation, planning, execution, monitoring and controlling, closing, and maintenance. Each activity at level 3 is separated into smaller activities at level 4 for easier management and understanding. A clearer version of Figure 7.1 can be assessed using the link in Appendix B.
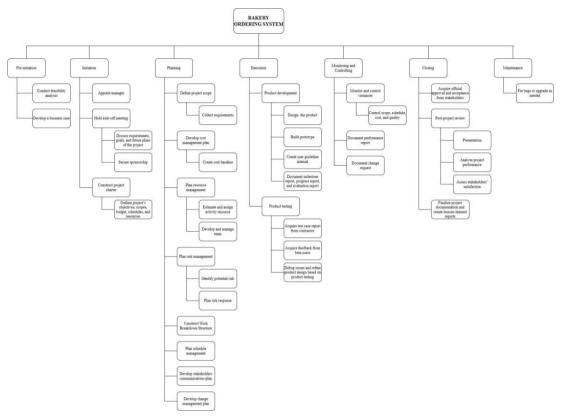

Figure 7.1: WBS chart of the bakery ordering system

7.2 WBS Tabular Form

Table 7.1 organizes the activities in the WBS chart (Figure 7.1) in tabular form for better interpretation.

Table 7.1: WBS of the bakery ordering system (Tabular Form)

WBS Level 2	WBS Level 3	WBS Level 4
	1.1 Conduct feasibility analysis	

1. Pre-initiation	1.2 Develop a business case	
2. Initiation	2.1 Appoint manager	
	2.2 Hold kick-off meeting	2.2.1 Discuss requirements, goals, and future plans of the project
		2.2.2 Secure sponsorship
	2.3 Construct project charter	2.3.1 Outline project's objectives, scopes, budget, schedules, and resources
3. Planning	3.1 Define project scope	3.1.1 Collect requirements
	3.2 Develop cost management plan	3.2.1 Create cost baseline
	3.3 Plan resource management	3.3.1 Estimate and assign activity resource
		3.3.2 Develop and manage team
	3.4 Plan risk management	3.4.1 Identify potential risk
		3.4.2 Plan risk response
	3.5 Construct Work Breakdown Structure	
	3.6 Plan schedule management	
	3.7 Develop stakeholders communication plan	

	3.8 Develop change management plan	
4. Execution	4.1 Product development	4.1.1 Design the product
		4.1.2 Build prototype
		4.1.3 Create user guideline manual
		4.1.4 Document milestone report, progress report, and evaluation report
	4.2 Product testing	4.2.1 Acquire test case report from contractor
		4.2.2 Acquire feedback from beta-users
		4.2.3 Debug issues and refine product design based on product testing
5. Monitoring and Controlling	5.1 Monitor and control variances	5.1.1 Control scope, schedule, cost, and quality
	5.2 Document performance report	
	5.3 Document change request	
6. Closing	6.1 Acquire official approval and acceptance from stakeholders	
	6.2 Post-project review	6.2.1 Presentation

		6.2.2 Analyze project performance	
		6.2.3 Assess stakeholders' satisfaction	
	6.3 Finalize project documentation and create lessons-learned reports		
7. Maintenance	7.1 Fix bugs or upgrade as needed		

7.3 WBS Dictionary

This section discusses the WBS dictionary. A WBS dictionary provides comprehension to the stakeholders to understand what is happening at each stage of the project. Table 7.2 lists the description of each WBS item at level 3 and level 4.

Table 7.2: WBS dictionary

WBS item No.	Item Name	Description
1.1	Conduct feasibility analysis	Assessing the possibility of the success of the project.
1.2	Develop a business case	Creating a business case that outlines the cost of investments, benefits, and risks of taking on the project and delivers justification for undertaking the proposed solution.
2.1	Appoint manager	Assigning the most qualified person to lead the project.
2.2	Hold kick-off meeting	Conducting the first meeting with the stakeholders.

2.2.1	Discuss requirements, goals, and future plans of the project	Collecting and analyzing the project's requirements, defining the project goal, and discussing how to develop the project.
2.2.2	Secure sponsorship	Securing the project sponsorship to gain funding for the project.
2.3	Construct project charter	Creating a project charter that outlines the core details of the project.
2.3.1	Outline project's objectives, scopes, budget, schedules, and resources.	Documenting the project's details such as purpose, objectives, scopes, budget, schedule, and resources on the project charter.
3.1	Define project scope	Determining the project scope including what will and will not be done during the project.
3.1.1	Collect requirements	Collecting stakeholders' requirements on the project.
3.2	Develop cost management plan	Estimating the project cost, determining the budget, and controlling the project cost.
3.2.1	Create cost baseline	Constructing a time-phased budget that estimates the project cost in a particular period to measure project performance.
3.3	Plan resource management	Identifying, managing, and controlling the project's physical and human resources.
3.3.1	Estimate and assign activity resource	Estimating and allocating the resource according to each activity.
3.3.2	Develop and manage team	Forming a project team and managing how the team members work together.

3.4	Plan risk management	Reviewing project documents such as corporate risk management policies, lessons-learned reports, and stakeholders' risk tolerance to analyze risks and develop strategies to address the risks that might arise during the project.
3.4.1	Identify potential risk	Identifying the potential risks that will occur to the project and list the prioritized risks.
3.4.2	Plan risk response	Developing strategies to specifically address each risk in case of occurrence.
3.5	Construct Work Breakdown Structure	Organizing the project in a hierarchical structure by breaking down the project activities into smaller components.
3.6	Plan schedule management	Identifying and estimating the duration of the activities that will produce the project deliverable and developing a schedule to guide the project's execution.
3.7	Develop stakeholders communication plan	Understanding the stakeholders' needs and identifying how to communicate and engage with different stakeholders.
3.8	Develop change management plan	Documenting the strategies and processes used to manage and deal with project changes.
4.1	Product development	Developing the barkery ordering system.
4.1.1	Design the product	Brainstorming to gather ideas on how to build a system that aligns with the project objectives to address specific needs.
4.1.2	Build prototype	Developing a preliminary of the bakery ordering system for design testing and refining and

		convincing the stakeholders to support the project.
4.1.3	Create a user guideline manual	Documenting a user manual to provide comprehensive instructions on how to use the bakery ordering system.
4.1.4	Document milestone report, progress report, and evaluation report	Recording the milestones achieved, project progress, and evaluating the project regularly for easier review and future improvement.
4.2	Product testing	Testing the system to ensure the features and functionality, security, quality, performance, and stability of the system are working as expected.
4.2.1	Acquire test case report from contractor	Collecting the test case report from the outsoured contractor and acknowledging the issues reported from the alpha testing.
4.2.2	Acquire feedback from beta-users	Obtaining feedback from the beta-testers to analyze the user experience and software quality.
4.2.3	Debug issues and refine product design based on product testing	Fixing issues and bugs and making changes to enhance user experience.
5.1	Monitor and control variances	Identifying variances that occur in the project, taking corrective or preventive action on the variances, and monitoring the effect of the actions
5.1.1	Control scope, schedule, cost, and quality	Monitoring and controlling the project to progress according to the planned scope and schedule and making sure the deliverables meet the quality standards within the approved budget.

5.2	Document performance report	Measuring and recording the project's possibility of success and the compatibility of the project against the project's goal regularly.
5.3	Document change request	Recording the project changes in the change request to keep the project stakeholders on the same page.
6.1	Acquire official approval and acceptance from stakeholders	Obtaining formal approval and sign-off to close the project.
6.2	Post-project review	Conducting review after the completion of the project to reflect on the project.
6.2.1	Presentation	Team members present their opinion on how to improve future projects and the lessons learned.
6.2.2	Analyze project performance	Comparing actual project cost, schedule, and quality to the predefined measurement baseline.
6.2.3	Assess stakeholders' satisfaction	Collecting feedback from the stakeholders and measuring their satisfaction with the project and its results.
6.3	Finalize project documentation and create lessons-learned reports	Compiling all project documentation and documenting the lesson learned from the project.
7.1	Fix bugs or upgrade as needed	Maintaining the system post-implementation by fixing bugs found and performing system upgrades regularly.

Chapter 8: Schedule Management

8.1 Gantt Chart

Figure 8.1 is the Gantt chart of our project. The project is implementing the waterfall model. The project timeline begins with pre-initiation, where a feasibility analysis is conducted and a business case is developed to assess the project's viability. During the initiation phase, a project manager is appointed, and a kick-off meeting is held to discuss requirements and secure sponsorship. The planning phase involves defining the project scope and developing cost, resource, and risk management plans. The execution phase is divided into product development which includes designing and prototyping, and product testing which involves alpha-testing provided by outsourced contractors, and beta testing from end users. During the closing phase, it is important to obtain official approval from the stakeholders. In addition, a post-project review takes place to identify areas for improvement through a presentation and analyzing the project performance and stakeholders' satisfaction. Among these phases, monitoring and controlling and maintenance has no deadline as monitoring and controlling is an ongoing process that keeps the project's scope, schedule, cost, and quality on track toward the goal while maintenance aims to keep the system stable. A clearer version of the Gantt chart can be accessed using the link in Appendix B.

Figure 8.1: Gantt chart

8.2 Critical Path Analysis

This section discusses the critical path of the project. Figure 8.2 shows the network diagram of our project. Not all WBS activities are shown in the network diagram; and only the activities with dependencies are included. Since our project is using a waterfall approach, the network diagram will be growing horizontally. Dummy link is used in the network diagram to show a logical sequence, and it is represented in red dotted line. The critical path of this project includes 18 activities which start from conducting feasibility analysis. It then extends to develop a business case, appoint manager, secure sponsorship, outline project's objectives, scopes, budget, schedules, and resources, collect requirements, create cost baseline, identify potential risk, plan risk response, develop change management plan, design the product, build prototype, create user guideline manual, acquire feedback from beta-users, debug issues and refine product design based on product testing, acquire official approval and acceptance from stakeholders, assess stakeholders' satisfaction, and finally ends at finalize project documentation and create lessons-learned reports. This sequence is the longest path as it takes 1994 days to complete. A clearer version of Figure 8.2 can be assessed using the link at Appendix B.
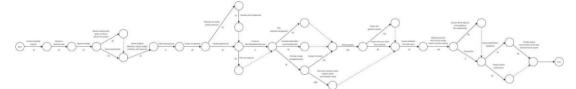

Figure 8.2: Network Diagram

Table 8.1 summarizes the predecessor and duration of each activity on the critical path that has dependencies. A predecessor is that the activity must start or end before a successor task can proceed.

Table 8.1: Predecessor and Duration of WBS Activities

Activity	Predecessor	Duration
Conduct feasibility analysis	-	45
Develop a business case	Conduct feasibility analysis	45
Appoint manager	Develop a business case	30

Discuss requirements, goals, and future plans of the project	Appoint manager	80
Secure sponsorship	Appoint manager	110
Outline project's objectives, scopes, budget, schedules, and resources	Secure sponsorship	20
Collect requirements	Outline project's objectives, scopes, budget, schedules, and resources	14
Create cost baseline	Collect requirements	60
Estimate and assign activity resource	Create cost baseline	42
Develop and manage team	Estimate and assign activity resource	15
Identify potential risk	Create cost baseline	42
Plan risk response	Identify potential risk	30
Construct Work Breakdown Structure	Identify potential risk	9
Plan schedule management	Construct Work Breakdown Structure	25
Develop stakeholders communication plan	Construct Work Breakdown Structure	25
Develop change management plan	Construct Work Breakdown Structure	25
Design the product	Develop change management plan	759

Build prototype	Design the product	336
Create user guideline manual	Build prototype	120
Document milestone report, progress report, and evaluation report	Develop change management plan	1095
Acquire test case report from contractor	Build prototype	60
Acquire feedback from beta-users	Acquire test case report from contractor	45
Debug issues and refine product design based on product testing	Acquire feedback from beta-users	105
Acquire official approval and acceptance from stakeholders	Debug issues and refine product design based on product testing	90
Presentation	Debug issues and refine product design based on product testing	2
Analyze project performance	Presentation	30
Assess stakeholders' satisfaction	Presentation	30
Finalize project documentation and create lessons-learned reports	Assess stakeholders' satisfaction	88

8.3 PERT Analysis

PERT estimation technique allows us to build in the uncertainties that might happen to our project and help us to complete the project ahead of expected time. Equation 8.1 calculates the PERT estimate of a task.

$$PERT\ Estimate\ = \frac{Optimistic\ time\ +\ (4\times Most\ likely\ time)\ +\ Pessimistic\ time}{6} \qquad (8.1)$$

where:

- Optimistic time: The minimum amount of time needed to accomplish a task
- Pessimistic time: The maximum amount of time needed to accomplish a task
- Most likely time: The best estimate of how long it will likely take to accomplish a task

We can use Equation 8.2 to calculate the weighted average to reduce uncertainty from the estimation and increase accuracy.

$$average\ project\ timeline\ = \frac{\Sigma\ (expected\ time\ per\ task)}{total\ task} \qquad (8.2)$$

Table 8.2 shows the PERT estimate of each WBS Activities. It is important to note that the average project timeline for each activity, as estimated in the PERT analysis, can help in identifying potential bottlenecks or activities that require additional attention. By understanding the expected duration for each activity, project managers can allocate resources and manage the project more effectively. Using the PERT estimate schedule, the critical path identified in Chapter 8.2 which takes 1994 days to complete the activities that determine the earliest time by which our project can be completed is shorten to 1982.5 days. The duration is reduced by 11.5 days. This analysis highlights the importance of considering estimated durations and uncertainties in project planning and management.

Table 8.2: PERT Estimate of each WBS Activities

	Optimistic time	Most likely time	Pessimistic time	PERT Estimate
Conduct feasibility analysis	34	45	50	44.00
Develop a business case	34	45	50	44.00
Appoint manager	22	30	32	29.00

Discuss requirements, goals, and future plans of the project	60	80	82	77.00
Secure sponsorship	85	110	120	107.50
Outline project's objectives, scopes, budget, schedules, and resources	15	20	31	21.00
Collect requirements	12	14	25	15.50
Create cost baseline	52	60	74	61.00
Estimate and assign activity resource	37	42	50	42.50
Develop and manage team	10	15	20	15.00
Identify potential risk	34	42	50	42.00
Plan risk response	25	30	35	30.00
Construct Work Breakdown Structure	6	9	15	9.50
Plan schedule management	20	25	30	25.00
Develop stakeholders communication plan	20	25	30	25.00
Develop change management plan	20	25	30	25.00
Design the product	730	759	770	756.00

Build prototype	313	336	365	337.00
Create user guideline manual	90	120	135	117.50
Document milestone report, progress report, and evaluation report	1043	1095	1135	1093.00
Acquire test case report from contractor	55	60	74	61.50
Acquire feedback from beta-users	30	45	60	45.00
Debug issues and refine product design based on product testing	90	105	120	105.00
Acquire official approval and acceptance from stakeholders	70	90	95	87.50
Presentation	2	2	2	2.00
Analyze project performance	22	30	32	29.00
Assess stakeholders' satisfaction	22	30	32	29.00
Finalize project documentation and create lessons-learned reports	77	88	90	86.50

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Appendix

Appendix A

Hardware Price

Figure A1: ASUS ROG Strix G531GT Price

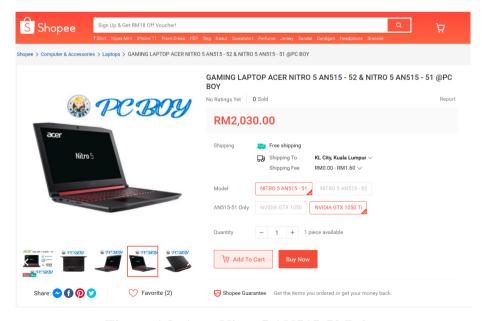**Figure A2: Asus TUF FX504G Price**

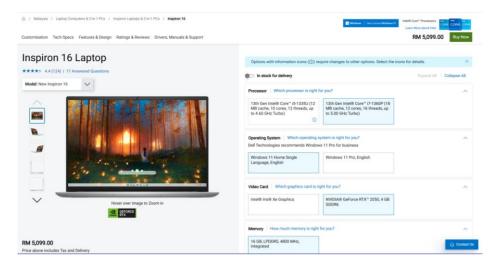**Figure A3: Acer Nitro 5 AN515-52 Price**

Figure A4:Dell Inspiron 16 Price

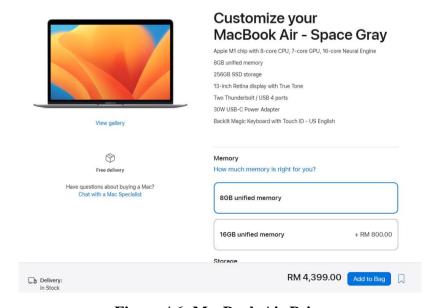**Figure A5: Samsung Galaxy S23 Price**
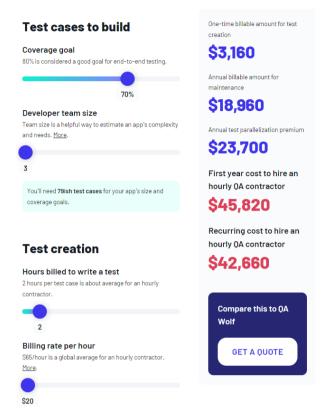

Figure A6: MacBook Air Price

Testing

Figure A7: Outsource testing price breakdown

Cash Inflow

Figure A8: Business Accelerator Programme (BAP 3.0) Grant

Cash Outflow

Schedule of Benefits

SECTION	COVERAGE / INTEREST INSURED	SUM INSURED/ LIMITS OF LIABILITY (RM)				
		Plan A	Plan B	Plan C	Plan D	Flexi²
A	**FIRE**					
	Loss or damage to building, stock in trade, fixtures, fittings, and furniture, and other contents caused by fire, lightning, and/or other optional perils selected	Mandatory cover - Sum Insured to be determined by the Insured				
B	**BURGLARY**					
	Loss or damage to property insured under Section A (excluding air-conditioner compressor) due to theft	35k	50k	80k	100k	___
C	**MONEY³**					
	a) Money in Insured Premises					
	i. Cash kept in the locked cabinet, locked drawer, cash registers and/or petty cash boxes	3k	4k	5k	7k	___
	ii. Cash kept in locked safe or strongroom:					
	- During business hours	10k	20k	30k	40k	___
	- After business hours	6k	10k	20k	30k	___
	iii. Cash kept in the premise not otherwise described in (i) and (ii) above	1.5k	2k	4k	6k	___
	b) Money in Transit	10k	20k	30k	40k	___
	c) Personal Accident (Assault) per person (up to 4 persons, age 18-70 years old)⁴	10k	10k	10k	10k	___
	d) Money via Electronic Funds Transfer	10k	20k	30k	40k	___
D	**PUBLIC LIABILITY**					
	On Insured's legal liability to third parties for bodily injury/death and/or property damage					
	• Limit on any one event	200k	300k	500k	1 mil	___
	• Limit on any one period	1 mil	1 mil	1 mil	1 mil	___
E	**PLATE GLASS, SIGNAGE AND SIGNBOARD**					
	To fixed glasses, signage and signboard	5k	10k	15k	20k	___
F	**EMPLOYER'S LIABILITY**					
	On employees					
	• Limit on any one event	100k	200k	300k	500k	___
	• Limit on any one period	1 mil	1 mil	1 mil	1 mil	___
G	**GROUP PERSONAL ACCIDENT⁵**					
	On accidental death and permanent disablement (up to 15 persons, age 18-70 years old) – per person	15k	20k	25k	30k	___
H	**FIDELITY GUARANTEE**					
	On employees Aggregate limit per policy	10k	20k	30k	40k	___

SECTION	COVERAGE / INTEREST INSURED	SUM INSURED/ LIMITS OF LIABILITY (RM)				
		Plan A	Plan B	Plan C	Plan D	Flexi²
I	**MACHINERY BREAKDOWN (optional⁶)**					
	On machineries used in the insured premises	35k	50k	80k	100k	___
J	**ALL RISKS (optional⁶)**					
	On office equipment, computers and peripherals, furniture and fittings, and the like	Sum Insured to be determined by the Insured				
K	**FIRE CONSEQUENTIAL LOSS (optional⁶)**					
	Consequential loss following a fire, lightning or any of the optional perils in Section A	Sum Insured to be determined by the Insured				
	ANNUAL PREMIUMS (RM)					
A		Refer to Note 1				
B-H	Subject to the applicable Government Tax at prevailing rate and RM10 stamp duty	497.85	761.52	1,096.96	1,492.50	Refer to Note 1
I-K		Refer to Note 1				

Note:
1. Refer to AIA General Berhad or AIA Life Planner for quotation.
2. For Flexi Plan, all sections are optional cover (i.e. Section B to K) except for Section A – Fire which is mandatory. Customers are required to select a minimum of 3 sections among Section B to K and to determine the desired sum insured amount.
3. For Flexi Plan, all subsections under Section C are not allowed to be unbundled if Section C is selected.
4. For Flexi Plan, customers are allowed to input the number of persons, up to a maximum of 10 persons under Section C (c).
5. For Flexi Plan, customers are allowed to input the number of persons, up to a maximum of 30 persons under Section G.
6. For Fixed Plan A-D, all sections from Section A to H are mandatory cover with Sum Insured as per stated in the Schedule of Benefits, while Section I to K are optional.
7. AIA General Berhad will only be liable for one (1) plan of this product issued per insured risk. If there are more than one (1) plan being covered, AIA General Berhad will only pay the benefit under one plan which AIA General Berhad will nominate, and refund in full any premiums that were paid under other plans.

Figure A9: AIA Insurance Plan

Loan calculator

Financing Amount

MYR **300,000**

20,000 — 500,000

To be paid over

5 year(s)

1 year — 7 year

Indicative interest/profit rate

6.5 %

5.9 — 13.78

Estimated monthly payment

MYR

6,625.00

Results from the calculation are provided as a guide and do not constitute an offer

Figure A10: Alliance Loan Calculator

2. Tariff B **Low Voltage Commercial Tariff** For all kWh The minimum monthly charge is RM7.20	sen/kWh	32.3
3. Tariff C1 **Medium Voltage General Commercial Tariff** For each kilowatt of maximum demand per month For all kWh The minimum monthly charge is RM600.00	RM/kW sen/kWh	19.50 23.4
4. Tariff C2 **Medium Voltage Peak/Off-Peak Commercial Tariff** For each kilowatt of maximum demand per month during the peak period For all kWh during the peak period For all kWh during the off-peak period The minimum monthly charge is RM600.00	RM/kW sen/kWh sen/kWh	29.00 23.4 14.4

Figure A11: Tariff code category

How do we calculate it?

First 200 kWh(1-200 kWh) per month: (200*43.50)/100	=	RM 87.00
For the next kWh (201 kWh onwards) per month: (1450*50.90)/100	=	RM 738.05
Estimated Bill:	=	RM 825.05

Details	ST not applicable	ST applicable	Total
Consumption (kWh)	1,650	0	1,650
Consumption (RM)	825.05	0	825.05
Green Electricity Tariff (RM)	0	0	0
ICPT (RM0.037 per kWh)	61.05	0	61.05
Current Month Consumption (RM)	886.10	0	886.10
Current Bill (RM)			886.10

Figure A12: myTNB electric bill calculator

Figure A13: Unifi Business Data Plan

Capital Budgeting

Figure A14: Malaysia CPI Inflation Calculator

Appendix B

WBS Chart

URL to Figure 7.1:

https://drive.google.com/file/d/18hvXZK60sic3m8VgxacUOTiCh60J48E2/view?usp=sharing

Schedule Management

URL to Figure 8.1:

https://drive.google.com/file/d/1GG11IaWmzK4XSkcXqFp02VLzoj0fSDTv/view?usp=sharing

Critical Path Analysis

URL to Figure 8.2:

https://drive.google.com/file/d/1jzR5zW-PJK3rRDdXbAp_r1_YSymLcD2f/view?usp=sharing