[MY UTEM LAPTOP SERVICE]

[MUHAMMAD IKHWAN BIN CHE ROSS]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report is submitted in partial fulfillment of the requirements for the Bachelor of [Computer Science (Database Management)] with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2024

DECLARATION

I hereby declare that this project report entitled

[MY UTEM LAPTOP SERVICE]

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

STUDENT : ______________ ________________ Date : 2 Sep. 24

([MUHAMMAD IKHWAN BIN CHE ROSS])

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

SUPERVISOR : ____ Date : 3/9/2024

([NOOR AZILAH BINTI DRAMAN@MUDA])

DEDICATION

Alhamdulillah, all praise and thanks are due to Allah (SWT), for His abundant grace and blessings bestowed upon us. With His permission and divine guidance, I have been able to complete this final project report for my bachelor's degree. This report is a significant milestone in my academic journey, and I am deeply grateful to Allah (SWT) for granting me the strength and perseverance to see it through. I would also like to express my heartfelt appreciation to my beloved mother and family members for their unwavering support and encouragement throughout this journey. My deepest gratitude goes to my project supervisor, Noor Azilah Muda, whose guidance and insights were invaluable to the completion of this project. I am also thankful to my comrades at Universiti Teknikal Malaysia Melaka (UTeM) for their support and camaraderie. This report is particularly meaningful to me as it signifies the completion of my studies in the Bachelor of Computer Science (Database Management) with Honors. Indeed, without the motivation and encouragement from those mentioned above, I would not have been able to complete and submit this final report on time. May Allah (SWT) reward them all for their kindness and support.

ACKNOWLEDGEMENTS

I want to thank you for your help and words of encouragement that have encouraged me to complete the system and at the same time the Final Report of this bachelor’s degree Project. I express my deepest appreciation to Puan Noor Azilah Binti Draman@Muda as the project supervisor for helping a lot by giving guidance, suggestions and emphasis as well as monitoring the ongoing project smoothly.

Thank you also to the Faculty of Information and Communication Technology (FTMK) who offered me a bachelor’s degree in project implementation as one of the conditions for awarding me a bachelor’s degree in computer science (Database Management) with honours. There is no denying that with the implementation of this bachelor’s degree Project, the objective is to produce students with high marketability. Finally, a chain of appreciation is given to comrades who provided moral support in completing the final report of this bachelor's degree project.

ABSTRACT

This project report presents the development of the "My UTeM Laptop Service" (MyUTeMLS) system, a web-based platform designed to improve the laptop service experience for staff and students at Universiti Teknikal Malaysia Melaka (UTeM). The project was developed to address critical issues in the existing manual system, including unclear service options, lack of real-time service updates and inadequate reporting mechanisms. The new system provides a comprehensive menu of services, allowing users to easily identify and select the services they need. Additionally, it offers real-time status tracking of repair progress and generates detailed reports for better management and decision making. The project follows a systematic methodology, covering analysis of current issues, more efficient system design, implementation of key functions, and rigorous testing to ensure reliability and performance. As a result, the "My UTeM Laptop Service" system has significantly improved operational efficiency, communication and user satisfaction, providing a robust solution to the challenges faced by the UTeM community in managing laptop services.

ABSTRAK

Laporan projek ini membentangkan pembangunan sistem "My UTeM Laptop Service" (MyUTeMLS), platform berasaskan web yang direka untuk meningkatkan pengalaman perkhidmatan komputer riba untuk kakitangan dan pelajar di Universiti Teknikal Malaysia Melaka (UTeM). Projek ini dibangunkan bagi menangani isu kritikal dalam sistem manual sedia ada, termasuk pilihan perkhidmatan yang tidak jelas, kekurangan kemas kini perkhidmatan masa nyata dan mekanisme pelaporan yang tidak mencukupi. Sistem baharu ini menyediakan menu perkhidmatan yang komprehensif, membolehkan pengguna mengenal pasti dan memilih perkhidmatan yang mereka perlukan dengan mudah. Selain itu, ia menawarkan pengesanan status masa nyata kemajuan pembaikan dan menjana laporan terperinci untuk pengurusan dan membuat keputusan yang lebih baik. Projek ini mengikut metodologi yang sistematik, meliputi analisis isu semasa, reka bentuk sistem yang lebih cekap, pelaksanaan fungsi utama, dan ujian yang ketat untuk memastikan kebolehpercayaan dan prestasi. Hasilnya, sistem "Perkhidmatan Komputer Riba UTeM Saya" telah meningkatkan kecekapan operasi, komunikasi dan kepuasan pengguna dengan ketara, memberikan penyelesaian yang mantap kepada cabaran yang dihadapi oleh komuniti UTeM dalam menguruskan perkhidmatan komputer riba.

TABLE OF CONTENTS

PAGE

LIST OF TABLES

PAGE

LIST OF FIGURES

PAGE

LIST OF ABBREVIATIONS

FYP	**-**	**Final Year Project**

LIST OF ATTACHMENTS

CHAPTER 1: INTRODUCTION

1.1 Introduction

The "My UTeM Laptop Service" project aims to provide a comprehensive website system that offers various laptop services to staff and students of Universiti Teknikal Malaysia Melaka (UTeM). Laptops are widely used for a variety of tasks, including academic research, online learning, coursework and administrative tasks. Imagine the laptop was damaged while completing the assignment. Panic sets in as the deadline approaches. Therefore, this project is an important service to the UTeM community to deal with laptop problems.

Nowadays, various laptop service systems have been developed; however, some problems can be identified in the existing system. Among them, the less clear service menu makes it easy for customers to identify the services offered by the laptop service center. Further, in most existing systems, customers are not informed of the progress of their laptop repair or maintenance, leaving them with no idea when their device will be ready for use again. In addition, the current systems do not include specific features to generate reports that can help staff identify their sales and service performance. Without these reporting capabilities, staff members struggle to analyze their sales data.

The objective of this system was to address the identified problems and enhance the overall user experience. Firstly, the system aims to develop a detailed and visually appealing service menu that clearly describes the range of services offered, ensuring that customers can easily identify and select the services they need. Next is, to provide a feature in the system that allows customers to track the status of their laptop repair in real time. furthermore, this system was also developed to overcome the limitations of current systems by incorporating specific features that generate comprehensive reports.

My UTeM Laptop Service represents an important step forward for the university, aiming to transform the entire laptop service experience. By prioritizing user needs and delivering a user-friendly, efficient and transparent system, this platform will make laptop services at UTeM more accessible and beneficial for the entire UTeM community.

1.2 Problem Statement

Existing laptop service systems often lack key features that hinder their effectiveness and user satisfaction. One major issue is the unclear and simple service menu in this system. This inadequacy makes it difficult for customers to understand and choose easily from the range of services offered by laptop service centers. As a result, customers may experience confusion and frustration when trying to identify whether their specific service needs can be met.

Another important problem is the lack of communication regarding the current status of the customer's laptop service. In most existing systems, customers are not informed about the progress of their laptop repair or maintenance. Customers really want to know about the status of their laptop service. This lack of transparency means customers won't know when their devices will be ready to use again, causing discomfort and uncertainty, especially for those who rely heavily on their laptops for academic and administrative tasks.

Additionally, the current system does not include specific features to generate reports that can help staff identify their sales and service performance. Without accurate reporting capabilities, staff members will struggle to analyse their sales data and make informed business decisions. An effective business report is very important for a service centre to know the current performance of its business. The absence of report facilities will hinder the service centre's ability to optimize its operations, make informed business decisions and improve its service offerings because it does not have reports that display current information on business and services offered to customers.

This problem emphasizes the need for a comprehensive and user-friendly solution, such as the "My UTeM Laptop Service" project, which aims to address this issue by providing a clear and detailed service menu, real-time updates on service status, robust communication channels, and advanced reporting features to improve customer support, staff efficiency and overall service quality.

1.3 Objective

The "My UTeM Laptop Service" project aims to address the problems of the existing laptop service system and improve the overall user experience for UTeM staff and students. To address the problem, this project will be developed based on several objectives. The main objective of this project is:

a) **Detailed Service Menu:**

This project aims to create a service menu that is not only comprehensive but also visually appealing and user-friendly. This menu will clearly explain the range of services offered by the "My UTeM Laptop Service" centre and the flow of data in the system. By improving the clarity and accessibility of service information, this objective aims to make it easier for service centre staff, and customers to use the system. This detailed service menu will help service centre staff manage the system easily and make it easier for customers to choose the specific services that they need easily. These improvements are important in reducing confusion and ensuring customers can make informed decisions about their laptop service needs.

b) **Real-Time Status Tracking:**

One of the special features that we want to keep in this system is the real-time tracking feature. This feature will allow users to monitor the progress of their laptop repair or maintenance activities in real-time. By providing transparent updates on the status of each service request, this system aims to increase user satisfaction and communicate the status of service to customers.

c) **Interactive Reporting Features:**

One of the main objectives of this project is to introducing reporting capabilities. This feature will allow staff members to generate comprehensive reports that analyse sales data, service report, inventory report and customer satisfaction indicators. By leveraging data from reports, the system empowers staff to make informed decisions, optimize operational workflows and improve service quality. This objective emphasizes the project's commitment to operational excellence and continuous improvement in the "My UTeM Laptop Service" centre.

1.4 Scope

The scope involved in the My UTeM Laptop Service. This system divided into two parts, which are involvement of user and module types. The scope is described as follows:

1.4.1 Target User:

a) **Staff:** Staff members have different roles, such as ‘technicians’ that responsible for diagnosing and fixing laptop issues, ‘administrators’ that will oversee system operations, manage staff roles, and ensure smooth functioning and ‘inventory staff’ that responsible to manage the store inventory.

b) **Customer:** Laptop users facing repair needs can utilize the system to browse service offerings, track their repair progress in real-time, and share feedback on both the service quality and the system's usability.

1.4.2 Module to be develop:

a) User Management Module

This module includes functions such as registration, login and logout. Users will register to create a new account with email, password, address, and phone number. Password and username will be used to access the system. Users are divided into two categories: customers and staff. Staff will be assigned to specific roles, responsibilities, and access levels. This module also includes functions such as registration, login and logout. Staff will register to create a new account with email, password, email, and phone number. password and email will be used to access the system. Customer information will be added to the system by staff when they want to have services.

b) Service Status Module

This module will inform customers about the service status of their laptops. Staff will update the status of repairs throughout the lifecycle, using predefined steps such as 'Pending', 'Completed' and 'Paid'. Customers will receive a tracking number via email when they finish sending the laptop for service. Customers will use the tracking number on the website to notify the status of their laptop service in real time.

c) Inventory Module

This module is used to track and manage inventory used for laptops service. The function that will be developed in this module is the categorization of parts that will help staff to organize parts by type and model. A low stock alert function will also be implemented in this module to track stock that falls below a set number. This module will make it easier for staff to manage inventory and ensure inventory is always sufficient.

d) Customer Module

Staff can register new customers by entering details such as name, email, and other relevant information into the database. This module also supports updating and deleting customer records, tracking customer service history, viewing submitted feedback, and generating reports based on customer interactions.

e) Payment Module

The Payment Module was designed to handle all financial transactions within the system. It supports various payment methods, ensures secure processing, and records payment histories for future reference. The module also generates invoices and receipts automatically.

f) Feedback Module

This module will provide a platform for customers to give their feedback, such as suggestions for improvements and ratings for the service and system.

g) Report Module:

The purpose of this module is to enable staff to generate comprehensive reports to analyse sales and service performance. Ability to generate reports on various metrics such as service report, inventory report, customer feedback analysis and inventory usage. The report template can be customized according to the desired date to meet specific operational and management needs.

1.5 Project Significant

The project "My UTeM Laptop Service" provides significant benefits to various stakeholders in Universiti Teknikal Malaysia Melaka (UTeM). For students, faculty staff and service center staff, it offers an enhanced user experience through a user-friendly interface, real-time tracking of repair status, better communication and feedback mechanisms, all of which reduce confusion and anxiety while fostering satisfaction and engagement. Technicians and customer service staff benefit from streamlined operational processes, efficient inventory management and data-driven decision making enabled by comprehensive reporting features. Administrators gain a centralized platform for system oversight, performance monitoring and strategic planning. Overall, the institution benefits from increased productivity, enhanced reputation and optimal use of resources, making this project an important enhancement to UTeM's support for the technical needs of its community.

1.6 Expected Output

The "My UTeM Laptop Service" project is expected to deliver a user-friendly interface featuring a clear and detailed menu that allows customers to easily navigate and identify available services. The system will generate unique tracking numbers for each service request, enabling customers to track the status of their laptop repairs in real time using these numbers. Additionally, the project aims to produce accurate and comprehensive sales reports, encompassing service reports, inventory reports, and supplier reports, all of which can be printed directly through the system. These outputs will collectively enhance the user experience, streamline service operations, and provide valuable insights for staff to optimize service delivery and inventory management.

1.7 Conclusion

In this chapter, we have outlined the scope and importance of the "My UTeM Laptop Service" project, which aims to improve the laptop service experience for the Universiti Teknikal Malaysia Melaka (UTeM) community. We have identified target users, including staff, and customers and detailed the various modules to be implemented, such as user management, service status tracking, inventory management, feedback collection and interactive reporting. Expected outputs include a user-friendly interface, real-time service tracking and accurate sales and service performance reports. The importance of this project is evident in the various benefits it offers, from improved user experience and operational efficiency to customers.

CHAPTER 2: PROJECT METHODOLOGY AND PLANNING

2.1 Introduction

This chapter provides an overview of the methodology and planning involved in the "My UTeM Laptop Service" project. It outlines the database life cycle (DBLC) phases related to the project, describes the specific tasks associated with each phase, and details the project schedule and milestones. The structured approach ensures systematic development and implementation, aiming to deliver a robust and user-friendly laptop service system.

2.2 Project Methodology

The "My UTeM Laptop Service" project follows the Database Life Cycle (DBLC) phase, ensuring a systematic approach to database development and implementation. DBLC is a series of phases that provide a systematic approach to the planning, creation, implementation and maintenance of a database system. These phases ensure that the database is designed to meet user needs, is implemented correctly, functions efficiently, and can be maintained and expanded as needed. DBLC phases related to this project include:

Table 2-1: Project Database Life Cycle

Phase	Task
Database Initial Study	During the Initial Database Review phase, a thorough analysis of the "My UTeM laptop service" system requirements will be conducted. This will involve gathering input from key stakeholders such as staff, technicians, administrators and customers through

	interviews. in this phase the current system workflow will be documented to clearly identify areas for improvement. The focus is defining the critical data entities, attributes and relationships required to support the core functionality of the system. In parallel, specific problems that the new system seeks to solve will be identified, such as unclear service menus, lack of real-time status updates and limited reporting capabilities. Any technical, budget or timeline constraints that may impact the project will also be identified. Finally, the scope and measurable objectives for the database will be clearly defined, such as enabling real-time status tracking and generating comprehensive service and sales reports. Task: 1) Identify and analyze the requirements of the UTeM laptop service system. 2) Define the problem and constraints 3) Define the scope and objectives of the database.
Database Design	The Database Design phase will commence with creating a conceptual model of the system using Entity-Relationship Diagrams (ERDs). The project team will identify the key entities such as users, services, repairs, inventory and feedback, along with their attributes. The relationships between these entities will be defined, including one-to-many and many-to-many associations. The ERD will be validated with stakeholders to ensure it accurately captures the system requirements. Next, the conceptual ERD will be translated into a logical schema with relational tables, columns and data types. Tables will be normalized to eliminate data redundancy and anomalies, and primary

	and foreign keys will be defined to enforce referential integrity. Task 1) Create a conceptual design using Entity-Relationship Diagrams (ERD). 2) Develop a logical design to map entities to relational tables.
Implementation and Loading	The Implementation and Loading Phase begins by installing and setting up the chosen Database Management System (DBMS), such as XAMMP, on the appropriate server and configuring it for optimal performance. The logical schema will then be implemented by creating tables, indexes and constraints in the DBMS. Stored procedures, functions and triggers can also be written to implement business logic in the database layer. Scripts will be developed to extract, transform and load data from existing systems if we want to transform data to the new system. Data integrity and completeness will be verified after loading to ensure a smooth transition. Task 1) Install and setup DBMS 2) Create the database 3) Load or convert data
Testing and Evaluation	The Testing and Evaluation phase will verify that the database correctly implements the functional requirements through rigorous testing. Functional testing will cover both positive and negative scenarios. Performance testing will measure the database's ability to handle the expected load in terms of concurrent users and data volume. Any identified performance bottlenecks will be addressed through query optimization and indexing. Security testing will assess

	the database's resilience against SQL injection and other attacks, ensuring appropriate access and authorization controls are in place. Task 1) Functional Testing 2) Performance Testing 3) Security Testing
Operation	Once the database is live, the operation phase will involve continuously monitoring its performance using monitoring tools to track key metrics like CPU, memory, disk I/O and connections. Any performance issues or resource constraints will be proactively identified and resolved. Task: 1) Continuously monitor database performance and health. 2) Produce the required system flow
Maintenance and Evaluation	The final phase is Maintenance and Evaluation, which will involve ongoing monitoring of the database's performance and addressing any issues or errors that arise. Feedback from customers will be gathered on desired improvements or new features. These enhancements will be prioritized and implemented to optimize the database schema and functionality based on evolving needs and best practices. Task: 1) Monitor system performance and fix issues 2) Implement enhancements based on user feedback

2.3 Project Schedule and Milestones

Table 2-2: Project Schedule

Milestones	Expected Document	Start Dates	End Date
Identify and analyze the requirements of the UTeM laptop service system.	Project Proposal	11 March 2024	22 March 2024
Problem identification and analysis			
Define the scope and objectives of system			
Conceptual design of proposed system	a) Complete Entity Relationship Diagram (ERD) b) Context Diagram c) Data Flow Diagram (DFD)	22 March 2024	1 April 2024
Develop a logical design to map entities to relational tables.			
Install and setup DBMS	a) XAMMP installation b) Database schema	1 April 2024	5 April 2024
Create the database			
System Development	a) System Interface b) Front end c) Back end	6 April 2024	10 Jun 2024
System and Database testing	a) Test Plan and Result	10 Jun 2024	14 Jun 2024
Monitor system performance and fix issues		1 Jun 2024	15 Jun 2024
Project Demostration	Complete System	20 Jun 2024	20 Jun 2024
Report Submission	Complete Report	20 Jun 2024	20 Jun 2024

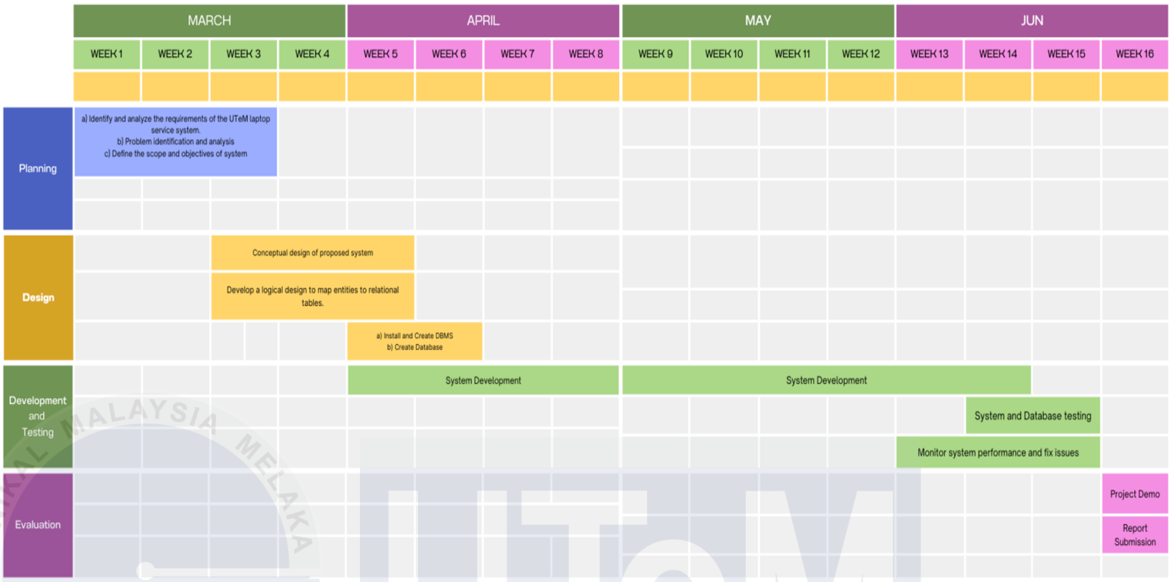


Figure 2-1: Gantt Chart

2.4 Conclusion

This chapter describe the phased approach and key tasks that will guide the development of the "My UTeM Laptop Service" system. The project will follow a standard Database Life Cycle (DBLC) methodology, consisting of an initial study to gather requirements, a design phase to create conceptual and logical models, an implementation phase to set up the database and load data, a testing phase to validate functionality and performance, an operational phase to monitor and maintain the system, and a maintenance phase to continuously enhance the system based on user feedback. Milestones and deliverables are defined for each phase, such as documenting requirements, developing ERDs and schemas, deploying the application, and generating reports. By adhering to this structured methodology and executing the tasks within each phase, the project aims to successfully deliver a robust and user-friendly laptop service system that meets the evolving needs of the UTeM community.

CHAPTER 3: ANALYSIS

3.1 Introduction

In this chapter, it will conduct a thorough analysis of the current laptop service system at UTeM and propose improvements to address the identified problems. System analysis is a methodical procedure that includes data analysis, workflow modelling, information collecting, and system requirement definition. This analysis helps in the development, execution, or optimization of a system to successfully accomplish its intended objectives. In the following sections, we will cover the analysis of the current system and propose the design of the improved "to-be" system. The current system will be investigated and described using suitable diagrams to illustrate the problems and constraints. We will then define the functional and non-functional requirements for the proposed system, including the process model, quality attributes, and other technical specifications.

3.2 Problem Analysis

The current laptop service center located at the UTeM main campus operates without an integrated system, relying entirely on paper-based methods to record data. This manual approach results in some inefficiencies and customer dissatisfaction. Key issues identified in the current system include:

a) **Lack of System Integration:** No digital system is available, all records are maintained manually on paper, which increases the risk of data loss and errors.

b) **Unclear Service and Price Information:** Customers do not know the services offered and their respective prices, which leads to confusion and lack of transparency. Existing services only promote their services through banners.

c) **Inefficient Service** Workflow: When customers bring their laptops to the service center, they verbally describe their needs. The staff then asks for the customer's phone number and name, recording only their contact information. This information is not organized or stored systematically.

d) **No Service Status Updates:** Customers do not know about the repair status of their laptops. They must proactively contact the service centre via WhatsApp to inquire about progress, which is inconvenient and inefficient.

e) **No Receipt After Payment:** After the service is completed and paid for, the customer does not receive any receipt, which is unprofessional and may lead to disputes regarding payment and services rendered.

This lack of systematization leads to disorganized workflows, poor customer service and potential data inaccuracies. The following Data Flow Diagram (DFD) illustrates the current service flow.

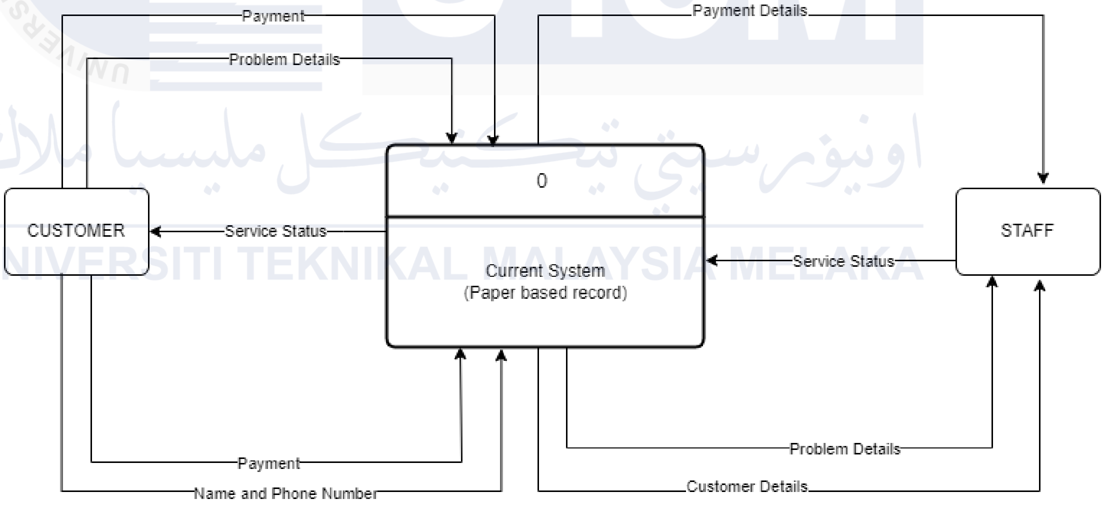


Figure 3-1: Context Current System

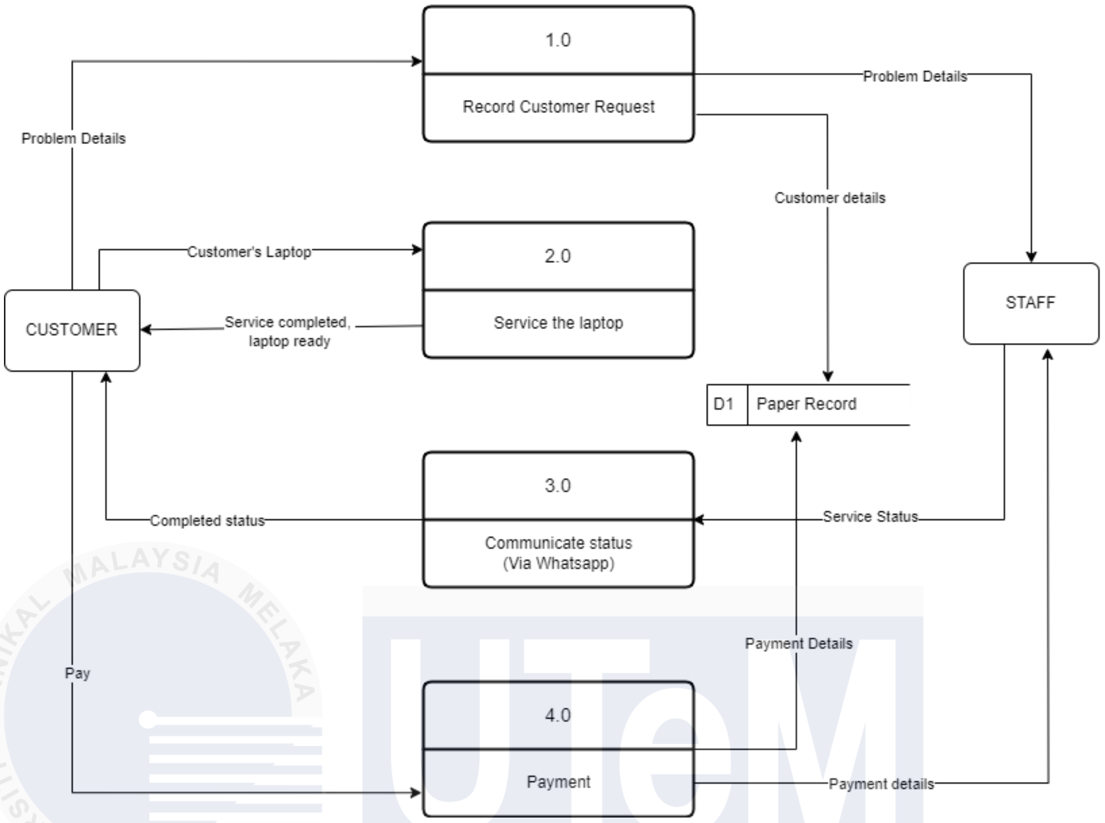


Figure 3-2: Data Flow Diagram Level 1 Current System

3.3 The proposed improvements/solutions

3.3.1 Suggestion Improvement

a) Implement a web-based system to manage all service-related activities.

The web-based system centralizes all service-related activities, streamlining operations for both staff and customers. This eliminates the need for paper records, fostering a more organized and environmentally friendly system. Staff can efficiently manage service requests and access customer information, while customers can track repair progress and access relevant information. All through a user-friendly web interface.

b) Implement an online service menu that clearly lists all available services and prices.

An online service menu with clear descriptions and prices for all available services empowers customers. This user-friendly format allows them to easily browse and select the specific service they need for their laptop repair. This eliminates confusion and fosters transparency, ensuring customers understand the services offered and their associated costs before making a decision.

c) Real-Time Service Status Tracking

Implementing a real-time service status tracking system empowers customers by providing continuous visibility into the progress of their laptop repairs. This eliminates the need for them to call or visit for updates, reducing uncertainty and frustration. Customers can access the system easily, enter the tracking number and submit to see the information and status of their laptop service.

d) Electronic Receipts and Payment Processing.

Introducing electronic payment and receipt generation streamlines the payment experience for customers and improves record keeping for service systems. Customers can easily pay for their repairs electronically using a secure method, eliminating the need for cash or checks. Additionally, the system automatically generates an electronic receipt after payment, providing instant and secure proof of purchase and service details. This not only simplifies the process for customers but also improves record keeping for service centres, ensuring accurate and organized financial data.

e) Comprehensive Reporting.

A comprehensive reporting module empowers service centers with valuable insights. By generating detailed reports on services rendered, service reports, inventory levels and inventory reports. This allows analysis of service popularity and identification of potential inventory shortages. With this insight, service centres can optimize service offerings and proactively manage inventory.

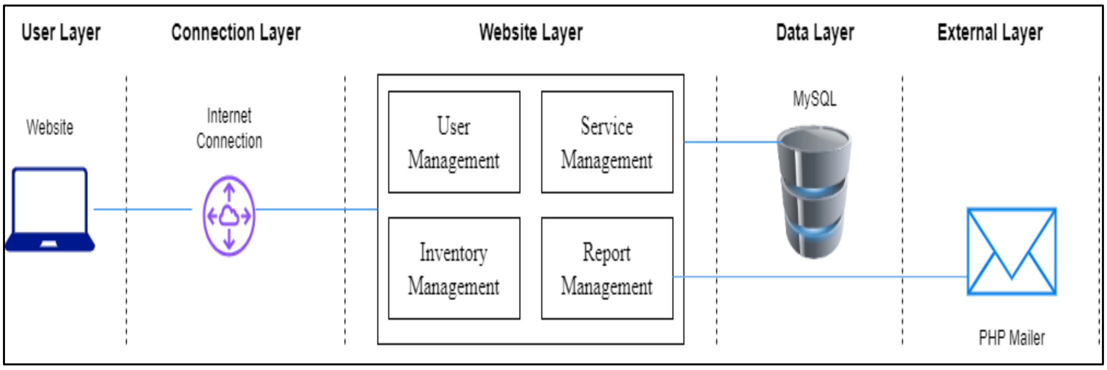


Figure 3-3: High Level Structure

3.4 Requirement analysis of the to-be system

3.4.1 Functional Requirement (Process Model)

Functional requirements outline the precise actions and capabilities that a system must have, with an emphasis on data processing, storing, and transfer.

User Management:

a) **Registration:** New staff can register by providing their email, phone number, and password.

b) **Login/Logout:** Staff are enabled to log in and log out using their credentials

c) **Role Assignment:** Staff will assign to specific role based on their function within the system

d) **Profile Management:** Staff are allowing users to view and update their personal information and preferences.

e) **User Authorization**: User has control access to different functionalities based on user roles and permissions.

Service Management:

a) **Service Catalog**: Display a comprehensive list of available services with detailed descriptions and prices.

b) **Assign Service:** Staff can assign specific service types, and the inventory items used for each service.

c) **Service Status Tracking**: Customer are allowed to track their real-time updates on the status of each service request.

d) **Notification System**: Send tracking number to customers via email.

e) **Service History**: Maintain a history of all past services provided to each customer.

f) **Service Feedback**: Enable customers to provide feedback and rate the service they received.

Inventory Management:

a) **Inventory Tracking**: Track the stock levels of replacement parts and materials used for laptop repairs.

b) **Stock Alerts**: Send alerts to staff when inventory levels fall below a predefined threshold.

c) **Supplier Management**: Maintain information about suppliers.

Report Management:

a) **Service Reports**: Generate detailed reports on the number and types of services provided, including metrics like turnaround time and customer satisfaction.

b) **Inventory Reports**: Produce reports on current inventory levels and usage patterns.

c) **Custom Reports**: Allow users to create custom reports based on specific criteria and filters.

d) **Export and Print**: Enable the export of reports in various formats (e.g., PDF, Excel) and support for printing.

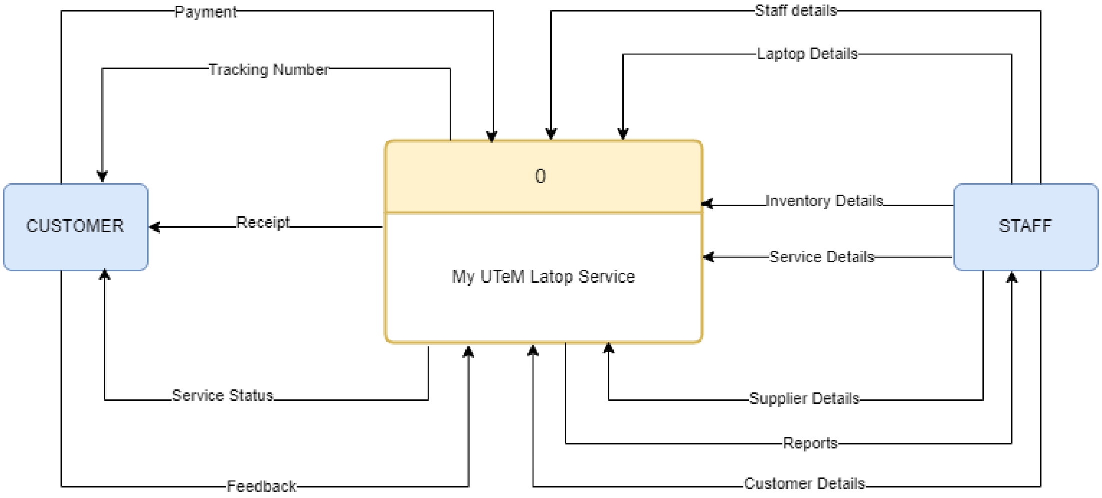


Figure 3-4: Context Diagram

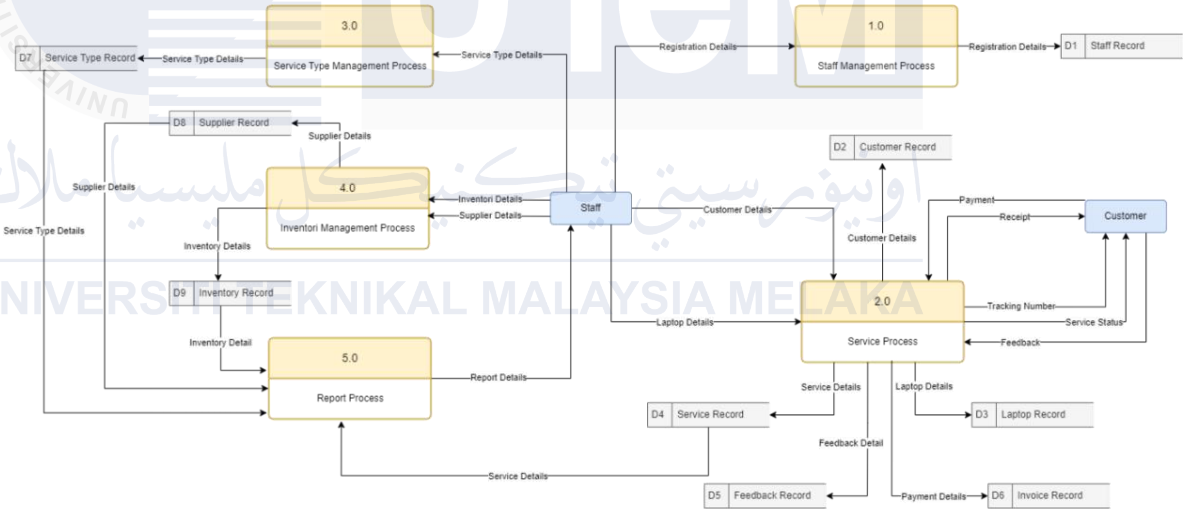


Figure 3-5: Data Flow Diagram Level 0

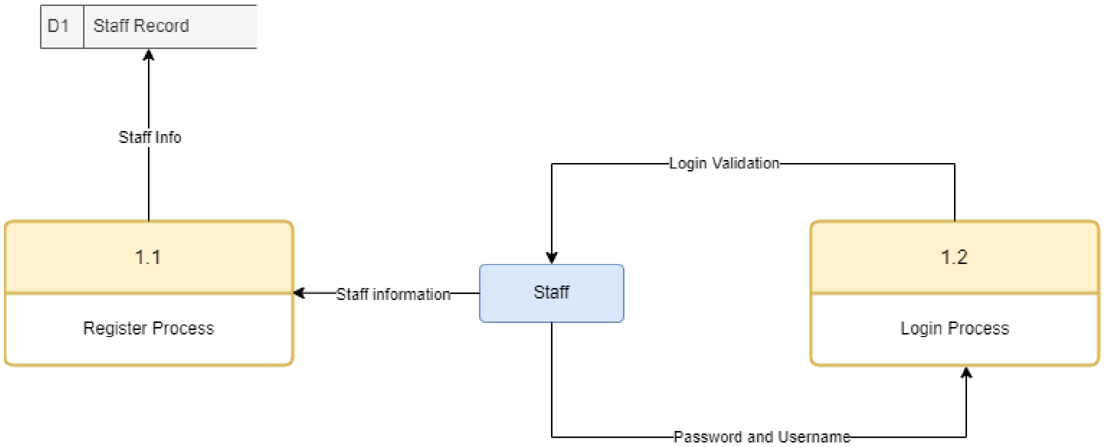


Figure 3-6: Staff Management DFD Level 1

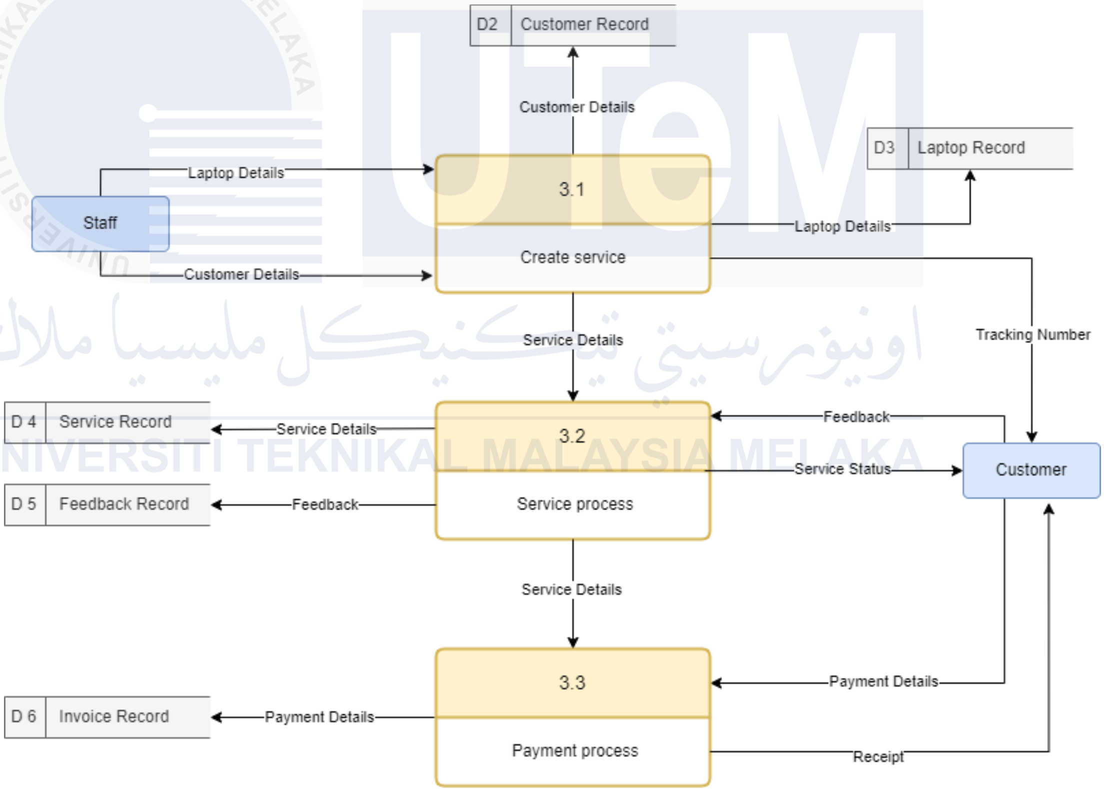


Figure 3-7: Service Process DFD Level 1

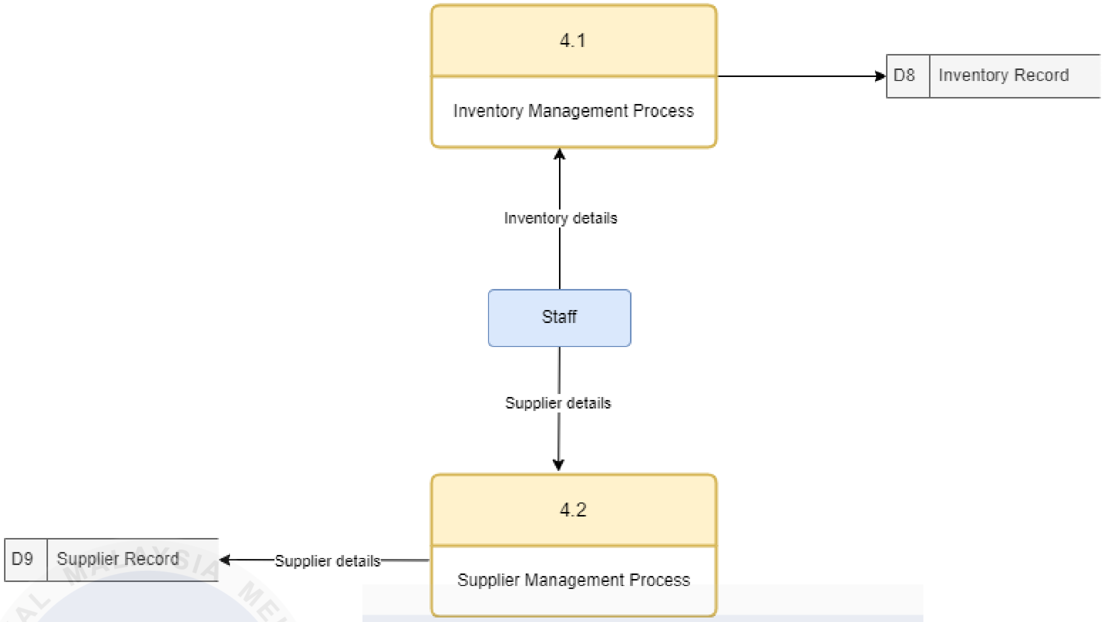


Figure 3-8: Inventory Management DFD Level 1

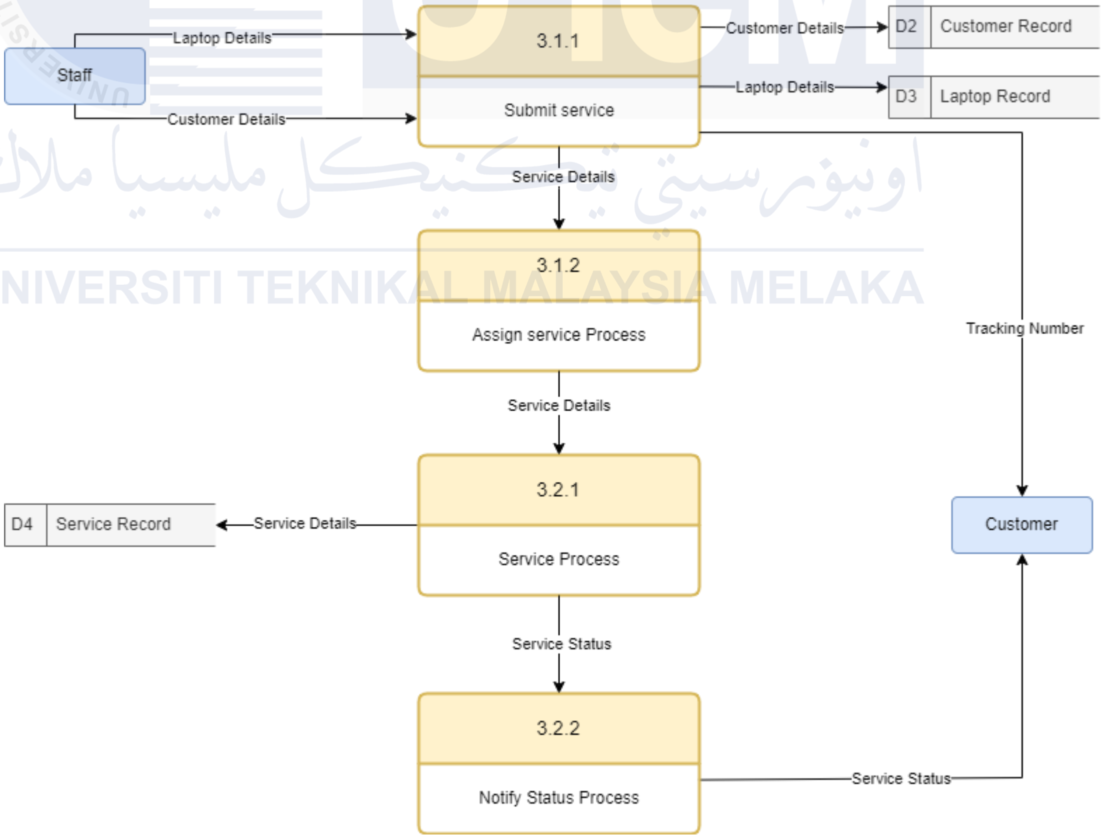


Figure 3-9: Service Process DFD Level 2

3.4.2 Non-functional Requirement

Non-functional requirements specify the limits, performance requirements, and quality characteristics that the system must fulfil to guarantee dependability, effectiveness, and user happiness.

a) User Interface

The system should have an intuitive and user-friendly interface. Users should be able to navigate the system easily.

b) Accuracy

The system must ensure high accuracy in capturing and storing customer details, service status, inventory records and financial transactions. A data validation mechanism will be implemented to minimize errors during data entry.

c) Data Volume

The system should efficiently handle and process large amounts of data, including historical data for reporting and analysis purposes.

3.4.3 Others Requirement

3.4.3.1 Software Requirement

The "My UTeM Laptop Service" system requires a set of software tools to support its development, deployment, and operation. Below are the detailed justifications for each software requirement:

a) Microsoft Visual Studio

Microsoft Visual Studio is used for developing the web-based components of the system. It provides a comprehensive set of tools and features for coding, debugging, and ensuring efficient and effective development processes.

b) PHP

PHP is essential for developing dynamic web pages and server-side logic for the system. It is widely used for building web applications and seamlessly integrates with MySQL databases.

c) Draw.io

Draw.io is used for creating various diagrams such as flowcharts, Entity-Relationship Diagrams (ERD), and Data Flow Diagrams (DFD). These diagrams are crucial for planning and visualizing the system's architecture and workflows.

d) XAMMP

XAMPP provides a local server environment for testing and developing the system. It includes Apache, MySQL, and PHP, making it a comprehensive solution for setting up a development server on a local machine.

e) Microsoft Word

Microsoft Word is used for creating, editing, and formatting project documentation, and reports. It ensures that all project-related documents are professionally presented and easily accessible.

f) Canva

Canva is used for creating visual content such as user interface designs, icons, and promotional materials.

3.4.3.2 Hardware Requirement

- Laptop

  Acer Nitro 5

  1. Processor: Intel® Core™ i5-10300H CPU @ 2.50Hz

2. Memory: 24 GB RAM
3. Storage: 1 TB SSD
4. Graphics: NVIDIA GeForce GTX 1650 Ti
5. Display: 15.6″, FHD (1920 x 1080)

3.5 Conclusion

In this chapter, we conduct a thorough analysis of the current paper-based system in use at the UTeM Laptop Service Centre and identify key areas for improvement. The proposed solution involves transitioning to a web-based system with defined functional requirements, including user management, service management, inventory management and report management, as well as non-functional requirements focusing on performance, security, usability and reliability. We outline the software and hardware requirements needed to support the development and implementation of the new system, selecting tools such as Microsoft Visual Studio, PHP, Draw.io, XAMPP, Microsoft Word and Canva, and hardware specifications such as an Acer Nitro 5 laptop to ensure development and testing which is efficient. The next chapter will cover the design phase, detailing the system architecture, database design, and user interface prototyping.

CHAPTER 4: DESIGN

4.1 Introduction

This chapter provides a detailed overview of the design phase for the "My UTeM Laptop Service" project. It includes system architecture, database design, and graphical user interface (GUI) design. Each section will elaborate on their respective design methodologies, ensuring that the system is well organized, efficient and user-friendly. This chapter aims to lay the groundwork for the next phase of implementation by defining clear design and output specifications.

4.2 Introductory preview to this chapter.

The architecture of the "My UTeM Laptop Service" system is designed to ensure scalability, reliability, and maintainability. The system is organized into multiple layers, each responsible for distinct aspects of functionality. The architecture includes the following layers:

a) **Front end:** This layer handles the user interface and interactions, providing a web-based interface for users to access and manage services.

b) **Back end:** This layer contains the business logic and processes that govern the application's functionality.

c) **Database Layer:** This layer is responsible for data storage, retrieval, and management.

4.3 Database Design

The database design for the "My UTeM Laptop Service" project follows a structured approach, involving several phases to ensure an efficient and organized database system. This comprehensive design process ensures that all data-related aspects of the system are carefully planned and implemented to meet the project's requirements and objectives

4.3.1 Conceptual Design

The conceptual design phase involves the creation of an Entity Relationship Diagram (ERD) that visually represents the data entities, attributes, and relationships in the system. This high-level diagram provides a clear and organized view of the data structure, facilitating the identification of key entities and their interactions, which is essential for developing a robust database schema.

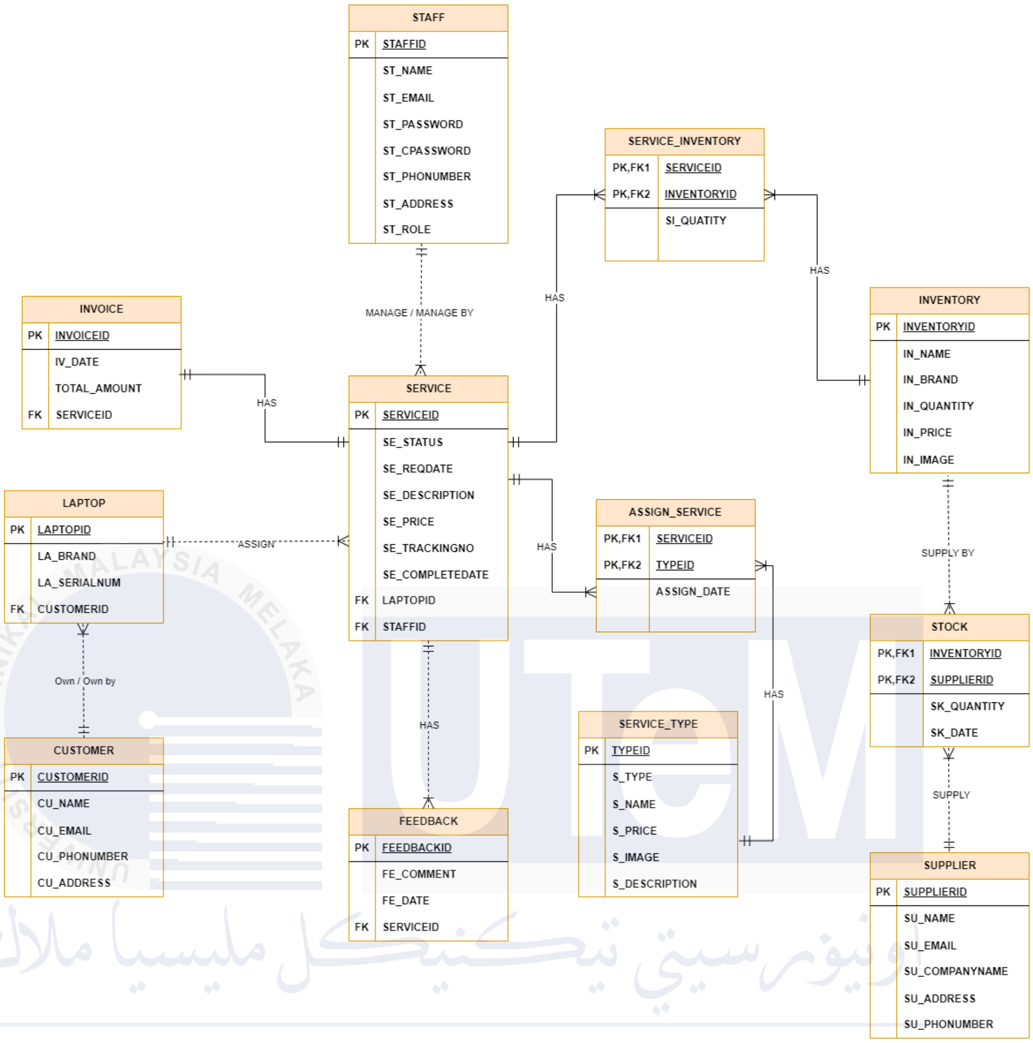


Figure 4-1: Entity Relationship Diagram (ERD)

4.3.1.1 Business Rules

a) A customer can own multiple laptops, but each laptop is associated with one and only one customer.

b) A service is performed on one and only one laptop, but each laptop can have multiple service.

c) Each service is managed by one and only one staff member, but a staff member can manage multiple services.

d) Each service may require multiple inventory items, and each inventory item can be used in multiple services. The quantity of inventory used for a service is tracked in the Service Inventory table

e) Services are assigned to specific service types. Each service can be assigned to one or many service type and a service type can be associated with multiple services.

f) Customers can provide feedback for services they have received. Each feedback entry is linked to one service.

g) Each service generates an invoice, with details such as the total amount and invoice date. Each invoice generated by one and only one service.

h) Inventory is supplied by one or many suppliers and each supplier can provide multiple inventory items.

4.3.2 Logical Design

The logical design phase takes the conceptual model (ERD) from the previous stage and translates it into a more detailed database-independent schema. This refined schema focuses on data organization and relationships, ensuring efficient data storage and retrieval. A data dictionary will be created along with the logical design, serving as a comprehensive reference for all data elements in the system. It will document each attribute name, data type, size, constraint and brief description, providing a clear understanding of the data structure.

4.3.2.1 Data Ditionary

Table 4-1: Customer

CUSTOMER							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
CUSTOMERID	int (11)	#######	N/A	YES	YES	PK	
CU_NAME	varchar (100)	XXXXX	N/A	YES			
CU_EMAIL	varchar (100)	XXXXX	N/A	YES	YES		
CU_PHONENUMBER	varchar (20)	999-999-9999	N/A	YES	YES		
CU_ADDRESS	varchar (200)	XXXXXX	N/A	YES			

Table 4-2: Laptop

LAPTOP							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
LAPTOPID	int(11)	#######	N/A	YES	YES	PK	
LA_BRAND	varchar (100)	XXXXX	N/A	YES			
LA_SERIALNUM	varchar (100)	XXXXX	N/A	YES	YES		
CUSTOMERID	int(11)	#######	N/A	YES	YES	FK	CUSTOMER

Table 4-3: Service

SERVICE							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
SERVICEID	int(11)	#######	N/A	YES	YES	PK	
SE_REQDATE	date	YY-MM-DD	N/A	YES			
SE_DESCRIPTION	varchar (300)	XXXXX	N/A	YES			
SE_STATUS	vachar (20)	XXXXX	N/A	YES			
SE_TRACKINGNO	vachar (50)	XXXXX	N/A	YES	YES		
SE_PRICE	Decimel (20,2)	#####.##	99999.99	YES			
COMPLETEDATE	date	YY-MM-DD					
LAPTOPID	int(11)	XXXXX	N/A	YES		FK	LAPTOP
STAFFID	int(11)	XXXXX	N/A	YES		FK	STAFF

Table 4-4: Staff

STAFF							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
STAFFID	int(11)	#######	N/A	YES	YES	PK	
ST_NAME	varchar	XXXXX	N/A	YES			

	(200)						
ST_EMAIL	varchar (100)	XXXXX	N/A	YES	YES		
ST_PASSWORD	vachar (100)	XXXXX	N/A	YES	YES		
ST_CPASSWORD	vachar (100)	XXXXX	N/A	YES	YES		
ST_PROFILEPICTURE	longblob			YES			
ST_PHONENUMBER	date	YY-MM-DD					
ST_ADDRESS	varchar (200)	XXXXX	N/A	YES			
ST_ROLE	varchar (50)	XXXXX	N/A	YES	YES		

Table 4-5: Inventory

INVENTORY							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
INVENTORYID	int(11)	#######	N/A	YES	YES	PK	
IN_NAME	date	YY-MM-DD	N/A	YES			
IN_BRAND	varchar (100)	XXXXX	N/A	YES			
IN_PRICE	Decimel (20,2)	#####.##	99999.99	YES			
IN_IMAGE	longblob	XXXXX	N/A	YES			
IN_QUANTITY	number (10)	#######	1-99999	YES			
IN_DESCRIPTION	varchar (300)	XXXXX	N/A				

Table 4-6: Service_Inventory

SERVICE_INVENTORY							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
SERVICEID	int(11)	#######	N/A	YES	YES	PK/FK	SERVICE
INVENTORYID	int(11)	#######	N/A	YES	YES	PK/FK	INVENTORY

SI_QUANTITY	number (10)	#######	1-99999	YES			
INVENTORY_AMOUNT	Decimel (20,2)	#####.##	99999.99	YES			

Table 4-7:Service_Type

SERVICE_TYPE							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
TYPEID	int(11)	#######	N/A	YES	YES	PK	
S_TYPE	date	YY-MM-DD	N/A	YES	YES		
S_NAME	varchar (100)	XXXXX	N/A	YES			
S_PRICE	Decimel (20,2)	#####.##	99999.99	YES			
S_IMAGE	longblob	XXXXX	N/A	YES			
S_DESCRIPTION	varchar (300)	XXXXX	N/A				

Table 4-8: Assign Service

ASSIGN_SERVICE							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
SERVICEID	int(11)	#######	N/A	YES	YES	PK/FK	SERVICE
TYPEID	int(11)	#######	N/A	YES	YES	PK/FK	SERVICE_TYPE
SERVICE_AMOUNT	Decimel (20,2)	#####.##	99999.99	YES			

Table 4-9: Supplier

SUPPLIER							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
SUPPLIERID	int(11)	#######	N/A	YES	YES	PK	
SU_NAME	varchar (100)	XXXXX	N/A	YES			
SU_COMAPNYNAME	varchar (100)	XXXXX	N/A	YES			
SU_EMAIL	varchar (100)	XXXXX	N/A	YES	YES		

SU_PHONENUMBER	varchar (20)	999-999-9999	N/A	YES	YES		
SU_ADDRESS	varchar (200)	XXXXXX	N/A	YES			

Table 4-10: Stock

STOCK							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
INVENTORYID	int(11)	#######	N/A	YES	YES	PK/FK	INVENTORY
SUPPLIERID	int(11)	#######	N/A	YES	YES	PK/FK	SUPPLIER
SK_QUANTITY	number (10)	#######	1-99999	YES			
SK_SUPPLYDATE	date	YY-MM-DD	N/A	YES			

Table 4-11: Invoice

INVOICE							
Attribute Name	Data Type (Size)	Format	Range	Required	Unique	PK/FK	FK Reference
INVOICEID	int(11)	#######	N/A	YES	YES	PK	
IN_DATE	date	YY-MM-DD	N/A	YES			
PAYMENT_METHOD	varchar (100)	XXXXX	N/A	YES			
TOTAL_AMOUNT	varchar (100)	Decimel (20,2)	#####.##	99999.99			
SERVICEID	int(11)	#######	N/A	YES	YES	FK	SERVICE

4.3.2.2 Query design

Query design is a crucial aspect of database design, focusing on crafting efficient and accurate database queries to retrieve and manipulate data as needed by the system. Here's an overview type of query design in the context of the "My UTeM Laptop Service" system:

a) **Select Queries:** These are the most common type, used to retrieve specific data from the database. For example:

```
$sql = "SELECT * FROM inventory";
```

b) **Join Queries:** To retrieve data from multiples tables based on related columns. For example:

```
$sql = "SELECT s.SERVICEID, s.SE_REQDATE, s.SE_DESCRIPTION,
l.LA_BRAND, l.LA_SERIALNUM
FROM service s
JOIN laptop l ON s.LAPTOPID = l.LAPTOPID
WHERE s.SE_STATUS='Pending'";
```

c) **Aggregate Queries:** Perform calculations on entire groups of data in the table. For example:

```
$serviceQuery = "SELECT COUNT(*) AS total_services FROM
service_type";
```

d) **Update Queries:** Update queries are used to modify specific data in a table based on certain conditions. For example:

```
$updateServiceSql = "UPDATE service SET SE_STATUS = 'Complete',
SE_PRICE = '$se_price', COMPLETEDATE = '$complete_date' WHERE
SERVICEID = '$serviceID'";
```

e) **Insert Queries:** To add new data to table

```
$insertAssignServiceSql = "INSERT INTO assign_service (SERVICEID,
TYPEID, SERVICE_AMOUNT) VALUES ('$serviceID',
'$typeID','$type_price')";
```

4.3.3 Physical Design

The physical design phase focuses on the implementation details of the database, ensuring that it operates efficiently and securely. This includes selecting the appropriate Database Management System (DBMS), utilizing database objects like stored procedures and triggers, implementing security mechanisms, and establishing contingency plans for backup and recovery.

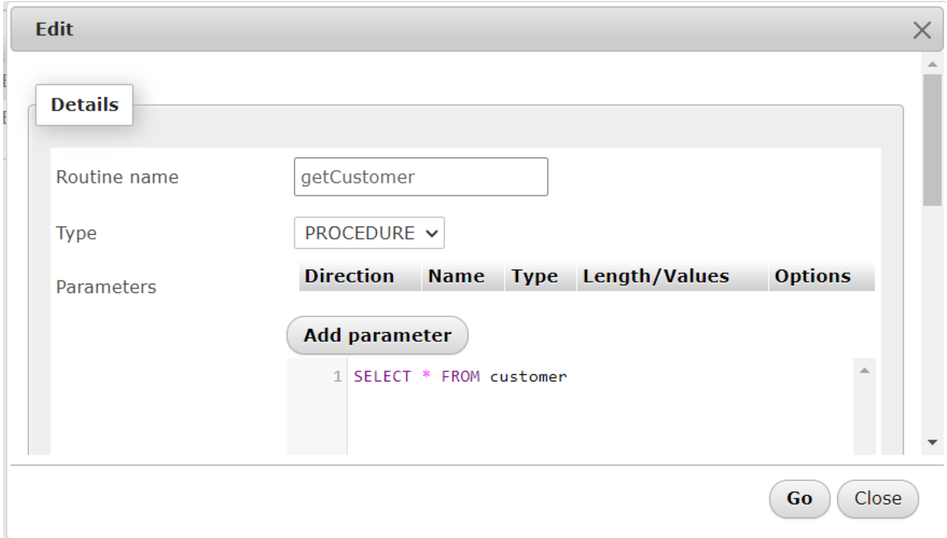
4.3.3.1 Selection of DBMS

The "My UTeM Laptop Service" system will use MySQL as a Database Management System (DBMS). MySQL was chosen for its stability, simplicity, and widespread use. It provides a reliable platform to manage the relational database required for this project.

Figure 4-2: MySQL logo

4.3.3.2 Database Object

a) Procedure are pre-compiled SQL statements stored within the database itself. They encapsulate complex business logic or frequently executed queries, improving performance and maintainability.



Routine name: getCustomer

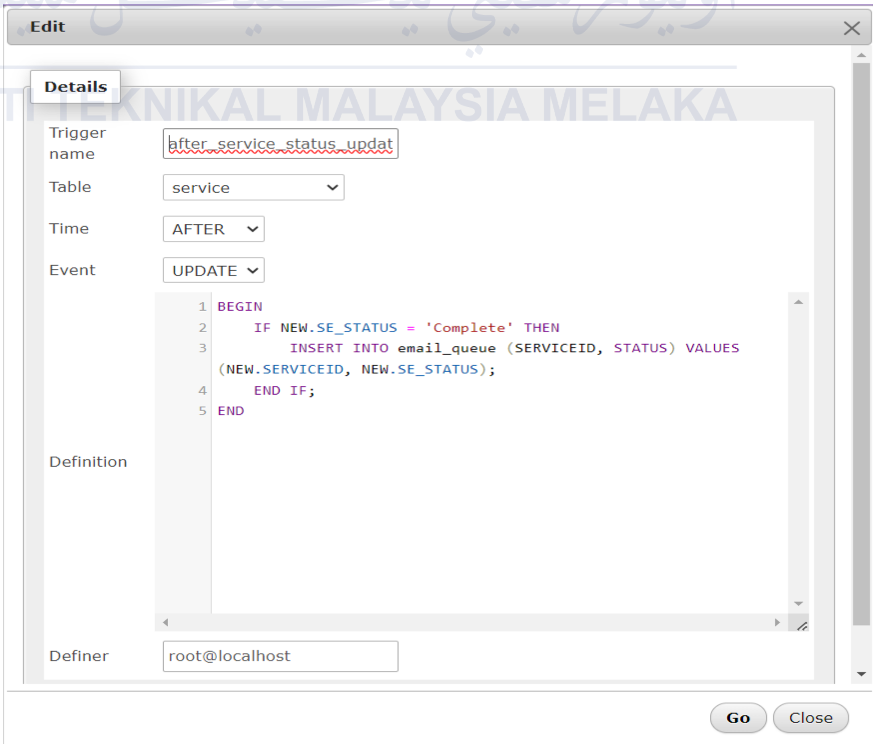
Type: PROCEDURE

Parameters: Direction | Name | Type | Length/Values | Options

```
SELECT * FROM customer
```

Figure 4-3: Procedure operation

b) The trigger is created on the service table and activates after an update operation. Specifically, it monitors changes in the SE_STATUS column. When the status of a service is updated to 'Complete', the trigger inserts a corresponding entry into the email_queue table.



Trigger name: after_service_status_updat

Table: service

Time: AFTER

Event: UPDATE

Definition:

```
BEGIN
    IF NEW.SE_STATUS = 'Complete' THEN
        INSERT INTO email_queue (SERVICEID, STATUS) VALUES
(NEW.SERVICEID, NEW.SE_STATUS);
    END IF;
END
```

Definer: root@localhost

Figure 4-4: Trigger Operation

4.4 Graphical User Interface (GUI)

The Graphical User Interface (GUI) design for the "My UTeM Laptop Service" system focuses on creating an intuitive, user-friendly interface that facilitates efficient interaction with the system. This section will detail the navigation flow, input methods, and output displays of the GUI, ensuring that it meets the functional and non-functional requirements specified in Chapter 3. The GUI design aims to enhance user experience by providing clear and easy access to all system features, such as user management, service tracking, inventory management, and report generation.

4.4.1 User Management (GUI)

The graphical user interface (GUI) of the User Management for the "My UTeM Laptop Service" system is designed to facilitate efficient staff management and secure access control. The Registration feature allows new staff members to register by providing their email, phone number and password, ensuring that only authorized staff can access the system. The Login/Logout function allows staff to securely log in and log out using their credentials, maintaining session integrity and system security. Role Assignment is an important feature where staff members are assigned specific roles based on their function in the system, ensuring that each user has the appropriate level of access and responsibility. Profile Management allows staff to view and update their personal information and preferences, keeping their profile up to date. User Permissions ensure that access to different functions is controlled based on user roles and permissions, providing a secure and structured environment where each user can only access features relevant to their role.

1) **Registration**

   Purpose: To allow new staff members to create an account in the system.

   Input: Name, email, phone number, address, password, confirmation password.

   Output: A new user account is created and saved in the system's database. The user receives a confirmation of successful registration.

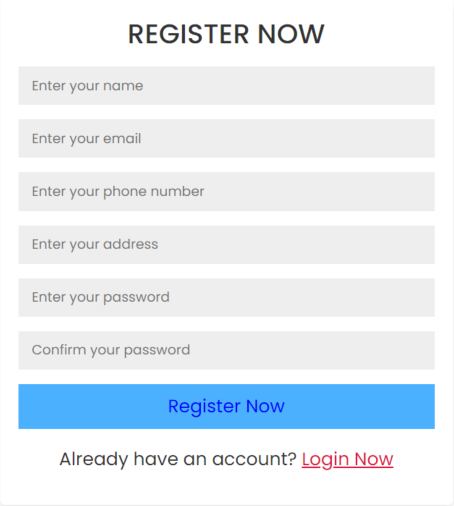


Figure 4-5: Register interface

2) **Forgot Password**

Purpose: To allow staff to forget their password.

Input: Email.

Output: Old password will be reset. The user receives a default password through email.

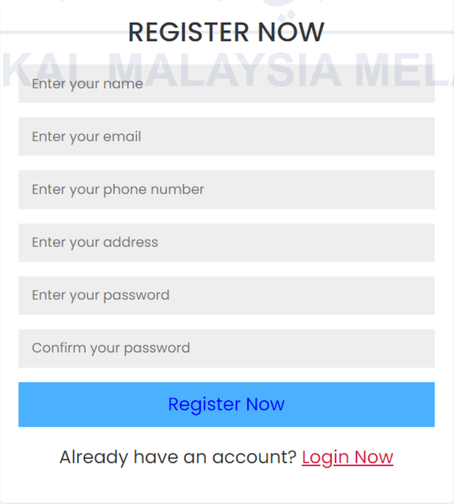


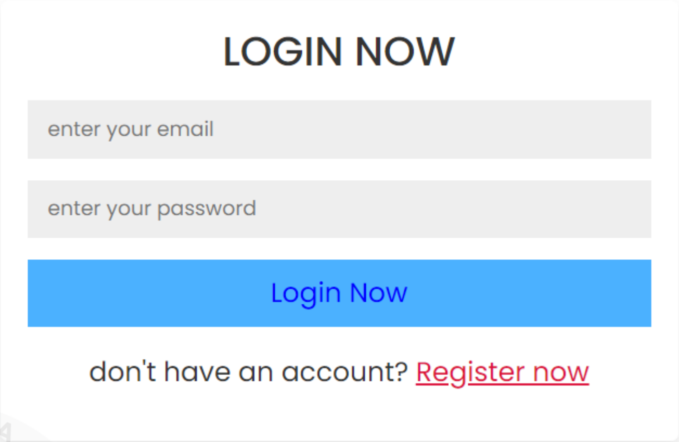
Figure 4-6: Forget Password Interface

3) **Login/Logout**

Purpose: To enable staff to access the system using their credentials and securely log out when their session is finished.

Input: Email and password for login; session termination request for logout.

Output: Successful login grants access to the system; logout terminates the user session and secures the account.



LOGIN NOW

enter your email

enter your password

don't have an account? Register now

Figure 4-7: Login Interface

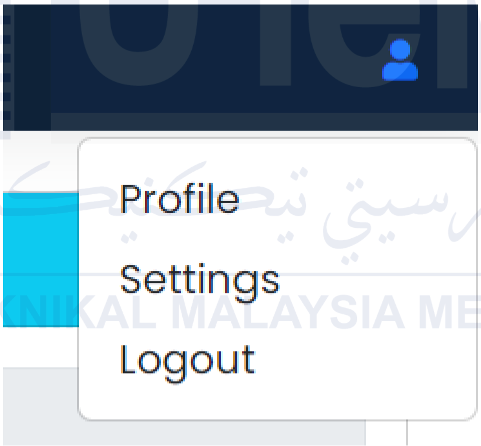


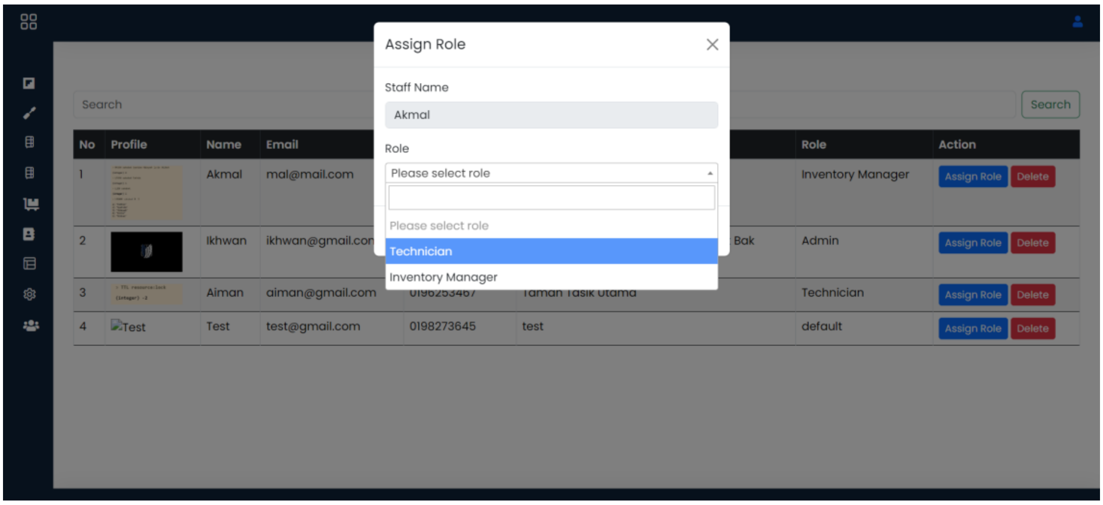
Figure 4-8: Logout button

4) **Role Assignment**

Purpose: To assign specific roles to staff members based on their functions within the system.

Input: role selection.

Output: Updated user account with the assigned role.



Assign Role

Staff Name: Akmal

Role: Please select role

- Please select role
- Technician
- Inventory Manager

No	Profile	Name	Email			Role	Action
1		Akmal	mal@mail.com			Inventory Manager	Assign Role Delete
2		Ikhwan	ikhwan@gmail.con		Bak	Admin	Assign Role Delete
3		Aiman	aiman@gmail.com	0196253467	Taman Tasik Utama	Technician	Assign Role Delete
4	Test	Test	test@gmail.com	0198273645	test	default	Assign Role Delete

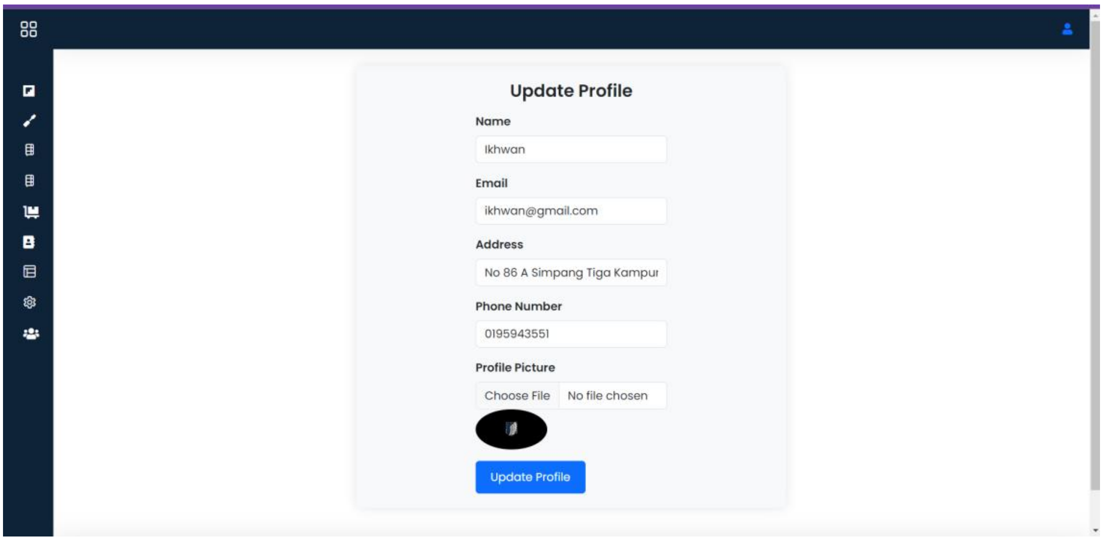
Figure 4-9: Assign role interface

5) **Profile Management**

Purpose: To allow staff members to view and update their personal information and preferences.

Input: User profile information such as name, contact details, preferences.

Output: Updated user profile information is saved in the system's database, reflecting any changes made by the user.



Update Profile

Name: Ikhwan

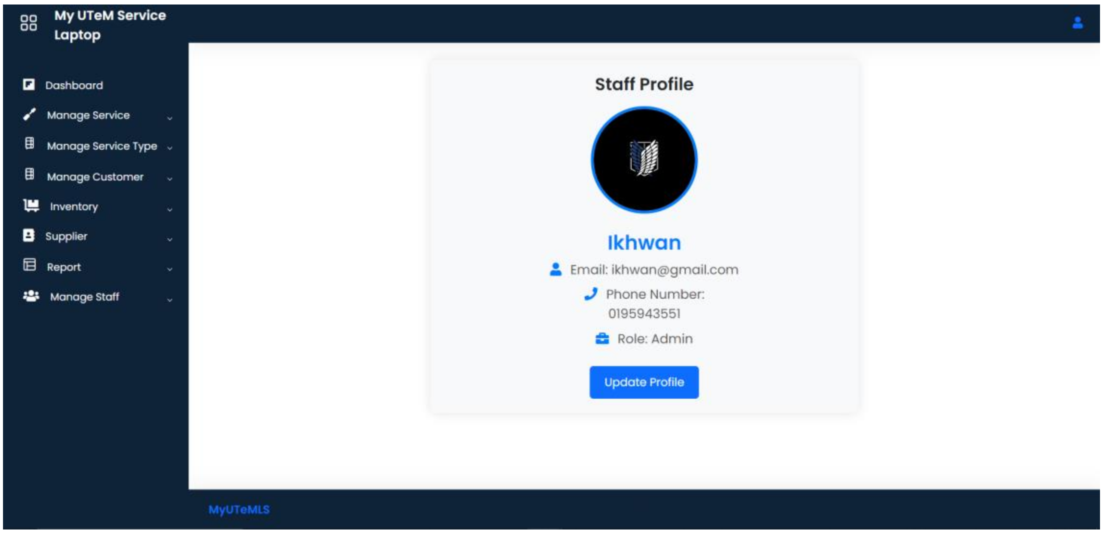
Email: ikhwan@gmail.com

Address: No 86 A Simpang Tiga Kampur

Phone Number: 0195943551

Profile Picture: Choose File No file chosen

Figure 4-10: Profile Interface



Staff Profile

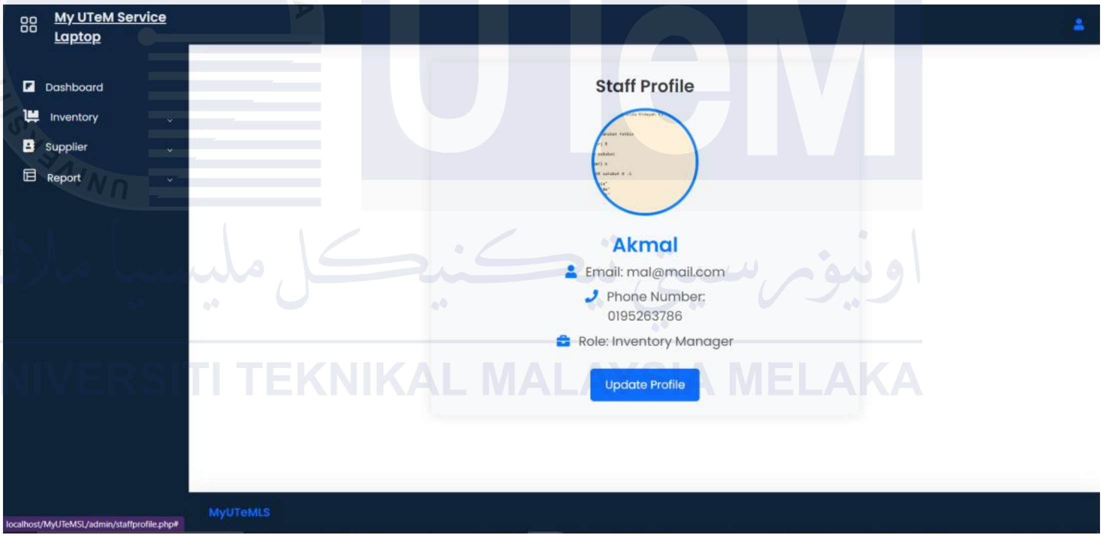
Ikhwan

Email: ikhwan@gmail.com

Phone Number: 0195943551

Role: Admin

Figure 4-11: Admin interface



Staff Profile

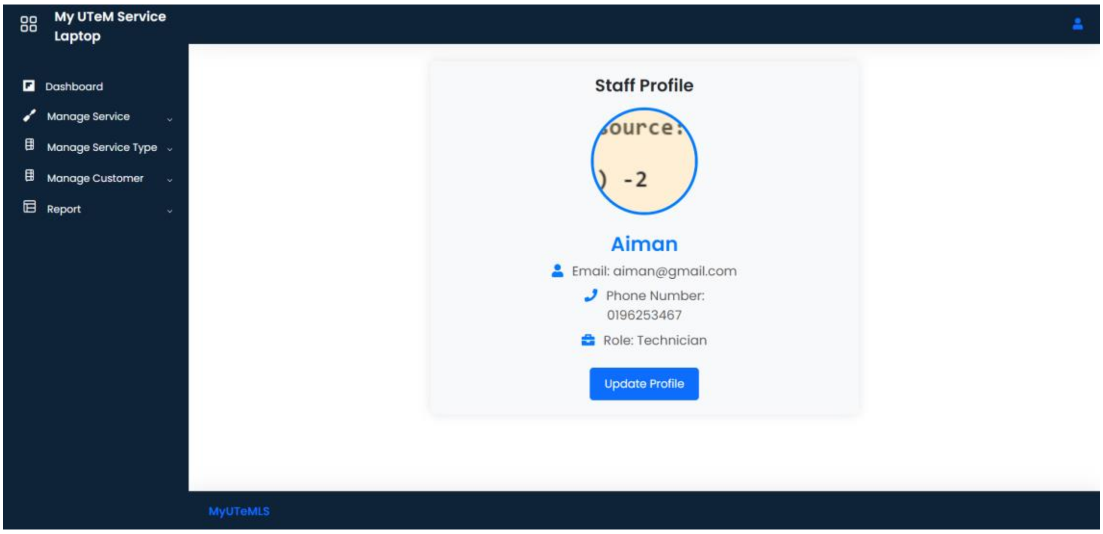
Akmal

Email: mal@mail.com

Phone Number: 0195263786

Role: Inventory Manager

Figure 4-12: Inventory manager interface



Staff Profile

Aiman

Email: aiman@gmail.com

Phone Number: 0196253467

Role: Technician

Figure 4-13: Technician interface

4.4.2 Service Management (GUI)

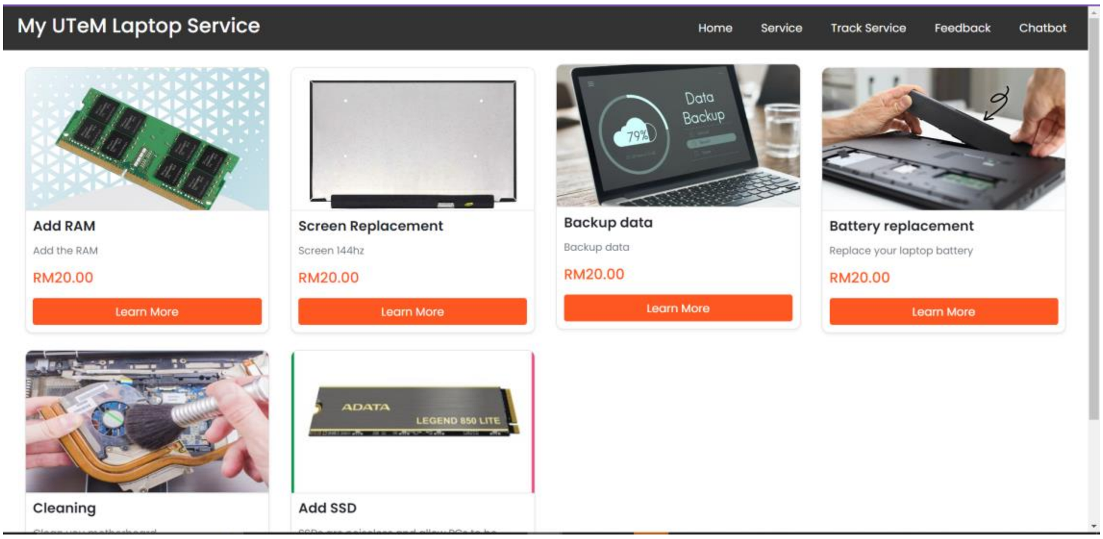
The Service Management graphical user interface (GUI) for the "My UTeM Laptop Service" system is designed to improve customer experience and streamline service operations. The Service Catalog feature displays a comprehensive list of available services with detailed descriptions and prices, allowing customers to make informed decisions about the services they need. The integrated Notification System sends tracking numbers and updates via email, customers can track real-time updates on the status of their service requests by using the tracking number. Additionally, the system maintains a detailed Service History for each customer, allowing easy access to past service records. To further improve service quality, customers can provide feedback and rate the service they receive through the Service Feedback feature, which helps service centers identify areas for improvement and recognize outstanding service performance.

1) **Service Catalog**

   Purpose: To provide customers with a comprehensive list of available services, including detailed descriptions and prices.

   Input: Service details such as name, description, and price.

   Output: Displayed catalog of services to customers.



Add RAM
Add the RAM
RM20.00
Learn More

Screen Replacement
Screen 144hz
RM20.00
Learn More

Backup data
Backup data
RM20.00
Learn More

Battery replacement
Replace your laptop battery
RM20.00
Learn More

Cleaning

Add SSD

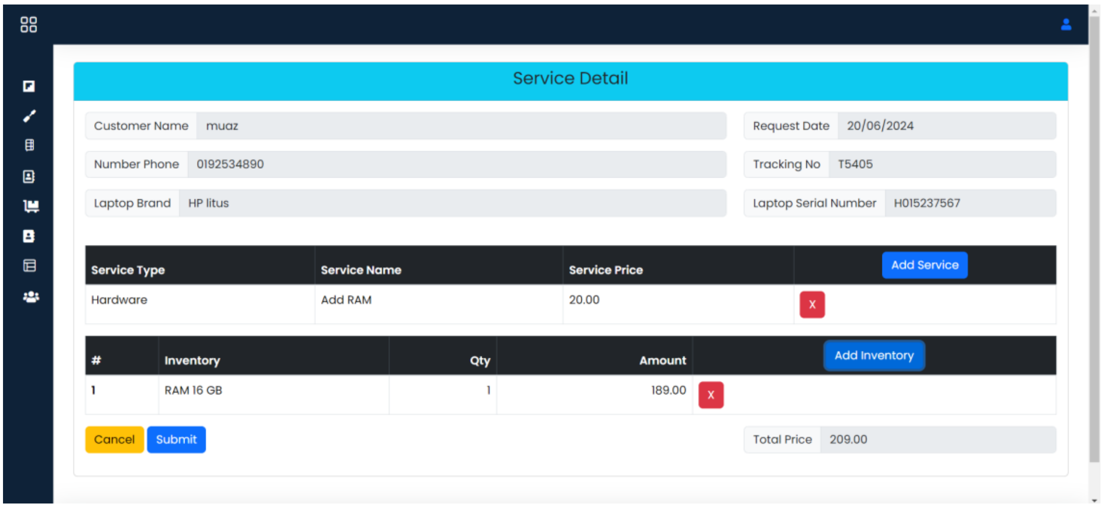
Figure 4-14: Service catalog interface

2) Assign Service

Purpose: To allow staff to assign specific service types and inventory used to each service request.

Input: Service type selection, inventory items used, and quantity of inventory.

Output: Updated service request with assigned service type and inventory items, tracked in the system for accurate record-keeping and inventory management.



Service Detail

Customer Name	muaz	Request Date	20/06/2024
Number Phone	0192534890	Tracking No	T5405
Laptop Brand	HP litus	Laptop Serial Number	H015237567

Service Type	Service Name	Service Price	Add Service
Hardware	Add RAM	20.00	X

#	Inventory	Qty	Amount	Add Inventory
1	RAM 16 GB	1	189.00	X

Cancel Submit

Total Price 209.00

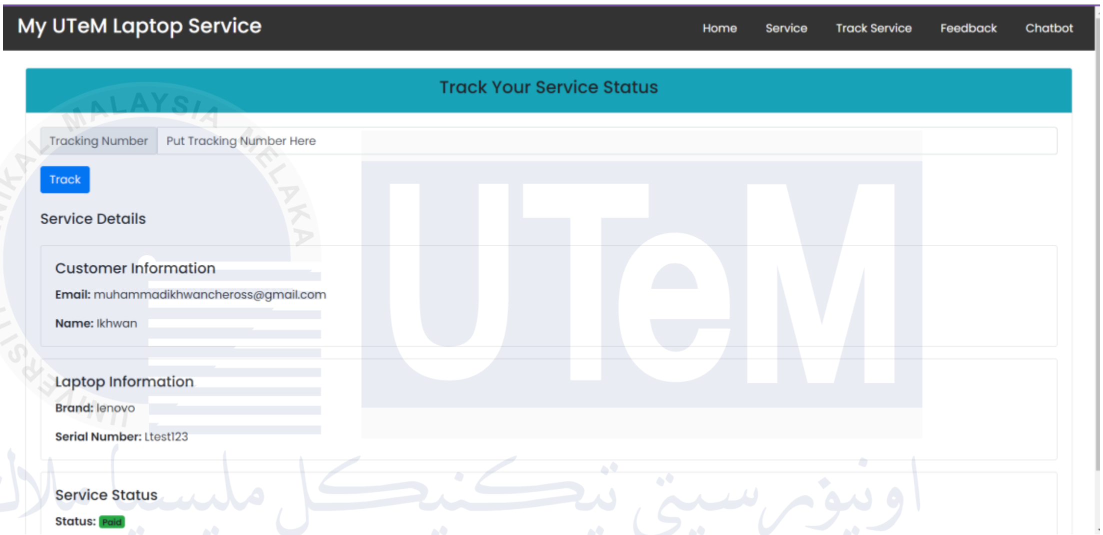
Figure 4-15: Assign service interface

3) **Service Status Tracking:**

Purpose: To allow customers to track real-time updates on the status of their service requests.

Input: Customer's service tracking number.

Output: Status of the service request, such as "Pending," "Completed," or "Paid."



Track Your Service Status

Tracking Number: Put Tracking Number Here

Service Details

Customer Information

Email: muhammadikhwancheross@gmail.com

Name: Ikhwan

Laptop Information

Brand: lenovo

Serial Number: Ltest123

Service Status

Status: Paid

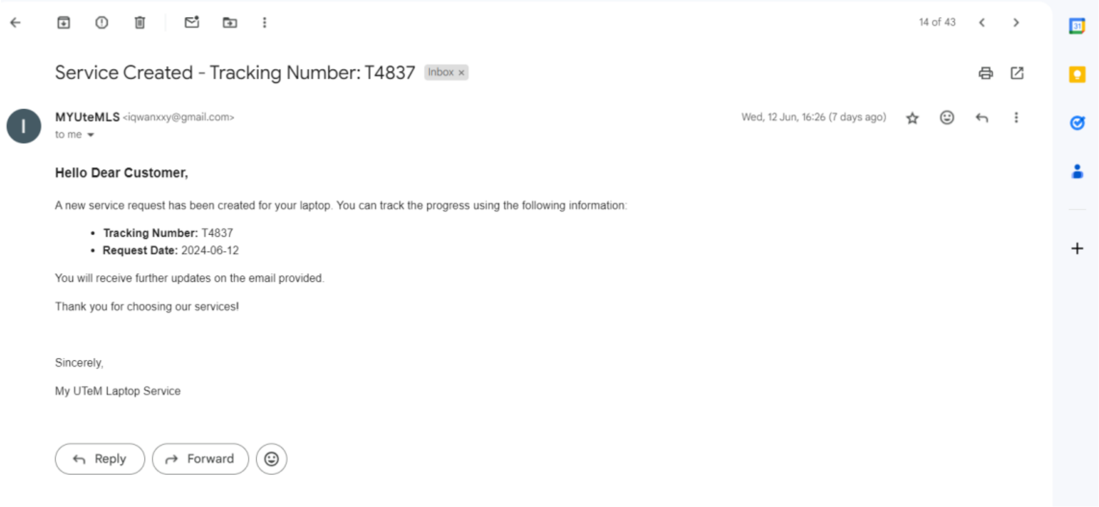
Figure 4-16: Status tracking interface

4) **Email Notification:**

Purpose: To send tracking numbers and updates to customers via email.

Input: Customer email address, service details, and tracking number.

Output: Email notifications sent to customers with their tracking number and any status updates.



Service Created - Tracking Number: T4837

MYUteMLS <iqwanxxy@gmail.com>
to me
Wed, 12 Jun, 16:26 (7 days ago)

Hello Dear Customer,

A new service request has been created for your laptop. You can track the progress using the following information:

- **Tracking Number:** T4837
- **Request Date:** 2024-06-12

You will receive further updates on the email provided.

Thank you for choosing our services!

Sincerely,

My UTeM Laptop Service

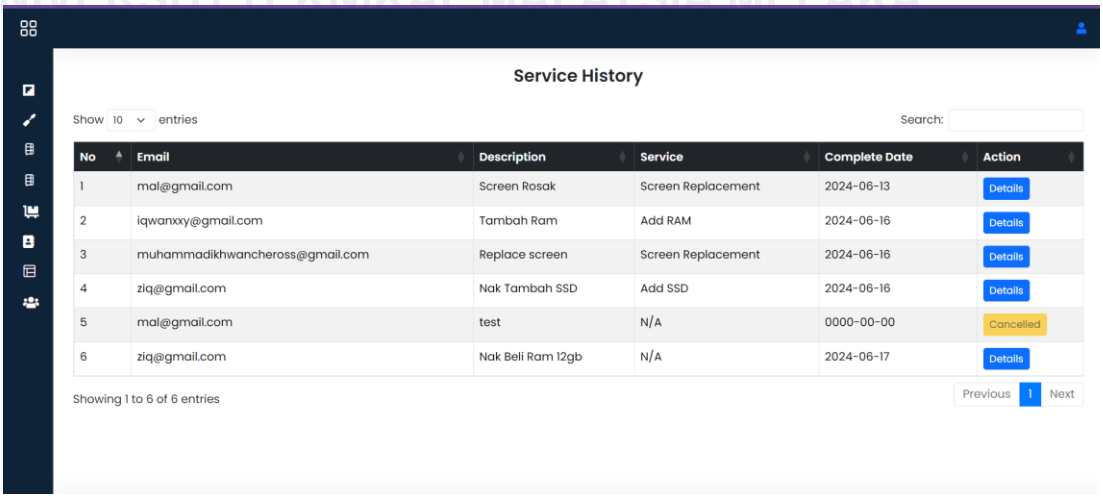
Figure 4-17: Email interface

5) Service History:

Purpose: To maintain a history of all past services provided to each customer for future reference and records.

Input: Service details and customer information.

Output: Displayed history of past services for each customer, including dates, descriptions, and outcomes.



Service History

No	Email	Description	Service	Complete Date	Action
1	mal@gmail.com	Screen Rosak	Screen Replacement	2024-06-13	Details
2	iqwanxxy@gmail.com	Tambah Ram	Add RAM	2024-06-16	Details
3	muhammadikhwancheross@gmail.com	Replace screen	Screen Replacement	2024-06-16	Details
4	ziq@gmail.com	Nak Tambah SSD	Add SSD	2024-06-16	Details
5	mal@gmail.com	test	N/A	0000-00-00	Cancelled
6	ziq@gmail.com	Nak Beli Ram 12gb	N/A	2024-06-17	Details

Showing 1 to 6 of 6 entries

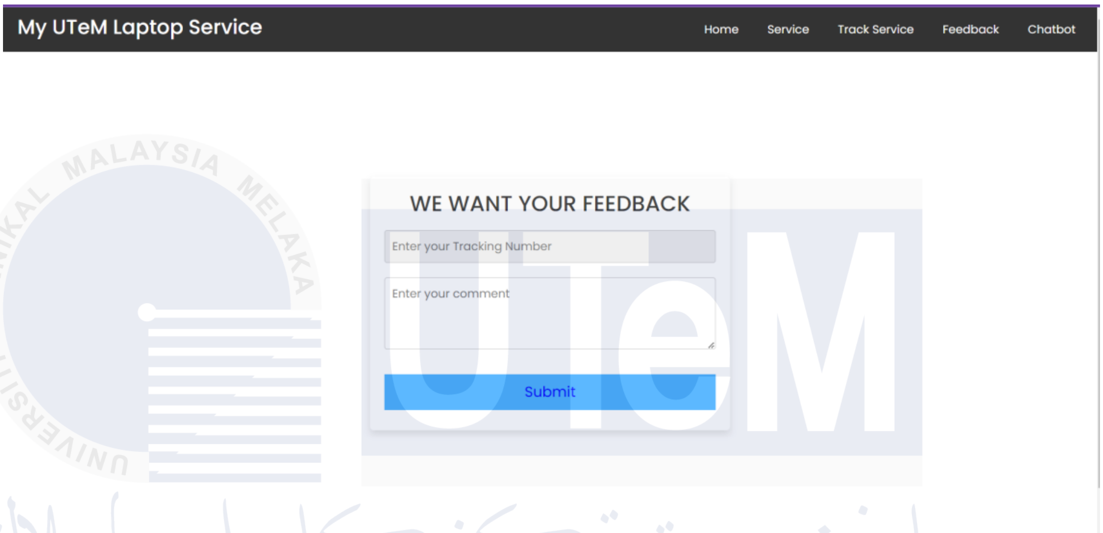
Figure 4-18: Customer history interface

6) **Service Feedback:**

Purpose: To enable customers to provide feedback and rate the service they received.

Input: Tracking number, Customer feedback form including rating and comments.

Output: Collected feedback and ratings that can be analyzed to improve service quality.



WE WANT YOUR FEEDBACK

Enter your Tracking Number

Enter your comment

Figure 4-19: Feedback form interface

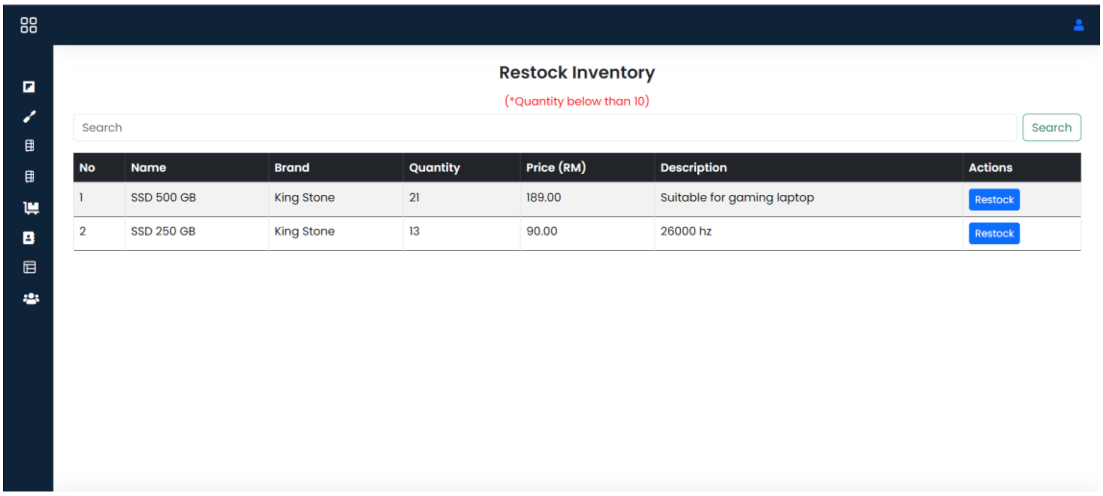
4.4.3 Inventory Management (GUI)

The inventory tracking feature is crucial for maintaining adequate stock levels of replacement parts and materials used in laptop repairs. This feature enables staff to monitor stock levels, manage restock, and manage supplier information, ensuring the service center operates smoothly without interruptions due to stockouts.

1) **Inventory tracking**

Purpose: To monitor the stock levels of inventory used for laptop repairs, ensuring that necessary inventory is available when needed.

Output: Real-time inventory levels and alerts for low stock items.



Restock Inventory

(*Quantity below than 10)

No	Name	Brand	Quantity	Price (RM)	Description	Actions
1	SSD 500 GB	King Stone	21	189.00	Suitable for gaming laptop	Restock
2	SSD 250 GB	King Stone	13	90.00	26000 hz	Restock

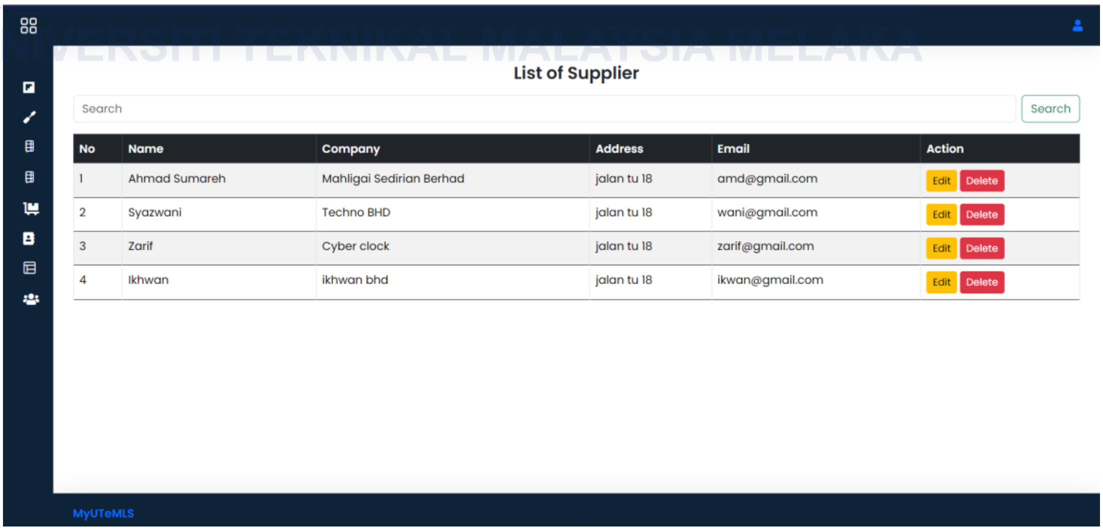
Figure 4-20: Low stock inventory interface

2) Supplier Management

Purpose: To maintain detailed information about suppliers, including contact details, email, and company name.

Input: Supplier details such as name, contact information, and company name.

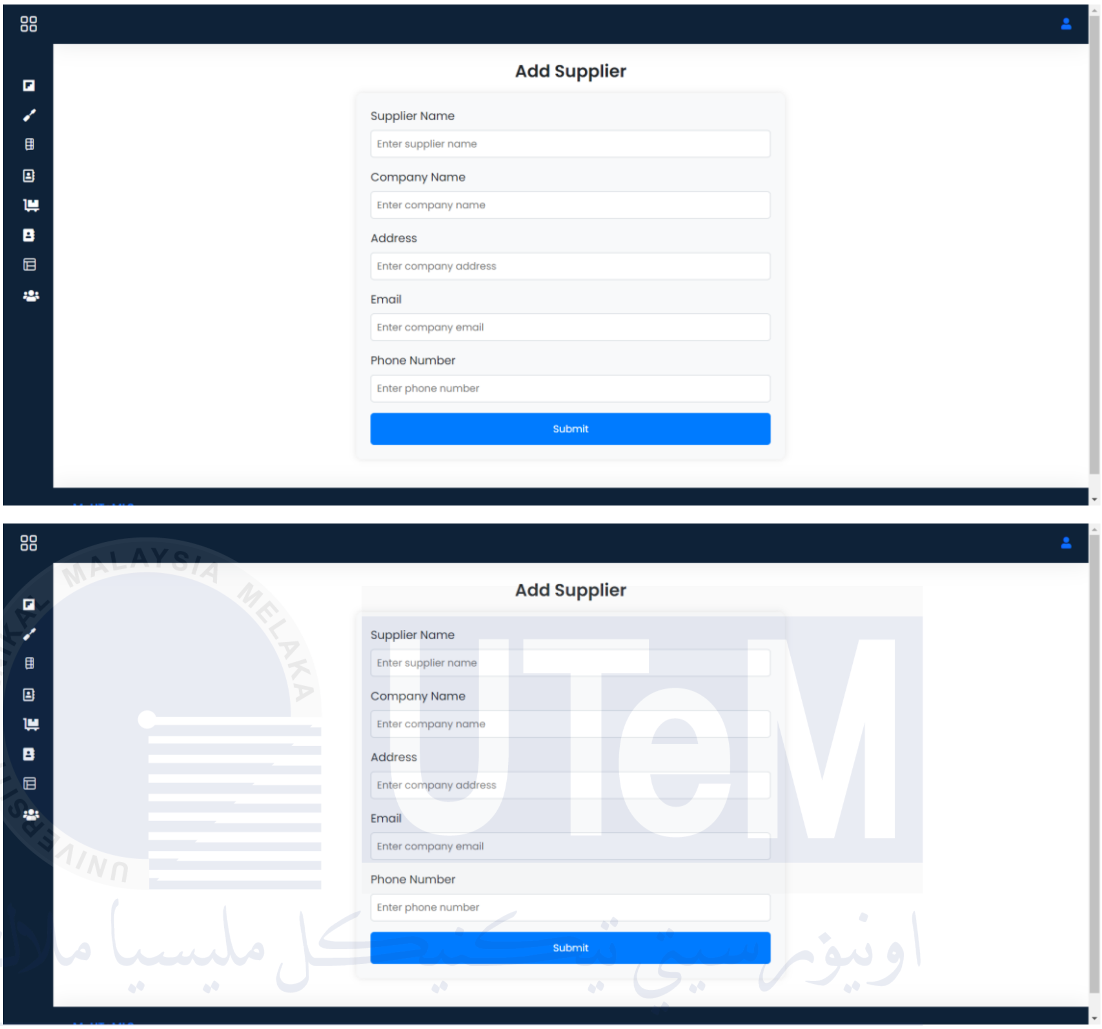
Output: A database of supplier information that can be accessed and updated by staff as needed.



List of Supplier

No	Name	Company	Address	Email	Action
1	Ahmad Sumareh	Mahligai Sedirian Berhad	jalan tu 18	amd@gmail.com	Edit Delete
2	Syazwani	Techno BHD	jalan tu 18	wani@gmail.com	Edit Delete
3	Zarif	Cyber clock	jalan tu 18	zarif@gmail.com	Edit Delete
4	Ikhwan	ikhwan bhd	jalan tu 18	ikwan@gmail.com	Edit Delete

Figure 4-21: List supplier interface



Add Supplier

Supplier Name

Enter supplier name

Company Name

Enter company name

Address

Enter company address

Email

Enter company email

Phone Number

Enter phone number

Add Supplier

Supplier Name

Enter supplier name

Company Name

Enter company name

Address

Enter company address

Email

Enter company email

Phone Number

Enter phone number

Submit

Figure 4-22: Add supplier interface

4.4.4 Report Management (GUI)

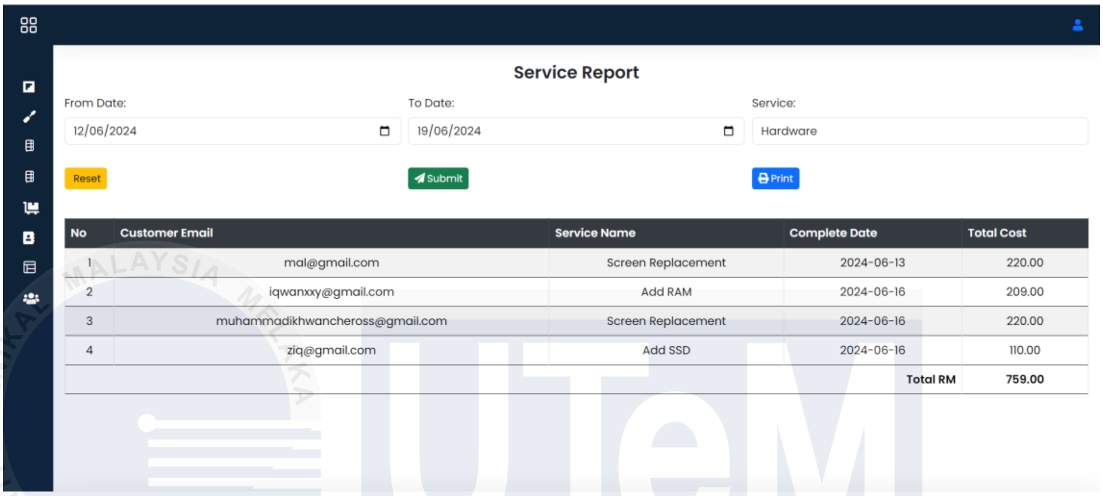
The service and inventory report feature are designed to provide comprehensive details about the services offered by the "My UTeM Laptop Service" system. This feature enables staff to generate detailed reports containing customer information, the services availed by each customer, and the total amount charged for those services, monitor inventory transactions within a selected date range. Additionally, the system allows staff to monitor the services performed within a specific date range by selecting a start date and an end date.

1) **Service Reports**

Purpose: To generate detailed reports on the services provided within a specified date range and service type, including customer details, service names, completion dates, and total costs. This helps in tracking the performance and financial aspects of the service center.

Input: From date to date and service type.

Output: Comprehensive reports detailing customer email, service name, complete date, total cost of service.



Service Report

From Date: 12/06/2024

To Date: 19/06/2024

Service: Hardware

No	Customer Email	Service Name	Complete Date	Total Cost
1	mal@gmail.com	Screen Replacement	2024-06-13	220.00
2	iqwanxxy@gmail.com	Add RAM	2024-06-16	209.00
3	muhammadikhwancheross@gmail.com	Screen Replacement	2024-06-16	220.00
4	ziq@gmail.com	Add SSD	2024-06-16	110.00
			Total RM	759.00

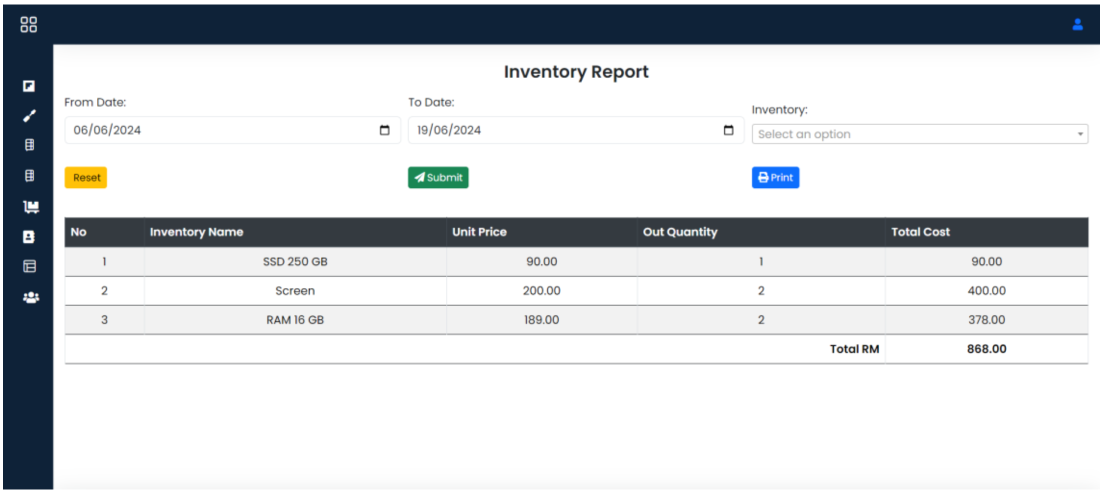
Figure 4-23: Inventory report interface

2) Inventory Reports

Purpose: To produce detailed reports on inventory levels and usage patterns, allowing staff to monitor stock and identify trends. This helps in managing inventory effectively and ensuring that essential parts are always in stock.

Input: From date to date and inventory name.

Output: Comprehensive reports detailing inventory name, unit price, Out Quantity, and total cost.



Inventory Report

From Date: 06/06/2024

To Date: 19/06/2024

Inventory: Select an option

No	Inventory Name	Unit Price	Out Quantity	Total Cost
1	SSD 250 GB	90.00	1	90.00
2	Screen	200.00	2	400.00
3	RAM 16 GB	189.00	2	378.00
			Total RM	868.00

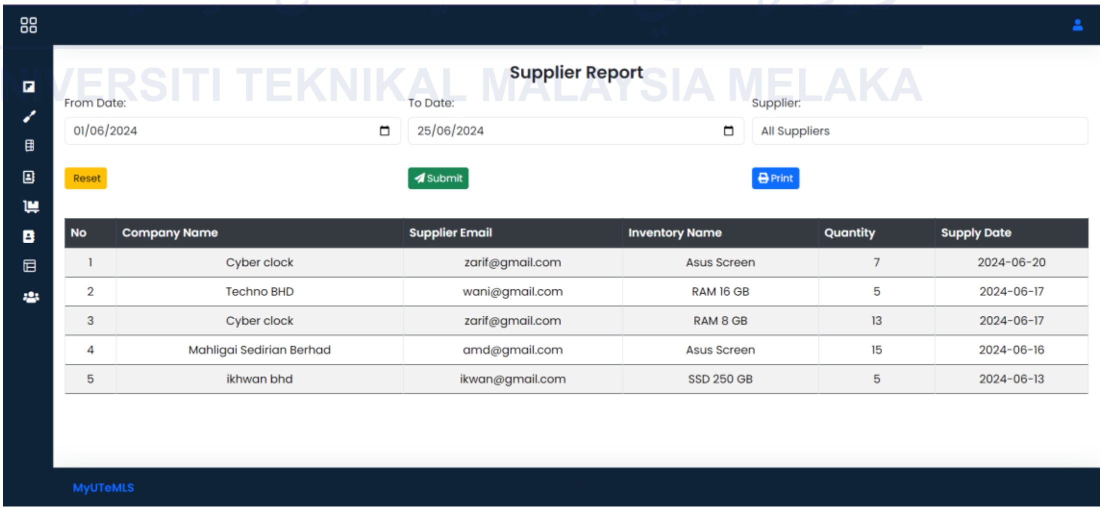
Figure 4-24: Inventory report interface

3) Supplier Reports

Purpose: To generate detailed reports on the suppliers and the inventory items they supply. This helps in tracking supplier performance, ensuring timely reordering, and managing supplier relationships effectively

Input: From date to date and supplier.

Output: Comprehensive reports detailing company name, supplier email, Inventory Name, Quantity, and supply date.



Supplier Report

From Date: 01/06/2024

To Date: 25/06/2024

Supplier: All Suppliers

No	Company Name	Supplier Email	Inventory Name	Quantity	Supply Date
1	Cyber clock	zarif@gmail.com	Asus Screen	7	2024-06-20
2	Techno BHD	wani@gmail.com	RAM 16 GB	5	2024-06-17
3	Cyber clock	zarif@gmail.com	RAM 8 GB	13	2024-06-17
4	Mahligai Sedirian Berhad	amd@gmail.com	Asus Screen	15	2024-06-16
5	ikhwan bhd	ikwan@gmail.com	SSD 250 GB	5	2024-06-13

Figure 4-25: Supplier report interface

4.5 Conclusion

In this chapter, an architectural view of the "My UTeM Laptop Service" system has been outlined, detailing the layered structure and specific functions of each component. Then database design, covering the conceptual, logical and physical phases, and highlighting the key entities and relationships in the system will be explored. A graphical user interface (GUI) design is also presented, showing how users will interact with the system across various modules such as user management, service management and inventory management. The GUI design has been aligned with the functional and non-functional requirements specified in Chapter 3, ensuring a cohesive and user-friendly experience. The next step involved detailed development and coding of the database and GUI components, rigorous testing to ensure system functionality and performance, and deployment of the system for real-world use at the UTeM laptop service center.

CHAPTER 5: IMPLEMENTATION

5.1 Introduction

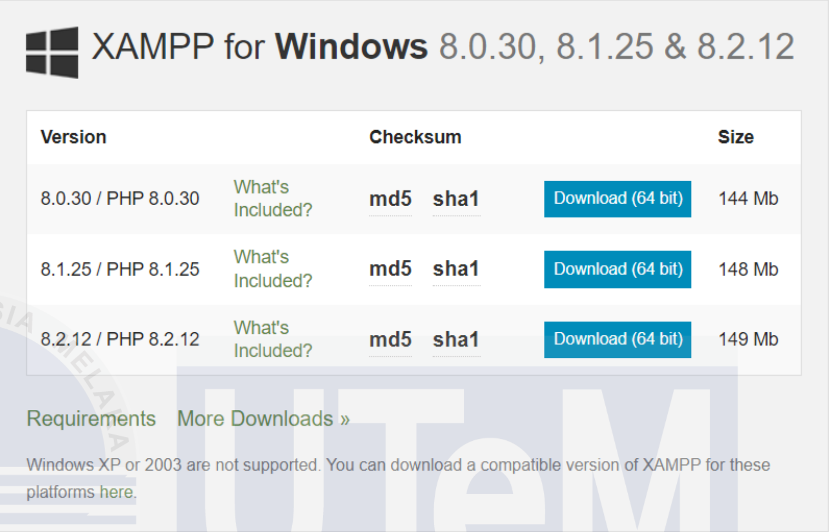
This chapter details the practical aspects of creating a "My UTeM Laptop Service" system. It describes the process of turning conceptual designs and plans into working systems, including technical setup, software development and core feature integration. The implementation phase involves preparing the database, coding the system functions, and ensuring smooth interaction between the user interface and back-end processes. Tests and refinements have been carried out to ensure the system operates efficiently and meets project objectives.

5.2 Software Development setup

The software development setup for the "My UTeM Laptop Service" system involves configuring the development environment and establishing the necessary tools for building and testing the system. Central to this setup is XAMPP, a widely used software package that includes Apache, MySQL, and PHP, providing an integrated environment for developing web applications. XAMPP simplifies the process of setting up a local server environment, which is crucial for developing and testing the system before deployment. By using XAMPP, developers can manage the system's database, run server-side scripts, and interact with the application through a unified platform. This setup supports efficient development by ensuring that all components required for the system's operation are correctly configured and readily available.

5.2.1 XAMPP Installation

- **Step 1:** Download the XAMPP installer at https://www.apachefriends.org/download.html



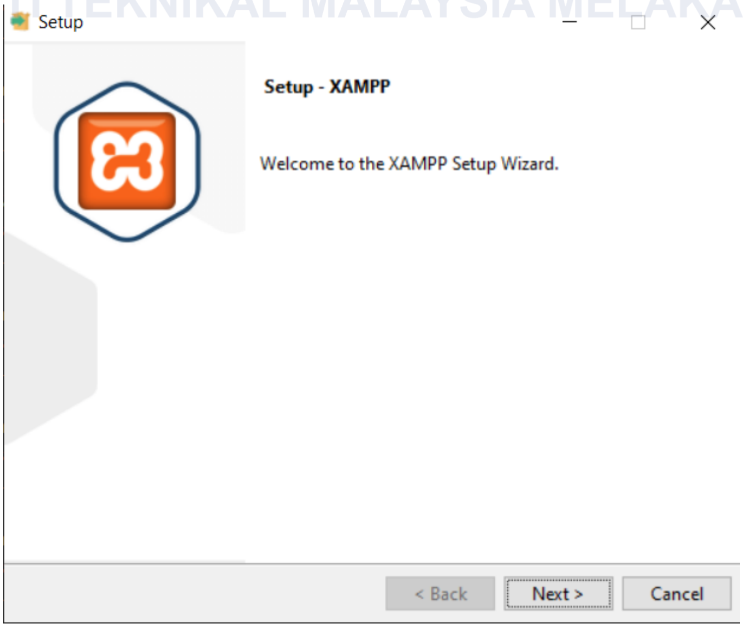
XAMPP for **Windows** 8.0.30, 8.1.25 & 8.2.12

Version		Checksum			Size
8.0.30 / PHP 8.0.30	What's Included?	md5	sha1	Download (64 bit)	144 Mb
8.1.25 / PHP 8.1.25	What's Included?	md5	sha1	Download (64 bit)	148 Mb
8.2.12 / PHP 8.2.12	What's Included?	md5	sha1	Download (64 bit)	149 Mb

Windows XP or 2003 are not supported. You can download a compatible version of XAMPP for these platforms here.

Figure 5-1: Download the XAMPP installer

- **Step 2:** Click next to configure installation setting.

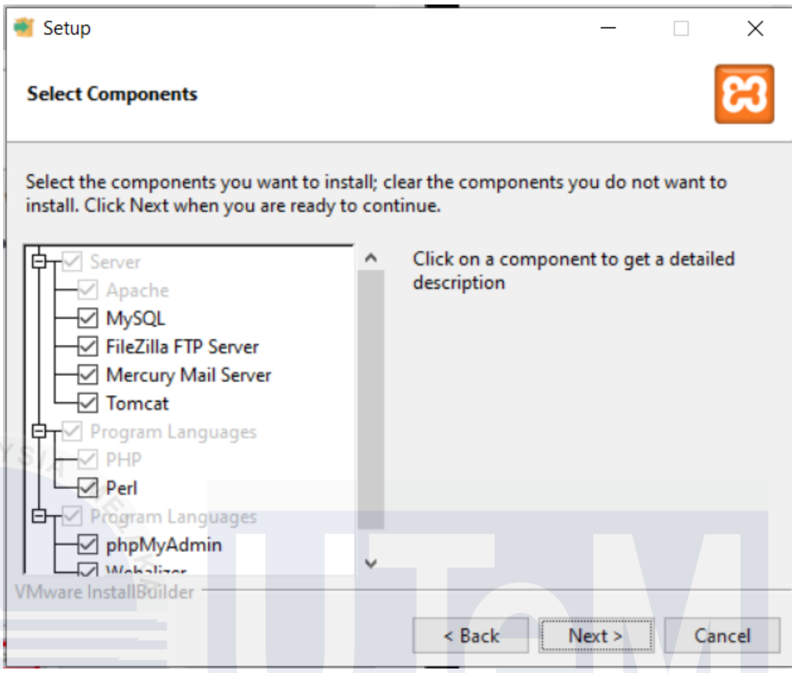


Setup - XAMPP

Welcome to the XAMPP Setup Wizard.

Figure 5-2: Click next to configure installation setting

- **Step 3:** Choose all components that need to install and click 'next' button.



Setup

Select Components

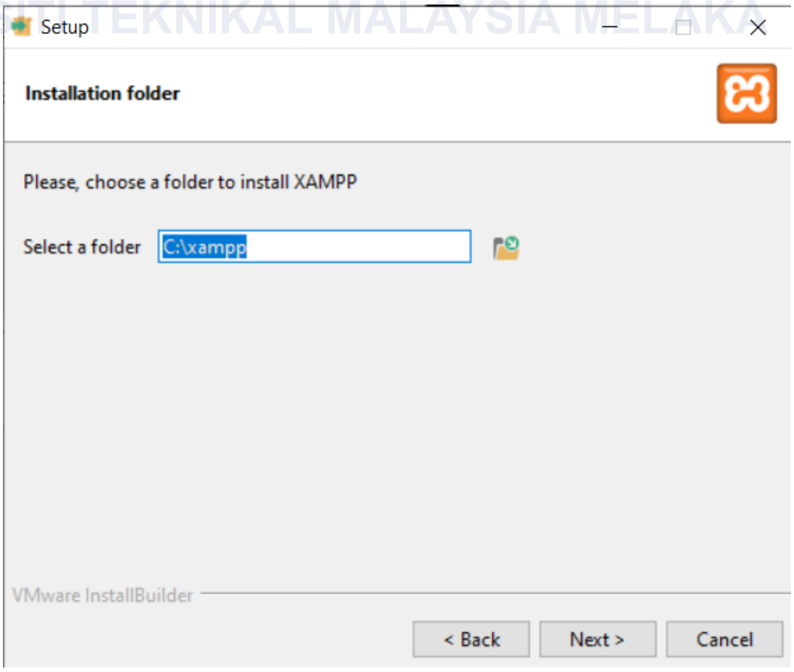
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.

- ☑ Server
  - ☑ Apache
  - ☑ MySQL
  - ☑ FileZilla FTP Server
  - ☑ Mercury Mail Server
  - ☑ Tomcat
- ☑ Program Languages
  - ☑ PHP
  - ☑ Perl
- ☑ Program Languages
  - ☑ phpMyAdmin
  - ☑ Webalizer

Click on a component to get a detailed description

Figure 5-3: Select system components to install

- **Step 4:** select the location for the installation. Then click next.



Setup

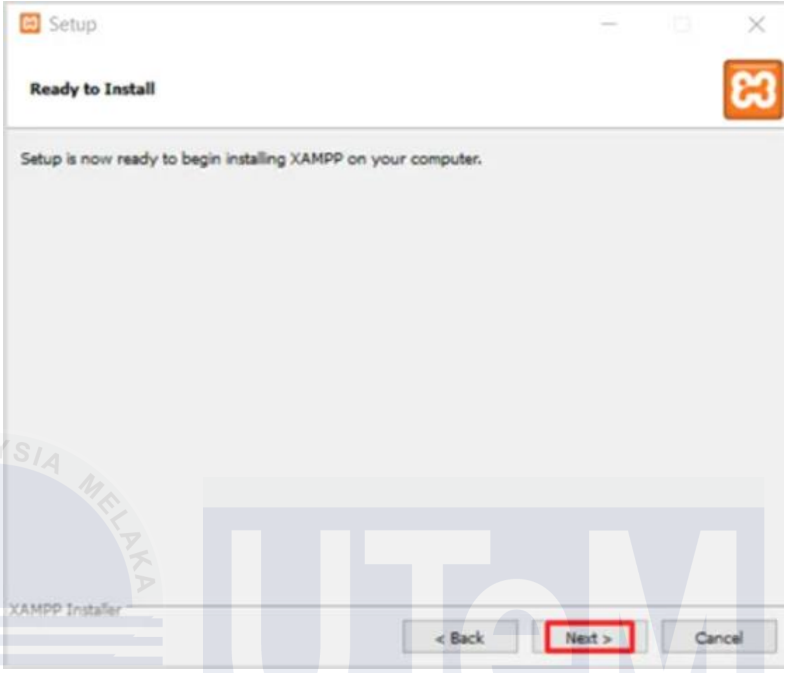
Installation folder

Please, choose a folder to install XAMPP

Select a folder: C:\xampp

Figure 5-4: Select location file for the installation

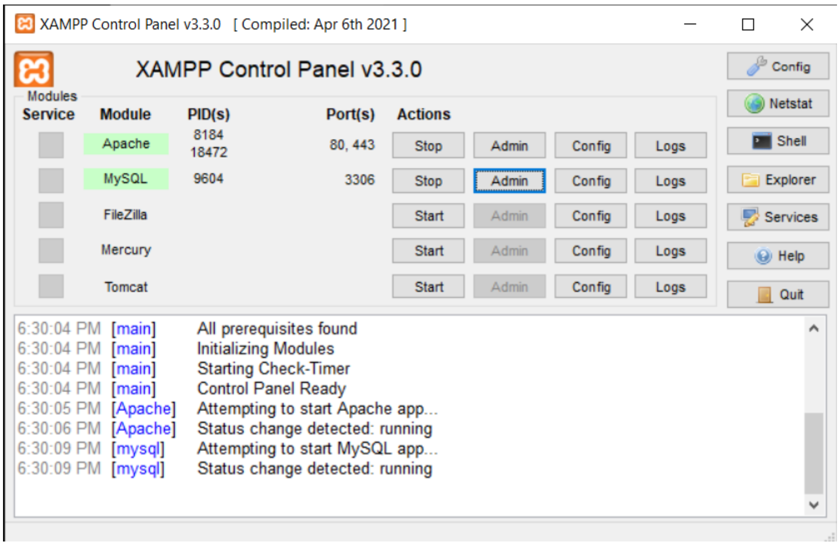
- **Step 5:** XAMPP setup ready to install on your laptop. Click the next button.



Setup is now ready to begin installing XAMPP on your computer.

Figure 5-5: XAMPP setup ready to install on your laptop

- **Step 6:** Click start at the Apache and MySQL module. The green color show that they are active module


XAMPP Control Panel v3.3.0 [Compiled: Apr 6th 2021]
XAMPP Control Panel v3.3.0
Modules
Config
Netstat
Shell
Explorer
Services
Help
Quit

Service	Module	PID(s)	Port(s)	Actions			
	Apache	8184 18472	80, 443	Stop	Admin	Config	Logs
	MySQL	9604	3306	Stop	Admin	Config	Logs
	FileZilla			Start	Admin	Config	Logs
	Mercury			Start	Admin	Config	Logs
	Tomcat			Start	Admin	Config	Logs

```
6:30:04 PM  [main]     All prerequisites found
6:30:04 PM  [main]     Initializing Modules
6:30:04 PM  [main]     Starting Check-Timer
6:30:04 PM  [main]     Control Panel Ready
6:30:05 PM  [Apache]   Attempting to start Apache app...
6:30:06 PM  [Apache]   Status change detected: running
6:30:09 PM  [mysql]    Attempting to start MySQL app...
6:30:09 PM  [mysql]    Status change detected: running
```

Figure 5-6: Click start at the Apache and MySQL module

5.3 Database Implementation

The database implementation for the "My UTeM Laptop Service" system involves creating and managing the data structures that support the system's functionality. The database is designed to store and organize information related to customers, services, inventory, feedback, and other key elements. This design ensures that data is efficiently stored, retrieved, and manipulated to support the system's operations.

5.3.1 Data Definition Language (DDL)

Data Definition Language (DDL) is used to define and manage the database schema, including objects such as tables, attributes, and constraints. DDL statements create and modify the database structure to ensure data is organized and constraints are enforced. Below are some examples of DDL statements used in the "My UTeM Laptop Service" system:

5.3.1.1 Create Table

Table 5-1: Create table customer

```
CREATE TABLE `customer` (
`CUSTOMERID` int(11)
NOT NULL AUTO_INCREMENT PRIMARY KEY,
`CU_NAME` varchar(100) NOT NULL,
`CU_EMAIL` varchar(100) NOT NULL,
`CU_PHONENUMBER` varchar(20) NOT NULL,
`CU_ADDRESS` varchar(300) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;
```

Table 5-2: Create table assign_service

```
CREATE TABLE `assign_service`
( `ASSIGNID` int(20) NOT NULL AUTO_INCREMENT PRIMARY KEY,
`SERVICEID` int(20) NOT NULL, `TYPEID` int(20) NOT NULL,
`SERVICE_AMOUNT` decimal(20,2) NOT NULL, FOREIGN KEY
(`SERVICEID`) REFERENCES `service` (`SERVICEID`), FOREIGN KEY
(`TYPEID`) REFERENCES `service_type` (`TYPEID`) ) ENGINE=InnoDB
DEFAULT CHARSET=utf8mb4;
```

Table 5-3: Create table feedback

```
CREATE TABLE `feedback` (
`FEEDBACKID` int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
`FE_COMMENT` varchar(500) NOT NULL,
`FE_DATE` date NOT NULL,
`SERVICEID` int(11) NOT NULL,
FOREIGN KEY (`SERVICEID`) REFERENCES `service` (`SERVICEID`)
 ) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;
```

Table 5-4: Create table inventory

```
CREATE TABLE `inventory` (
  `INVENTORYID` int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `IN_NAME` varchar(200) NOT NULL,
  `IN_BRAND` varchar(200) NOT NULL,
  `IN_PRICE` decimal(10,2) NOT NULL,
  `IN_IMAGE` longblob NOT NULL,
  `IN_QUANTITY` int(20) NOT NULL,
  `IN_DESCRIPTION` varchar(500) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-5: Create table invoice

```
CREATE TABLE `invoice` (
  `INVOICEID` int(20) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `IN_DATE` date NOT NULL,
  `TOTAL_AMOUNT` decimal(10,2) NOT NULL,
  `SERVICEID` int(30) NOT NULL,
FOREIGN KEY (`SERVICEID`) REFERENCES `service` (`SERVICEID`)

) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-6: Create table laptop

```
CREATE TABLE `laptop` (
  `LAPTOPID` int(20) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `LA_BRAND` varchar(100) NOT NULL,
  `LA_SERIALNUM` varchar(100) NOT NULL,
  `CUSTOMERID` int(20) NOT NULL,
FOREIGN KEY (`CUSTOMERID`) REFERENCES `customer`
(`CUSTOMERID`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-7: Create table service

```
CREATE TABLE `service` (
  `SERVICEID` int(20) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `SE_REQDATE` date NOT NULL,
  `SE_DESCRIPTION` varchar(300) NOT NULL,
  `SE_STATUS` varchar(50) NOT NULL,
  `SE_TRACKINGNO` varchar(50) NOT NULL,
  `SE_PRICE` decimal(20,2) NOT NULL,
  `COMPLETEDATE` date NOT NULL,
  `LAPTOPID` int(20) NOT NULL,
  `STAFFID` int(20) NOT NULL,
FOREIGN KEY (`LAPTOPID`) REFERENCES `laptop` (`LAPTOPID`),
FOREIGN KEY (`STAFFID`) REFERENCES `staff` (`STAFFID`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-8: Create table service inventory

```
CREATE TABLE `service_inventory` (
  `SI_ID` int(20) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `SERVICEID` int(20) NOT NULL,
  `INVENTORYID` int(20) NOT NULL,
  `SI_QUANTITY` int(20) NOT NULL,
  `INVENTORY_AMOUNT` decimal(20,2) NOT NULL,
FOREIGN KEY (`SERVICEID`) REFERENCES `service` (`SERVICEID`),
FOREIGN KEY (`INVENTORYID`) REFERENCES `inventory`
(`INVENTORYID`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-9: Create table service_type

```
CREATE TABLE `service_type` (
  `TYPEID` int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `S_TYPE` varchar(200) NOT NULL,
  `S_NAME` varchar(200) NOT NULL,
  `S_PRICE` decimal(50,2) NOT NULL,
  `S_IMAGE` longblob NOT NULL,
  `S_DESCRIPTION` varchar(500) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-10: Create table staff

```
CREATE TABLE `staff` (
  `STAFFID` int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `ST_NAME` varchar(200) NOT NULL,
  `ST_EMAIL` varchar(100) NOT NULL,
  `ST_PASSWORD` varchar(50) NOT NULL,
  `ST_CPASSWORD` varchar(50) NOT NULL,
  `ST_PROFILEPICTURE` longblob NOT NULL,
  `ST_PHONENUMBER` varchar(20) NOT NULL,
  `ST_ADDRESS` varchar(100) NOT NULL,
  `ST_ROLE` varchar(50) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-11: Create table stock

```
CREATE TABLE `stock` (
  `STOCKID` int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `INVENTORYID` int(11) DEFAULT NULL,
  `SUPPLIERID` int(11) DEFAULT NULL,
  `SK_QUANTITY` int(11) DEFAULT NULL,
  `SK_SUPPLYDATE` date DEFAULT NULL,
FOREIGN KEY (`INVENTORYID`) REFERENCES `inventory`
(`INVENTORYID`),
FOREIGN KEY (`SUPPLIERID`) REFERENCES `supplier` (`SUPPLIERID`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

Table 5-12: Create table supplier

```
CREATE TABLE `supplier` (
  `SUPPLIERID` int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `SU_NAME` varchar(100) NOT NULL,
  `SU_COMPANYNAME` varchar(200) NOT NULL,
  `SU_ADDRESS` varchar(300) NOT NULL,
  `SU_EMAIL` varchar(200) NOT NULL,
  `SU_PHONENUMBER` varchar(50) NOT NULL
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;
```

5.4 Conclusion

The implementation phase of the "My UTeM Laptop Service" system has effectively transformed the initial designs and plans into a working solution. By configuring the development environment with XAMPP and implementing the database using Data Definition Language (DDL), the system's core functionalities have been successfully established. The database design supports essential aspects of service management, including handling customer data, service assignments, inventory management, and feedback collection. This structured approach has resulted in a streamlined and efficient system that enhances operational processes and addresses the specific needs of UTeM. The completed system now provides a solid foundation for future enhancements and demonstrates the project's capability to improve service management within the university.

CHAPTER 6: TESTING

6.1 Introduction

This chapter focuses on the testing phase of the "My UTeM Laptop Service" system. Software Testing is an important process in the software development life cycle. It requires verification and validation to ensure that the "My UTeM Laptop Service" system is free of bugs, and that all system components work as expected and meet the specified requirements. Various types of testing, including unit testing, integration testing, database testing, and user acceptance testing, were conducted to thoroughly evaluate the system. This chapter will explain in detail about the testing that has been done on the "My UTeM Laptop Service” system.

6.2 Test plan

The test plan is a designed document that systematically outlines the strategy for the testing. It includes the testing objectives, scope, criteria, and schedule, providing a clear framework for identifying and resolving bugs or issues. The test plan will be divided into several parts, like test organization, test environment, and test schedule. By defining the testing approach, resources, and responsibilities, the test plan ensures that all components of the system are thoroughly tested.

6.2.1 Test Organization

Test organization is the method used to define roles and responsibilities in the testing process, ensuring that each performs the required testing tasks. In the context of the "My UTeM Laptop Service" system, there are two types of roles that will perform testing tasks, namely staff and customers. This role is important to verify that the system complies with both functional and non-functional requirements.

Table 6-1: Test Organization

Test ID	Name	Position	Task
T1	Muhammad Ikhwan Bin Che Ross	System developer and Test Manager	• Prepare test plan and test script • Perform Uni testing and Integration testing
T2	Haziq Hakimi Bin Suhaimi	Customer	• Testing real-time service status tracking
T3	Muzamir	Staff Global We Shop Group Sdn. Bhd.	• Testing service management module • Testing user management module • Customer Management Module • Testing inventory management module • Report Management Module

6.2.2 Test Environment

The test environment will describe the hardware and software configuration setup. It will outline the hardware setup used, including software settings to ensure the testing process is executed smoothly and accurately.

Table 6-2: Hardware environment

Hardware	Description

Laptop	Acer Nitro 5
Processor	Intel® Core™ i5-10300H CPU @ 2.50Hz
Random Access Memory	24 GB
Storage	1 TB

Table 6-3: Software environment

Software	Description
Text Editor	Visual Studio Code: It is used for writing and testing the coding of the system. It supports HTML, CSS, JavaScript and PHP
Web Server	XAMPP: It is an open-source package that includes Apache HTTP Server, MariaDB, and interpreters for PHP and Perl.
Database	MariaDB: It is a popular database for storing and organizing data.
Operating System	Windows 10: It is a widely used operating system.
Web browser	Google Chrome: It is a web browser used to access and display web content on electronic devices.
Documentation Tools	Microsoft Office 365: It is a suite of productivity tools, including Word, for creating and managing various types of documentation.

6.2.3 Test Schedule

The test schedule is a plan summary that outlines the activities and milestones associated with the testing plan phase of the "My UTeM Laptop Service" system. The test schedule will organize the various testing types, start date, end date, testing module, and tester. It will ensure that the system is completely test before to deployment.

Table 6-4: Test Schedule

Module	Test Type	Start Date	End Date	Tester
User Management Module	Unit Testing	10/8/2024	11/8/2024	T1, T3
Inventory Management Module	Unit Testing, Integration Testing	12/8/204	14//8/2024	T3
Customer Management Module	Unit Testing	15/8/2024	16/8/2024	T3
Service Management Module	Unit Testing, Integration Testing	17/8/2024	18/82024	T3
Report Management Module	Integration Testing	19/8/2024	20/8/2024	T3
Real Time Service Status Tracking Module	Integration Testing	22/8/2024	24/8/2024	T2

6.3 Test Strategy

The test strategy will outline the strategy and methodology that will be used to test the "My UTeM Laptop Service" system. It will highlight the step of detail type of testing, technique to be employed and approach that can be used to test the system. During the “My UTeM Laptop Service” system testing process, black box and white box are two types of testing methods that will be used to test the system.

Black box testing is a high level of testing that will focus on evaluating the functionality of the system. It will provide testing based on requirements and specifications to make sure the system will produce the correct output for the given inputs. In black box testing, testers will focus on the external behavior of the system without examining the internal structure or code. Tester no need to have high skill or knowledge of the implementation of programming language to perform the testing. This method also can be performed by the end user and developer. The benefit of this method is that it is well suited and efficient for large code implementations.

Additionally, white box testing is a testing method that will focus on the internal structures, code, logic, and functionality of the system. This method needs an expert tester with vast experience and complete understanding of the systems codebase to perform white box testing, it is typically performed by system developer and tester. This testing allows removing the extra lines of code that can bring bugs or hidden defects to the system. It is suitable for lower levels of testing like unit testing and integration testing.

Unit testing is the first level of testing done before integration testing. It is a fundamental level of software testing where individual components or modules of a system are tested in isolation. A unit may be an individual function, method, procedure, module, or object, is examined to ensure it performs as expected according to its design and requirements. The primary objective of unit testing is to validate that each unit of the software code performs as expected before it is integrated with other components. This testing is usually done by developers during the coding phase, unit testing is a white box testing techniques to examine the internal logic, data flow, and code paths. Unit testing helps in catching bugs early in the development process, making it easier and more cost-effective to fix issues before they affect other parts of the system.

Integration testing focuses on verifying the interactions between integrated modules or components within a system. After unit testing has been done and confirmed to function correctly in work, they are combined, and integration testing is conducted to ensure they work together as intended. This level of testing aims to identify issues related to the interface, communication, and data exchange between different modules. There are two types of integration testing, the big bang approach and incremental approach. The Big Bang approach is a method of software integration testing where all components or modules of the system are integrated simultaneously. In the Incremental Testing approach, testing is done by integrating two or more modules that are logically related to each other. Then more modules are incrementally added and tested until the entire system is integrated and tested.

The incremental approach has been divided into two approaches, top-down approach and bottom-up approach. Bottom-up integration testing is a strategy in which lower-level modules will test first, progressively moving up to the higher modules. The benefit of using this approach is isolating faults more easily and avoiding the delays associated with waiting for all modules to be completed in a big-bang approach. In top-down integration testing, the modules will be tested starting from the top or highest-level modules and down to the lower-level modules. The integration will begin with the main control modules. The advantages using this approach is, the main modules can be demonstrated early in the development process, even if the lower-level modules are not yet complete.

For the "My UTeM Laptop Service" system, I have chosen the Bottom-Up approach for testing. This decision was made because the project involves critical lower-level modules, like the Login module, that need to be thoroughly tested and validated before integrating them with higher-level components. By starting with these foundational modules, I can ensure that the core functionalities are robust and free of defects, which simplifies the debugging process as the system grows in complexity. This approach also allows for early identification and resolution of issues, ensuring a stable foundation for the entire system as additional modules are progressively integrated and tested.

System testing is a comprehensive testing phase where the entire "My UTeM Laptop Service" system is evaluated. This testing is conducted after all modules have been integrated, ensuring that the system functions according to the specified requirements. System testing includes verifying both functional and non-functional aspects, such as performance, security, and usability, to ensure that the system meets the needs of its users. The objective is to detect any defects that may arise from the interaction between integrated components, ensuring that the system operates seamlessly in its intended environment.

User Acceptance Testing (UAT) is the final phase of testing where the system is tested by the end-users, in this case, UTeM staff and students, to ensure it meets their expectations and requirements. UAT focuses on validating the system’s usability, functionality, and performance from the user's perspective, ensuring that the system is ready for deployment. During UAT, real-world scenarios are simulated to confirm that the system can handle actual use cases effectively. Successful completion of UAT signifies that the system is ready for production and satisfies the users' needs.

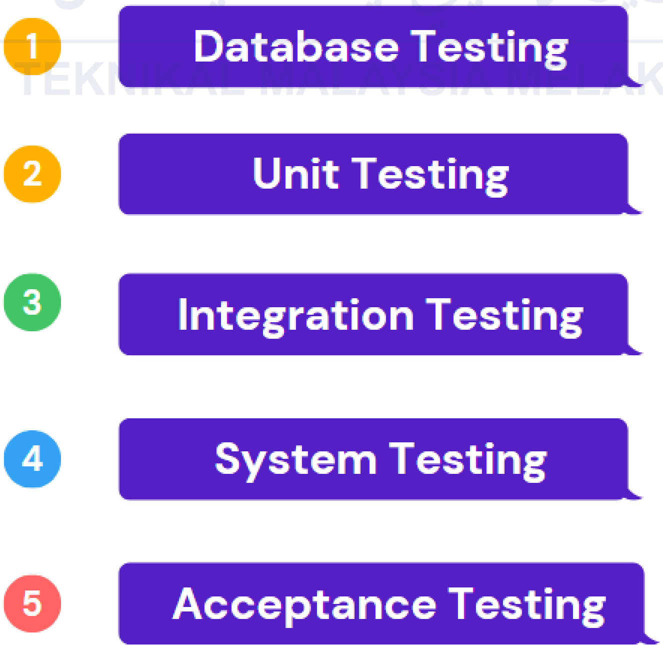


Figure 6-1: Testing Phase

6.3.1 Classes of tests

Error handling, security, and integration tests are the three main categories of tests chosen for the "My UTeM Laptop Service" system to ensure the system's dependability, security, and usefulness.

a) Error handling test

Error Handling Tests are designed to evaluate how well the system manages and responds to errors. This involves intentionally causing errors, such as users entering invalid emails and passwords in login forms. My UTeM Laptop Service System should respond by displaying an error message to the user for entering invalid data. The goal is to verify that the system provides appropriate error messages, maintains data integrity, and is always ready to accept multiple errors.

b) Security test

Security Testing is important to ensure that the "My UTeM Laptop Service" system is protected from unauthorized access. This test will evaluate the system's ability to protect sensitive information, manage user authentication and allow authorized users to access the correct modules and specific privileges according to the roles that have been set.

c) Integration test

Integration Testing focuses on verifying the interactions between different modules or components within the “My UTeM Laptop Service” system. After individual modules are tested, they are integrated, and this test checks whether they work together as expected. The purpose of this test ensuring that the system operates smoothly and consistently across different components.

6.4 Test Design

The Test Design phase aims to create detailed test cases and scenarios used to test the "My UTeM Laptop Service" system against the defined requirements. This stage will be broken down into two parts, test description and test data.

6.4.1 Database Testing

Database testing is an important part of software development to ensure that data in a software application is accurate, reliable and stored correctly. It is important for any system that handles data, such as inventory or customer service systems. This type of test will check the structure of the database, such as tables and relationships, and verify that data operations such as adding, updating, or deleting data are working correctly. There are 2 types of database testing that has been use in testing process:

6.4.1.1 Structural Testing

Structural Database Testing will validate all the elements inside the data repository that are used to store data and avoid end-users manipulating the data. This testing needs tester that mastery in SQL queries.

1) Schema Testing

Schema testing will ensure that the data displayed on the screen (user interface) accurately reflects the data stored in the database (schema).

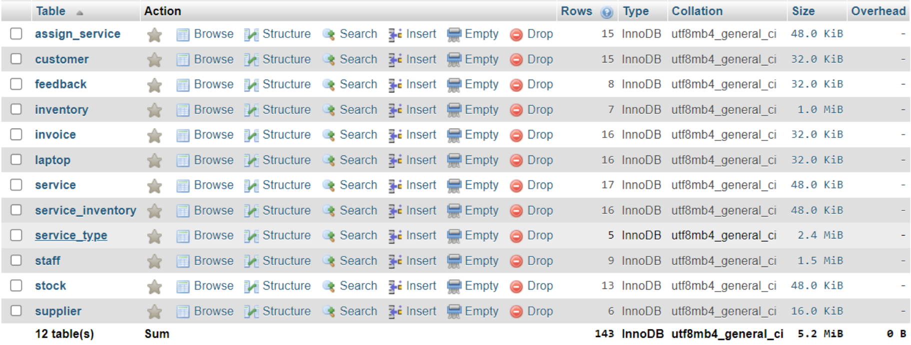


	Table ▲	Action							Rows	Type	Collation	Size	Overhead
□	assign_service	☆	Browse	Structure	Search	Insert	Empty	Drop	15	InnoDB	utf8mb4_general_ci	48.0 KiB	-
□	customer	☆	Browse	Structure	Search	Insert	Empty	Drop	15	InnoDB	utf8mb4_general_ci	32.0 KiB	-
□	feedback	☆	Browse	Structure	Search	Insert	Empty	Drop	8	InnoDB	utf8mb4_general_ci	32.0 KiB	-
□	inventory	☆	Browse	Structure	Search	Insert	Empty	Drop	7	InnoDB	utf8mb4_general_ci	1.0 MiB	-
□	invoice	☆	Browse	Structure	Search	Insert	Empty	Drop	16	InnoDB	utf8mb4_general_ci	32.0 KiB	-
□	laptop	☆	Browse	Structure	Search	Insert	Empty	Drop	16	InnoDB	utf8mb4_general_ci	32.0 KiB	-
□	service	☆	Browse	Structure	Search	Insert	Empty	Drop	17	InnoDB	utf8mb4_general_ci	48.0 KiB	-
□	service_inventory	☆	Browse	Structure	Search	Insert	Empty	Drop	16	InnoDB	utf8mb4_general_ci	48.0 KiB	-
□	service_type	☆	Browse	Structure	Search	Insert	Empty	Drop	5	InnoDB	utf8mb4_general_ci	2.4 MiB	-
□	staff	☆	Browse	Structure	Search	Insert	Empty	Drop	9	InnoDB	utf8mb4_general_ci	1.5 MiB	-
□	stock	☆	Browse	Structure	Search	Insert	Empty	Drop	13	InnoDB	utf8mb4_general_ci	48.0 KiB	-
□	supplier	☆	Browse	Structure	Search	Insert	Empty	Drop	6	InnoDB	utf8mb4_general_ci	16.0 KiB	-
	12 table(s)	Sum							143	InnoDB	utf8mb4_general_ci	5.2 MiB	0 B

Figure 6-2: Database Schema

2) Keys and indexes testing

Key and index testing ensures that your database is organized efficiently and that you can find the data you need quickly and accurately. For example, it will check whether the primary key and the corresponding foreign keys are the same in the two tables.

Table 6-5: Database testing indexes for table `customer`

```
ALTER TABLE `customer`

ADD PRIMARY KEY (`CUSTOMERID`);
```

Table 6-6: Database testing indexes for table `laptop`

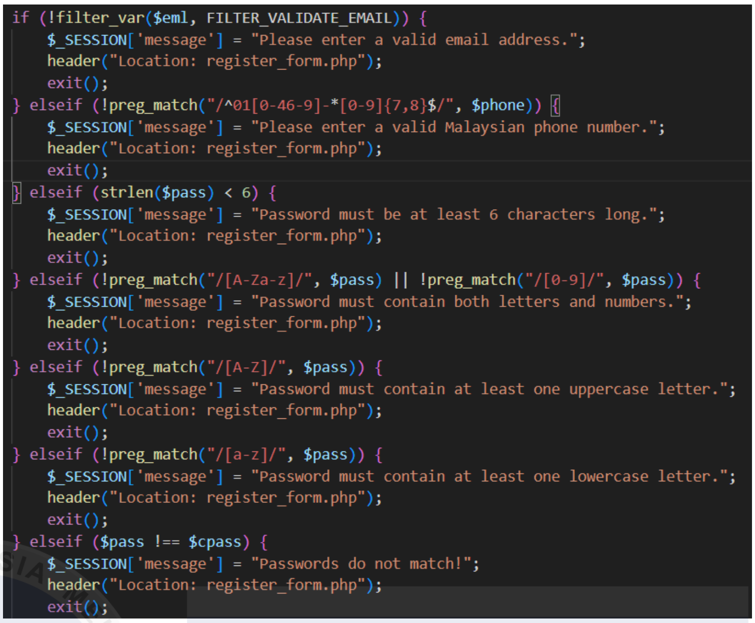
```
ALTER TABLE `laptop`

ADD PRIMARY KEY (`LAPTOPID`),

ADD KEY `CUSTOMERID` (`CUSTOMERID`);
```

6.4.1.2 Functional Testing

Functional database testing is used to validate the functional requirement of database from the end user perspective. For example, "My UTeM Laptop Service" system staff need to create a strong password when registering into the system. \



```php
if (!filter_var($eml, FILTER_VALIDATE_EMAIL)) {
    $_SESSION['message'] = "Please enter a valid email address.";
    header("Location: register_form.php");
    exit();
} elseif (!preg_match("/^01[0-46-9]-*[0-9]{7,8}$/", $phone)) {
    $_SESSION['message'] = "Please enter a valid Malaysian phone number.";
    header("Location: register_form.php");
    exit();
} elseif (strlen($pass) < 6) {
    $_SESSION['message'] = "Password must be at least 6 characters long.";
    header("Location: register_form.php");
    exit();
} elseif (!preg_match("/[A-Za-z]/", $pass) || !preg_match("/[0-9]/", $pass)) {
    $_SESSION['message'] = "Password must contain both letters and numbers.";
    header("Location: register_form.php");
    exit();
} elseif (!preg_match("/[A-Z]/", $pass)) {
    $_SESSION['message'] = "Password must contain at least one uppercase letter.";
    header("Location: register_form.php");
    exit();
} elseif (!preg_match("/[a-z]/", $pass)) {
    $_SESSION['message'] = "Password must contain at least one lowercase letter.";
    header("Location: register_form.php");
    exit();
} elseif ($pass !== $cpass) {
    $_SESSION['message'] = "Passwords do not match!";
    header("Location: register_form.php");
    exit();
```

Figure 6-3: Database testing- create strong password

6.4.2 Test Description

Test Descriptions will provide test cases that outline the test type, test strategy and expected results for each test scenario. Each test case is carefully designed to ensure that it thoroughly evaluates a specific function or aspect of the system. A clear test description helps ensure the test is conducted accurately and consistently and provides a simple but comprehensive knowledge of its objective.

Table 6-7: Test cases new staff registration

Test Module	User Management Module: Registration		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	New staff registration		
Test Case ID	Test Case Description	Test Step	Expected Result

TC1_1	Verify new staff registration function can only be performed if new user inputs the correct and needed data.	1. Go to registration page. 2. Input name, email, phone number, and address. 3. Input password and confirm the password 4. Make sure confirm password same with password 5. Click register button	New staff register successfully. New staff will be directed to the login page. Display message "Register successful".
TC1_2	Verify new staff registration **CANNOT** be performed if new staff left any input field empty.	Left any input field empty.	New staff failed to register. Display message "Please field out this field".
TC1_3	Verify new staff registration **CANNOT** be performed if new staff input invalid format of email and phone number.	Fill the input field with invalid format of email and phone number.	New staff failed to register. Display message "Please enter a valid email address" for invalid email. Display message "Please enter a valid Malaysian phone number." for

			invalid phone number.
TC1_4	Verify new staff registration **CANNOT** be performed if new staff input invalid format of password	Create password with less 6 character or not contain uppercase letter or not contain lowercase letter or not contain alphabet and number.	New staff failed to register. Display message “Password must be at least 6 characters long” or Display message “Password must contain both letters and numbers.” or Display message “Password must contain at least one uppercase letter” or Display message “Password must contain at least one lowercase letter”
TC1_5	Verify new staff registration **CANNOT** be performed if password and confirm password did not match.	Fill the input field of password and confirm password with different value.	New staff failed to register. Display message “Passwords do not match!”.
TC1_6	Verify new staff registration **CANNOT** be performed if new staff input email that already exist in the database	Fill the input field of email which exist in the database	New staff failed to register. Display message “User already exists”.

Table 6-8: Test cases to login into the system.

Test Module	User Management Module: Login		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To login into the system		
Test Case ID	Test Case Description	Test Step	Expected Result
TC2_1	Verify new staff able to login with valid email and password	Fill the input field with valid email, new password and confirm password.	Login successfully. The user is directed to the dashboard or appropriate section based on their role such as admin, Technician and Inventory Manager.
TC2_2	Verify new staff login function **CANNOT** be performed if input invalid email or invalid password.	Fill the input field of email or password with invalid data.	Login failed. Display a message “Login Failed: Incorrect email or password”.
TC2_3	Verify new staff login function **CANNOT** be performed if left any input empty.	Left the following form empty: 1) Password	Login failed. Display message “Please fill out this field”.

Table 6-9: Test cases to forgot old password

Test Module	User Management Module: Forgot password		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To forgot old password		
Test Case ID	Test Case Description	Test Step	Expected Result
TC3_1	Verify staff able to forget old password	Fill the input field with valid email.	Forgot password successfully. Display a message "Password reset successfully! Please check your email". The default password will be sent to staff email.
TC3_2	Verify forgot password function **CANNOT** be performed if input invalid email.	Fill the input field with invalid email.	Forgot password failed. Display a message "The email address does not exist in our system".
TC3_3	Verify forgot password function **CANNOT** be performed if email left empty.	Left email input field empty.	Forgot password failed. Display message "Please field out this field".

Table 6-10: Test cases to view, search, inventory.

Test Module	Inventory Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To view, search, inventory.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC4_1	Verify display inventory information function can be perform.	Go to list of inventory page	Inventory information displayed successfully.
TC4_2	Verify search inventory information function can be performed only if user input valid information of inventory.	Input any valid information of inventory which exist in database.	Inventory information displayed successfully.
TC4_3	Verify search inventory information function **CANNOT** be if user input invalid information of inventory	Input any invalid information of inventory which does not exist in database.	A message "No matching records found" will be display.

Table 6-11: Test case to add and view inventory.

Test Module	Inventory Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To add and view inventory		
Test Case ID	Test Case Description	Test Step	Expected Result
TC5_1	Verify add new inventory function can be performed only if user input valid data.	Under inventory menu, click add inventory and input the following information: 1) Inventory name 2) Inventory brand 3) Inventory price 4) Inventory Image 5) Inventory description or left it empty.	A new inventory was added successfully. Display message "New inventory added successfully".
TC5_2	Verify add Inventory function **CANNOT** be performed if user input invalid data.	Under inventory menu, click add inventory and input invalid information:	A new inventory was failed added. Display message "Please enter a valid price".

		1) Input invalid inventory price	
TC5_3	Verify add inventory function **CANNOT** be performed if user left inventory name, brand, price, image input empty.	Left the following form empty: 2) Inventory Name 3) Inventory brand 4) Inventory price 5) Inventory Image	A new inventory was failed added. Display message “Please fill out this field”.
TC5_4	Verify add Inventory function **CANNOT** be performed if user input inventory name that already exists in the database.	Under inventory menu, click add inventory and input the following information: 2) Inventory name that already exist in database 3) Inventory brand 4) Inventory price 5) Inventory image 6) Inventory description or left it empty	A new inventory was failed added. Display message “Inventory item with the name '$iname' already exists.”.

Table 6-12: Test case to update and delete inventory.

Test Module	Inventory Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To update and delete inventory.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC6_1	Verify update inventory function can be performed only if user input valid data.	Under the inventory menu, click view inventory and click update button at any inventory that we want to update. Update any of following data: 1) Inventory name 2) Inventory brand 3) Inventory price 4) Inventory description or left it empty.	Inventory updated successfully. Display message "Inventory updated successfully".
TC6_2	Verify update Inventory function **CANNOT** be	Under inventory menu, click add	Inventory was failed added. Display message

	performed if user input invalid data.	inventory and input invalid information: 1) Input invalid inventory price	"Please enter a valid price".
TC6_3	Verify delete inventory function **CANNOT** be performed if user left any input empty.	Left any form empty	Inventory was failed update. Display message "Please fill out this field".
TC6_4	Verify delete inventory function can be performed only if user click delete button.	Under inventory menu, click view inventory and click the delete button to remove the inventory.	Inventory deleted successfully. Display message "Inventory deleted successfully.".

Table 6-13: Test case to view, search, supplier.

Test Module	Supplier Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To view, search, supplier.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC7_1	Verify display supplier information function can be perform.	Go to list of supplier page.	Supplier information

			displayed successfully.
TC7_2	Verify search supplier information function can be performed only if user input valid information of supplier.	Input any valid information of supplier which exist in database.	Supplier information displayed successfully.
TC7_3	Verify search supplier information function **CANNOT** be if user input invalid information of supplier.	Input any invalid information of supplier which does not exist in database.	A message "No matching records found" will be display.

Table 6-14: Test case to add and view supplier.

Test Module	Supplier Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To add and view supplier.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC8_1	Verify add new supplier function can be performed only if user input valid data.	Under supplier menu, click add supplier and input the following information:	A new supplier was added successfully. Display message "New supplier

		1) Supplier name 2) Company Name 3) Address 4) Email 5) Phone Number	added successfully”.
TC8_2	Verify add supplier function **CANNOT** be performed if user input invalid data.	Under inventory menu, click add inventory and input invalid information: 1) Input invalid email. 2) Input invalid phone number.	Supplier failed to add. Display message “Please enter a valid email address.” or Display message “Please enter a valid Malaysian phone number.”.
TC8_3	Verify add supplier function **CANNOT** be performed if user left any input empty.	Left the following form empty: 1) Supplier name 2) Company Name 3) Address 4) Email 5) Phone Number	A new supplier was failed added. Display message “Please fill out this field”.
TC8_4	Verify add supplier function **CANNOT** be performed if user input supplier email that	Under supplier menu, click add supplier and input the following information:	A new supplier was failed added. Display message “Supplier already

	already exists in the database.	1) Supplier name 2) Company Name 3) Address 4) Email 5) Phone Number	registered in the system.”.

Table 6-15: Test case to update and delete supplier.

Test Module	Supplier Management Module:		
Test Type	Unit Testing	Test Date	
Test Strategy	Black Box Testing		
Test Description	To update and delete supplier.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC9_1	Verify update supplier function can be performed only if user input valid data.	Under the supplier menu, click view supplier and click update button at any inventory that we want to update. Update any of following data: 1) Supplier name 2) Company Name	Supplier updated successfully. Display message “Supplier updated successfully”.

		3) Address 4) Email 5) Phone Number	
TC9_2	Verify update supplier function **CANNOT** be performed if user input invalid data.	Input email and phone number with invalid information: 1) Input invalid email. 2) Input invalid phone number.	Supplier failed to update. Display message “Please enter a valid email address.” or Display message “Please enter a valid Malaysian phone number.”.
TC9_3	Verify update supplier function **CANNOT** be performed if user left any input empty	Left all input field empty.	Supplier failed to update. Display message “Please field out this field”.
TC9_4	Verify delete supplier function can be performed only if user click delete button.	Under supplier menu, click view supplier and click the delete button to remove the inventory.	Supplier deleted successfully. Display message “Supplier deleted successfully.”.

Table 6-16: Test case to restock the inventory quantity.

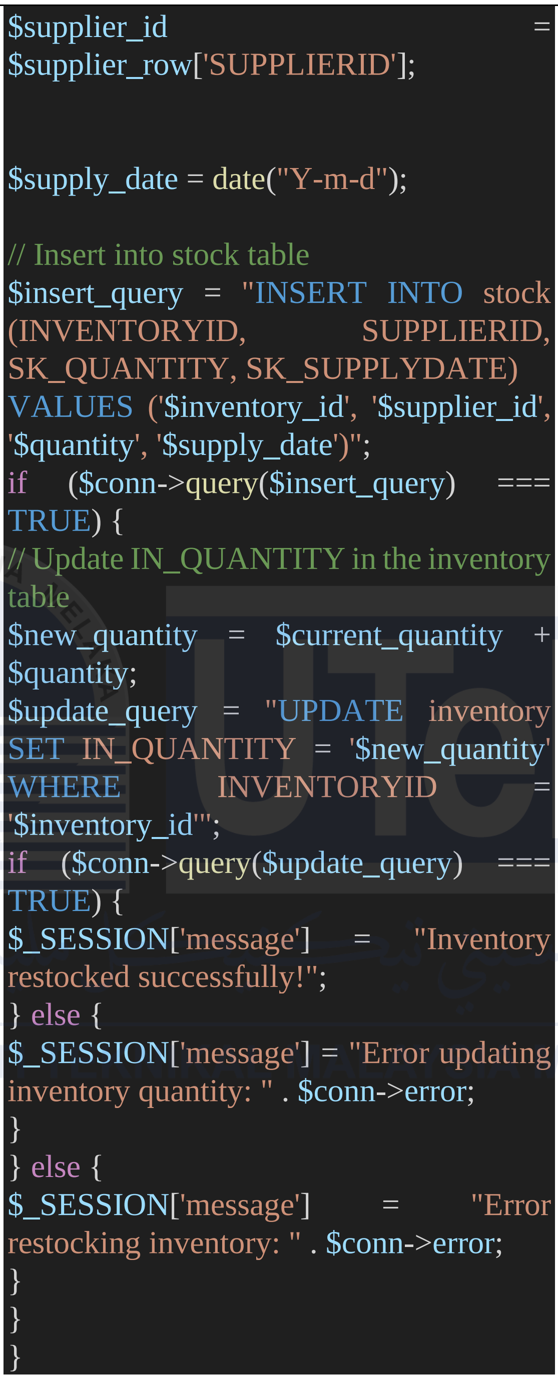
Test Module	Integration between inventory module and supplier module
Test Type	Integration Testing
Test Strategy	White Box Testing

<table>
<tr><td>Test Description</td><td>To restock the inventory quantity.</td></tr>
<tr><td>Pseudo code</td><td><pre>
if(isset($_POST['submit'])) {
// Get form data
$id = $_POST['id'];
$quantity = $_POST['quantity'];
$supplier_name = $_POST['supplier'];

if (!is_numeric($quantity) || $quantity <= 0) {
$_SESSION['message'] = "Please enter a valid positive quantity.";
header("Location: restock.php?id=$id");
exit();
}
elseif (empty($supplier_name)) {
$_SESSION['message'] = "Please select Supplier.";
header("Location: restock.php?id=$id");
exit();
}
else{

// Get InventoryID from inventory table
$inventory_query = "SELECT INVENTORYID, IN_QUANTITY FROM inventory WHERE INVENTORYID = '$id'";
$inventory_result = $conn->query($inventory_query);
$inventory_row = $inventory_result->fetch_assoc();
$inventory_id = $inventory_row['INVENTORYID'];
$current_quantity = $inventory_row['IN_QUANTITY'];

// Get SupplierID from supplier table
$supplier_query = "SELECT SUPPLIERID FROM supplier WHERE SU_COMPANYNAME = '$supplier_name'";
$supplier_result = $conn->query($supplier_query);
$supplier_row = $supplier_result->fetch_assoc();
</pre></td></tr>
</table>

	
	$supplier_id = $supplier_row['SUPPLIERID'];
	
	$supply_date = date("Y-m-d");
	
	// Insert into stock table
	$insert_query = "INSERT INTO stock (INVENTORYID, SUPPLIERID, SK_QUANTITY, SK_SUPPLYDATE) VALUES ('$inventory_id', '$supplier_id', '$quantity', '$supply_date')";
	if ($conn->query($insert_query) === TRUE) {
	// Update IN_QUANTITY in the inventory table
	$new_quantity = $current_quantity + $quantity;
	$update_query = "UPDATE inventory SET IN_QUANTITY = '$new_quantity' WHERE INVENTORYID = '$inventory_id'";
	if ($conn->query($update_query) === TRUE) {
	$_SESSION['message'] = "Inventory restocked successfully!";
	} else {
	$_SESSION['message'] = "Error updating inventory quantity: " . $conn->error;
	}
	} else {
	$_SESSION['message'] = "Error restocking inventory: " . $conn->error;
	}
	}
	}		

Test Case ID	Test Case Description	Test Step	Expected Result
TC10_1	Verify that the system correctly processes valid quantity input.	Under the inventory menu, click restock button at inventory that we want to restock.	1) Inventory updated successfully. 2) Display message

		1) Input the valid quantity 2) Select the supplier	“Inventory updated successfully”. 3) The IN_QUANTITY in the database reflects the new quantity.
TC10_2	Verify that the system rejects invalid quantity input and displays the appropriate error message.	Input invalid quantity.	Inventory failed to update. Display message “Please enter a valid positive quantity.”
TC10_3	Verify that the system halts the process and displays an error message if the supplier is not selected.	1) Start the inventory restocking process. 2) Input a valid quantity. 3) Leave the supplier field empty	Inventory failed to update. Display message “Please select Supplier.”

Table 6-17: Test case to view, search service type.

Test Module	Service Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		

Test Description	To view, search service type.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC11_1	Verify display service type information function can be perform.	Under manage service type menu, click view service.	Service type information displayed successfully.
TC11_2	Verify search service type information function can be performed only if user input valid information of service.	Input any valid information of service type which exist in database.	Service type information displayed successfully.
TC11_3	Verify search service type information function **CANNOT** be if user input invalid information of service type.	Input any invalid information of service type which does not exist in database.	A message "No matching records found" will be display.

Table 6-18: Test case to add new service type.

Test Module	Service Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To add new service type.		
Test Case ID	Test Case Description	Test Step	Expected Result

TC12_1	Verify add new service type function can be performed only if user input valid data.	Under manage service type menu, click add service and input the following information: 1) Select service type 2) Service name 3) Service price 4) Service image 5) Service description or left empty	A new service type was added successfully. Display message "New service added successfully".
TC12_2	Verify add service type function **CANNOT** be performed if user input invalid data.	Input invalid service price	A new service type was failed added. Display message "Please enter a valid price.".
TC12_3	Verify add service function **CANNOT** be performed if user left any empty field except service description.	Left the following form empty: 1) Select service type 2) Service name 3) Service price 4) Service image	A new service was failed added. Display message "Please fill out this field".
TC12_4	Verify add service function **CANNOT** be performed if user input	Input service name that already exist in database	A new service was failed added. Display message

	service name that already exists in the database.		"Service '$sname' exists in the database."

Table 6-19: Test case to update and delete service.

Test Module	Service Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To update and delete service.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC13_1	Verify update service function can be performed only if user input valid data.	Under the manage menu, click view service and click update button at any service that we want to update. Update any of following data: 1) Select service type 2) Service name 3) Service price 4) Service image	Service updated successfully. Display message "Service updated successfully".

		5) Service description or left empty	
TC13_2	Verify update service function **CANNOT** be performed if user input invalid data.	Input invalid service price	Service was failed added. Display message “Please enter a valid price”.
TC13_3	Verify delete service function **CANNOT** be performed if user left any input empty.	Left any form empty	Service failed update. Display message “Please fill out this field”.
TC13_4	Verify delete service function can be performed only if user click delete button.	Under manage service type menu, click view service and click the delete button to remove the service.	Service deleted successfully. Display message “Service deleted successfully.”.

Table 6-20: Test case to add customer

Test Module	Customer Management Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To add customer.		
Test Case ID	Test Case Description	Test Step	Expected Result

TC14_1	Verify add new customer function can be performed only if user input valid data.	Under manage service menu, click create service menu, click add customer button and input the following information: 1) Customer name 2) Customer email 3) Phone number 4) Address or left it empty	A new customer was added successfully. Display message “New customer added successfully”.
TC14_2	Verify add customer function **CANNOT** be performed if user input invalid data.	1) Input invalid email. 2) Input invalid phone number.	Customer failed to add. Display message “Please enter a valid email address.” or Display message “Please enter a valid Malaysian phone number.”.
TC14_3	Verify add supplier function **CANNOT** be performed if user left any input empty.	Left the following form empty: 1) Customer name 2) Customer email	A new customer was failed added. Display message “Please fill out this field”.

		3) Phone number	
TC14_4	Verify add supplier function **CANNOT** be performed if user input information that already exists in the database.	Input customer email which already exist in database	A new customer was failed added. Display message "Customer already registered in the system.".

Table 6-21: Test case to add laptop.

Test Module	Customer Module:		
Test Type	Unit Testing		
Test Strategy	Black Box Testing		
Test Description	To add laptop.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC15_1	Verify add new laptop function can be performed only if user input valid data.	Under manage service menu, click create service menu, click add laptop button and input the following information: 1) Select Customer 2) Laptop brand	A new laptop was added successfully. Display message "Laptop added successfully".

		3) Laptop serial number	
TC15_2	Verify add laptop function **CANNOT** be performed if user input invalid data.	1) Input invalid laptop serial number.	The laptop failed to add. Display message “Laptop serial number must contain only letters and numbers.” or Display message “Laptop serial number must be at least 10 characters long.”.
TC15_3	Verify add laptop function **CANNOT** be performed if user left any input empty.	Left the following form empty: 1) Laptop brand 2) Laptop serial number	A new laptop was failed added. Display message “Please fill out this field”.
TC15_4	Verify add laptop function **CANNOT** be performed if user input information that already exists in the database.	Input laptop serial number which already exist in database	A new laptop was failed added. Display message “Laptop with this serial number already exists.”.

Table 6-22: Test case to record the service that customer wants.

Test Module	Integration between customer module and service module.
Test Type	Integration Testing

Test Strategy	Black Box Testing		
Test Description	To record the service that customer wants.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC16_1	Verify record service function can be performed only if user input valid data.	Under the manage service menu, click create service and input the following information. 1) Select customer email 2) Select customer laptop 3) Input description 4) Click generate tracking no button Click add service button to record the service.	Service recorded successfully. Display message “Service record successfully”.
TC16_2	Verify record service function **CANNOT** be performed if user left any input empty.	Left the following field empty: 1) Select customer email	Service was failed to record. Display message “Please fill out this field”.

		2) Select customer laptop 3) Input description 4) Click generate tracking no button	

Table 6-23: Test case to record service type and inventory data that is used in service process.

Test Module	Integration between customer module, inventory module, and service module.		
Test Type	Integration Testing		
Test Strategy	Black Box Testing		
Test Description	To record service type and inventory data that use in service process.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC17_1	Verify display service information function that has been record before at TC15_1 can be perform.	Under the manage service menu, click pending service.	Service display successfully.
TC17_2	Verify that clicking the "Repair" button	Click on the "Repair" button next to a pending service.	The system should redirect to the repair initiation

	initiates the repair process.		page with the details of the recorded service.
TC17_3	Verify that the correct service details are displayed when initiating a repair.	Click the "Repair" button and observe the pre-filled service details.	The service details like Laptop Brand, Serial Number, Description) should match the selected item from the pending list.
TC17_4	Verify that service type can be selected for the repair.	Proceed with repair process with selecting required service type.	The system should allow the selection of service type.
TC17_5	Verify that inventory can be selected for the repair.	Proceed with the repair process by selecting the required inventory items.	The system should allow the selection of inventory items.
TC17_6	Verify that the system deducts the used inventory quantity from the inventory list after a repair is initiated.	Complete a repair that uses inventory items and check the inventory list.	The inventory count should decrease according to the items used in the repair process.
TC17_7	Verify that the system prevents initiating select inventory if the required inventory items are out of stock.	Attempt to select or search requires out-of-stock inventory items.	The system should not display the out-of-stock inventory.
TC17_8	Verify that the system **CANNOT** attempt to	Attempt to add the same service and inventory again.	The system should block the duplication and

	add duplicate service and inventory items.		display message “You already added this service to the table.” or “You already added this inventory to the table.”
TC17_9	Verify that the system correctly calculates the overall total cost (service + inventory) for the repair.	Select both services and inventory items, then proceed with the repair.	The system should display the correct overall total cost, which includes both the service costs and inventory costs.
TC17_10	Verify the cancellation of the repair process.	Start the repair process, then cancel it before completion.	The repair should not be recorded, and the service status should remain "Cancelled."

Table 6-24: Test case to proceed payment process.

Test Module	Integration between customer module, inventory module, and service module.		
Test Type	Integration Testing		
Test Strategy	Black Box Testing		
Test Description	To proceed payment process.		
Test Case ID	Test Case Description	Test Step	Expected Result

TC18_1	Verify that the system correctly displays the details of the service and inventory used, including the laptop brand, serial number, customer name, request date, and complete date	Access the "payment" page click proceed payment button.	The system should display all the relevant details accurately.
TC18_2	Verify that the total price is correctly calculated and displayed based on the selected service and inventory items.	Access the "Service Details and Payment" page and review the total price calculation.	The total price should be the sum of the service and inventory costs, accurately displayed.
TC18_3	Verify that the "Submit Payment" button processes the payment and completes the transaction successfully.	Select a payment method and click on the "Submit Payment" button.	The payment should be processed, and a confirmation successful message should be displayed. The system should generate receipt after payment success.
TC18_4	Verify that the "Cancel Payment" button cancels the payment process and returns the user to the previous	Click on the "Cancel Payment" button without selecting a payment method.	The payment process should be canceled, and no changes should be saved.

	screen without saving changes.		

Table 6-25: Test case to generate service report.

Test Module	Integration between customer module, service module and payment module.		
Test Type	Integration Testing		
Test Strategy	Black Box Testing		
Test Description	To generate service report.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC19_1	Verify that the service report can be generated for a specified date range.	Select a date range and generate the service report.	The report should display all services performed within the selected date range.
TC19_2	Verify that the service report can be printed.	Click the print button.	The report should be printed successfully in pdf format without any data loss or formatting issues.

Table 6-26: Test case to generate inventory report.

Test Module	Integration between customer module, inventory and payment module.

Test Type	Integration Testing		
Test Strategy	Black Box Testing		
Test Description	To generate inventory report.		
Test Case ID	Test Case Description	Test Step	Expected Result
TC20_1	Verify that the inventory report accurately lists all inventory items used during services.	Select a date range and generate the inventory report.	The report should include all inventory items used, along with quantities, associated services, and total costs.
TC20_2	Verify that the inventory report can be printed.	Click the print button.	The report should be printed successfully in pdf format without any data loss or formatting issues.

Table 6-27: Test case to generate supplier report.

Test Module	Integration between supplier module and inventory.
Test Type	Integration Testing
Test Strategy	Black Box Testing
Test Description	To generate supplier report.

Test Case ID	Test Case Description	Test Step	Expected Result
TC21_1	Verify that the supplier report accurately lists all inventory received from suppliers.	Select a date range and generate the supplier report.	The report should include all information about restock activity such as supplier information, inventory information and supply date.
TC21_2	Verify that the supplier report can be printed.	Click the print button.	The report should be printed successfully in pdf format without any data loss or formatting issues.

Table 6-28: Test case to track real time service status.

Test Module	Integration between customer module, laptop, and service module.		
Test Type	Integration Testing		
Test Strategy	Black Box Testing		
Test Description	To track real time service status.		
Test Case ID	Test Case Description	Test Step	Expected Result

TC22_1	Verify that the customer can tracks their service status.	Click "Track service" button and fill the following form: 1) Input Tracking number	The system should display customer information, laptop information and status of the service.
TC22_2	Verify tracking service status function **CANNOT** be performed if user input invalid data.	1) Input invalid tracking number.	System failed to track the status. Display message "Tracking number is invalid."
TC22_3	Verify track service status function **CANNOT** be performed if user left any input empty.	Left the following form empty: 1) Input Tracking number	System failed to track the status. Display message "Please fill out this field".

Table 6-29: Test case to give feedback.

Test Module	Integration between feedback module and service module.		
Test Type	Integration Testing		
Test Strategy	Black Box Testing		
Test Description	To give feedback		
Test Case ID	Test Case Description	Test Step	Expected Result

TC23_1	Verify that the customer can tracks their service status.	Go to feedback page and fill the following form: 1) Input Tracking number. 2) Input comment	The feedback should save into database
TC23_2	Verify submit feedback function **CANNOT** be performed if user left any input empty.	Left the following form empty: 1) Input Tracking number. Input comment	Feedback was failed to submit. Display message "Please fill out this field".
TC23_3	Verify submit feedback function **CANNOT** be performed if user input invalid data.	2) Input invalid tracking number.	The feedback failed to add. Display message "Tracking number is invalid."
TC23_4	Verify submit function **CANNOT** be performed if try user input feedback for the same tracking number.	Go to feedback page and fill the following form twice: 1) Input Tracking number. 2) Input comment	Feedback was failed submit. Display message "You have already given feedback for this service."

6.4.3 Test Data

Table 6-30: Test data staff registration.

Test Data ID	Name	Email	Phone number	Address	Password	Confirm Password
TD1_1	Akmal	Akmal@gmail.com	019-526-3786	Taman Setiau	Akmal@123	Akmal@123
TD1_2		Akmal@gmail.com	019-526-3786	Taman Setiau	Akmal@123	Akmal@123
TD1_3	Akmal	Akmal@	06-3786-9	Taman Setiau	Akmal@123	Akmal@123
TD1_4	Akmal	Akmal@gmail.com	019-526-3786	Taman Setiau	Akmal12	Akmal12
TD1_5	Akmal	Akmal@gmail.com	019-526-3786	Taman Setiau	Akmal@123	Akmal@167
TD1_6	Akmal	Akmal@gmail.com	019-526-3786	Taman Setiau	Akmal@123	Akmal@123

Table 6-31: Test data login

Test Data ID	Email	Password
TD2_1	Akmal@gmail.com	Akmal@123
TD2_2	kma@gmail.com	Akmal@293
TD2_3	Akmal@gmail.com	

Table 6-32: Test data forgot password

Test Data ID	Email
TD3_1	Akmal@gmail.com
TD3_2	kma@gmail.com
TD3_3	

Table 6-33: Test data search inventory

Test Data ID	Inventory Name
TD4_1	Battery
TD4_2	Cloth

Table 6-34: Test data add inventory.

Test Data ID	TD5_1

Name	SSD 130 GB
Inventory	King Stone
Inventory price	133.00
Inventory Image	Photo.png
Inventory description	Suitable for gaming laptop

Test Data ID	TD5_2

Name	SSD 130 GB
Inventory	King Stone
Inventory price	-12
Inventory Image	Photo.png
Inventory description	Suitable for gaming laptop

Test Data ID	TD5_3

Name	-
Inventory	-
Inventory price	-
Inventory Image	-
Inventory description	-

Test Data ID	TD5_4

Name	SSD 130 GB
Inventory	King Stone
Inventory price	133.00
Inventory Image	Photo.png
Inventory description	Suitable for gaming laptop

Table 6-35: Test data update and deletes inventory.

Test Data ID	TD6_1

Name	SSD 130 GB
Inventory	King Stone
Inventory price	155.00
Inventory Image	Photo.png
Inventory description	Suitable for gaming laptop

Test Data ID	TD6_2

Name	SSD 130 GB
Inventory	King Stone
Inventory price	-155.00
Inventory Image	Photo.png
Inventory description	Suitable for gaming laptop

Test Data ID	TD6_3

Name	-
Inventory	King Stone
Inventory price	155.00
Inventory Image	Photo.png
Inventory description	Suitable for gaming laptop

Test Data ID	TD6_4

Name	-
Inventory	-
Inventory price	-
Inventory Image	-
Inventory description	-

Table 6-36: Test data search and view supplier.

Test Data ID	**Supplier Name**
TD7_1	Kairil
TD7_2	Zaki

Table 6-37: Test data add supplier

Test Data ID	TD8_1

Supplier Name	Aiman
Company Name	King Stone
Company Address	Bandar Tengah Kedah
Email	farhanatech@gmail.com
Phone Number	019-825-3647

Test Data ID	TD8_2

Supplier Name	Aiman
Company Name	King Stone
Company Address	Bandar Tengah Kedah
Email	Farhanatech#9
Phone Number	077-85-47

Test Data ID	TD8_3

Supplier Name	-
Company Name	-
Company Address	-
Email	-
Phone Number	-

Test Data ID	TD8_4

Supplier Name	Aiman
Company Name	King Stone
Company Address	Bandar Tengah Kedah
Email	farhanatech@gmail.com
Phone Number	019-825-3647

Table 6-38: Test data update and delete supplier

Test Data ID	TD9_1

Supplier Name	Aiman
Company Name	King Stone
Company Address	Taman Seri, Bandar Tengah Kedah
Email	farhanatech@gmail.com
Phone Number	019-825-9441

Test Data ID	TD9_2

Supplier Name	Aiman
Company Name	King Stone
Company Address	Taman Seri, Bandar Tengah Kedah
Email	farhanatechgmail.com
Phone Number	019-00021

Test Data ID	TD9_3

Supplier Name	-
Company Name	King Stone
Company Address	Taman Seri, Bandar Tengah Kedah
Email	farhanatech@gmail.com
Phone Number	019-825-9441

Test Data ID	TD9_4

Supplier Name	-
Company Name	-
Company Address	-
Email	-
Phone Number	-

Table 6-39: Test data restock inventory

Test Data ID	Inventory Name	Inventory Brand	Quantity	Supllier
TD10_1	Screen	Acer	15	Farhana Tech
TD10_2	Screen	Acer	-15	Farhana Tech
TD10_3	Screen	Acer	15	

Table 6-40: Test data search service type

Test Data ID	Service Name
TD11_1	Add Ram
TD11_2	Cloth

Table 6-41: Test data add new service

Test Data ID	TD12_1

Service Type	Hardware
Service Name	Add Ram
Service Price	20.00
Service Image	Photo.png
Service Description	Add the RAM

Test Data ID	TD12_2

Service Type	Hardware
Service Name	Add Ram
Service Price	-20.00
Service Image	Photo.png
Service Description	Add the RAM

Test Data ID	TD12_3

Service Type	-
Service Name	Add Ram
Service Price	20.00
Service Image	Photo.png
Service Description	Add the RAM

Test Data ID	TD12_4

Service Type	Hardware
Service Name	Add Ram
Service Price	20.00
Service Image	Photo.png
Service Description	Add the RAM

Table 6-42: Test data update and delete service

Test Data ID	TD13_1

Service Type	Hardware
Service Name	Add Ram
Service Price	15.00
Service Image	Photo.png
Service Description	Add the RAM

Test Data ID	TD13_2

Service Type	Hardware
Service Name	Add Ram
Service Price	-15.00
Service Image	Photo.png
Service Description	Add the RAM

Test Data ID	TD13_3

Service Type	-
Service Name	Add Ram
Service Price	15.00
Service Image	Photo.png
Service Description	Add the RAM

Test Data ID	TD13_4

Service Type	-
Service Name	-
Service Price	-
Service Image	-
Service Description	-

Table 6-43: Test data add customer

Test Data ID	TD14_1

Customer Name	Muaz
Customer Email	muaz@gmail.com
Phone Number	0192534890
Address	Kampung pelepah

Test Data ID	TD14_2

Customer Name	Muaz
Customer Email	muazgmail.com
Phone Number	01-23-890
Address	Kampung pelepah

Test Data ID	TD14_3

Customer Name	-
Customer Email	muazgmail.com
Phone Number	01-23-890
Address	Kampung pelepah

Test Data ID	TD14_4

Customer Name	Muaz
Customer Email	muaz@gmail.com
Phone Number	0192534890
Address	Kampung pelepah

Table 6-44: Test data add laptop

Test Data ID	TD15_1

Customer Email	muaz@gmail.com
Laptop Brand	Asus
Laptop Serial Number	A982637453

Test Data ID	TD15_2

Customer Email	muaz@gmail.com
Laptop Brand	Asus
Laptop Serial Number	A98jwuii

Test Data ID	TD15_3

Customer Email	muaz@gmail.com
Laptop Brand	-
Laptop Serial Number	-

Test Data ID	TD15_4

Customer Email	muaz@gmail.com
Laptop Brand	Asus
Laptop Serial Number	A982637453

Table 6-45: Test data create service

Test Data ID	TD16_1

Customer Email	tanyui@gmail.com
Customer Laptop	Asus ROG
Description	Tukar screen
Tracking Number	T2583

Test Data ID	TD16_2

Customer Email	tanyui@gmail.com
Customer Laptop	
Description	Tukar screen
Tracking Number	T2583

Table 6-46: Test data record service type and inventory data that is used in service process.

Test Data ID	TD17_1

Service Type	Hardware
Service Name	Screen Replacement

Test Data ID	TD17_2

Inventory Name	Screen
Inventory Brand	Asus

Test Data ID	TD17_3

Service Type	Hardware
Service Name	Screen Replacement

Test Data ID	TD17_4

Service Type	Hardware
Service Name	Screen Replacement
Inventory Name	Screen
Inventory Brand	Asus

Table 6-47: Test data proceed payment process.

Test Data ID	TD18_1
Payment Method	Cash

Table 6-48: Test data generate service report

Test Data ID	TD19_1
Start Date	1/7/2024
End Date	28/8/2024

Table 6-49: Test data generate inventory report

Test Data ID	TD20_1
Start Date	1/7/2024
End Date	28/8/2024

Table 6-50: Test data generate supplier report

Test Data ID	TD21_1

Start Date	1/7/2024
End Date	28/8/2024

Table 6-51: Test data tracking real time service status

Test Data ID	TD22_1
Tracking Number	T2583
Test Data ID	TD22_2
Tracking Number	T23d3m
Test Data ID	TD22_3
Tracking Number	-

Table 6-52: Test data give feedback

Test Data ID	TD23_1
Tracking Number	T2583
Comment	Terbaik
Test Data ID	TD23_2

Tracking Number	
Comment	Terbaik

Test Data ID	TD23_3

Tracking Number	Tasygi
Comment	Terbaik

Test Data ID	TD23_4

Tracking Number	T2583
Comment	Terbaik

6.5 Test Results and Analysis

Table 6-53: Test result new staff registration

Test Case ID	**Test Data ID**	**Expected Result**	**Actual Result**	**Pass/Fail**
TC1_1	TD1_1	New staff register successfully. New staff will be directed to the login page. Display message "Register successful".	New staff register successfully. New staff will be directed to the login page. Display message "Register successful".	Pass
TC1_2	TD1_2	New staff failed to register. Display message "Please field out this field".	New staff failed to register. Display message "Please field out this field".	Pass

TC1_3	TD1_3	New staff failed to register. Display message “Please enter a valid email address” for invalid email. Display message “Please enter a valid Malaysian phone number.” For invalid phone number.	New staff failed to register. Display message “Please enter a valid email address” for invalid email. Display message “Please enter a valid Malaysian phone number.” For invalid phone number.	Pass
TC1_4	TD1_4	New staff failed to register. Display message “Password must be at least 6 characters long” or Display message “Password must contain both letters and numbers.” Or Display message “Password must contain at least one uppercase letter” or Display message “Password must contain at least one lowercase letter”	New staff failed to register. Display message “Password must be at least 6 characters long” or Display message “Password must contain both letters and numbers.” Or Display message “Password must contain at least one uppercase letter” or Display message “Password must contain at least one lowercase letter”	Pass
TC1_5	TD1_5	New staff failed to register. Display message “Passwords do not match!”.	New staff failed to register. Display message “Passwords do not match!”.	Pass
TC1_6	TD1_6	New staff failed to register. Display	New staff failed to register. Display	Pass

		message “User already exists”.	message “User already exists”.	

Table 6-54: Test result login into system

Test Case ID	**Test Data ID**	**Expected Result**	**Actual Result**	**Pass/Fail**
TC2_1	TD2_1	Login successfully. The user is directed to the dashboard or appropriate section based on their role such as admin, Technician and Inventory Manager.	Login successfully. The user is directed to the dashboard or appropriate section based on their role such as admin, Technician and Inventory Manager.	Pass
TC2_2	TD2_2	Login failed. Display a message “Login Failed: Incorrect email or password”.	Login failed. Display a message “Login Failed: Incorrect email or password”.	Pass
TC2_3	TD2_3	Login failed. Display message “Please fill out this field”.	Login failed. Display message “Please fill out this field”.	Pass

Table 6-55: Test result old password

Test Case ID	**Test Data ID**	**Expected Result**	**Actual Result**	**Pass/Fail**
TC3_1	TD3_1	Forgot password successfully. Display a message “Password reset successfully! Please check your	Forgot password successfully. Display a message “Password reset successfully! Please check your	Pass

		email”. The default password will be sent to staff email.	email”. The default password will be sent to staff email.	
TC3_2	TD3_2	Forgot password failed. Display a message “The email address does not exist in our system”.	Forgot password failed. Display a message “The email address does not exist in our system”.	Pass
TC3_3	TD3_3	Forgot password failed. Display message “Please field out this field”.	Forgot password failed. Display message “Please field out this field”.	Pass

Table 6-56: Test result view, search, inventory.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC4_1		Inventory information displayed successfully.	Inventory information displayed successfully.	Pass
TC4_2	TD4_1	Inventory information displayed successfully.	Inventory information displayed successfully.	Pass
TC4_3	TD4_2	A message “No matching records found” will be display.	A message “No matching records found” will be display.	Pass

Table 6-57: Test result add and view inventory

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC5_1	TD5_1	A new inventory was added successfully. Display message “New inventory added successfully”.	A new inventory was added successfully. Display message “New inventory added successfully”.	Pass
TC5_2	TD5_2	A new inventory was failed added. Display message “Please enter a valid price”.	A new inventory was failed added. Display message “Please enter a valid price”.	Pass
TC5_3	TD5_3	A new inventory was failed added. Display message “Please fill out this field”.	A new inventory was failed added. Display message “Please fill out this field”.	Pass
TC5_4	TD5_4	A new inventory was failed added. Display message “Inventory item with the name ‘$iname’ already exists.”.	A new inventory was failed added. Display message “Inventory item with the name ‘$iname’ already exists.”.	Pass

Table 6-58: Test result update and deleted inventory.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC6_1	TD6_1	Inventory updated successfully. Display message “Inventory updated successfully”.	Inventory updated successfully. Display message “Inventory updated successfully”.	Pass

TC6_2	TD6_2	Inventory was failed added. Display message “Please enter a valid price”.	Inventory was failed added. Display message “Please enter a valid price”.	Pass
TC6_3	TD6_3	Inventory was failed update. Display message “Please fill out this field”.	Inventory was failed update. Display message “Please fill out this field”.	Pass
TC6_4	TD6_4	Inventory deleted successfully. Display message “Inventory deleted successfully.”.	Inventory deleted successfully. Display message “Inventory deleted successfully.”.	Pass

Table 6-59: Test result view, search, supplier.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC7_1		Supplier information displayed successfully.	Supplier information displayed successfully.	Pass
TC7_2	TD7_1	Supplier information displayed successfully.	Supplier information displayed successfully.	Pass
TC7_3	TD7_2	A message “No matching records found” will be display.	A message “No matching records found” will be display.	Pass

Table 6-60: Test result add and view supplier

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail

TC8_1	TD8_1	A new supplier was added successfully. Display message "New supplier added successfully".	A new supplier was added successfully. Display message "New supplier added successfully".	Pass
TC8_2	TD8_2	Supplier failed to add. Display message "Please enter a valid email address." Or Display message "Please enter a valid Malaysian phone number.".	Supplier failed to add. Display message "Please enter a valid email address." Or Display message "Please enter a valid Malaysian phone number.".	Pass
TC8_3	TD8_3	A new supplier was failed added. Display message "Please fill out this field".	A new supplier was failed added. Display message "Please fill out this field".	Pass
TC8_4	TD8_4	A new supplier was failed added. Display message "Supplier already registered in the system.".	A new supplier was failed added. Display message "Supplier already registered in the system.".	Pass

Table 6-61: Test result update and deleted supplier.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC9_1	TD9_1	Supplier updated successfully. Display message "Supplier updated successfully".	Supplier updated successfully. Display message "Supplier updated successfully".	Pass
TC9_2	TD9_2	Supplier failed to update. Display	Supplier failed to update. Display	Pass

		message “Please enter a valid email address.” Or Display message “Please enter a valid Malaysian phone number.”.	message “Please enter a valid email address.” Or Display message “Please enter a valid Malaysian phone number.”.	
TC9_3	TD9_3	Supplier failed to update. Display message “Please field out this field”.	Supplier failed to update. Display message “Please field out this field”.	Pass
TC9_4	TD9_4	Supplier deleted successfully. Display message “Supplier deleted	Supplier deleted successfully. Display message “Supplier deleted	Pass

Table 6-62: Test result restock the inventory quantity

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC10_1	TD10_1	Inventory should update successfully. Display message “Inventory updated successfully”.	Inventory updated successfully. Display message “Inventory updated successfully”.	Pass
TC10_2	TD10_2	Inventory failed to update. Display message “Please enter a valid positive quantity.” And Display message “Please select Supplier.”.	Inventory failed to update. Display message “Please enter a valid positive quantity.” And Display message “Please select Supplier.”.	Pass

TC10_3	TD10_3	Inventory failed to update. Display message "Please select Supplier."	Inventory failed to update. Display message "Please select Supplier."	Pass

Table 6-63: Test result view, search service type.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC11_1		Service type information displayed successfully.	Service type information displayed successfully.	Pass
TC11_2	TD11_1	Service type information displayed successfully.	Service type information displayed successfully.	Pass
TC11_3	TD11_2	Input any invalid information of service type which does not exist in database.	Input any invalid information of service type which does not exist in database.	Pass

Table 6-64: Test result add new service type

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC12_1	TD12_1	A new service type should be added successfully. Display message "New service added successfully".	A new service type was added successfully. Display message "New service added successfully".	Pass
TC12_2	TD12_2	A new service type should fail to be added. Display message	A new service type was failed to add. Display message	Pass

		“Please enter a valid price.”.	“Please enter a valid price.”.	
TC12_3	TD12_3	A new service type should fail to be added. Display message “Please fill out this field”.	A new service was failed added. Display message “Please fill out this field”.	Pass
TC12_4	TD12_4	A new service type should fail to be added. Display message “Service ‘$sname’ exists in the database.”	A new service was failed added. Display message “Service ‘$sname’ exists in the database.”	Pass

Table 6-65: Test result update and delete service.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC13_1	TD13_1	Service updated successfully. Display message “Service updated successfully”.	Service updated successfully. Display message “Service updated successfully”.	Pass
TC13_2	TD13_2	Service was failed added. Display message “Please enter a valid price”.	Service was failed added. Display message “Please enter a valid price”.	Pass
TC13_3	TD13_3	Service failed update. Display message “Please fill out this field”.	Service failed update. Display message “Please fill out this field”.	Pass
TC13_4	TD13_4	Service deleted successfully. Display	Service deleted successfully. Display	Pass

		message "Service deleted successfully.".	message "Service deleted successfully.".	

Table 6-66: Test result add customer.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC14_1	TD14_1	A new customer was added successfully. Display message "New customer added successfully".	A new customer was added successfully. Display message "New customer added successfully".	Pass
TC14_2	TD14_2	Customer failed to add. Display message "Please enter a valid email address." Or Display message "Please enter a valid Malaysian phone number.".	Customer failed to add. Display message "Please enter a valid email address." Or Display message "Please enter a valid Malaysian phone number.".	Pass
TC14_3	TD14_3	A new customer was failed added. Display message "Please fill out this field".	A new customer was failed added. Display message "Please fill out this field".	Pass
TC14_4	TD14_4	A new customer was failed added. Display message "Customer already registered in the system.".	A new customer was failed added. Display message "Customer already registered in the system.".	Pass

Table 6-67: Test result add laptop.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC15_1	TD15_1	A new laptop was added successfully. Display message “Laptop added successfully”.	A new laptop was added successfully. Display message “Laptop added successfully”.	Pass
TC15_2	TD15_2	The laptop failed to add. Display message “Laptop serial number must contain only letters and numbers.” Or Display message “Laptop serial number must be at least 10 characters long.”.	The laptop failed to add. Display message “Laptop serial number must contain only letters and numbers.” Or Display message “Laptop serial number must be at least 10 characters long.”.	Pass
TC15_3	TD15_3	A new laptop was failed added. Display message “Please fill out this field”.	A new laptop was failed added. Display message “Please fill out this field”.	Pass
TC15_4	TD15_4	A new laptop was failed added. Display message “Laptop with this serial number already exists.”.	A new laptop was failed added. Display message “Laptop with this serial number already exists.”.	Pass

Table 6-68: Test Result records the service that customer wants.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC16_1	TD16_1	Service recorded successfully. Display	Service recorded successfully. Display	Pass

		message "Service record successfully".	message "Service record successfully".	
TC16_2	TD16_2	Service was failed to record. Display message "Please fill out this field".	Service was failed to record. Display message "Please fill out this field".	Pass

Table 6-69: Test Result records service type and inventory data that is used in service process.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC17_1		Service information display successfully.	Service information display successfully.	Pass
TC17_2		The system should redirect to the repair initiation page with the details of the recorded service.	The system redirects to the repair initiation page with the details of the recorded service.	Pass
TC17_3		The service details like Laptop Brand, Serial Number, Description) should match the selected item from the pending list.	The service details like Laptop Brand, Serial Number, Description) match the selected item from the pending list.	Pass
TC17_4	TC17_1	The system should allow the selection of service type.	The system allows the selection of service type.	Pass
TC17_5	TC17_2	The system should allow the selection of inventory items.	The system should allow the selection of inventory items.	Pass
TC17_6		The inventory count should decrease	The inventory decreases according to	Pass

		according to the items used in the repair process.	the items used in the repair process.	
TC17_7		The system should not display the out-of-stock inventory.	The system does not display the out-of-stock inventory.	Pass
TC17_8	TC17_3	The system should block the duplication and display message “You already added this service to the table.” or “You already added this inventory to the table.”	The system blocks the duplication and display message “You already added this service to the table.” or “You already added this inventory to the table.”	Pass
TC17_9	TC17_4	The system should display the correct overall total cost, which includes both the service costs and inventory costs.	The system displays the correct overall total cost, which includes both the service costs and inventory costs.	Pass
TC17_10		The repair should not be recorded, and the service status should remain "Cancelled."	The repair should not be recorded, and the service status should remain "Cancelled."	Pass

Table 6-70: Test Result payment process.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC18_1		The system should display all the relevant details accurately.	The system displays all the relevant details accurately.	Pass

TC18_2		The total price should be the sum of the service and inventory costs, accurately displayed.	The total sum of the service and inventory costs, accurately displayed.	Pass
TC18_3	TD18_1	The payment should be processed, and a confirmation successful message should be displayed. The system should generate receipt after payment success.	The payment be processed, and a confirmation successful message be displayed. The system generate receipt after payment success.	Pass
TC18_4		The payment process should be canceled, and no changes should be saved.	The payment process canceled, and no changes saved.	Pass

Table 6-71: Test results generate service report.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC19_1	TD19_1	The report should display all services performed within the selected date range.	The report displays all services performed within the selected date range.	Pass
TC19_2		The report should be printed successfully in pdf format without any data loss or formatting issues.	The report should be printed successfully in pdf format without any data loss or formatting issues.	Pass

Table 6-72: Test results generate inventory report.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC20_1	TD20_1	The report should display all inventory items used, along with quantities, associated services, and total costs.	The report displays all inventory items used, along with quantities, associated services, and total costs.	Pass
TC20_2		The report should be printed successfully in pdf format without any data loss or formatting issues.	The report printed successfully in pdf format without any data loss or formatting issues.	Pass

Table 6-73: Test results generate supplier report.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC21_1	TD21_1	The report should include all information about restock activity such as supplier information, inventory information and supply date.	The report displays all information about restock activity such as supplier information, inventory information and supply date.	Pass
TC21_2		The report should be printed successfully in pdf format without any data loss or formatting issues.	The report printed successfully in pdf format without any data loss or formatting issues.	Pass

Table 6-74: Test results track real time service status.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC22_1	TD22_1	The system should display customer information, laptop information and status of the service.	The system display customer information, laptop information and status of the service.	Pass
TC22_2	TD22_2	System failed to track the status. Display message "Tracking number is invalid."	System failed to track the status. Display message "Tracking number is invalid."	Pass
TC22_3	TD22_3	System failed to track the status. Display message "Please fill out this field".	System failed to track the status. Display message "Please fill out this field".	Pass

Table 6-75: Test results give feedback.

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC23_1	TD23_1	The feedback should be saved into a database.	The feedback saves into database successfully.	Pass
TC23_2	TD23_2	Feedback was failed to submit. Display message "Please fill out this field".	Feedback was failed to submit. Display message "Please fill out this field".	Pass
TC23_3	TD23_3	The feedback failed to add. Display message "Tracking number is invalid."	The feedback failed to add. Display message "Tracking number is invalid."	Pass

TC23_4	TD23_4	Feedback was failed submit. Display message “You have already given feedback for this service.”	Feedback was failed submit. Display message “You have already given feedback for this service.”	Pass

6.6 User Acceptance Testing

This section describes the User Acceptance Test (UAT) conducted for the "My UTeM Laptop Service" system. UAT is the final phase of testing where real users of the system verify that the developed system meets their needs and is ready for use. In this case, the test involved staff from Global We Shop Group Sdn. Bhd. will act as My UTeM Laptop Service staff and two randomly selected students from UTeM will act as customers. The objective of UAT is to verify that the system works as expected in real-world scenarios and meets the needs of both staff and students. The feedback obtained during this phase is important in identifying any final adjustments or improvements needed before the system is fully implemented.

6.6.1 User Acceptance Testing Process

The UAT process involved a group of users, including staff and customers:

Table 6-76: User acceptance testing role

Tester ID	Role
UT_1	Staff
UT_2	Customer

6.6.1.1 Test Result – Acceptance Testing (Staff)

Table 6-77: Test result 1 - user acceptance (Staff)

Tester ID	UT_1		
Role	Staff		
Test ID	Acceptance Requirement	Yes	No
T1_1	Ever Experience with similar systems Before?	3	

Table 6-78: Test result 2 - user acceptance (Staff)

Tester ID	UT_1					
Role	Staff					
Test ID	Accepance Requirement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
T2_1	The system is easy to navigate and understand.				2	1
T2_2	The system's interface is visually appealing and user-friendly.				1	2
T2_3	The system’s features meet my expectations and needs in managing services.				1	2

T2_4	The system's features meet my expectations and needs in managing inventory.				1	2
T2_5	The system is responsive and performs tasks quickly.				2	1

Table 6-79: Test result 3 - user acceptance (Staff)

Test ID	Comments	Tester ID
T3_1	Can improve by sending receipt customer email	UT_1

6.6.1.2 Test Result – Acceptance Testing (Customer)

Table 6-80: Test result 1 - user acceptance (Customer)

Tester ID	UT_2		
Role	Customer		
Test ID	Acceptance Requirement	Yes	No
T1_1	Ever Experience with similar systems Before?	2	3

Table 6-81: Test result 2 - user acceptance (Customer)

Tester ID	UT_2					
Role	Customer					
Test ID	Accepance Requirement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
T2_1	I found it easy to navigate through the MyUTeMLS system to find the services I needed.					5
T2_2	The system's interface is visually appealing and user-friendly.				4	1
T2_3	The service menu clearly displayed all the available options and their details.				2	3
T2_4	The real-time service status tracking feature was useful				1	4
T2_5	Overall, I am satisfied with the MyUTeMLS system.					5

6.7 Conclusion

In this chapter, the testing process for the "My UTeM Laptop Service" system has been thoroughly discussed. Various testing methods, including unit testing, integration testing and user acceptance testing (UAT), have been used to ensure that the system works as planned and meets the specified requirements. The results of these tests have provided valuable insight into the performance, usability and reliability of the system. The feedback collected during the UAT, especially from the staff at Global We Shop Group Sdn. Bhd. and selected UTeM students, have played an important role in identifying system weaknesses for improvement. All this information will be used as future system improvements.

CHAPTER 7: PROJECT CONCLUSION

7.1 Introduction

This chapter provides a comprehensive conclusion of the "My UTeM Laptop Service" project, summarizing the key achievements, contributions, and limitations encountered during the development. It also outlines potential future work that could enhance the system and discusses the overall reflection on the project's journey.

7.2 Project summarization

The "My UTeM Laptop Service" project represents significant progress in digital service management at Universiti Teknikal Malaysia Melaka (UTeM). Before this system was developed, UTeM did not have an integrated system to manage laptop services. The project has introduced a streamlined approach that increases operational efficiency, reduces human error and provides real-time data to support better decision-making. By using modern web technologies and advanced database management systems, this project works well and benefits the UTeM community as it improves service management. This implementation will significantly improve the efficiency and effectiveness of the laptop service process at UTeM.

7.3 Project Contribution

The "My UTeM Laptop Service" project has significantly improved the quality and efficiency of laptop service management at Universiti Teknikal Malaysia Melaka (UTeM), in line with its initial objectives by introducing a detailed and accessible service menu, real-time status tracking, advanced reporting features, Streamlined inventory management and improved feedback. These improvements have addressed problems such as slow service management, lack of report management, inefficient operations and poor status service tracking, resulting in a more effective and user-centric service management system that has improved the user experience for both staff and students. The project's success in meeting its objectives shows its potential for further development and integration into other service areas within the university.

7.4 Project Limitation

One limitation of the system is that the data backup and recovery process may not be implemented into the system. If something goes wrong, such as a system failure or cyber-attack, the system may not save data often enough or restore everything to the latest state. This means there may be a risk of losing important customer and service information, which could disrupt system operations. This proves that this system needs a more reliable backup and recovery plan to ensure data is safe and accessible.

Next is a limited type of service, where the “My UTeM Laptop Service” system is specifically designed to provide hardware and software services for laptops, without offering to sell equipment, laptops or related products. This focused approach ensures that service centers can provide high quality repair and maintenance services. However, this narrow focus may limit the system's ability to serve other industries or customers who may need to purchase hardware or other products along with the service.

Lastly, the system might not work perfectly on all devices like mobile phones or tablets, or in every web browser. This could cause problems for users, such as the website not displaying correctly, some features not working as they should, or the entire system being inaccessible on those devices or browsers.

7.5 Future Works

For future work to improve customer satisfaction and service efficiency, a real-time chat feature will be developed in the “My UTeM Laptop Service” system. This feature will allow customers to communicate directly with staff in real time, facilitating immediate responses to inquiries and issues. Customers will be required to create an account on the “My UTeM Laptop Service” system platform to access the chat feature, allowing for personalized interactions and the ability to track communication history. The chat interface will be designed to be user-friendly, incorporating features such as message history to improve communication effectiveness. Additionally, the role of customer service staff will be assigned to handle customer inquiries via the chat feature at certain times, with a system implemented to automatically send messages to available staff. By providing real-time chat capabilities, MyUTeMLS aims to offer a more responsive and personalized customer support experience, leading to increased satisfaction among UTeM students and staff.

Second future work is implementation WhatsApp messaging notifications into the "My UTeM Laptop Service" system will make it easier for customers to keep their service status updated. Customers can provide their WhatsApp number when they make a service request, and the system will send them updates at important moments, such as when their request is received, in progress, completed, or if there are any issues. This keeps customers informed, reduces their anxiety, and improves their experience. As WhatsApp is widely used, it enables quick and easy updates directly on their phones, helping to avoid delays or confusion.

A booking system will be added to the "My UTeM Laptop Service" system, allowing customers to select available time slots for their appointments. Once the appointment is booked, the customer will receive an automated confirmation email or message. This feature will improve scheduling efficiency by allowing customers to choose a convenient time, which helps reduce wait times, and improve overall service. It also helps manage service better by preventing overbooking through effective use of booking data. By providing a clear and easy-to-use booking feature, customers can plan their service requests more easily and effectively.

This future work aims to improve the efficiency of the "My UTeM Laptop Service" system by providing some additional features and improving the user experience. By implementing real-time chat, WhatsApp notifications and booking features, the system can be more accessible, convenient and efficient for UTeM staff and students.

7.6 Conclusion

In conclusion, the "My UTeM Laptop Service" (MyUTeMLS) project has successfully achieved its set objectives, providing a comprehensive and user-friendly platform that addresses the critical issues identified in the existing manual system. The implementation of clear and detailed service menus, real-time status tracking and robust reporting features have significantly improved the overall user experience, operational efficiency and communication within the UTeM community.

The development of this project has gone through several phases, among which is through the phase of systematic analysis, design, implementation and strict testing, to ensure that the system meets the set requirements and works reliably and effectively, fulfilling its intended purpose. The system also received very positive feedback from user acceptance tests, which confirmed the project's success in meeting its goals.

Overall, the MyUTeMLS system provides multiple benefits to the management of laptop services at Universiti Teknikal Malaysia Melaka (UTeM), offering a solid foundation for future improvement and expansion. This project not only addresses the immediate needs of users but also sets a benchmark for future digital service initiatives at UTeM.

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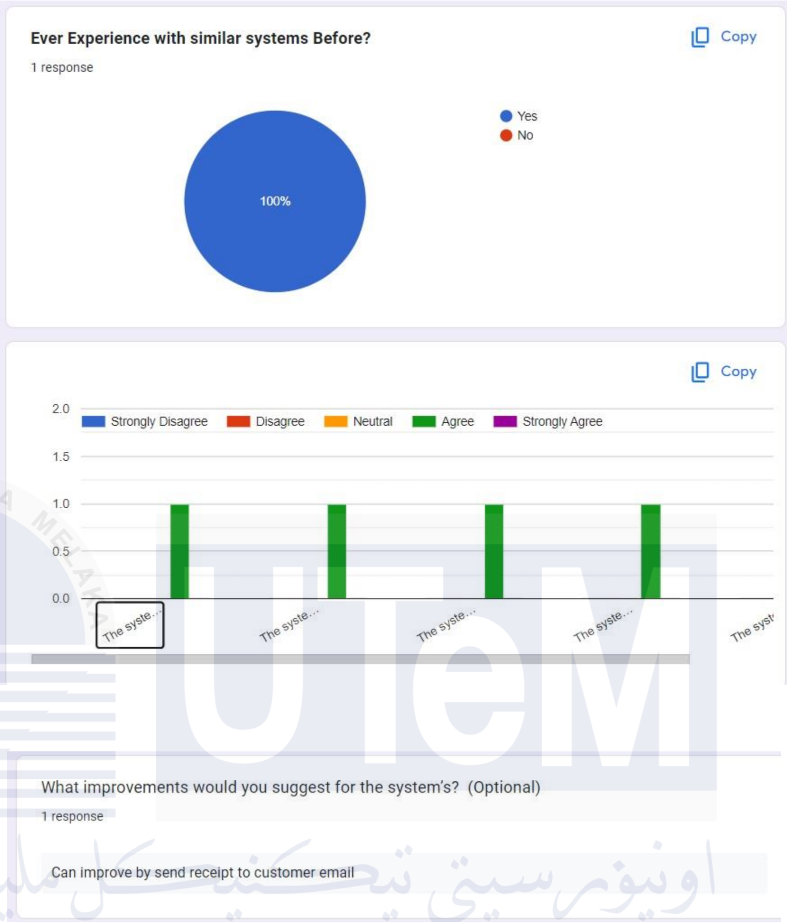
APPENDIX A

APPENDIX B



Ever Experience with similar systems Before?

1 response

What improvements would you suggest for the system's? (Optional)

1 response

Can improve by send receipt to customer email