# CEMENT COMPANY LOGISTIC MANAGEMENT SYSTEM (CCLMS)



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This report is submitted in partial fulfilment of the requirement 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

# **CEMENT COMPANY LOGISTIC MANAGEMENT SYSTEM (CCLMS)**

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

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STUDENT:(WONG YI XUAN)	Date:	25/9/2024
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this project report is sufficient in term of the scope and	1	
of Computer Science (Database Manage	ment) wit	h Honours.
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SUPERVISOR: (PROFESOR MADYA TS. DR. NURUL AKMAR BINTI EMRA	Date: _ N)	25/9/2024

# **DEDICATION**

I dedicate this work to my supervisor, lecturers, my family, and the employees of Unipertiwi Sdn. Bhd. for their unwavering support, guidance, and encouragement throughout this journey.



### ABSTRACT

Cement Company Logistic Management System (CCLMS) is a web-based digital solution designed to manage the operations of a cement company, addressing challenges associated with manual processes in account creation, order management, and logistics coordination. Utilizing a three-tier architecture built with ASP.NET for the presentation and business logic layers, and SQL Server for the data layer, the system streamlines and enhances operational efficiency. The primary users of this system are admins, logistics partners, and customers. Key modules encompass order placement, order processing, order tracking, as well as billing and payment functionalities. The project introduces its background, problem statement, objectives, scope, significance, and expected outcomes, establishing the need for a digital solution to improve operational transparency and efficiency. It outlines the methodology and planning, employing the Database Life Cycle (DBLC) methodology to ensure systematic progress. The project's aim is to create a user-friendly system that enhances productivity, reduces operational costs, and improves customer satisfaction, thereby contributing to the company's growth and competitiveness.

### ABSTRAK

Sistem Pengurusan Logistik Syarikat Simen (CCLMS) adalah penyelesaian digital berasaskan web yang direka untuk menguruskan operasi syarikat simen, menangani cabaran yang berkaitan dengan proses manual dalam penciptaan akaun, pengurusan pesanan, dan koordinasi logistik. Menggunakan seni bina tiga lapisan yang dibina dengan ASP.NET untuk lapisan persembahan dan logik perniagaan, serta SQL Server untuk lapisan data, sistem ini menyelaraskan dan meningkatkan kecekapan operasi. Pengguna utama sistem ini adalah pentadbir, rakan logistik, dan pelanggan. Modul utama merangkumi penempatan pesanan, pemprosesan pesanan, penjejakan pesanan, serta fungsi pengebilan dan pembayaran. Projek ini memperkenalkan latar belakangnya, pernyataan masalah, objektif, skop, kepentingan, dan hasil yang diharapkan, dengan menegaskan keperluan untuk penyelesaian digital bagi meningkatkan ketelusan dan kecekapan operasi. Ia menggariskan metodologi dan perancangan, menggunakan metodologi Kitaran Hayat Pangkalan Data (DBLC) untuk memastikan kemajuan yang sistematik. Matlamat projek ini adalah untuk mencipta sistem mesra pengguna yang meningkatkan produktiviti, mengurangkan kos operasi, dan meningkatkan kepuasan pelanggan, sekali gus menyumbang kepada pertumbuhan dan daya saing syarikat.

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# LIST OF ABBREVIATIONS

- CCLMS Cement Company Logistic Management System
- DBLC Database Life Cycle
- DFD Data Flow Diagram
- GUI Graphical User Interface
- DDL Data Definition Language
- DML Data Manipulate Language
- ERD Entity Relationship Diagram
- PO-Purchase Order
- PO Num-Purchase Order Number
- SO-Sales Order
- SO Num-Sales Order Number
- DO-Delivery Order
- POD-Proof of Delivery



اونيومرسيتي تيكني

# **CHAPTER 1**

# INTRODUCTION

#### **1.1 Project Background**

Unipertiwi Sdn. Bhd. serves as a construction, specializing in providing cement for a diverse array of projects, including commercial buildings, industrial facilities, road construction and housing development. However, the company's current operational processes heavily rely on manual intervention. For instance, customers are required to initiate orders by contacting the administrative team via telephone. Subsequently, the administrative staff must then coordinate with logistics companies to arrange for order collection. This dependence on manual efforts not only introduces the possibility of human errors but also poses challenges in terms of efficiency and scalability. Thus, there is a pressing need for the implementation of an automated system to streamline Unipertiwi Sdn. Bhd.'s business workflow, enhancing accuracy and optimizing resource utilization.

The system is designed with a focus on three primary users: the admin, the customer, and the logistic company. The admin holds the authority to approve and manage customer orders, allocate delivery tasks to logistic companies, and generate invoices for customers upon order completion. Customers, on the other hand, are able to place orders and track their status directly through the system interface. For logistic companies, they can view assigned delivery orders and facilitates the assignment of appropriate lorries and drivers for efficient order fulfillment.

# **1.2 Problem Statements**

- a) The current logistics operations lack efficiency, leading to delays in order processing, suboptimal inventory management, and increased operational costs.
- b) The absence of reporting functions to visualize the company sales performance.
- c) The current invoicing and billing processes heavily rely on manual efforts, resulting in delays, errors, and a lack of agility in financial transactions.

### 1.3 Objectives

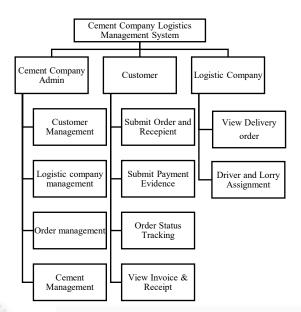
- a) To streamline order processing, inventory management, and delivery logistics to improve overall operational efficiency.
- b) To implement an automated reporting function to generate sales report.
- c) To implement an automated invoicing and billing system to reduce manual efforts, minimize errors, and expedite financial transactions.

# 1.4 Scope

Figure 1.1 shows the structured chart of CCLMS. The scope encompasses three users: cement company admin, customer and logistic. For the Cement Company Admin, the system allows them to create and update customer accounts while setting parameters such as credit limits. Admins also manage partnerships with logistic companies, overseeing account details and their roles in the order fulfillment process. Additionally, the admin is responsible for managing orders, including approving orders, updating their status, assigning them to logistic companies, and overseeing the issuance of invoices and receipts. Cement management is another critical area, where admins can add and update cement products and track price changes.

For customers, the system facilitates the submission of new orders, where customers can specify the type and quantity of cement, as well as recipient details. The system also allows customers to submit payment evidence, which is verified and processed, ensuring that their orders are fulfilled smoothly. Customers can track the status of their orders at any time. Additionally, they can view and download invoices and receipts related to their orders, ensuring they have all the necessary documentation for their transactions.

In the logistic module, logistic companies have the tools to efficiently manage delivery orders assigned to them. They can view these orders and are responsible for assigning drivers and lorries to ensure that deliveries are completed on time. This module streamlines the logistics process, helping to optimize routes and improve the overall efficiency of the company's delivery operations. Overall, the CCLMS is designed to cover all aspects of the company's operations, ensuring a seamless and integrated workflow from order placement to delivery.



**Figure 1.1: Structured Chart** 

# **1.5 Project Significance**

The implementation of an automated system for Unipertiwi Sdn. Bhd. holds immense significance, promising a transformative impact on the company's operations and overall efficiency. By streamlining the current manual workflow, the system will reduce ordering processing times, facilitate driver and lorry assignment of logistic company, and automate the invoice and billing process.

# **1.6 Expected Outcomes**

Output 1: Automated generation of purchase order, sales order, delivery order.

Output 2: Automated generation of invoice, receipt.

Output 3: Driver and lorry assignment time table.

### **1.7 Conclusion**

In this chapter, the background of the project is being discussed in detail. The problem statement is figured out and is aimed to be solved based on the objectives listed. The scope of system modules and users are also discussed to provide a better solution to overcome the challenges and problems. The system is expected to have 3 modules which are cement company admin, customer and logistic. The system will be developed web based as the users can use the system whenever there is a connection.

### CHAPTER 2

#### **PROJECT METHODOLOGY AND PLANNING**

# **2.1 Introduction**

This chapter describes the development methodology utilized for the project. While several System Development Life Cycle (SDLC) approaches, such as waterfall, agile, and spiral models, can be applied to build and test software effectively, the Database Life Cycle (DBLC) was chosen for this project. The DBLC offers a structured approach through essential stages: initial database analysis, design, implementation and data loading, training and assessment, and long-term operations and maintenance. A key characteristic of the DBLC is its ongoing nature, where tasks such as monitoring, updates, and maintenance continue throughout the database's life, well beyond the initial setup. In summary, the DBLC manages the database's entire lifecycle.

# 2.2 Project Methodology

The Database Life Cycle (DBLC) methodology was selected for the development of the CCLMS. The DBLC consists of six key phases: initial database study, database design, implementation and loading, testing and evaluation, and ongoing operations, maintenance, and evaluation.

# 2.2.1 Database Initial Study

In this phase, the existing manual business process is analyzed to identify the reasons for its inefficiencies. To gain a deeper understanding and evaluate the current system's workflow, an unstructured interview was conducted on 1st March 2024 with Ms Gigi Pang, the director of the cement company and Ms Chu Lee Fang, the staff of one of the partner logistic companies to understand business flow of the ordering process.

From the unstructured interview, the problems and limitations of the current system were identified, leading to the creation of objectives that form the fundamental requirements for the new system. An analysis was then conducted to differentiate between the ideal and the achievable by acknowledging the system's scope and boundaries. The scope outlines the design's extent based on operational needs, such as defining the necessary data structures, data types, the number of entities, and the physical size of the database.

### 2.2.2 Database Design

The second phase centers on crafting the database model to fulfill the data requirements that support the system's functionality and goals. This phase is crucial for ensuring the final solution meets the system's specifications. It is divided into four key sub-phases: conceptual design, DBMS selection, logical design, and physical design. In the conceptual design stage, an entity-relationship diagram (ERD) is created, and normalization is applied according to the system's specifications. Microsoft SQL Server was chosen as the DBMS for this system. In the logical design phase, data definitions and business logic were outlined, and a relational data model was established to define the necessary data and queries. Finally, the physical design stage organized attributes from the logical model into detailed tables, columns, indexes, sequences, and constraints, reflecting the core business rules and data relationships.

# 2.2.3 Implementation and Loading

In this phase, the DBMS software which is SQL Server Management Studio (SSMS) is installed in the computer, and connected with Microsoft SQL Server in the local system. Next, the database is created using Data Definition Language (DDL) based on the Entity-Relationship Diagram (ERD) produced. Data Manipulation Language (DML) is then utilized to populate data into the database tables. The website is developed using the ASP.NET framework, with C# serving as the programming language for the backend.

# 2.2.4 Testing and evaluation

This phase consists of three sub-phases: testing the database, fine-tuning the database, and evaluating the database and its application programs to ensure data integrity, security, and performance.

Test the Database: During this sub-phase, the database is tested to verify data integrity and security, ensuring the system's performance. Data integrity is enforced by the DBMS through the use of primary keys, foreign keys, unique constraints, and other mechanisms. Data security is tested by evaluating password protection, privileges, and access rights. Unit testing is performed to check individual functions like registration, login, and admin features by inputting sample data to assess database connections and error messages, ensuring correct data types are entered. System testing is then conducted to validate the business processes and ensure the system operates without errors.

Fine-Tune the Database: If the database shows errors or does not meet the required data specifications, it is fine-tuned to improve performance and ensure it aligns with the data requirements.

Evaluate the Database and Its Application Programs: Once the database has been tested and fine-tuned, an evaluation process is carried out. This involves broader system testing to confirm that all components function together correctly and meet the data requirements.

# 2.2.5 Operation

Upon completing the evaluation process, the system transitions into a fully operational information system. Users will then be able to utilize the system to handle essential tasks such as data entry, data management, and generating reports, facilitating the required information flow.

#### 2.2.6 Maintenance and Evolution

The database maintenance phase includes routine activities like index maintenance, table optimization, user management, and password updates, along with regular backups and restoration in the event of a failure. As the system and organization grow, new requirements or changes may emerge, prompting adaptive maintenance. This could involve adding new fields or creating additional tables to enhance system performance and address evolving needs.

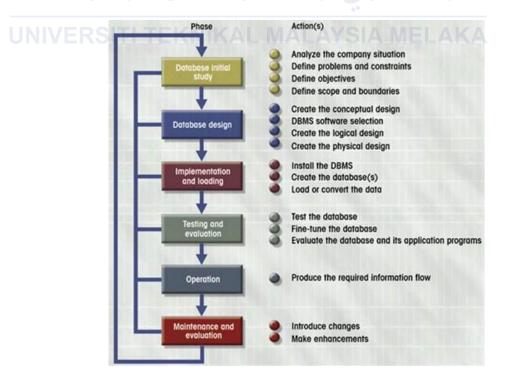


Figure 2.1: Database Life Cycle Illustration

# 2.3 Project Schedule and Milestones

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Task															
Database Initia	1														
Study															
Database desig	n														
NA A	LAYSIA														
Implementation	1		X												
and loading	•		A												
Testing and															
evaluation									7						

# Table 2.1: Gantt Chart of Cement Company Logistic Management System (CCLMS)



Milestones	Expected Outcomes	Date
Interview Ms Gigi Pang & Ms Chu Lee Fang	The business flow of the cement company and partnered logistic company.	10/3/2024
Problems identification and analysis	Problem statement Objective Flow chart of the current and proposed system Requirement and module of proposed system.	18/3/2024
Conceptual design of the proposed system	DFD and ERD of the proposed system Business rules Data Definition Language Data Manipulation Language Normalization and query	5/4/2024
Implementation of the proposed system	Database environment set up Graphical User Interface (GUI) Source code Procedure and trigger.	15/4/2024
Testing of the proposed system functionality	Test plan KAL MALAYSIA M Test case Test result and analysis Solution solving of error message from testing process	31/5/2024
Completed documentation and log book	PSM 1 final report Project Demonstration	24/6/2024
Project Demonstration	Final Presentation	24/6/2024

**Table 2.2: Project Milestones** 

# **2.4 Conclusion**

This chapter outlines the chosen methodology that guided the system's development, detailing the methods used and the processes involved in each phase of the Database Life Cycle (DBLC), as well as the rationale for selecting this methodology. The DBLC was selected for this project because it encompasses six stages: initial database study, database design, implementation and loading, training and evaluation, and operations and maintenance. Additionally, the maintenance phase will persist throughout the system's operation to ensure its smooth functioning. A more comprehensive technical analysis of the overall system will be provided in the next chapter.



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#### **CHAPTER 3**

#### ANALYSIS

### **3.1 Introduction**

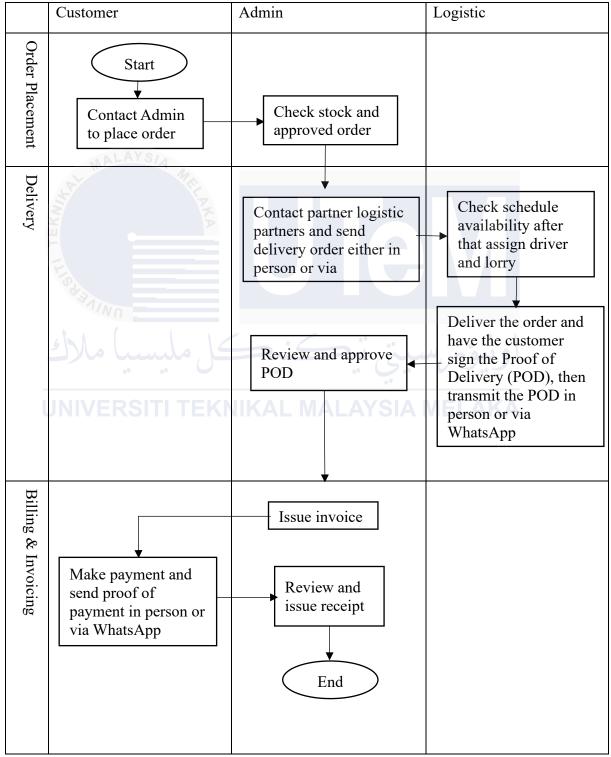
This chapter focuses on the analysis phase of the project, where the system is broken down into sub-modules to gather factual data, understand processes, identify problems, and recommend viable solutions for improvement. This includes examining the current business processes of the cement company, collecting operational data, analyzing data flow, pinpointing user bottlenecks, and devising strategies to ease their workload. The chapter will emphasize comprehending the existing business operations, recognizing weaknesses in the recruitment process, and proposing enhancements for the new system to meet user needs.

# **3.2 Problem Analysis**

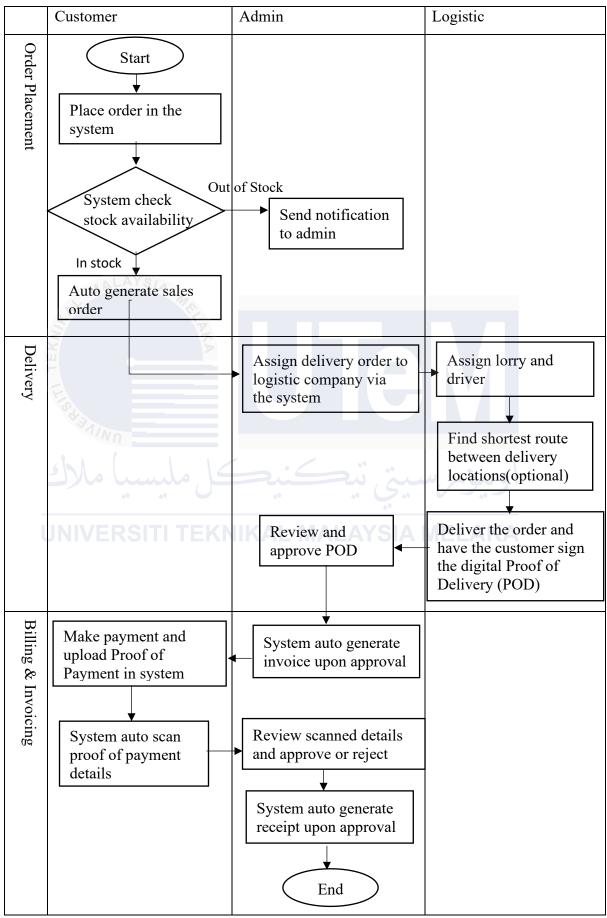
Figure 3.1 shows the current manual business workflow at Unipertiwi Sdn. Bhd. begins with customers contacting the administrative team to place their orders. This process, while traditional, is prone to delays and miscommunications due to its reliance on phone calls or other manual forms of communication. Once orders are received, admin will check the stock and decide whether or not to approve customer order. This manual approach not only introduces inefficiencies but also increases the likelihood of errors in order processing and fulfilment.

Following order approval, the administrative team manually contacts logistics partners to send out delivery orders, either through face-to-face interaction or via messaging platforms like WhatsApp. Additionally, logistics personnel must manually check availability, assign drivers and vehicles, and execute. Submitting the prove of delivery (POD) through face-to-face interaction or via WhatsApp to the administrative team introduces an additional manual step, exacerbating inefficiencies in the delivery workflow. This is compounded by the fact that admins often make mistakes due to the necessity of cross-referencing the delivery order number with the received POD for approval.

In the final stage of the current workflow, administrative staff issue invoices in paper format, contributing to administrative burden and potential delays in payment processing. Customers, in turn, are required to make payments and provide proof of payment via manual channels (WhatsApp), prolonging transaction times. The issuance of paper receipts further extends the administrative overhead, completing a cumbersome billing and invoicing cycle. This manual approach not only hampers efficiency but also impedes financial transparency and accuracy in the billing process.



**Figure 3.1: Current Business Flow** 



**Figure 3.2: Proposed Improvement** 

# 3.3 Requirement Analysis

# **3.3.1 Functional Requirement**

a) Cement Company Admin

- Admin can create new customer accounts by entering required details such as name, contact information, and address.
- Admin can set and update the credit limit for each customer.
- System should enforce credit limit constraints during order processing.
- Admin can create accounts for partnered logistic companies by entering necessary details such as company name, contact information, and address.
- Admin can view and approve customer orders.
- Admin can update the status of orders (e.g., pending, approved, shipped, delivered, cancelled).
- Admin can assign approved orders to partnered logistic companies for delivery.
- System can generate and issue invoices to customers upon order approval.
- System can generate and issue receipts upon payment confirmation.
- Admin can add new cement products and update existing cement product details.
- System should maintain a history of price changes for each cement product.

#### b) Customer VERSITI TEKNIKAL MALAYSIA MELAKA

- Customers can place orders for cement products by selecting desired products and quantities.
- Customers can upload proof of payment for their orders.
- Customers can view the status of their orders.
- Customers can view and download invoices for their orders.
- Customers can view and download receipts upon payment confirmation.

# c) Logistic Company

- Logistic company users can view the list of orders assigned to their company for delivery.
- Logistic company users can assign drivers and lorries to each delivery order.
- Logistic company users can upload proof of delivery.

# 3.3.2 Data Flow Diagram (DFD)

A Data Flow Diagram (DFD) is a graphical representation that illustrates the processes or activities within a system and how data moves between those functions. For this project, a context diagram is first created to show the external entities involved and the data flows originating or ending with them. Following this, a DFD fragment is constructed based on the project requirements, detailing the flow of data through various processes, interactions with external entities, and connections to data stores. Figures 3.3 to 3.7 provide these diagrams for the Cement Company Logistics Management System (CCLMS).

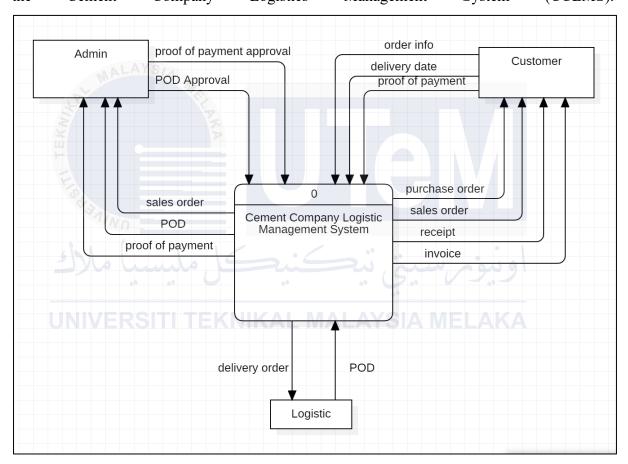


Figure 3.3: Context Diagram

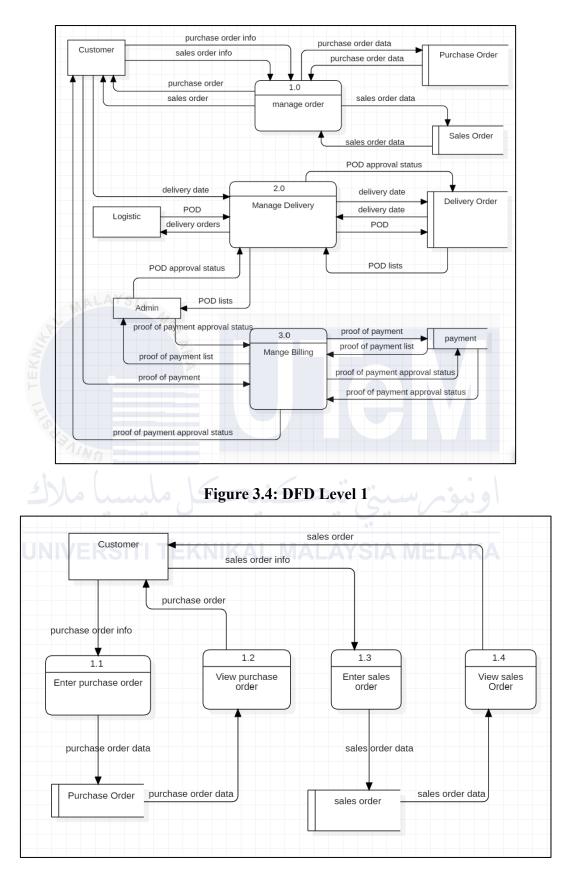
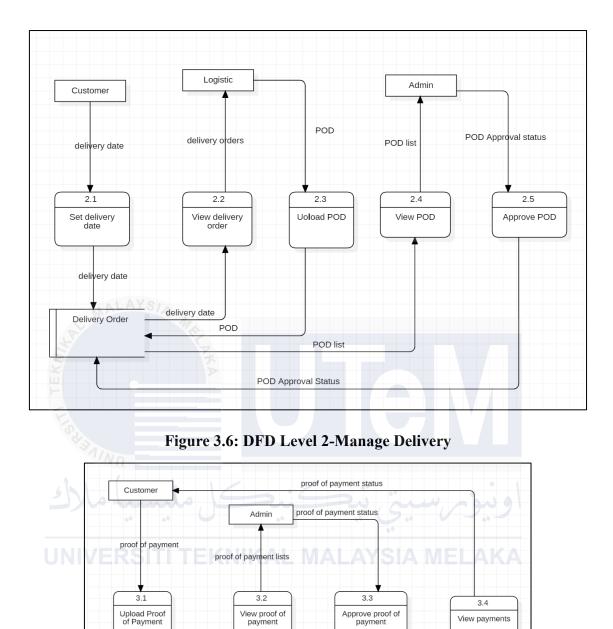
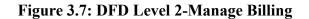


Figure 3.5: DFD Level 2-Manage Order





proof of payment status

proof of payment status

proof of payment lists

payment

proof of payment

View payments

# 3.3.3 Non-functional Requirement

Aspect	Requirement
Performance	-The system must ensure high reliability to
	maintain consistent operations.
	-Clear and appropriate error messages should
	be provided to notify users when a request
	cannot be processed.
Security	-The system should authenticate users with a
MALAYSIA	valid username and password and determine
	user access levels based on their roles.
Usability	- The system should have a user-friendly
	interface that is intuitive and easy for users to
E.	learn and operate.
*BAINO	-The system should have an easy navigation
5 h l l l c · c	and access to key functionalities.
Reliability	-The calculation of order and billing
	documents must be correct
UNIVERSITI TEKNIKAL I	-The dashboard sales should be accurate base
	on the data in database

Table 3.1: Non-Functional Requirement

# 3.3.4 Software Requirement

<b>Table 3.2:</b>	Software Requirement
Table 5.2:	Software Requirement

Software	Description
Microsoft Visual Studio	Usage: Integrated Development
	Environment (IDE) for developing the web
	application.
	Purpose: Used for writing, debugging, and
	deploying ASP.NET code. It provides tools

	and features to enhance productivity and
	streamline the development process.
SQL Server Management Studio (SSMS)	Purpose: Used for designing, managing, and
	querying the database. It helps in creating
	and managing database schemas, tables,
	stored procedures, and performing database
	maintenance tasks.
ASP.NET	Usage: Web framework for building web
	applications and services with .NET.
	Purpose: Used for creating the web interfaces
MALATSIA MA	and handling HTTP requests. It allows the
	development of dynamic, data-driven web
A	applications with robust security,
	performance, and scalability features.
PyCharm	Usage: Integrated Development
AINO	Environment (IDE) for Python development.
5/1/ 1/2000	Purpose: Used for developing Python
سيكس ميسيا مارك	endpoints and scripts.

# 3.3.5 Hardware Requirement

# **Table 3.3: Hardware Requirement**

Hardware	Description
Laptop	To develop the website.

# **3.4 Conclusion**

Flow charts illustrating the current (as-is) and proposed (to-be) systems have been presented to clarify the concept of system flow. The context diagram provides a high-level overview of the entire system to be developed, while the data flow diagram (DFD) breaks down the flow of data within the system's processes. The DFD details how data moves through inputs and outputs, associated with each entity and process. In conclusion, Chapter 3 has summarized the investigation of the current system, highlighted areas for improvement, and established a conceptual framework for the new system.

#### **CHAPTER 4**

#### DESIGN

### **4.1 Introduction**

In the design phase, the architecture of the proposed system is established, focusing on creating a design that meets the agreed application requirements. The requirements developed during the analysis phase are refined and expanded to encompass all specified functions of the application. This chapter will cover the system architecture design, database design, and graphical user interface (GUI) design, ensuring that the final product aligns with user needs and system objectives.

#### 4.2 System Architecture Design

Figure 4.1 shows the three-tier architecture in ASP.NET is a well-established software architecture pattern that organizes an application into three main logical layers: Presentation Tier, Business Tier, and Data Tier. This structured approach helps in organizing code, improving scalability, and making the application easier to maintain and update.

The Presentation Tier is the topmost layer of the application, dedicated to displaying the user interface and handling user interactions. It consists of HTML, CSS, JavaScript, and ASP.NET Web Forms or MVC views, providing a platform for users to interact with the application. This tier is responsible for rendering data to the user, capturing user inputs, and facilitating communication with the Business Tier.

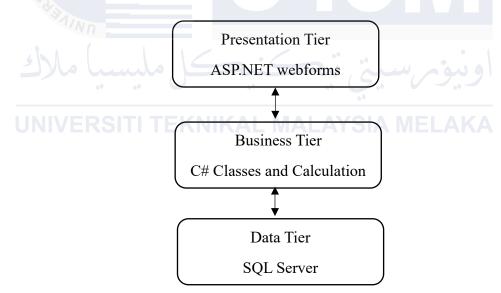
The Business Tier, also known as the middle tier or logic tier, serves as the core processing unit of the application, where the business logic is implemented. This layer contains business logic classes, services, and controllers that execute the business rules and workflows of the application. It validates data, orchestrates operations by interacting with both the Presentation Tier and the Data Tier, and ensures the business rules are adhered to. The Business Tier relies on tools like ASP.NET Controllers.

The Data Tier, also known as the database layer, is responsible for data storage, retrieval, and management. This tier includes the SQL Server database, tables, stored procedures, and Entity Framework models. It manages database operations such as Create, Read, Update, and

Delete (CRUD), ensuring data integrity and security. The Data Tier provides the necessary data to the Business Tier as required and is managed using tools like Microsoft SQL Server, SQL Server Management Studio (SSMS) and Entity Framework (EF).

Adopting a three-tier architecture provides several benefits. Firstly, it ensures a clear separation of concerns, with each tier having distinct responsibilities, making the system more modular and easier to manage. Secondly, it enhances scalability, as each tier can be scaled independently to handle increased loads. Thirdly, it improves maintainability, allowing changes in one tier (such as UI updates in the Presentation Tier) without affecting the others, making the system easier to update. Lastly, it promotes reusability, as business logic and data access code can be reused across different parts of the application or even in different applications.

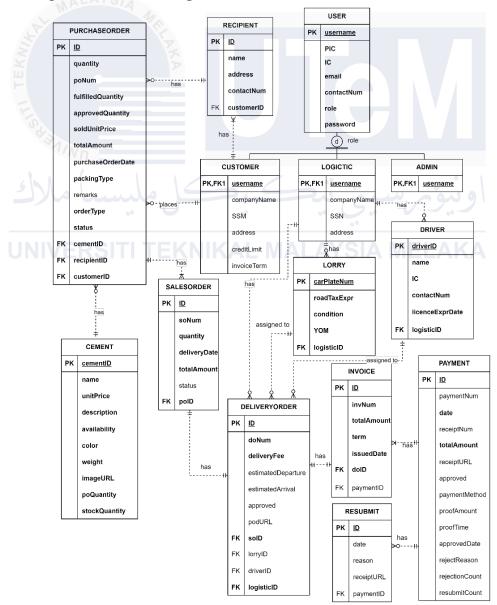
Implementing this architecture for the cement company management system will result in a well-organized, scalable, and maintainable application, ensuring robust performance and efficient operations.



**Figure 4.1: Tier Architecture** 

### 4.3 Database Design

Database design is the process of defining the structure, organization, and constraints of a database to effectively store, manage, and retrieve data. It involves creating a detailed data model that outlines the entities, attributes, and relationships within the database, ensuring that the design aligns with the specific requirements of the application or system. The design phase typically includes conceptual, logical, and physical design stages, which help to optimize data integrity, reduce redundancy, and enhance overall performance. A well-designed database not only supports current data needs but also allows for scalability and adaptability as requirements evolve over time.



### 4.3.1 Conceptual Database Design

Figure 4.2: ERD

### **Business Rule**

- a) Each cement has zero or many purchase orders.Each purchase order can has one and only one cement.
- b) Each customer places zero or many purchase order.Each purchase order can be placed by one and only one customer.
- c) Each recipient has zero or many purchase orders.Each purchase order can has one and only one recipient.
- d) Each purchase order has one or many sales order.Each sales order has one and only one purchase order.
- e) Each sales order has one and only one delivery order. Each delivery order has one and only one sales order.
- f) Each logistic has zero or many delivery order.Each delivery order has one and only one logistic.
- g) Each logistic has zero or may drivers.Each driver has one and only one logistic.
- h) Each logistic has zero or may lorries.Each lorry has one and only one logistic.
- Each logistic has zero or many delivery orders.
   Each delivery order has one and only one logistic.
- j) Each lorry can be assigned to zero or many delivery order.
   Each delivery order has one and only one lorry.
- k) Each driver can be assigned to zero or many delivery order.Each delivery order has one and only one driver.
- Each delivery order has one and only one invoice.
   Each invoice has one and only one delivery order.
- m) Each payment has one or many invoices.Each invoice has one and only one payment.
- n) Each payment has zero or many resubmits.Each resubmit has one and only one payment.

### 4.3.2 Logical Design

Logical design is the second part of database design. In this phase, conceptual design is translated into logical design that is in relational model. In relational model, entities are translated into tables. Data dictionary consists of the structure design of the tables following the data types of the targetted DBMS (MS SQL Server).

### 4.3.2.1 Data Dictionary

Attribute	Description	Data Type	Required	PK/FK	Reference Table
Username	Unique identifier used	nvarchar(max)	Yes	РК	
A AL	by the user to log in.				
Password	Secret key for user authentication.	nvarchar(30)	Yes		
companyName	Name of the customer's company.	nvarchar(100)			
creditLimit	Maximum allowable credit for a customer.	float	مىنى نيا	ونيغر	-
invoiceTerm =	Payment terms of invoices.	int AL MAL	AYSIA	MELAKA	
address	Location of the customer company.	nvarchar(200)			
SSN	Social Security Number of the company.	nvarchar(30)			
PIC	Person In Charge at the company.	nvarchar(100)	Yes		
IC	Identity Card number of the PIC.	nvarchar(14)	Yes		
contactNum	Phone number of PIC.	nvarchar(20)	Yes		
email	Email address of PIC.	nvarchar(80)	Yes		
role	User's role (admin, customer, logistic)	nvarchar(10)	Yes		

 Table 4.1: Data Dictionary of User Table

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Unique identifier for each cement product.	int	Yes	РК	
Name	Name of the cement product.	nvarchar(50)	Yes		
Description	Detailed information about the cement product.	nvarchar(max)	Yes		
unitPrice	Price per unit of the cement.	Float	Yes		
Color	Color of the cement product.	nvarchar(20)	Yes		
Weight	Weight of the cement product per unit.	float	Yes		
availability UNIVE	Availability status of the cement product (Yes or No).	nvarchar(10)	Yes ALAYSIA	MELAK	4
ImageURL	URL of the image representing the cement product.	nvarchar(max)	Yes		
poQuantity	Quantity of cement ordered in purchase orders.	Int	Yes		
stockQuantity	Quantity of cement available in stock.	int	Yes		

 Table 4.2: Data Dictionary of Cement Table

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Name of the recipient.	int	Yes	РК	
Name	Name of the recipient.	nvarchar(max)	Yes		
Address	Address of the recipient.	nvarchar(100)	Yes		
contactNum	Contact number of the recipient.	nvarchar(250)	Yes		
customerID	Unique identifier for the customer associated with the recipient.	nvarchar(20)	Yes	FK	User

 Table 4.3: Data Dictionary of Recipient Table

Table 4.4: Data	Dictional	ry of Purchase O	order Table

	<b>D</b>			DATIONA	<b>D</b> 4
Attribute	Description	Data Type	Required	PK/FK	Reference
					Table
ID	Unique	int	Yes	PK •	
يها مالاك	identifier		ىتى بە	ويومر	
44	for the	64	•• • • • •	0	
	order.		9.		-
poNumVERS	Purchase	nvarchar(16)	Yes	IELAKA	
1	order				
	number.				
Quantity	Total	int	Yes		
	quantity of				
	cement				
	ordered.				
fulfilledQuantity	Quantity of	int	Yes		
	cement that				
	has been				
	fulfilled				
	(delivered).				
ApprovedQuantity	Quantity of	int	Yes		
rippio ( ou Quantity	cement that	1110	105		
	has been				
	approved				
	for				
	fulfillment.				
soldUnitPrice	Unit price	float	Yes		
	at which the	11040	100		
	cement is				
	sold.				
	5014.				

totalAmount	Total amount for the order calculated as approved quantity multiplied by sold unit	float	Yes		
	price.				
orderDate	Date when the order was placed.	Datetime 2(7)	Yes		
packingType	Type of packing for the order, either palletized or non- palletized.	nvarchar(20)	Yes		
Remarks	Additional remarks about the order.	nvarchar(max)			
orderType	Type of order, either single or bulk.	nvarchar(20)	Yes مىبنى ئېد	ونيومر	
Status	Current status of the order.	nvarchar(30)	Yes AYSIA N	IELAKA	
cementID	Unique identifier for the type of cement ordered.	int	Yes	FK	Cement
customerID	Unique identifier for the customer placing the order.	nvarchar(450)	Yes	FK	User
recipientID	Unique identifier for the recipient of the order.	int	Yes	FK	Recipient

Attribute	Description	Data Type	Required	PK/FK	Reference Table
carPlateNum	The license plate number of the lorry.	nvarchar(450)	Yes	РК	
roadTaxExprDate	The expiration date of the lorry's road tax.	Datetime2(7)	Yes		
Condition	The current condition of the lorry.	Nvarchar(30)			
YOM	Year of Manufacture of the lorry.	Int	Yes		
logisticID	Unique identifier for the logistic company that owns or operates the lorry.	Nvarchar(450)	Yes	FK	User

 Table 4.5: Data Dictionary of Lorry Table

# Table 4.6: Data Dictionary of Driver Table

UNIVE					
Attribute	Description	Data Type	Required	PK/FK	Reference
					Table
ID	Unique	int	Yes	PK	
	identifier for				
	the lorry				
	driver.				
Name	Full name of	Nvarchar(100)	Yes		
	the lorry				
	driver.				
IC	Identification	Nvarchar(14)	Yes		
	card number				
	of the lorry				
	driver.				
contactNum	Contact	Nvarchar(20)	Yes		
	number of				
	the lorry				
	driver.				
licenseExprdate	Expiration	Datetime2(7)	Yes		
	date of the				
	lorry driver's				
	license.				

logisticID	Unique	Nvarchar(450)	Yes	FK	User
	identifier for				
	the logistic				
	company				
	that employs				
	the lorry				
	driver.				

 Table 4.7: Data Dictionary of Sales Order Table

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Unique identifier for the sales order.	Int	Yes	РК	
soNum	Sales order number associated with the sales order.	Nvarchar(18)	Yes		
Quantity	Total quantity of cement ordered.	Int	Yes		
totalAmount	Total monetary	Float	Yes	ويوريق	
UNIVE	amount for the sales order.	KNIKAL I	/IALAYSI/	A MELAK	4
Status	Current status of the sales order.	30	Yes		
deliveryDate	Scheduled date for the delivery of the order.	Datetime2(7)	Yes		
poID	Identifier for the related purchase order.	int	Yes	FK	Purchase Order

Table 4.8: Data Dictionary of Delivery Order Table	
Table 4.0. Data Decionary of Derivery Order Table	

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Unique identifier	int	Yes	РК	
	for the				

	4.1				
	delivery				
1 N	order.	$N_{\rm I} = 1$ (10)	N7		
doNum	Delivery	Nvarchar(18)	Yes		
	order				
	number				
	associated				
	with the				
	delivery				
	order.				
deliveryFee	Fee charged	Float	Yes		
	for the				
	delivery				
	service.				
estimatedDeparture	Estimated	Datetime2(7)			
	departure				
MALAT	date and				
A STATEMENT	time for the				
E Contraction	delivery.				
estimatedArrival	Estimated	Datetime2(7)			
CstillatedAllival	arrival date	Datetime2(7)			
	and time for				
E.					
	the delivery.	$\mathbf{N} = 1 \cdot (0)$			
approved	Approval	Nvarchar(8)			
	status of the				
5 1 .	proof of	_ · C_	**		
	delivery.		سې د	ويوم	
podURL ···	URL to the	Nvarchar(max)	•• •• ••		
	proof of				
UNIVERS	delivery KN	IKAL MAL	AYSIA N	IELAKA	k.
	image.				
soID	Identifier	int	Yes	FK	Sales Order
	for the				
	related sales				
	order.				
logisticID	Identifier	Nvarchar(450)	Yes	FK	User
- C	for the	· · · · ·			
	logistic				
	company				
	handling				
	the delivery.				
lorryID	Identifier	Nvarchar(450)		FK	Lorry
	for the lorry			1 1 2	2011 y
	assigned to				
	the delivery.				
driverID	Identifier	int		FK	Driver
		1111		ГК	Dirver
	for the				
	driver				
	assigned to				
	the delivery.				

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Unique identifier for the invoice.	int	Yes	РК	
invNum	Invoice number associated with the invoice.	Nvarchar(18)	Yes		
Term	Invoice term agreed upon.	Int	Yes		
date	Date when the invoice was issued.	Datetime2(7)	Yes		
doID	Identifier for the related delivery order.	int	Yes	FK	Delivery Order
paymentID	Identifier for the related payment transaction.	int		FK	Payment

 Table 4.9: Data Dictionary of Invoice Table

# Table 4.10: Data Dictionary of Payment Table

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Unique identifier for the payment.	Int	Yes	РК	
Date	Date when the payment information was uploaded.	Datetime2(7)	Yes		
totalAmount	Total amount paid.	Float	Yes		
receiptNum	Receipt number associated with the payment.	Nvarchar(16)			
Approved	Boolean indicating if the payment is approved.	Nvarchar(8)			

' (IDI		$\mathbf{N} \mathbf{I} (\mathbf{i})$		
receiptURL	URL link to	Nvarchar(max)		
	the scanned			
	receipt.			
paymentMethod	Method	Nvarchar(40)		
	used for the			
	payment			
	(e.g., credit			
	card, bank			
	transfer).			
proofAmount	Amount	Nvarchar(40)		
	shown in the			
	scanned			
	receipt.			
proofDate	Date	Nvarchar(40)		
1	extracted	()		
MAL	from the			
E.	scanned			
E State	receipt.			
proofTime	Time	Nvarchar(40)		
proortinie	extracted	(10)		
	from the			
E	scanned			
des	receipt.			
annuar dData	Date when	Detetine 2(7)		
approvedDate		Datetime2(7)		
5 10	the payment	$  \cdot   $	4	
	was		ويوريه	
·	approved.	$\mathbf{N} = 1  (2 0 0)$		
rejectReason	Reason for	Nvarchar(200)		
UNIVER	rejecting the	NIKAL WA	VIELANA	
	payment, if			
	applicable.			
RejectionCount	Number of	int		
	times the			
	payment has			
	been			
	rejected.			
paymentNum	Payment	Nvarchar(16)		
	number			
	associated			
	with the			
	transaction.			
resubmitCount	Number of	int		
	times the			
	payment has			
	been			
	resubmitted.			
L		1	1	

Attribute	Description	Data Type	Required	PK/FK	Reference Table
ID	Unique identifier for the resubmit.	int	Yes	РК	
reason	Invoice number associated with the invoice.	Nvarchar(200)			
date	Date when the invoice was issued.	Datetime2(7)	Yes		
receiptURL	URL link to the scanned receipt.	Nvarchar(max)	Yes		
paymentID	Identifier for the related payment transaction.	int	Yes	FK	Payment

 Table 4.11: Data Dictionary of Resubmit Table



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### 4.3.2.3 Normalization

Normalization is a database design process focused on minimizing redundancy and enhancing data integrity by organizing a schema into clearly defined tables. Full dependency ensures that non-key attributes rely on the entire primary key, thus preventing partial dependencies. Transitive dependency arises when a non-key attribute depends on another nonkey attribute rather than directly on the primary key. Figures 4.3 and 4.4 illustrate the normalization of the Purchase Order.

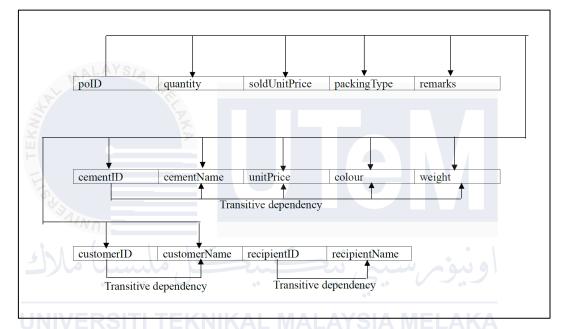


Figure 4.3: 1<sup>st</sup> and 2<sup>nd</sup> Normalization of Purchase Order

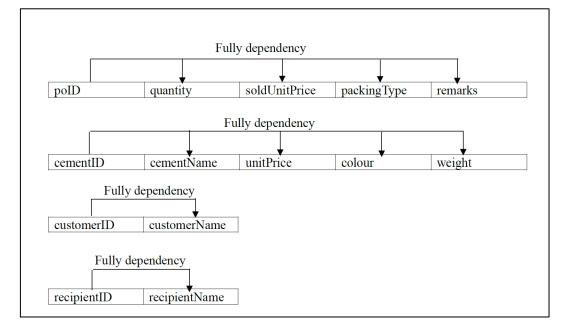


Figure 4.4: 3<sup>rd</sup> Normalization of Purchase Order

### 4.3.3 ERD Validation

Transaction	Entities Involved
To retrieve all the purchases order along	User: provide customer name
with customer name, item, quantity, total	Cement: item
amount and status	Purchase Order: quantity, total amount
	status
To retrieve all pending assignment sales	Recipient: recipient address
order along with so number, delivery date,	Sales Order: so number, delivery date,
item, quantity, recipient address	quantity, status
St	Cement: item
Customer search for sales order using	Sales Order: so number
SONumber.	
Retrieve Top 5 best selling cements	Purchase Order: total amount
* HIAN	Cement: cement name
Generate a list of sales order of certain	Invoice- issuedDate, paymentID.
month with status 'Invoice Issued' along	Sales Order: status
with customer name.	User-customer name
Find all lorries registered under the logistic	Lorry: lorry details
company 'Rapid Logistic Sdn. Bhd.'	User: logistic company name

### Table 4.12: ERD Validation

### 4.3.4 Query Design

### Table 4.12: Query Design

No	User Transaction	SQL Statement
1	To retrieve all the purchases order	SELECT
	along with customer name, item,	po.ID AS PurchaseOrderID,
	quantity, total amount and status	u.Name AS CustomerName,
		c.Name AS Item,
		po.Quantity,
		po.TotalAmount,
		po.Status
		FROM
		PurchaseOrders po
		JOIN
		Users u ON po.CustomerID =
		u.username
		JOIN

		Comont a ON no ComontID -
		Cement c ON po.CementID = c.CementID;
2		
2	To retrieve all pending assignment	SELECT
	sales order along with so number,	so.soNum AS SalesOrderNumber,
	delivery date, item, quantity,	so.deliveryDate AS DeliveryDate,
	recipient address	c.Name AS Item,
		so.Quantity,
		r.Address AS RecipientAddress
		FROM
		SalesOrders so
		JOIN
		Cement c ON so.cementID = $c.ID$
		JOIN
		Recipients r ON so.recipientID = r.ID
	MALAYSIA	WHERE
2		so.Status = 'approved';
3	Customer search for sales order	SELECT *
	using SONumber.	FROM SalesOrders
4		WHERE soNum = @SONumber;
4	Retrieve Top 5 best selling cements	SELECT TOP 5
		c.Name AS CementName,
	· · · · · · · · · · · · · · · · · · ·	SUM(po.totalAmount) AS
	×1/NO	TotalSalesAmount
		FROM
	641	PurchaseOrders po
		JOIN JOIN JOIN
		Cement c ON po.cementID = $c.ID$
		GROUP BY
	UNIVERSITI TERNIKALI	c.Name
		ORDER BY
5	Conceptor district of a loss of the set	TotalSalesAmount DESC;
5	Generate a list of sales order of	SELECT
	certain month with status 'Invoice	so.soNum AS SalesOrderNumber,
	Issued' along with customer name.	so.Status,
		u.Name AS CustomerName, i.issuedDate
		FROM
		SalesOrders so
		JOIN
		Users u ON so.customerID = $u.ID$
		JOIN
		Invoice i ON so.ID = i.soID
		WHERE
		so.Status = 'Invoice Issued'
		AND MONTH(i.issuedDate) = $@$ Month
		、 , <u>,</u>
		Replace @Month with the specific month
		(e.g., 6 for June) AND VE A $P(i \text{ issuedData}) = @Vear:$
		AND YEAR(i.issuedDate) = @Year; Replace @Year with the specific year
		Replace @Year with the specific year

6	Find all lorries registered under the	SELECT
	logistic company 'Rapid Logistic	l.carPlateNum,
	Sdn. Bhd.'	1.roadTaxExprDate,
		1.Condition,
		1.YOM,
		1.logisticID
		FROM
		Lorries 1
		JOIN
		Users u ON l.logisticID = u.ID
		WHERE
		u.companyName = 'Rapid Logistic Sdn.
		Bhd.';

# 4.3.5 Application of Procedure & Trigger

Procedure	Database Table >	Query		
Insert	Recipient	CREATE PROCEDURE [dbo].[AddRecipient]		
T				
S.		@CustomerID NVARCHAR(50),		
C J		@Name NVARCHAR(100),		
	NN.	@Address NVARCHAR(100),		
1.1		@ContactNum NVARCHAR(20)		
الأك	کا ملیسیا م	evin win we		
	0	AS G. C.		
		BEGIN		
UNI	<b>ERSITI TEK</b>	INSERT INTO Recipients (CustomerID, name,		
		address, contactNum)		
		VALUES (@CustomerID, @Name, @Address,		
		(a)contactNum)		
		END		
Select	Recipient	CREATE PROCEDURE [dbo].[GetRecipients]		
	reenpient			
		@CustomerID NVARCHAR(50)		
		AS		
		BEGIN		
		SET NOCOUNT ON;		
		SELECT * FROM Recipients WHERE CustomerID =		
		@CustomerID;		
		END;		
Update	Recipient	ALTER PROCEDURE [dbo].[UpdateRecipient]		
Spaulo				
		@RecipientID INT,		
		@Name NVARCHAR(100),		
		@Address NVARCHAR(100),		
		@ContactNum NVARCHAR(20)		
		1		

# Table 4.13 Application of Procedure

		AS
		BEGIN
		SET NOCOUNT ON;
		UPDATE Recipients
		SET Name = $(a)$ Name,
		Address = @Address,
		ContactNum = @ContactNum
		WHERE id=@RecipientID;
		END;
Delete	Recipient	CREATE PROCEDURE DeleteRecipient
	1	(
		@RecipientID INT
		)
		AS
	ALAVO.	BEGIN
	MALAISIA	SET NOCOUNT ON;
SP-	TT.	DELETE FROM Recipients WHERE Id =
	P	@RecipientID;
X	S I	END;
Ë		
1		
	Tab	le 4.14 Application of Trigger

F			
	Table 4	1.14 Application of Trigger	
Trigger	Database Table	Query	Explanation
After Insert	SalesOrders	ALTER TRIGGER	This trigger
		[dbo].[AfterSalesOrderInsert]	ensures that after
		ON [dbo].[SalesOrders]	each insertion into
		AFTER INSERT	the SalesOrders
UNIVE	RSIIIIENN	AS - MALAYSIA MEL	table, the related
		BEGIN	PurchaseOrders
		Update PurchaseOrder table	and Cements
		UPDATE PurchaseOrders	tables are
		SET approvedQty =	appropriately
		approvedQty + 800	updated to reflect
		WHERE Id IN (SELECT	the changes in
		poID FROM inserted);	approved
			quantities and
		Update Cement table	stock levels.
		UPDATE Cements	
		SET poQuantity=poQuantity-	
		800,	
		stockQuantity =	
		stockQuantity - 800	
		WHERE Id IN (	
		SELECT c.Id	
		FROM Cements c	
		INNER JOIN	
		PurchaseOrders po ON c.id =	
		po.cementID	

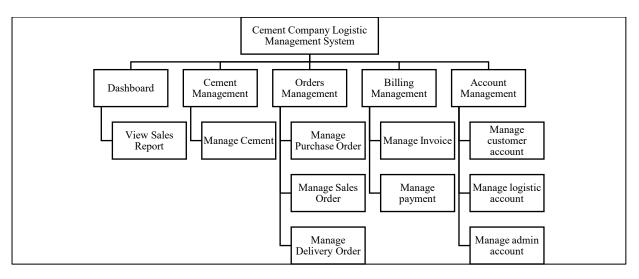
		INNER JOIN inserted i ON	
		po.Id = i.poID	
		);	
		END;	
After Insert	PurchaseOrders	ALTER trigger	This trigger
		[dbo].[AfterPurchaseOrderInsert]	ensures that the
		ON [dbo].[PurchaseOrders]	Cements table
		AFTER INSERT	accurately reflects
		AS	the updated
		BEGIN	purchase order
			quantities
		Update Cement table	whenever new
		UPDATE Cements	purchase orders
		SET	are added.
	AVO	poQuantity = poQuantity +	
MA	LAISIA	i.quantity	
· FY	in the second seco	FROM Cements c	
E Contraction of the second se	P	INNER JOIN inserted i ON	
KY	X A	c.id = i.cementID;	
E E	•	END;	

### 4.4 Graphical User Interface (GUI) Design

Graphical User Interface design is the process of designing the aesthetics and user interaction of the system. The design often focuses on ease-of-use to ensure users can interact with the software easily and intuitively. Graphical user interface design consists of three designs which are navigation design, output design and input design.

### 4.4.1 Navigation Design

Navigation design is to design the system navigation and how the users can navigate between the screens. Navigation can be image based and text based and is the act of moving from one screen to another. A good navigation design can enable users to spend minimal time to make the right interactions.





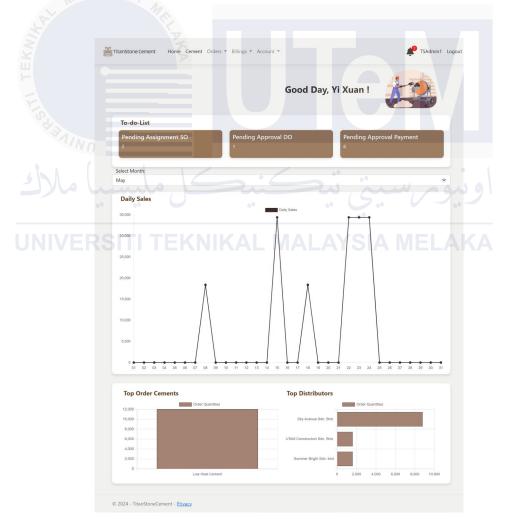


Figure 4.6: Admin Dashboard

		Produ	ct List			
					+ Add nev	/ Product
Show 10 v entries				Sea		
Name	Unit Pric					
Low Heat Cement Portland Cement	21.50 53.00	4,500	0 3,200		Stock	
Quick Setting Cement	35.00	0	0		of Stock	
Sulphate Resisting Ceme		0	0		of Stock	
Test Cement	13.00	0	0		of Stock	2 1
White Cement	23.00	600	1,600	Low	Stock 📀	2 1
Showing 1 to 6 of 6 entries	5	1			Previous 1	Next
MINE	11					_
9 2024 - TitanStoneCement -	Privacy ure 4.7: Adm	in Cemen	t Manager	nent Inter	rface	
Fig	ure 4.7: Adm	iin Cemen	t Manager	nent Inter	rface	7 TSAdmin1
Fig	ure 4.7: Adm		t Manager	nent Inter	rface	TSAdmin1
Fig anStone Cement Home	ure 4.7: Adm			nent Inter	به الم	7 TSAdmin1
anStone Cement Home ales Order	ure 4.7: Adm			nent Inter	June, 2024	
anStone Cement Home ales Order Require Action	ure 4.7: Adm		، نید	)سينچ	June, 2024 Search:	E Searc
anStone Cement Home ales Order	ure 4.7: Adm		ی نید	nent Inter	June, 2024	
equire Action Require Action w 10 ~ entries DNum A Customer	ure 4.7: Adm e Cement Orders - Bill	lings * Account *	y Total(MYR)	Delivery Date	June, 2024 Search: status	Searce Action
anStone Cement Home ales Order Require Action w 10 → entries DNum 4 Customer D-0018-01 TSCustomer3	ure 4.7: Adm e Cement Orders - Bill	lings * Account *	y Total(MYR) 17,200.00 17,200.00	Delivery Date           2024-06-08	June, 2024 Search: status Invoice Issued Invoice Issued	E Searce
AnStone Cerrent Home Ales Order Require Action 10 vertries DNum Customer3 0-0019-01 TSCustomer3 0-0020-01 TSCustomer3	ure 4.7: Adm e Cement Orders - Bill	lings * Account * Quantit 800 800	y Total(MYR) 17,200.00	Delivery Date           2024-06-08           2024-06-08	June, 2024 Search: status Invoice Issued	E Searce Action O tic O
anStone Cerrent Pione anStone Cerrent Pione Ales Order Require Action Num  10  → entries ONum  10  → Customer3 0-0019-01 TSCustomer3 0-0020-01 TSCustomer3 0-0021-01 TSCustomer3	e Cement Orders - Bill	lings + Account + Quantity 800 800	y Total(MYR) 17,200.00 17,200.00 17,200.00	Delivery Date           2024-06-08           2024-06-08	June, 2024 Search: status Invoice Issued Invoice Issued Assigned to Logis	E Searce Action O tic O tic O
anStone Cerrent Pione anStone Cerrent Pione Ales Order Require Action Num  10  → entries ONum  10  → Customer3 0-0019-01 TSCustomer3 0-0020-01 TSCustomer3 0-0021-01 TSCustomer3	e Cement Orders - Bill	lings * Account * Quantity 800 800 800 800 800	y Total(MYR) 17,200.00 17,200.00 17,200.00 17,200.00	Delivery Date           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08	June, 2024 Search: status Invoice Issued Invoice Issued Assigned to Logis	Searce     Action     O     tic     O
Require Action Require Action Num 0 ← entries PNum 2 Customer3 0-0018-01 75Customer3 0-0019-01 75Customer3 0-0021-01 75Customer3 0-0022-01 75Customer3	e Cement Orders - Bill Low Heat Cement	lings * Account * Quantit 800 800 800 800 800 800 800	y Total(MYR) 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00	Delivery Date           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08	June, 2024 Search: status Invoice Issued Invoice Issued Assigned to Logis Assigned to Logis	Cearce Action Action Cearce C
Require Action         Require Action         Require Action         Solution         Colored         Dolution         Colored         Colored     <	e Cement Orders - Bill burkent Orders - Bill burkent Cement Low Heat Cement Low Heat Cement Low Heat Cement Low Heat Cement Low Heat Cement Low Heat Cement	lings * Account * Quantity 800 800 800 800 800 800 800 800	y Total(MYR) 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00	Delivery Date           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08	June, 2024 Search: status Invoice Issued Assigned to Logis Assigned to Logis Assigned to Logis	Action Action tic tic tic o tic tic tic tic tic tic tic tic
Require Action       Customeral         anStone Cement       Home         anStone Cement       Home         anStone Cement       Stone         anStone Cement       Stone	e Cement Orders - Bill be Cement Orders - Bill be Cement Orders - Bill be Cement be Cement Low Heat Cement Low Heat Cement Low Heat Cement Low Heat Cement Low Heat Cement Low Heat Cement	lings * Account * Quantit 800 800 800 800 800 800 800 800 800	y Total(MYR) 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00 17,200.00	Delivery Date           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08           2024-06-08	June, 2024 Search: status Invoice Issued Assigned to Logis Assigned to Logis Invoice Issued Invoice Issued	Searce     Action     O

Figure 4.8: Admin Order Management Interface

Payment	t			
Pending Approv	val Approved Rejected Re	submitted		June, 2024 📼 Search
how 10 ~ en	atries			Search:
ReceiptNum	IssueDate	• TotalAmount	Customer	Action
REC-0021	2024-06-09	18,400.00	UTeM Construction Sdn. Bhd.	<b>●</b> <u>View receipt</u>
REC-0022	2024-06-08	17,200.00	Sky Avenue Sdn. Bhd.	View receipt
REC-0023	2024-06-10	17,200.00	Sky Avenue Sdn. Bhd.	Oview receipt
REC-0024	2024-06-10	17,200.00	Sky Avenue Sdn. Bhd.	View receipt
REC-0025	2024-06-11	17,200.00	Sky Avenue Sdn. Bhd.	Oview receipt
REC-0026	2024-06-11	17,200.00	Sky Avenue Sdn. Bhd.	<b>⊘</b> View receipt
REC-0027	2024-06-11	18,400.00	UTeM Construction Sdn. Bhd.	<b>⊘</b> <u>View receipt</u>
REC-0028	2024-06-11	18,400.00	UTeM Construction Sdn. Bhd.	View receipt
REC-0034	2024-06-12	17,200.00	Sky Avenue Sdn. Bhd.	• <u>View receipt</u>
howing 1 to 9 o	f 9 entries			Previous 1 Nex
	_	: Admin Payr	nent Management In	terface
2024 - TitanSto	Figure 4.9		· · ·	
2024 - TitanSto	Figure 4.9		· · ·	terface TSAdmin1 L
2024 - TitanSto	Figure 4.9		· · ·	
2024 - TitanSto TitanStone Cer Invoice	Figure 4.9	Orders 🔹 Billings 👻 Accou	ىيىنى نېچ	TSAdmin1 L
TitanStone Cer Invoice Unpaid Paid	Figure 4.9		ىيىنى نېچ	TSAdmin1 L
2024 - TitanSto TitanStone Cer Invoice Unpaid Paid Show 10 ~ e	Figure 4.9	Orders • Billings • Accou	سبنی نیک MALAYS Issued Mo	TSAdmin1 L nth: B Search Search:
TitanStone Cer Invoice Invoice Num	Figure 4.9	Orders • Billings • Accou	ant Amount	TSAdmin1 L
2024 - TitanSto TitanStone Cer Invoice Unpaid Paid Show 10 ~ e Invoice Num INV-0006-01	ment Home Cement C entries Customer Summer Bright Sdr	Drders • Billings • Accou	ant         Amount           ssued Date         Amount           2024-05-12         17,200.00	nth: Search Search: Action
2024 - TitanSto TitanStone Cer Invoice Invoice Num INV-0006-01 INV-0007-01	Tigure 4.9	Drders Billings Account	ant Alay Sissued Mo ssued Date Amount 2024-05-12 17,200.00	TSAdmin1 L TSAdmin1 L Search: Action Search Search
2024 - TitanSto TitanStone Cer Invoice Unpaid Paid Show 10 ~ e Invoice Num INV-0006-01	ment Home Cement C entries Customer Summer Bright Sdr	Drders Billings Account	ant         Amount           ssued Date         Amount           2024-05-12         17,200.00	nth: Search Search: Action
TitanStone Cer Invoice Vnpaid Paid Show 10 ~ e Invoice Num INV-0007-01 INV-0007-02	Tigure 4.9 Figure 4.9 Home Cement C ERSITIE entries Customer Summer Bright Sdr Summer Bright Sdr	Drders Billings Account	ant Sused Date Amount 2024-05-12 17,200.00 2024-04-28 17,200.00	TSAdmin1 L TSAdmin1 L Search: Action Search Search Search
2024 - TitanSto TitanStone Cer Invoice Unpaid Paid Show 10 ~ e Invoice Num INV-0006-01 INV-0007-01 INV-0007-02 INV-0010-02	Tigure 4.9 Figure 4.9 Home Cement C RESITIENT Summer Bright Sdr Summer Bright Sdr Summer Bright Sdr Summer Bright Sdr Summer Bright Sdr	Prders Billings Account h. bhd 2 h. bhd 2 h. bhd 2 h. bhd 2 h. dhd 2 h.	Amount           Ssued Date         Amount           2024-05-12         17,200.00           2024-05-12         17,200.00           2024-05-12         17,200.00           2024-05-12         17,200.00           2024-05-12         18,400.00	TSAdmin1 L TSAdmin1 L Search: Action Search Search Search Search Search

Figure 4.10: Admin Invoice Management Interface

		<b>c</b>				
		Cu	stomer Lis	t		
					+ Add nev	v Customer
Show 10 ~ e	ntries			Se	earch:	
Username 🔶	Company Name	PIC 🔶	Contact Num	Email 🔶	Credit Limit ≬	Action
TSCustomer1	UTeM Construction Sdn. Bhd.	Wong Yi Xuan	0127766554	yixuan@gmail.com	-193,200.00	2 🖬
TSCustomer2	Summer Bright Sdn. bhd	Taylor Ma	0127632244	summerbright@gmail.com	-41,600.00	2 🗖
TSCustomer3	Sky Avenue Sdn. Bhd.	Lew Jia Ling	0176545566	skyave123@example.com	68,800.00	2 🖬
TSCustomer4	Ahead Sdn. Bhd.	Zhang Hao	0127352199	customer1@gmail.com	10,000.00	2 🖬
Showing 1 to 4					Previous	1 Next
AM	LAYSIA					
© 2024 - TitanStor		Admin Ac	count Ma	nagement Inte	erface	
© 2024 - TitanStor		Admin Ac Cement C Logi Manageme	Company istic	nagement Inte	erface	
er Cement Pag	Figure 4.11: A	Cement C Logi Manageme	Company istic ent System Rec	پر بینی تب ا	erface Billing Mana	agement
NINESSITI TEKNIN	Figure 4.11: 4	Cement C Logi Manageme	Company istic ent System Rec: Mana	ipient	Billing Mana	agement age Invoid

Figure 4.12: Navigation Design of Customer Interface

			Search our Produc	ts	Search		and the second
Sort By	Price: Low To Hig	gh 🗸					
	OW EAT EMENT	1 m					
Low Heat	Cement	Sulphate R	Resisting Cement	White Cement		Quick Setting Cement	
MYR 21.50		MYR 22.50	/bag Details	MYR 23.00 /bag De	tails	MYR 35.00 /bag Details	
		Figure 4.1	13: Custome	er Order Ce	ement Pa	ge	
TitanStone Ce		ent Orders Recipient		er Order Ce	ement Pa	ge	er1 Lc
TitanStone Ce Purcha SingleOrder	ement Cem se Order BulkOrder	ent Orders Recipient	: Billings *			April, 2024 🖾 Sea	
TitanStone Ce Purcha SingleOrder Show 10 ~	ement Cem se Order BulkOrder entries	ent Orders Recipient	Billings *		ىىيى SIA M	April, 2024 🖻 Search:	arch
TitanStone Ce Purcha SingleOrder Show 10 ~ PONum	ement Ceme se Order BulkOrder entries Date	ent Orders Recipient	Billings *	ApprovedQty	SIA M DeliveredQt	April, 2024  Search: ty Status Actic	arch
TitanStone Ce Purcha SingleOrder Show 10 ~ PONum PO-0008	ement Ceme se Order entries Date 2024-04-20	ent Orders Recipient	Billings * OrderedQty 2,400	ApprovedQty 2,400	SIA M DeliveredQt 2,400	April, 2024 🗊 Sea Search: ty Status Action Completely Fulfilled 💿	arch
TitanStone Ce Purcha SingleOrder Show 10 ~ PONum	ement Ceme se Order BulkOrder entries Date	ent Orders Recipient	Billings *	ApprovedQty	SIA M DeliveredQt	April, 2024  Search: ty Status Actic	on

Figure 4.14: Customer Order Management Interface

	0008-01							
#SO-0008-01				Trac	king Status			
O NUMBER								
PO-0008		Apr 20,2024		Approved				
em		21:49		View Sales Order	ſ			
/hite Cement x 800				• · · · · · · · · · · · · · · · · · · ·				
acking Type: Palletized		Apr 20,2024 21:53	$( \bullet )$	Assigned to Logi	Istic			
<b>elivery Date</b> 024-04-20								
		Apr 20,2024		Out for Delivery				
hipping Address Construction & Safety Door, Ja	alan Mersing	22:13		View Delivery Or	<u>'der</u>			
ampung Masjid Lama, Kluang,								
ontact Number		Apr 20,2024 22:17	$( \bullet )$	Delivered View POD				
127352222 ALAYS								
		Apr 20,2024		Invoice Issued				
		22:17		View Invoice				
024 - TitanStoneCement - <u>Priv</u>	<u>acy</u>							
				x orucr s	Status Interf	ucc		
itanStone Cement Cemen	t Orders Recipient	Billings 👻 🄷				- • · ·	TSCustome	er1
						•		
<b>JNIVERSI</b>	TITEKN	IKAL	N	ALAY	SIA MEL	AK	A	
		Recip	bien	t List				
							d new Recipien	
							Thew Recipien	
Show 10 ~ entries					Search			
Name 🔶	Address			+	Contact Number	Act	tion	4
AME Construction Sdn.	K Construction & Saf Lama, Kluang, Johor,		sing, Ka	mpung Masjid	0127352244			
Bhd					010706007		~ +	
LEGOLAND Malaysia	Legoland Malaysia, B 79250, Johor, MYS	andar Medini, Kota	Iskanda	r, Johor Bahru,	0127352233			
						Previous	1 Nex	ct
Showing 1 to 2 of 2 entries								

Figure 4.16 Customer Manage Recipient Interface

Invoice						
Unpaid Paid				Issue	d Month:,	Search
Show 10 v entrie	95				Search:	
Invoice Num	+ Issued Date	Payment Num	Payment Date	Amount	Approved	Action
INV-0001-01	2024-04-20	PAY-0005	2024-04-24	17,200.00	yes	0
INV-0001-02	2024-05-12	PAY-0020	2024-05-27	17,200.00	no	•
INV-0002-01	2024-04-25	PAY-0007	2024-04-25	18,400.00	no	•
INV-0005-01	2024-04-25	PAY-0007	2024-04-25	42,400.00	no	•
INV-0008-01	2024-04-20	PAY-0005	2024-04-24	18,400.00	yes	0
INV-0008-02	2024-04-20	PAY-0006	2024-04-24	18,400.00	no	0
INV-0008-03	2024-04-20	PAY-0010	2024-05-08	18,400.00	yes	0
INV-0009-01	2024-04-23	PAY-0012	2024-05-18	18,400.00	yes	0
INV-0009-02	2024-04-23	PAY-0021	2024-06-08	18,400.00	yes	0
INV-0009-03	2024-04-23	PAY-0027	2024-06-11	18,400.00	yes	•
Showing 1 to 10 of	13 entries Cement - <u>Privacy</u> Figure 4.1	7: Custome	r Invoice M	anagement	Previous	1 2 Nex
Showing 1 to 10 of	13 entries Cement - <u>Privacy</u> Figure 4.1		r Invoice M	anagement	Previous	1 2 Nex
Showing 1 to 10 of © 2024 - TitanStone	13 entries Cement - <u>Privacy</u> Figure 4.1	7: Custome	r Invoice M		Previous	
Showing 1 to 10 of 0 2024 - TitanStone TitanStone Cement Payment	13 entries Cement - <u>Privacy</u> Figure 4.1	7: Customer	r Invoice M	يتي ني	Previous	
Showing 1 to 10 of 0 2024 - TitanStone TitanStone Cement Payment	13 entries Cement - Privacy Figure 4.1 Cement Orders Approved Rejected	7: Customer	, °	يتي ني	Previous t Interface	TSCustomer1 L
Showing 1 to 10 of © 2024 - TitanStone TitanStone Cement Payment Pending Approval	13 entries Cement - <u>Privacy</u> Figure 4.1 Cement Orders Approved Rejected	7: Customer	, °	ىينى ني AYSIA	Previous t Interface	TSCustomer1 L
Showing 1 to 10 of 2024 - TitanStone TitanStone Cement Payment Pending Approval Show 10 ~ entrie	13 entries Cement - <u>Privacy</u> Figure 4.1 Cement Orders Cement Orders	7: Customes	کنی	ىينى ني AYSIA	Previous t Interface	TSCustomer1 L
Showing 1 to 10 of 2024 - TitanStone TitanStone Cement Payment Pending Approval Show 10 ~ entrie ReceiptNum	13 entries Cement - Privacy Figure 4.1 Cement Orders Approved Rejected s Is	7: Custome Recipient Billings • Resubmitted		ىينى ني AYSIA	Previous t Interface June, 2024 Search: Action	TSCustomer1 L Search
Showing 1 to 10 of 2024 - TitanStone TitanStone Cement Payment Pending Approval Show 10 • entrie ReceiptNum REC-0021	13 entries Cement - <u>Privacy</u> Figure 4.1 Cement Orders Approved Rejected s	7: Custome Recipient Billings • Resubmitted	<b>TotalAmot</b> 18,400.00	ىينى ني AYSIA	Previous t Interface June, 2024 Search: Action	TSCustomer1 L Search eipt eipt

Figure 4.18: Customer Manage Payment Interface

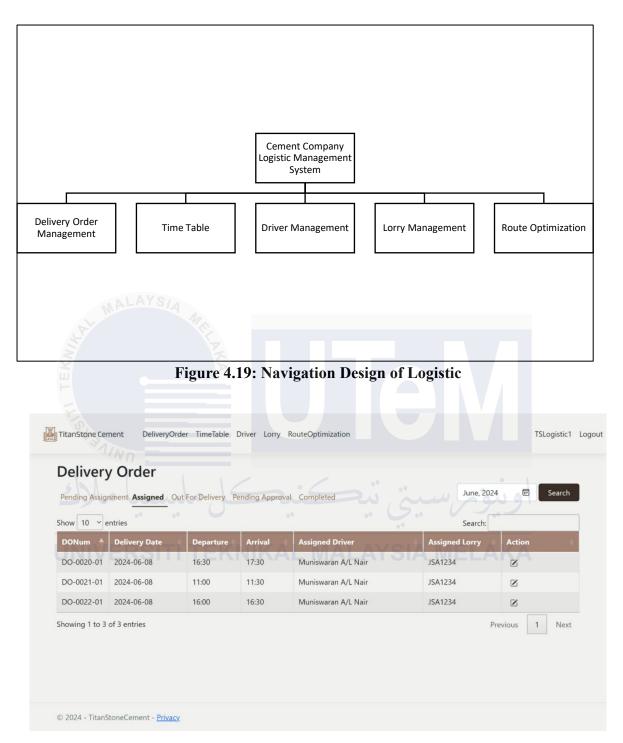


Figure 4.20: Logistic Delivery Order Management Interface

June 8	2024								202	4-06-08	
June o	2024				Saturda	v					
all-day					Juturuu						
6am											1
	1 - 8:00										
8am	1234 - Muniswaran	AVC INAIT			 		9 III - 9 II				
	- 10:00										
10am	1234 - Muniswaran	A/L Nair									
11am 11	10 - 11:30 - JSA 1234 - M	duniswaran A/L N	ait								
12pm											
	I - 2:00	1.16.17.1									
2pm	1234 - Muniswaran	A/L Nair									
3pm											
4pm 40	I - 4:30 - JSA1234 - Mu	niswaran A/L Nair									
43 5pm <sup>35/</sup>											
6pm		X									
7pm											
8pm											
Show 10	ing Delive	ry Orde	r								
		ate .	Delivery	Adross			Deliver	n Foo	Search:		
DONum	Delivery D	Date	Delivery A	Address			Deliver	y Fee 💧	Action		

# Figure 4.21: Logistic Time table interface

			Driver List				
Show 10 v entries					Sear	_	Add new Driver
Name	+	ю	Contact Number	License Expired	+	Action	+
Muniswaran A/L Nair		680709-01-2347	0163986760	2025-08-12		Z	Ū
Tan Kim Hock		660909-10-8865	0127352222	2024-06-05		Z	Ť
Showing 1 to 2 of 2 enti	ies					Previous	1 Next

Figure 4.22: Logistic Driver Management Interface

			Lorry Li	st					
						( ±	Add ne	w Lorry	
Show	10 v entries				Search	:			
Car	Plate 🔶	Road Tax Expired	Condition	YOM	+	Action			
JSA1	1234	2024-12-28	good	2012		Z	Ť		
JSJ5	678	2025-12-26	good	2015		Z	Ū		
Show	ing 1 to 2 of 2 entries					Previous	1	Next	
-									
© 2024 -	TitanStoneCement - Pri	ivacy							
	Fig	uro 1 23: Logi	stia Lorm	Managaman	t Intorf	0.00			
	Fig	ure 4.23: Logi	stic Lorry	Managemen	t Interf	ace			
	Fig	ure 4.23: Logi	stic Lorry	Managemen	t Interf	ace			
	Fig	ure 4.23: Logi	stic Lorry	Managemen	it Interf	ace			
	Fig	ure 4.23: Logi	stic Lorry	Managemen	it Interf	ace			
	AINO		U		t Interf	ace			
	AINO	ure 4.23: Logi	U		t Interf	ace			TSLogistic
	AINO		U		t Interf	ace			TSLogistic
itanStone	AINO	Order TimeTable Driver	U		t Interf	ace			TSLogistic
itanStone	Cement Delivery	Order TimeTable Driver	r Lorry RouteOpti	mization	t Interf	ينور	2		TSLogistic
itanStone Route	Cement Delivery Planner entries	(Order TimeTable Driver	r Lorry RouteOpti	mization	t Interf	Route		nation	,
itanStone Route	Cement Delivery	(Order TimeTable Driver	r Lorry RouteOpti	mization + Pater	t Interf	Route Total Di	istance	mation 107.90 km	,
itanStone Coute now 10 Select	Cement Delivery Planner entries Delivery Addres Legoland Malays	yOrder TimeTable Driver Search: ssa, Bandar Medini, Kota Isk	r Lorry RouteOpti	mization	t Interf	Route Total Di Sequen	istance nce of S	mation :: 107.90 km :tops:	<
tanStone Coute now 10 Select	Cement Delivery Planner entries Delivery Addres Legoland Malays Bahru, 79250, Jo	(Order TimeTable Driver Search: ss sia, Bandar Medini, Kota Isk hor, MYS	r Lorry RouteOpti timize Route	mization + Palon Q Peng Kurng	t Interf	Route Total Di Sequen • 1. Le Kota	istance nce of S egoland i Iskand	mation 107.90 km itops: Malaysia, B ar, Johor Ba	andar Medir
tanStone Coute now 10 Select	Cement Delivery Planner entries Delivery Addres Legoland Malays Bahru, 79250, Jo K Construction 8	(Order TimeTable Driver Search: sia, Bandar Medini, Kota Isk hor, MYS & Safety Door, Jalan Mersin	r Lorry RouteOpti timize Route	mization + Palon Q Peng Aver hum Renggam Simpart Renggam		Route Total Di Sequen • 1. Le Kota John • 2. K	istance egoland Iskand or, MYS Constru	mation :: 107.90 km itops: Malaysia, B ar, Johor Ba uction & Safe	andar Medii hru, 79250, ety Door, Jai
tanStone Coute Now 10 Select	Cement Delivery Planner entries Delivery Addres Legoland Malays Bahru, 79250, Jo K Construction 8 Masjid Lama, Klu	vOrder TimeTable Driver Search: sia, Bandar Medini, Kota Isk hor, MYS & Safety Door, Jalan Mersin iang, Johor, MYS	r Lorry RouteOpti timize Route kandar, Johor ng, Kampung	mization + Palob o Peng Ayer Ram Renggam		Route Total Di Sequen • 1. Le Kota Joho • 2. K K	istance egoland Iskand or, MYS Constru- sing, Ka	nation : 107.90 km stops: Malaysia, B ar, Johor Ba uction & Safe mpung Masj	andar Medii hru, 79250, ety Door, Jai
tanStone Coute Now 10 Select	Cement Delivery Planner entries Delivery Addres Legoland Malays Bahru, 79250, Jo K Construction 8 Masjid Lama, Klu JB Fast Construct	(Order TimeTable Driver Search: sia, Bandar Medini, Kota Isk hor, MYS & Safety Door, Jalan Mersin	r Lorry RouteOpti timize Route kandar, Johor ng, Kampung nan Impian	mization + Palon Q Peng Aver hum Renggam Simpart Renggam	Kaharig Bandar Tenggara	Route Total Di Sequen • 1. Le Kota Joho • 2. K Mers Joho	istance egoland Iskand or, MYS Constru	nation : 107.90 km stops: Malaysia, B ar, Johor Ba uction & Safe mpung Masj	andar Medii hru, 79250, ety Door, Jai
tanStone Route now 10 Select	Cement Delivery Planner entries Delivery Addres Legoland Malays Bahru, 79250, Jo K Construction 8 Masjid Lama, Klu JB Fast Construct Emas, Tampoi, Jo	yOrder TimeTable Driver Search: ss sia, Bandar Medini, Kota Isk hor, MYS & Safety Door, Jalan Mersin iang, Johor, MYS tion, Jalan Selatan 3/3, Tam shor Bahru, 81300, Johor, N	r Lorry RouteOpti timize Route kandar, Johor ng, Kampung nan Impian MYS	mization + Palon Q Peng Aver hum Renggam Simpart Renggam	Kaharig Bandar Tenggara	Route Total Di Sequen • 1. Le Kota Joho • 2. K K	istance egoland Iskand or, MYS Constru- sing, Ka or, MYS	nation : 107.90 km stops: Malaysia, B ar, Johor Ba uction & Safe mpung Masj	andar Medii hru, 79250, ety Door, Jai
itanStone	Cement Delivery	20rder TimeTable Driver Search: ss sia, Bandar Medini, Kota Isk hor, MYS & Safety Door, Jalan Mersin iang, Johor, MYS tion, Jalan Selatan 3/3, Tarr ohor Bahru, 81300, Johor, N eering & Building Construc g 6, Kawasan Perindustrian	r Lorry RouteOpti timize Route kandar, Johor ng, Kampung nan Impian MYS ction Works,	mization + Palon Q eng Klung Kung	Kaharing Bandar Tenggara	Route Total Di Sequen • 1. Le Kota Joho • 2. K Mers Joho	istance ace of S egoland I Iskand or, MYS Constn. sing, Ka sing, Ka Tanj	mation : 107.90 km itops: Malaysia, B ar, Johor Ba uction & Safe mpung Masj	andar Medil hru, 79250, ety Door, Jal iid Lama, Ki

Figure 4.24: Logistic Route Planner Interface

### 4.5 Conclusion

In conclusion, this chapter has covered the project design, which encompasses the selection of the Database Management System (DBMS) for the physical design, the establishment of business rules for the conceptual design, the creation of the Entity Relationship Diagram, the development of the data dictionary, and the normalization process for the logical design, as well as the design of the Graphical User Interface (GUI). The outputs from this phase will serve as a foundation for the subsequent phases, including implementation, testing, and maintenance.



### **CHAPTER 5**

### **IMPLEMENTATION**

### **5.1 Introduction**

In this chapter, the primary focus is on the successful implementation of the previously designed database. The procedures for database installation and configuration will be outlined. SQL Server is installed on Windows 11, and both Data Definition Language (DDL) and Data Manipulation Language (DML) will be implemented during this phase.

### 5.2 System Development Environment Setup

In CCLMS, the software development environment has to be set up before developing the website. The project consists of two main components which includes the ASP.Net MVC Framework with Microsoft Visual Studio 2022 as Integrated development Environment and Microsoft SQL Server with SQL Server Management Studio.

### 5.2.1 Step of Installation Setup

Step 1: Install the Microsoft SQL Server. Link: <u>https://www.microsoft.com/en-my/sql-server/sql-server-downloads</u>

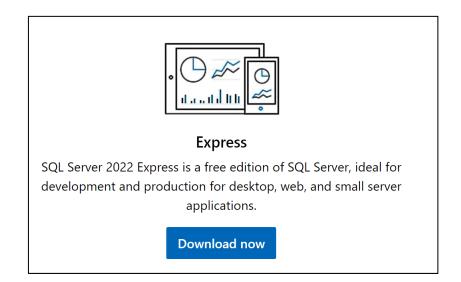


Figure 5.1: Website to install Microsoft SQL Server

Step 2: Configure the storage location of log files, media files and resources files.

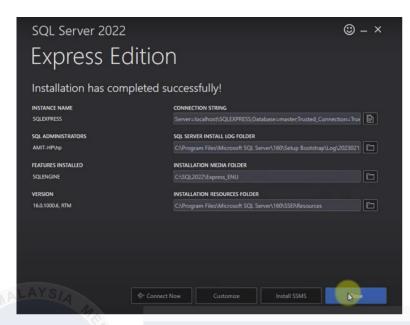


Figure 5.2: Configure the storage location of log files, media files and resources files.

# Step 3: Install SQL Server Management Studio (SSMS). Link:

https://learn.microsoft.com/en-us/sql/ssms/download-sql-server-management-studiossms?view=sql-server-ver16

Download SSMS
$ m \pm$ Free Download for SQL Server Management Studio (SSMS) 19.2 🛛
SSMS 19.2 is the latest general availability (GA) version. If you have a <i>preview</i> version of SSMS 19 installed, uninstall it before installing SSMS 19.2. If you have SSMS 19.x installed, installing SSMS 19.2 upgrades it to 19.2.
Release number: 19.2
• Build number: 19.2.56.2
• Release date: November 13, 2023

Figure 5.3: Website to install SQL Server Management Studio (SSMS)

Step 4: Run the SQL Server in local operating system.

SQL Server (SQLEXPRESS)	Name	Description	Status	Startup Type	Log On As
	🌼 Smart Card Device Enumerat	Creates soft		Manual (Trigg	Local System
<u>Stop</u> the service Pause the service	🎑 Smart Card Removal Policy	Allows the s		Manual	Local System
Restart the service	🔍 SNMP Trap	Receives tra		Manual	Local Service
	🎑 Software Protection	Enables the		Automatic (De	Network Se
	🎑 Spatial Data Service	This service i		Manual	Local Service
Description: Provides storage, processing and	🎑 Spot Verifier	Verifies pote		Manual (Trigg	Local System
controlled access of data, and rapid	🎑 SQL Server (MSSQLSERVER)	Provides sto	Running	Automatic (De	NT Service\
transaction processing.	SQL Server (SQLEXPRESS)	Provides sto	Running	Automatic (De	NT Service\
	🤹 SQL Server Agent (MSSQLSE	Executes job		Manual	NT Service\
	🤹 SQL Server Agent (SQLEXPRE	Executes job		Disabled	Network Se
	🎑 SQL Server Browser	Provides SQ		Disabled	Local Service
	🤹 SQL Server CEIP service (MSS	CEIP service	Running	Automatic (De	NT Service\
	🎑 SQL Server CEIP service (SQL	CEIP service	Running	Automatic (De	NT Service\
	🎑 SQL Server VSS Writer	Provides the	Running	Automatic	Local System
ALAYSI	🎑 SSDP Discovery	Discovers ne	Running	Manual	Local Service

Figure 5.4: Services in local operating system

Step 5: Connect the local SQL Server to the SSMS.

Connect to Server	
مايسيا ملا	SQL Server
Server type:	Database Engine
Server name:	LAPTOP-QL24LNLV/SQLEXPRESS
Authentication:	Windows Authentication ~
User name:	LAPTOP-QL24LNLV\User
Password:	
	Remember password
	Connect Cancel Help Options >>

Figure 5.5: Connection of local SQL Server with SSMS

Step 6: Connection successful.

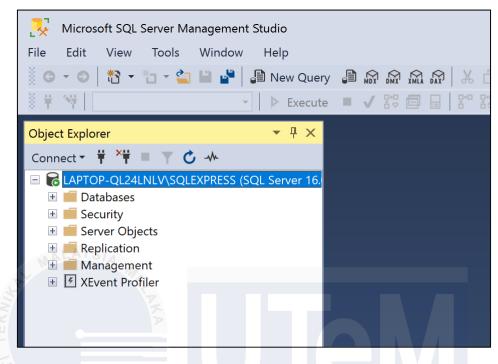


Figure 5.6: Connection of local SQL Server with SSMS is successful

### **5.3 Database Implementation**

In the database implementation phase, the database is utilized to execute various queries, including simple queries, complex queries, aggregate functions, stored procedures, and triggers within the system. The purpose of these queries is to insert, retrieve, validate, and verify the information stored in the database.

### 5.3.1 Data Definition Language

Data Definition Language (DDL) refers to the SQL commands used to create and manipulate tables in a relational database. DDL statements can be employed to create, alter, and drop database objects, including tables, procedures, and triggers for the Cement Company Logistics Management System (CCLMS). Figures 5.7 to 5.15 display the DDL for each create table command.

```
CREATE TABLE [dbo].[Users](
       [username] [nvarchar](450) NOT NULL,
       [password] [nvarchar](30) NOT NULL,
       [companyName] [nvarchar](100) NULL,
       [SSN] [nvarchar](30) NULL,
       [PIC] [nvarchar](100) NOT NULL,
       [contactNum] [nvarchar](20) NOT NULL,
       [email] [nvarchar](80) NOT NULL,
       [IC] [nvarchar](14) NOT NULL,
       [role] [nvarchar](10) NOT NULL,
       [address] [nvarchar](200) NULL,
       [creditLimit] [float] NULL,
       [invoiceTerm] [int] NULL,
 CONSTRAINT [PK_Users] PRIMARY KEY CLUSTERED
(
       [username] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY]
GO
```

Figure 5.7: DDL of User Table

```
CREATE TABLE [dbo].[Cements](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [name] [nvarchar](50) NOT NULL,
       [description] [nvarchar](max) NOT NULL,
       [unitPrice] [float] NOT NULL,
       [color] [nvarchar](20) NOT NULL,
       [weight] [float] NOT NULL,
       [availability] [nvarchar](10) NOT NULL,
[ImageUrl] [nvarchar](max) NULL,
       [PeriodEnd] [datetime2](7) GENERATED ALWAYS AS ROW END HIDDEN NOT NULL,
       [PeriodStart] [datetime2](7) GENERATED ALWAYS AS ROW START HIDDEN NOT NULL,
       [poQuantity] [int] NOT NULL,
       [stockQuantity] [int] NOT NULL,
 CONSTRAINT [PK_Cements] PRIMARY KEY CLUSTERED
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY],
       PERIOD FOR SYSTEM_TIME ([PeriodStart], [PeriodEnd])
) ON [PRIMARY] TEXTIMAGE_ON [PRIMARY]
WITH
SYSTEM_VERSIONING = ON (HISTORY_TABLE = [dbo].[CementsHistory])
GO
ALTER TABLE [dbo].[Cements] ADD DEFAULT ((0)) FOR [poQuantity]
GO
ALTER TABLE [dbo].[Cements] ADD DEFAULT ((0)) FOR [stockQuantity]
GO
```

```
Figure 5.8: DDL of Cement Table
```

```
CREATE TABLE [dbo].[Recipients](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [name] [nvarchar](100) NOT NULL,
       [address] [nvarchar](250) NOT NULL,
       [contactNum] [nvarchar](20) NOT NULL,
[customerID] [nvarchar](450) NOT NULL,
       [latitude] [float] NULL,
       [longitude] [float] NULL,
 CONSTRAINT [PK_Recipients] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY]
GO
ALTER TABLE [dbo].[Recipients] WITH CHECK ADD CONSTRAINT
[FK_Recipients_Users_customerID] FOREIGN KEY([customerID])
REFERENCES [dbo].[Users] ([username])
GO
ALTER TABLE [dbo].[Recipients] CHECK CONSTRAINT [FK_Recipients_Users_customerID]
GO
```

Figure 5.9: DDL of Recipient Table



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```
CREATE TABLE [dbo].[PurchaseOrders](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [poNum] [nvarchar](16) NOT NULL,
       [quantity] [int] NOT NULL,
       [soldUnitPrice] [float] NOT NULL,
       [totalAmount] [float] NOT NULL,
       [orderDate] [datetime2](7) NOT NULL,
       [packingType] [nvarchar](20) NOT NULL,
       [remarks] [nvarchar](max) NULL,
       [orderType] [nvarchar](20) NOT NULL,
       [status] [nvarchar](30) NOT NULL,
       [cementID] [int] NOT NULL,
       [recipientID] [int] NOT NULL,
       [customerID] [nvarchar](450) NOT NULL,
       [fulfilledQty] [int] NOT NULL,
       [approvedQty] [int] NOT NULL,
 CONSTRAINT [PK_PurchaseOrders] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY] TEXTIMAGE_ON [PRIMARY]
GO
ALTER TABLE [dbo] [PurchaseOrders] ADD DEFAULT ((0)) FOR [fulfilledQty]
GO
ALTER TABLE [dbo].[PurchaseOrders] ADD DEFAULT ((0)) FOR [approvedQty]
GO
ALTER TABLE [dbo].[PurchaseOrders] WITH CHECK ADD CONSTRAINT
[FK_PurchaseOrders_Cements_cementID] FOREIGN KEY([cementID])
REFERENCES [dbo].[Cements] ([Id])
GO
ALTER TABLE [dbo]. [PurchaseOrders] CHECK CONSTRAINT
[FK_PurchaseOrders_Cements_cementID]
GO
ALTER TABLE [dbo]. [PurchaseOrders] WITH CHECK ADD CONSTRAINT
[FK_PurchaseOrders_Recipients_recipientID] FOREIGN KEY([recipientID])
```

Figure 5.10: DDL of PurchaseOrder Table

```
CREATE TABLE [dbo].[Lorries](
       [carPlateNum] [nvarchar](450) NOT NULL,
       [roadTaxExprDate] [datetime2](7) NOT NULL,
       [condition] [nvarchar](30) NULL,
       [YOM] [int] NOT NULL,
       [logisticID] [nvarchar](450) NOT NULL,
 CONSTRAINT [PK_Lorries] PRIMARY KEY CLUSTERED
(
       [carPlateNum] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY]
GO
ALTER TABLE [dbo] [Lorries] WITH CHECK ADD CONSTRAINT
[FK_Lorries_Users_logisticID] FOREIGN KEY([logisticID])
REFERENCES [dbo].[Users] ([username])
GO
ALTER TABLE [dbo] [Lorries] CHECK CONSTRAINT [FK_Lorries_Users_logisticID]
GO
```

# Figure 5.11: DDL of Lorry Table

```
CREATE TABLE [dbo].[Drivers](
       [Id] [int] IDENTITY(1,1) NOT NULL,
      [name] [nvarchar](100) NOT NULL,
     [IC] [nvarchar](14) NOT NULL,
       [contactNum] [nvarchar](20) NOT NULL,
       [licenseExprDate] [datetime2](7) NOT NULL,
[logisticID] [nvarchar](450) NOT NULL,
CONSTRAINT [PK_Drivers] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY]
GO
ALTER TABLE [dbo]. [Drivers] WITH CHECK ADD CONSTRAINT
[FK Drivers Users logisticID] FOREIGN KEY([logisticID])
REFERENCES [dbo].[Users] ([username])
GO
```

Figure 5.12: DDL of Driver Table

```
CREATE TABLE [dbo].[SalesOrders](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [soNum] [nvarchar](18) NOT NULL,
       [quantity] [int] NOT NULL,
       [totalAmount] [float] NOT NULL,
       [status] [nvarchar](30) NOT NULL,
       [deliveryDate] [datetime2](7) NOT NULL,
       [poID] [int] NOT NULL,
       [PeriodEnd] [datetime2](7) GENERATED ALWAYS AS ROW END HIDDEN NOT NULL,
       [PeriodStart] [datetime2](7) GENERATED ALWAYS AS ROW START HIDDEN NOT
NULL,
 CONSTRAINT [PK_SalesOrders] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF)
ON [PRIMARY],
       PERIOD FOR SYSTEM_TIME ([PeriodStart], [PeriodEnd])
) ON [PRIMARY]
WITH
SYSTEM_VERSIONING = ON (HISTORY_TABLE = [dbo].[SalesOrdersHistory])
)
GO
ALTER TABLE [dbo].[SalesOrders] WITH CHECK ADD CONSTRAINT
[FK_SalesOrders_PurchaseOrders_poID] FOREIGN KEY([poID])
REFERENCES [dbo].[PurchaseOrders] ([Id])
GO
ALTER TABLE [dbo]. [SalesOrders] CHECK CONSTRAINT
[FK_SalesOrders_PurchaseOrders_poID]
GO
```

# Figure 5.13: DDL of SalesOrder Table

```
CREATE TABLE [dbo].[DeliveryOrders](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [doNum] [nvarchar](18) NOT NULL,
       [deliveryFee] [float] NOT NULL,
       [estimatedDeparture] [datetime2](7) NULL,
       [estimatedArrival] [datetime2](7) NULL,
       [soID] [int] NOT NULL,
       [logisticID] [nvarchar](450) NOT NULL,
       [lorryID] [nvarchar](450) NULL,
       [driverID] [int] NULL,
       [approved] [nvarchar](8) NULL,
       [podURL] [nvarchar](max) NULL,
       [accepted] [nvarchar](8) NULL,
 CONSTRAINT [PK_DeliveryOrders] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY] TEXTIMAGE_ON [PRIMARY]
GO
ALTER TABLE [dbo]. [DeliveryOrders] WITH CHECK ADD CONSTRAINT
[FK_DeliveryOrders_Drivers_driverID] FOREIGN KEY([driverID])
REFERENCES [dbo].[Drivers] ([Id])
GO
ALTER TABLE [dbo]. [DeliveryOrders] CHECK CONSTRAINT
[FK_DeliveryOrders_Drivers_driverID]
GO
ALTER TABLE [dbo] [DeliveryOrders] WITH CHECK ADD CONSTRAINT
[FK_DeliveryOrders_Lorries_lorryID] FOREIGN KEY([lorryID])
REFERENCES [dbo].[Lorries] ([carPlateNum])
GO
ALTER TABLE [dbo]. [DeliveryOrders] CHECK CONSTRAINT
[FK_DeliveryOrders_Lorries_lorryID]
GO
ALTER TABLE [dbo] [DeliveryOrders] WITH CHECK ADD CONSTRAINT
[FK_DeliveryOrders_SalesOrders_soID] FOREIGN KEY([soID])
REFERENCES [dbo].[SalesOrders] ([Id])
GO
ALTER TABLE [dbo].[DeliveryOrders] CHECK CONSTRAINT
[FK_DeliveryOrders_SalesOrders_soID]
GO
ALTER TABLE [dbo]. [DeliveryOrders] WITH CHECK ADD CONSTRAINT
[FK_DeliveryOrders_Users_logisticID] FOREIGN KEY([logisticID])
REFERENCES [dbo].[Users] ([username])
GO
ALTER TABLE [dbo].[DeliveryOrders] CHECK CONSTRAINT
[FK_DeliveryOrders_Users_logisticID]
GO
```

```
CREATE TABLE [dbo].[Invoices](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [invNum] [nvarchar](18) NOT NULL,
       [term] [int] NOT NULL,
       [date] [datetime2](7) NOT NULL,
       [doID] [int] NOT NULL,
       [paymentID] [int] NULL,
 CONSTRAINT [PK_Invoices] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF)
ON [PRIMARY]
) ON [PRIMARY]
GO
ALTER TABLE [dbo].[Invoices] WITH CHECK ADD CONSTRAINT
[FK_Invoices_DeliveryOrders_doID] FOREIGN KEY([doID])
REFERENCES [dbo].[DeliveryOrders] ([Id])
GO
ALTER TABLE [dbo].[Invoices] CHECK CONSTRAINT [FK_Invoices_DeliveryOrders_doID]
GO
ALTER TABLE [dbo].[Invoices] WITH CHECK ADD CONSTRAINT
[FK_Invoices_Payments_paymentID] FOREIGN KEY([paymentID])
REFERENCES [dbo]. [Payments] ([Id])
ON DELETE SET NULL
GO
ALTER TABLE [dbo] [Invoices] CHECK CONSTRAINT [FK_Invoices_Payments_paymentID]
GO
```

# Figure 5.14: Invoice Table

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```
CREATE TABLE [dbo].[Payments](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [date] [datetime2](7) NOT NULL,
       [totalAmount] [float] NOT NULL,
       [receiptNum] [nvarchar](16) NULL,
       [approved] [nvarchar](8) NULL,
       [receiptURL] [nvarchar](max) NULL,
       [paymentMethod] [nvarchar](40) NULL,
       [proofAmount] [nvarchar](40) NULL,
       [proofDate] [nvarchar](40) NULL,
       [proofTime] [nvarchar](40) NULL,
       [approvedDate] [datetime2](7) NULL,
       [rejectReason] [nvarchar](200) NULL,
       [rejectionCount] [int] NOT NULL,
       [paymentNum] [nvarchar](16) NULL,
       [resubmitCount] [int] NOT NULL,
 CONSTRAINT [PK_Payments] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY] TEXTIMAGE_ON [PRIMARY]
GO
ALTER TABLE [dbo]. [Payments] ADD DEFAULT ((0)) FOR [rejectionCount]
GO
ALTER TABLE [dbo]. [Payments] ADD DEFAULT ((0)) FOR [resubmitCount]
GO
```

Figure 5.15: Data Dictionary of Payment Table

```
CREATE TABLE [dbo].[Resubmits](
       [Id] [int] IDENTITY(1,1) NOT NULL,
       [reason] [nvarchar](200) NULL,
       [date] [datetime2](7) NOT NULL,
       [paymentID] [int] NOT NULL,
       [receiptURL] [nvarchar](max) NOT NULL,
 CONSTRAINT [PK_Resubmits] PRIMARY KEY CLUSTERED
(
       [Id] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON, OPTIMIZE_FOR_SEQUENTIAL_KEY = OFF) ON
[PRIMARY]
) ON [PRIMARY] TEXTIMAGE_ON [PRIMARY]
GO
ALTER TABLE [dbo].[Resubmits] ADD DEFAULT (N'') FOR [receiptURL]
GO
ALTER TABLE [dbo].[Resubmits] WITH CHECK ADD CONSTRAINT
[FK_Resubmits_Payments_paymentID] FOREIGN KEY([paymentID])
REFERENCES [dbo].[Payments] ([Id])
GO
ALTER TABLE [dbo]. [Resubmits] CHECK CONSTRAINT [FK_Resubmits_Payments_paymentID]
GO
```

Figure 5.16: Data Dictionary of Resubmit Table

# 5.3.2 Data Loading

Data loading is the phase where data is loaded into the database to be used in the future. The data is loaded using Data Manipulation Language (DML), for example INSERT statement. After the user interface is developed, the users can now use the system to insert new data into the database since the system is now connected to the database. Figure 5.16 shows the query to insert new recipient into the database. Table 5.1 shows the sample data of recipient table.

INSERT INTO Recipients (CustomerID, name, address, contactNum) VALUES (@CustomerID, @Name, @Address, @contactNum)

# Figure 5.17: Insert Statement of Recipient Table

# Table 5.1: Sample data of recipient table

ID	customerID	name 🗲	address	contactNum
1		Future Sdn. Bhd.	No 12, Jalan Kluang Baru 1, Taman Kluang Baru, 86000 Kluang.	0127685566

# 5.3.3 Data Access

Users can access the data stored in the database using queries such as restricted data queries, join data queries and aggregate function queries. These queries will be discussed later in this section.

# 5.3.3.1 Restricted Data Queries

Figure 5.17 shows query retrieves all records from the Drivers table where the logisticID matches the specified username.

SELECT *	
FROM Drivers	
WHERE logisticID = 'username';	

# Figure 5.18: Example of restricted select statement

# 5.3.3.2 Join Data Queries

Figure 5.18 shows example of quey that join four tables: PurchaseOrder, Cement, Customer, Recipient.

SELECT *
FROM PurchaseOrders p
LEFT JOIN Cements c ON p.CementID = c.ID
LEFT JOIN Customers cu ON p.CustomerID = cu.ID
LEFT JOIN Recipients r ON p.RecipientID = r.ID
WHERE p.Id = @salesOrder_poID;

# Figure 5.19: Example of join statement

# **5.3.3.3 Aggregate Function Queries**

Figure 5.19 shows the query counts the number of records in the DeliveryOrders table where the driverID column matches the specified id. The COUNT(\*) function is used to return the total number of such records.

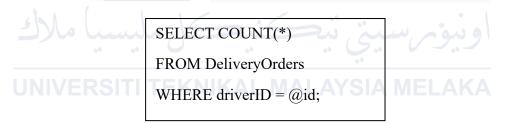


Figure 5.20: Example of aggregate function

# **5.4 Implementation Status**

The implementation status provides an overview of each module, including its description, the duration required to complete it, and the completion date throughout the implementation process.

Module	Description	Duration (days)	Completed Date
Customer management	This module allows the admin to manage customer information, including creating and updating customer accounts. It also includes setting customer credit limits.	10/4/2024	12/4/2024

Logistic Commons	In this module, the admin con	13/4/2024	15/4/2024
Logistic Company	In this module, the admin can	13/4/2024	15/4/2024
Management	manage the details of partnered		
	logistic companies. This		
	includes creating and		
	maintaining logistic company		
	profiles, assigning delivery		
0.1.14	orders.	4.6/4/2024	
Order Management	This module handles the entire	16/4/2024	24/4/2024
	process of managing orders,		
	from submission to approval.		
	Admins can view and approve		
	orders, update order statuses,		
	and manage related documents		
	such as invoices and receipts.		
Cement	The Cement Management	25/4/2024	27/4/2024
Management	module is responsible for		
	managing the inventory of		
N N	cement products. Admins can		
	add new cement types, update		
F	pricing, track stock levels, and		
	monitor price changes.		
Submit Order &	This module allows customers to	28/4/2024	30/4/2024
Recipient	place orders for cement and		
NO.	specify the recipient details.		
Submit payment	Customers can use this module	1/5/2024	10/5/2024
evidence	to submit evidence of payment,	ىيەم سىخ	0
00	such as bank slips or cheque.	> /	
	This evidence is then verified by	•*	
	the admin before processing the	<b>BIA MELAK</b>	Α
	order further.		
Order status tracking	This module provides customers	11/5/2024	25/5/2024
C	with real-time updates on the		
	status of their orders.		
View invoice and	Customers can use this module	26/5/2024	31/5/2024
receipt	to view and download invoices		
1	and receipts for their completed		
	transactions.		
View delivery order	This module allows logistic	1/6/2024	5/6/2024
,	companies to view, reject all		
	delivery orders assigned to them.		
	It provides details such as the		
	destination, required delivery		
	date, and the specific cement		
	products to be delivered.		
Driver lorry and	Logistic companies use this	6/6/2024	8/6/2024
assignment	module to assign or edit drivers		0.0.2021
	and lorries to specific delivery		
	orders.		
	014010.	1	L

# **5.5** Conclusion

In summary, this chapter outlines the setup of the development environment for the Cement Company Logistics Management System (CCLMS), detailing the procedures for installing Microsoft SQL Server on a Windows platform. Additionally, the chapter covers the execution of database implementation to facilitate the system's processes. The system is designed based on business logic that incorporates Data Definition Language (DDL), Data Manipulation Language (DML), as well as commands for creating database tables and constraints.



## **CHAPTER 6**

### TESTING

# **6.1 Introduction**

Testing is a process aimed at evaluating the functionality of a software application to determine whether the developed software meets the specified requirements and to identify any defects, ensuring that the system is free of errors. In this chapter, verification and validation will be performed on the Cement Company Logistics Management System (CCLMS). The two main goals of testing CCLMS are:

- a) To demonstrate CCLMS to the end users has meet its user requirement
- b) To discover any bug or faults from the CCLMS with difference test strategy

Additionally, system testing is a crucial phase in the Database Life Cycle (DBLC). The testing phase for the Cement Company Logistics Management System (CCLMS) includes a test plan that encompasses the test organization, test schedule, and test environment.

## 6.2 Test Plan

A test plan is a technical document that outlines the testing strategy, scope, resources (including manpower, software, and hardware) needed for testing, the test schedule, and the expected deliverables. It provides a comprehensive understanding of the system's workflow and functions, detailing how each component will be tested to assess whether the system operates as designed, identify bugs, and determine its actual limitations.

#### 6.2.1 Test Organization

In the Cement Company Logistics Management System (CCLMS), the test organization consists of three user roles: admin, customer, and logistic. Both functional and non-functional requirements will be tested for each user role. Table 6.1 illustrates how the three users undergo testing based on their specific responsibilities.

<b>Tester ID</b>	User	Responsibilities	
T1	Admin	<ul> <li>Testing the system with follow the test script given</li> <li>Testing the admin module</li> <li>Defect and bug detection</li> </ul>	
		• Defect and bug detection	

 Table 6.1: User Responsibilities List

T2	Customer	<ul> <li>Testing the system with follow the test script given</li> <li>Testing the customer module</li> <li>Defect and bug detection</li> </ul>
T3	Logistic	<ul> <li>Testing the system with follow the test script given</li> <li>Testing the logistic module</li> <li>Defect and bug detection</li> </ul>

# **6.2.2 Test Environment**

The test environment refers to the configuration of software, hardware, operating systems, tools, and network settings necessary for the testing teams to execute test cases. Tables 6.2 and 6.3 present the list of hardware and software required for the testing environment of the Cement Company Logistics Management System (CCLMS).

<b>Table 6.2:</b>	Test <b>F</b>	<b>Enviro</b> n	ment I	Hardwar	e List

Environment Specification	Description
Laptop	Lenovo Yogo Slim 5i
Processor	Intel Cire i7
RAM	16GB
Mouse	Dell

# Table 6.3: Test Environment Software List

Environment	Description
Database	Microsoft SQL Server
Operating System	Window 11
Web Browser	Google Chrome
Microsoft Visual Studio 2022	Integrated Development Environment

# 6.2.3 Test Schedule

The test schedule is defined as a summary that outlines key test milestones and timelines for testing activities. It organizes test activities based on specific dates for the completion of the testing process. Preparing the test schedule involves estimating dates and making necessary revisions. Table 6.4 illustrates the test schedule for the development of the Cement Company Logistics Management System (CCLMS).

Testing Task	Test Date
User Login	1/8/2024
Insert Cement	1/8/2024
Register Customer Account	2/8/2024
Add Recipient	2/8/2024

# Table 6.4 Test Schedule

Add Lorry	3/8/2024
Add Driver	3/8/2024
Product Searching	4/8/2024
Credit Limit Checking	4/8/2024
Upload Proof of Payment	5/8/2024
Assign Delivery Order	6/8/2024
Place Purchase Order	7/8/2024
Assign Sales Order	8/8/2024
Request Sales Order	8/8/2024

# 6.3 Test Strategy

Black box testing involves evaluating the software without knowledge of its internal workings. In this approach, the tester provides inputs and observes the outputs generated by the system, enabling the identification of how the system responds to both expected and unexpected user actions, as well as assessing its response time, usability, and reliability. This testing can be performed by any tester, regardless of their programming or software development background. The primary goal of black box testing is to validate the system and ensure it meets both functional and non-functional requirements.

White box testing, in contrast, focuses on examining the internal logic and structure of the code. This technique requires detailed knowledge of the application's source code, architecture, and configuration. White box testing can reveal issues such as security vulnerabilities, broken paths, or data flow problems—areas that black box testing may not comprehensively cover. Therefore, it is essential for testers conducting white box testing to possess programming skills or knowledge.

By combining both techniques, testers and developers can ensure that the system meets all objectives and requirements, while also enhancing the overall quality of the system through thorough testing.

# 6.3.1 Classes of Tests

a) Unit Test

A test that focuses on verifying the functionality of individual components or pieces of code in isolation, ensuring that each unit works correctly on its own.

b) Integration Test

Integration test is to ensure that this system captures data into the database correctly based on what key in the data. A test that examines how different units or components

of a system work together, ensuring that the integrated modules function as expected when combined.

c) Usability Test

A test that evaluates the user experience and ease of use of a system or application, focusing on how real users interact with the interface and whether it meets their needs effectively.

# 6.4 Test Design

# 6.4.1 Test Description

The test description outlines the identification of test cases, types of testing, preconditions, test requirements, procedural steps for each test case, and the expected output results, which are documented for every module's test case. Tables 6.6 to 6.17 provide detailed descriptions of the test cases in relation to the various system modules.

Test ID	T001-Login			
Testing Type	Unit testing			
Test Strategy	White box Testing	5		
Test Class	Security and error	handling testing		
Test Case ID	Test	<b>Pre-condition</b>	Test/Step	Expected
	Requirements		Procedure	Output
TC1_1	Validate that the	User has valid	1. Navigate to login	Login
UNIVE	login function is	username and	page.	Successful.
	accessible when	password.	2. Provide valid	
	valid username	-	username.	
	and password		3. Provide valid	
	are provided.		password.	
			4. Click on Login	
			button.	
TC1_2	Validate that the		1. Navigate to login	Login failed.
	login function is		page.	Display error
	not accessible		2. Click on Login	message
	when the		button.	"Invalid
	username or			username or
	password fields			password".
	are left blank.			
TC1_3	Validate that the		1. Navigate to login	Login failed.
	login function is		page.	Display error
	not accessible		2. Provide valid	message
	when the		username.	"Invalid
	username and		3. Provide invalid	username or
	password		password.	password".

provided are	4. Click on Login	
invalid.	button.	

# Table 6.6: Test Description of Insert Cement

Tert ID	T002 Insert Consert		
Test ID	T002-Insert Cement		
Testing Type	Unit testing		
Test Strategy	White box Testing		
Pre-condition	User must log in as admin		
Test Case ID	Test Requirements	<b>Test/Step Procedure</b>	Expected
			Output
TC2_1	Validate the insert cement	1. Navigate to insert	Insert cement
	function is accessible	cement page.	successful.
	when all the input data are	2. Enter correct data type	
MA	valid.	to input text field "product	
al is	MA	name", "price per bag",	
S.	i i i i i i i i i i i i i i i i i i i	"colour", "weight" and	
3	K	"description".	
Ξ.		3. Upload an image for	
F		product image.	
E		3. Click on create button.	
TC2_2	Validate the insert cement	1. Navigate to insert	Insert cement
- 31/1	function is not accessible	cement page.	failed. Display
	when all the input fields	2. Click on create button.	error message
5 1	are left blank.		"The name filed
	units	ور شکی م	is required" at
			the "Product
			name" input
UNIVE	RSIII IENNINAL	MALATSIA MELA	text field.
TC2 3	Validate the insert cement	1. Navigate to insert	Insert cement
_	function is not accessible	cement page.	failed. Display
	when the certain input data	2. Enter correct data type	error message
	type are invalid.	to input text field "product	"Please enter a
	• •	name", "colour", "weight"	value greater
		and "description".	than or equal to
		3. Enter invalid "price per	1." at the "Price
		bag" range.	per Bag" input
		4. Click on create button.	text field.
		1. Cher on create button.	text field.

# Table 6.7: Test Description of Register Customer Account

Test ID	T003-Register Customer Account		
Testing Type	Unit testing		
Test Strategy	White box Testing		
Pre-condition	User must log in as admin		
Test Case ID	Test Requirements Test/Step Procedure Expected		
			Output

TC2 1	X71·1 / /1 · /	1 37 4 7 11	Q t
TC3_1	Validate the register	1. Navigate to add new	Customer .
	customer account function	customer page.	account register
	is accessible when all the	2. Enter correct data type	successful.
	input data are valid.	to input text field	
		"username", "temporary	
		password", "company	
		name", "SSM", "address",	
		"Person in Charge", "IC",	
		"contact number",	
		"email", "credit limit" and	
		"invoice term".	
		3. Click on create button.	
TC3 2	Validate the register	1. Navigate to add new	Customer
_	customer account is not	customer page.	account register
	accessible when there are	2. Click on create button.	failed. Display
MA	all the input fields are left		error message
· PY	blank.		"The name filed
	P		is required" at
N N	<b>A</b>		the "username"
μ			input text field.
TC3_3	Validate the register	1. Navigate to add new	Customer
	customer account function	customer page.	account register
CE D	is not accessible when the	2. Enter correct data type	failed. Display
	certain input data type are	to input text field	error message
. 1. 1	invalid.	"username", "temporary	"Please enter a
ملاك	Lundo Cari	password", "company	value greater
		name", "SSM", "address",	than or equal to
		"Person in Charge", "IC",	1." at the
UNIVE	RSITI TEKNIKAI	"contact number",	"Credit Limit"
		"email", "credit limit" and	input text field.
		"invoice term".	1
		3. Enter invalid "credit	
		limit" range.	
		4. Click on create button.	
L	l	T. CHER OII CICALE DULLOII.	

Test ID	T004- Add Recipient		
Testing Type	Unit testing		
Test Strategy	White box Testing		
Pre-condition	User must log in as custom	ner	
<b>Test Case ID</b>	Test Requirements	<b>Test/Step Procedure</b>	<b>Expected Output</b>
TC4_1	Validate the add recipient	1. Navigate to add new	Add recipient
	function is accessible	recipient page.	successful.
	when all the input data	2. Enter correct data type	
	are valid.	to input text field	
		"recipient name",	
		"address and "contact	
		number".	

		3. Click on create button.	
TC4_2	Validate the add recipient	1. Navigate to add new	Add recipient
	is not accessible when all	recipient page.	failed. Display
	the input fields are left	2. Click on create button.	error message
	blank.		"This field is
			required" at the
			"recipient name"
			input text field.
TC4_3	Validate the add recipient	1. Navigate to add new	Add recipient
	function is not accessible	recipient page.	failed. Display
	when the certain input	2. Enter correct data type	error message
	data type are invalid.	to input text field	"Please enter only
		"recipient name" and	digit." at the
		"address".	"contact number"
	LAYSI	3. Enter invalid "contact	input text field.
MA	A MA	number" format.	
	in the second seco	4. Click on create button.	

	4. Chek on create button	1.
Table 6.9:	Test Description of Add Lorry	

Test ID	T005-Insert Lorry			
Testing Type	Unit Testing			
Test Strategy	White box Testing			
Pre-condition	User must log in as logistic			
Test Case ID	Test Requirements	<b>Test/Step Procedure</b>	<b>Expected Output</b>	
TC5_1	Validate the insert lorry	1. Navigate to add lorry	Insert lorry	
	function is accessible	page.	successful.	
UNIVE	when all the input data are	2. Enter correct data	ΔΚΔ	
	valid.	type to input text field		
		"car plate number",		
		"road tax expired date",		
		"condition" and "Year		
		of Manufacture".		
		3. Click on create		
		button.		
TC5_2	Validate the insert lorry	1. Navigate to add lorry	Insert lorry failed.	
	function is not accessible	page.	Display error	
	when all the input fields	2. Click on create	message "This	
	are left blank.	button.	field is required"	
			at the "Car Plate	
			Number" input	
			text field.	
TC5_3	Validate the insert lorry	1. Navigate to add lorry	Insert lorry failed.	
	function is not accessible	page.	Display error	
	when the certain input data	2. Enter correct data	message "Please	
	types are invalid.	type to input text field	enter a value	
		"car plate number",	greater than or	
		"road tax expired date",	equal to 2000." at	
			the "Year of	

<ul> <li>"condition" and "Year of Manufacture".</li> <li>3. Enter invalid "year of manufacture" range.</li> <li>4. Click on create</li> </ul>	Manufacture" input text field.
button.	

Test ID	T006-Insert Driver				
Testing Type	Unit testing				
Test Strategy	White box Testing				
Pre-condition	User must log in as logistic				
Test Case ID	Test RequirementsTest/Step ProcedureExpected Output				
TC6_1	Validate the insert driver function is accessible when all the input data are valid.	<ol> <li>Navigate to add driver page.</li> <li>Enter correct data type to input text field "name", "IC Number", "Contact Number" and "Licence Expired Date".</li> </ol>	Insert driver successful.		
	<u>n</u>	3. Click on create button.			
TC6_2	Validate the insert driver function is not accessible when all the input fields	<ol> <li>Navigate to add driver page.</li> <li>Click on create</li> </ol>	Insert driver failed. Display error message "This		
UNIVE	are left blank.	button. MEL	field is required" at the "Driver name" input text field.		
TC6_3	Validate the insert driver function is not accessible when the certain input data type are invalid.	<ol> <li>Navigate to add driver page.</li> <li>Enter correct data type to input text field "name", "IC Number", "Contact Number" and "Licence Expired Date".</li> <li>Enter invalid "IC Number" format.</li> <li>Click on create button.</li> </ol>	Insert driver failed. Display error message "Please enter IC in the format of XXXXXX-XX- XXXX, where X is digit." at the "IC Number" input text field.		

# Table 6.11: Test Description of Product Searching

Test ID	T007- Product Searching
Testing Type	Integration testing
Test Strategy	Black box Testing

Pre-condition	Customer is logged into the system, the product database contains several products.			
Test Case ID	Test Requirements	Test/Step Procedure	Expected Output	
TC7_1	Verify that the product search is case insensitive.	<ol> <li>Navigate to the product search page.</li> <li>Enter a product name in lowercase (e.g., "low heat cement").</li> <li>Click the "Search" button.</li> <li>Observe and note the search results.</li> <li>Repeat steps 2-4 with the product name in uppercase (e.g., "LOW HEAT CEMENT").</li> </ol>	The system should return the same search results regardless of the case of the entered text.	
TC7_2	Verify that partial name searches return all relevant products.	<ol> <li>Navigate to the product search page.</li> <li>Enter a partial product name (e.g., "Low Heat").</li> <li>Click the "Search" button.</li> </ol>	The system should return all products whose names contain the entered substring.	
ملاك	Table 6.12: Test Descripti	on of Credit Limit Checking	اونو	

Test ID	T008- Credit Limit Checking				
Testing Type	Integration Testing				
Test Strategy	Black box Testing	L MALATSIA MEL	.ANA		
Pre-condition	Customer is logged into a	an account with sufficient crea	dit limit and another		
	account with insufficient credit limit.				
Test Case ID	Test Requirements	<b>Test/Step Procedure</b>	<b>Expected Output</b>		
TC8_1	Verify that an account	1.Log in with an account	The system should		
	with an insufficient	that has a credit limit	prevent the order		
	credit limit cannot place	lower than the total	from being placed,		
	an order.	amount of the order.	display a message		
		2.Navigate to the order	indicating that the		
		placement page.	credit limit is		
		3.Select the products and	insufficient and		
		enter the desired	redirect to unpaid		
		quantities.	invoices page.		
		4.Attempt to place the			
		order.			
TC8_2	Verify that an account	1.Log in with an account	The system should		
	with a sufficient credit	that has a credit limit	allow the order to		
	limit can successfully	higher than the total	be placed and		
	place an order.	amount of the order.	redirect to the		
		2.Navigate to the order	purchase order		
		placement page.	entry page.		

4.Place the order.
--------------------

 Table 6.13: Test Description of Upload Proof of Payment

Test ID	T009- Upload Proof of Payment			
Testing Type	Integration Testing			
Test Strategy	Black box Testing			
Pre-condition		he system, the database conta	ins several unpaid	
	invoices.	<b>.</b>	1	
Test Case ID	Test Requirements	<b>Test/Step Procedure</b>	Expected Output	
TC9_1	Verify that the system	1.Navigate to the new	The system display	
1 Pr	requires at least one	payment page.	an error message	
N N	invoice to be selected.	2.Attempt to upload a	indicating that at	
EX I	P	proof of payment image	least one invoice	
F		without selecting any	must be selected	
F		invoice from the list.	before uploading	
5		3.Submit the form.	proof of payment.	
TC9_2	Verify that the system	1.Navigate to the new	The form should	
1	prevents submission if	payment page.	not be submitted,	
61-1	invoice/ invoices is	2.Select at least one	and the customer	
ملاك	selected but no proof of	invoice from the list.	should be	
	payment is uploaded	3.Do not upload any proof	prompted to	
		of payment image file.	upload a proof of	
UNIVE	RSITI TEKNIKA	Attempt to submit the	payment before	
		form.	they can proceed.	
TC9_3	Verify that the system	1.Navigate to the new	The system should	
	allows proof of	payment page.	accept the proof of	
	payment upload with at	2.Select at least one	payment upload,	
	least one invoice	invoice from the list.	associate it with	
	selected.	3.Upload a valid proof of	the selected	
		payment image file.	invoice(s), and	
		Submit the form.	confirm the	
			successful	
			submission of the	
			payment evidence.	

Test ID	T010- Assign Delivery order				
Testing Type	Unit testing and error handling testing				
Test Strategy	White box Testing	ing testing			
Pre-condition	User must log in as logistic				
Test Case ID	Test Requirements	Test/Step Procedure	Exposted Output		
TC10 1	Validate the assign	1. Navigate to assign	Expected Output Assign delivery		
1010_1	delivery order function is	delivery order page.	order successful.		
	available if all the input	2. Enter correct data	order successful.		
	data are valid.	type to input text field			
	data ale valid.	"Assigned Driver",			
		"Assigned Lorry",			
		"Departure Time" and			
		"Estimated Duration".			
A AA	LAYSIA	3. Click on create			
St III	MAX	button.			
TC10 2	Validate the assign	1. Navigate to assign	Assign delivery		
	delivery order function is	delivery order page.	order failed.		
<u> </u>	not available if there are	2. Click on create	Display error		
	no data fill in to the input	button.	message "This		
1-10	field		field is required"		
d'a			at the "Departure		
1/1	n		Time" input text		
		1	field.		
TC10_3	Validate the assign	1. Navigate to add	Assign delivery		
	delivery order function is	driver page.	order failed.		
	not available if the certain	2. Enter correct data	Display error		
UNIVE	input data type are invalid.	type to input text field	message "Value		
		"Assigned Driver",	must be greater		
		"Assigned Lorry" and	than or equal to 1."		
		"Departure Time".	at the "Estimated		
		3. Enter invalid	Duration" input		
		"Estimated Duration"	text field.		
		format.			
		4. Click on create			
		button.			

 Table 6.14: Test Description of Assign Delivery order

Test ID	T011- Place Purcha	ase Order		
Testing	Integration testing			
Туре				
Test	Black box Testing			
Strategy	C C			
Test Case	Test	Pre-	Test/Step	<b>Expected Output</b>
ID	Requirements	condition	Procedure	
TC11_1	Verify that the	The customer	1. Log in as a	The system
_	system notifies	has not	customer.	displays a
	the customer to	created any	2. Navigate to the	notification:
	create a recipient	recipients in	product list.	"Please create a
	if none exists.	their account.	3. Select a cement	recipient."
	1 AV C		product and specify	The customer is
	ALAYSIA		the quantity.	redirected to the
E.	TT I		4. Attempt to place	"Add Recipient"
M	P		the order.	page.
TC11_2	Verify that the S	The customer	1. Log in as a	The first recipient
μ	system selects	has already	customer.	is automatically
-	the first recipient	created at	2. Navigate to the	selected in the
E.	by default and	least one	product list.	recipient
E.P.	allows the	recipient in	3. Select a cement	dropdown.
	customer to	their account.	product and specify	The customer can
	choose another		the quantity.	select any other
50	recipient from a		4. Verify that the	recipient from the
	dropdown list.		first recipient is	list.
			selected by default	The order is
UNIV	<b>ERSITI TEK</b>		in the recipient	successfully
<b>U</b>			dropdown.	placed with the
			5. Optionally select	selected recipient
			another recipient	and optional
			from the dropdown	remarks.
			list.	
			Optionally enter	
			any remarks (if	
			desired).	
			6. Place the order.	

 Table 6.15: Test Description of Place Purchase Order

Test ID	T012- Assign Sales	s Order		
Testing	Integration testing			
Туре				
Test	Black box Testing			
Strategy	E E			
Test Case	Test	Pre-	Test/Step	<b>Expected Output</b>
ID	Requirements	condition	Procedure	
TC12_1	Verify that the system enforces the selection of at least one logistic company from the dropdown.	The sales order is available, and no logistic company has been assigned yet.	Log in as an admin. Navigate to the sales order management page. Select a sales order to assign. Verify that the delivery fee is set to the default value (e.g., "1").	The system displays a notification: "Please select a logistic company." The sales order is not assigned until a logistic company is selected.
IL EITI TE			Attempt to assign the sales order without selecting any logistic company from the dropdown.	
TC12_2	Verify that the admin can successfully assign a sales order to a logistic company with delivery fee.	The customer has already created at least one recipient in their account.	Log in as an admin. Navigate to the sales order management page. Select a sales order to assign. Verify that the delivery fee is set to the default value (e.g., "1"). Set a new delivery fee. Select a logistic company from the dropdown. Assign the sales order.	The selected logistic company is assigned to the sales order.

 Table 6.16: Test Description of Assign Sales Order

Test ID	T013- Request Sale	es Order		
Testing	Integration testing			
Туре				
Test	Black box Testing			
Strategy	_			
Test Case	Test	Pre-	Test/Step	<b>Expected Output</b>
ID	Requirements	condition	Procedure	
TC13_1	Verify that the	The selected	1.Log in as a	The customer is
	system notifies	cement's	customer.	notified that the
	the customer	stock is less	2.Navigate to the	stock is not
	when stock is	than the	"Sales Order lists"	available.
	unavailable and	requested	of a purchase order.	A restock request
	sends a restock	quantity.	3.Click "Request	is automatically
	request to the		Sales Order	sent to the admin.
E.	admin.		button".	The order is not
II.	P			processed further.
TC13_2	Verify that when	The selected	1.Log in as a	The requested
μ	stock is	cement's	customer.	cement quantity is
-	available, the	stock is equal	2.Navigate to the	deducted from the
50.	cement quantity	to or greater	"Sales Order lists"	inventory.
C. A.	is deducted from	than the	of a purchase order.	A sales order is
	the inventory,	requested	3.Click "Request	generated .
1.1	and the sales	quantity.	Sales Order	The customer
للاك	order is	-	button".	receives a
	generated	64		confirmation
	successfully.		6 <sup>4</sup>	message of the
UNIV	<b>ERSITI TEK</b>	NIKAL MA	<b>LAYSIA MEL</b>	successful order
				placement.

 Table 6.17: Test Description of Request Sales Order

# 6.4.2 Test Data and Test Result

Test Data ID	Username	Password	
TD1_1	TSAdmin1	123Aa@	
TD1_2	TSAdmin1		
TD1_3	TSAdmin123	123Aa@	

Test	Product	Price	Colour	Weight	Description	Image
Data ID	Name	per Bag				
TD2_1	Low Heat Cement	21.50	Grey	80	Low Heat Cement is specially blended to provide a lower heat of hydration in concrete.	LowHeat Cement.p ng
TD2_2	Low Heat Cement	21.50	Grey	80	null	null
TD2_3	Low Heat Cement	abc	Grey	abc	Low Heat Cement is specially blended to provide a lower heat of hydration in concrete.	LowHeat Cement.p ng

Table 6.20: Test Data of Register Customer Account

Test Data ID	username	Temporary Password	Company Name	SSM	Address	PIC	IC SAM	Contact Num	Email	Credit Limit	Inv Term
TD3_1	TSCust omer1	123Aa@	UTeM Constru ction Sdn. Bhd.	2019 0122 3344	UTEM Constructi on, jalan Hang Tuah Jaya, 76100 Durian Tunggal, Melaka	Wong Yi Xuan	01122 8-01- 0088	01277 66554 4	yixuan @gma il.com	30,000	30
TD3_ 2	TSCust omer1	null	null	2019 0122 3344	UTEM Constructi on, jalan Hang Tuah Jaya, 76100 Durian Tunggal, Melaka	Wong Yi Xuan	01122 8-01- 0088	01277 66554 4	yixuan @gma il.com	30,000	30

TD3_	TSCust	123Aa@	UTeM	2019	UTEM	Wong	01122	01277	yixuan	abc	30
3	omer1		Constru	0122	Constructi	Yi	8-01-	66554	@gma		
			ction	3344	on, jalan	Xuan	0088	4	il.com		
			Sdn.		Hang						
			Bhd.		Tuah Jaya,						
					76100						
					Durian						
					Tunggal,						
					Melaka						

# Table 6.21: Test Data of Add Recipient

Test Data ID	Name	Address	Contact Number	
TD4_1	AME Construction	K Construction & Safety	0127352243	
	Sdn. Bhd	Door, Jalan Mersing,		
	MA	Kampung Masjid Lama,		
A.		Kluang, Johor, MYS		
TD4_2	null	null	null	
TD4_3	AME Construction	K Construction & Safety	abc-defg	
	Sdn. Bhd	Door, Jalan Mersing,		
		Kampung Masjid Lama,		
		Kluang, Johor, MYS		
1/N	1	· · · · · ·		
Table 6.22: Test Data of Add Lorry				

Test Data ID	Car Plate Number	Road Tax Expired Date	Condition	Year of Manufacture
TD5_1NVE	JSD1234	28/12/2025 MALAYSIA	Good_AK	2001
TD5_2	null	null	null	null
TD5_3	JSD1234	28/12/2025	Good	-2000

# Table 6.23: Test Data of Add Driver

Test Data ID	Name	IC Number	Contact Number	License Expired
				Date
TD6_1	Tan Kim	680909-01-	0127656655	28/12/2027
	Hock	1247		
TD6_2	null	null	null	null
TD6_3	Tan Kim	123-450-678	0127656655	28/12/2027
	Hock			

# Table 6.24: Test Data of Product Searching

Test Data ID	Search Data
TD7_1	low heat cement
TD7_2	LOW HEAT CEMENT
TD7_3	Low Heat

Test Data ID	Account	Credit Limit
TD8_1	TSCustomer1	-193200
TD8_2	TSCustomer4	164800

# Table 6.25: Test Data of Credit Limit Checking

# Table 6.26: Test Data of Upload Proof of Payment

Test Data ID	Invoice List	Proof of Payment
TD8_1		Unipertiwicheque17200.png
TD8_2	INV-0036-02	
TD8_3	INV-0036-02	Unipertiwicheque17200.png

# Table 6.27: Test Data of Assign Delivery order

Test Data ID	Assigned	Assigned	Departure Time	Estimated	
	Driver	Lorry		Duration	
TD9_1	Tan Kim	JSD1234	09:00a.m.	60	
E.	Hock				
TD9_2	null	null	null	null	
TD9_3	Tan Kim	JSD1234	09:00a.m.	-60	
1 012	Hock	1 .1		•	

# Table 6.28: Test Data of Place Purchase order

Test Data ID	Cement	Quantity	Recipient	Remarks
TD10_1	White	800	null	null
	Cement			
TD10_2	White	800	Anything Logistic	null
	Cement		Sdn. Bhd.	

# Table 6.29: Test Data of Assign Sales Order

Test Data ID	Delivery Fee	Logistic Company
TD11_1	Default (1.00)	null
TD11_2	800.00	Anything Logistics Sdn. Bhd.

# Table 6.30: Test Data of Request Sales Order

Test Data ID	Purchase Order	Logistic Company
TD12_1	PO-0034	null
TD12_2	PO-0035	Anything Logistics Sdn. Bhd.

# 6.4.3 Test Result and Analysis

Test Case ID	Test Data ID	<b>Expected Result</b>	Actual Result	Pass/Fail
TC1_1	TD1_1	Login	Login	Pass
		Successful.	Successful.	
TC1_2	TD1_2	Login failed.	Login failed.	Pass
		Display error	Display error	
		message "Invalid	message "Invalid	
		username or	username or	
		password".	password".	
TC1_3	TD1_3	Login failed.	Login failed.	Pass
		Display error	Display error	
MA F	LAYSIA	message "Invalid	message "Invalid	
at in	MA	username or	username or	
H.	1 Start	password".	password".	

Table 6.31: Test Result of User Login

Table 6.3	2: Test	Result	of Insert	t Cement	

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC2_1	TD2_1	Insert cement	Insert cement	Pass
	In .	successful.	successful.	
TC2_2	TD2_2	Insert cement	Insert cement	Pass
ملاك	June	failed. Display	failed. Display	ا ہ د
	0	error message	error message "The	
		"The name filed	name filed is	
UNIVE	<b>RSITI TEP</b>	is required" at the	required" at the	KA
		"Product name"	"Product name"	
		input text field.	input text field.	
TC2_3	TD2_3	Insert cement	Insert cement	Pass
		failed. Display	failed. Display	
		error message	error message	
		"Please enter a	"Please enter a	
		value greater than	value greater than	
		or equal to 1." at	or equal to 1." at	
		the "Price per	the "Price per Bag"	
		Bag" input text	input text field.	
		field.		

Test Case ID	Test Data ID	<b>Expected Result</b>	Actual Result	Pass/Fail	
TC3_1	TD3_1	Customer account register successful.	Customer account register successful.	Pass	
TC3_2	TD3_2	Customer account register failed. Display error message "The name filed is required" at the "username" input text field.	Customer account register failed. Display error message "The name filed is required" at the "username" input text field.	Pass	
T3_3	TD3_3	Customer account register failed. Display error message "Please enter a value greater than or equal to 1." at the "Credit Limit" input text field.	Customer account register failed. Display error message "Please enter a value greater than or equal to 1." at the "Credit Limit" input text field.	Pass	
Table 6.34: Test Result of Add Recipient					

Table 6.33: Test Result of Register Customer Account

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC4 1	TD4 1	Add recipient	Add recipient	Pass
UNIVE	<b>RSITI TEI</b>	successful.	successful.	KA
TC4_2	TD4_2	Add recipient	Add recipient	Pass
		failed. Display	failed. Display	
		error message	error message	
		"This field is	"This field is	
		required" at the	required" at the	
		"recipient name"	"recipient name"	
		input text field.	input text field.	
T4_3	TD4_3	Add recipient	Add recipient	Pass
		failed. Display	failed. Display	
		error message	error message	
		"Please enter only	"Please enter only	
		digit." at the	digit." at the	
		"contact number"	"contact number"	
		input text field.	input text field.	

# Table 6.35: Test Result of Add Lorry

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC5_1	TD5_1	Insert lorry successful.	Insert lorry successful.	Pass

TC5_2	TD5_2	Insert lorry failed. Display error message "This field is required" at the "Car Plate Number" input text field.	Insert lorry failed. Display error message "This field is required" at the "Car Plate Number" input text field.	Pass
TC5_3	TD5_3	Insert lorry failed. Display error message "Please enter a value greater than or equal to 2000." at the "Year of Manufacture" input text field.	Insert lorry failed. Display error message "Please enter a value greater than or equal to 2000." at the "Year of Manufacture" input text field.	Pass

# Table 6.36: Test Result of Add Driver

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC6_1	TD6_1	Insert driver successful.	Insert driver successful.	Pass
TC6_2	TD6_2	Insert driver failed. Display error message "This field is required" at the "Driver name" input text field.	Insert driver failed. Display error message "This field is required" at the "Driver name" input text field.	Pass
TC6_3	TD6_3	Insert driver failed. Display error message "Please enter IC in the format of XXXXX- XX-XXXX, where X is digit." at the "IC Number" input text field.	Insert driver failed. Display error message "Please enter IC in the format of XXXXX- XX-XXXX, where X is digit." at the "IC Number" input text field.	Pass

Table 6.37: Test Result of Product Searching
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Test Case ID	Test Data ID	<b>Expected Result</b>	Actual Result	Pass/Fail
TC7_1	TD7_1	The system	The system should	Pass
		should return the	return the same	
		same search	search results	
		results regardless	regardless of the	
		of the case of the	case of the entered	
		entered text.	text.	
TC7_1	TD7_2	The system	The system should	Pass
		should return the	return the same	
		same search	search results	
		results regardless	regardless of the	

		of the case of the entered text.	case of the entered text.	
T7_2	TD7_3	The system should return all products whose names contain the entered substring.	The system should return all products whose names contain the entered substring.	Pass

# Table 6.38: Test Result of Credit Limit Checking

Test Case ID	Test Data ID	<b>Expected Result</b>	Actual Result	Pass/Fail
TC8_1	TD8_1	The system	The system should	Pass
		should prevent	prevent the order	
		the order from	from being placed,	
A AA	LAYSIA	being placed,	display a message	
St III	MA	display a message	indicating that the	
E.	I I I I	indicating that the	credit limit is	
<u>S</u>	2	credit limit is	insufficient and	
Ē	2	insufficient and	redirect to unpaid	
		redirect to unpaid	invoices page.	
F		invoices page.		
TC8_1	TD8_2	The system	The system should	Pass
21/1	0	should allow the	allow the order to	
	1	order to be placed	be placed and	
5 1		and redirect to the	redirect to the	
	units (	purchase order	purchase order	2
		entry page.	entry page.	

# Table 6.39: Test Result of Upload Proof of Payment

Test Case	Test Data	Expected Result	Actual Result	Pass/Fail
ID	ID			
TC9_1	TD9_1	The system display an error message indicating that at least one invoice must be selected before uploading proof of payment.	The system display an error message indicating that at least one invoice must be selected before uploading proof of payment.	Pass
TC9_2	TD9_2	The form should not be submitted, and the customer should be prompted to upload a proof of payment before they can proceed.	The form should not be submitted, and the customer should be prompted to upload a proof of payment before they can proceed.	Pass
T9_3	TD9_3	The system should accept the proof of payment upload,	The system should accept the proof of payment upload,	Pass

associate it with the selected invoice(s), and confirm the successful submission of the payment evidence.	associate it with the selected invoice(s), and confirm the successful submission of the payment	
	evidence.	

# Table 6.40: Test Result of Assign Delivery order

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC10_1	TD10_1	Assign delivery order successful.	Assign delivery order successful.	Pass
TC10_2	TD10_2	Assign delivery order failed. Display error message "This field is required" at the "Departure Time" input text field.	Assign delivery order failed. Display error message "This field is required" at the "Departure Time" input text field.	Pass
TC10_3		Assign delivery order failed. Display error message "Value must be greater than or equal to 1." at the "Estimated Duration" input text field.	Assign delivery order failed. Display error message "Value must be greater than or equal to 1." at the "Estimated Duration" input text field.	Pass

# UNIVERS Table 6.41: Test Result of Assign Purchase order

Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC11_1	TD11_1	The system displays a notification: "Please create a recipient." The customer is redirected to the "Add Recipient" page.	The system displays a notification: "Please create a recipient." The customer is redirected to the "Add Recipient" page.	Pass
TC11_2	TD11_2	The first recipient is automatically selected in the recipient dropdown. The customer can select any other recipient from the list. The order is successfully placed with the selected recipient and optional remarks.	The first recipient is automatically selected in the recipient dropdown. The customer can select any other recipient from the list. The order is successfully placed with the selected	Pass

	recipient and optional remarks.	

Test Case	Test Data	Expected Result	Actual Result	Pass/Fail
ID	ID			
TC12_1	TD12_1	The system displays a notification: "Please select a logistic company." The sales order is not assigned until a logistic company is selected.	The system displays a notification: "Please select a logistic company." The sales order is not assigned until a logistic company is selected.	Pass
TC12_2	TD12_2	The selected logistic company is assigned to the sales order.	The selected logistic company is assigned to the sales order.	Pass

# Table 6.42: Test Result of Assign Sales Order

Table 6.43: Test Result of Request Sales Order				
Test Case ID	Test Data ID	Expected Result	Actual Result	Pass/Fail
TC13_1	TD13_1	The customer is notified that the stock is not available. A restock request is automatically sent to the admin. The order is not processed further.	The customer is notified that the stock is not available. A restock request is automatically sent to the admin. The order is not processed further.	Pass
TC13_2	TD13_2	The requested cement quantity is deducted from the inventory. A sales order is generated. The customer receives a confirmation message of the successful order placement.	The requested cement quantity is deducted from the inventory. A sales order is generated. The customer receives a confirmation message of the successful order placement.	Pass

#### 6.5 Usability Test

A Google Form was used to distribute a structured questionnaire to a sample group consisting of 10 Admin users, 12 Customers, and 12 Logistic users. The questionnaire employed the USE (Usefulness, Satisfaction and Ease of Use) Questionnaire, which evaluates four key components: usefulness, ease of use, ease of learning, and satisfaction. The USE Questionnaire contained 30 question items, each rated on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). This scale allowed respondents to express their level of agreement with various statements related to their experience with the system. The results were analyzed based on the demographic characteristics of the respondents, including gender, age, educational level, tenure and user role. For each demographic category, the average score for questions within each component of the USE Questionnaire was calculated.

# 6.5.1 Result and Discussion

Table 6.44 shows that the results based on gender reveal that female respondents consistently reported higher average scores across all components of the USE Questionnaire compared to their male counterparts. Specifically, females rated the system's usefulness at 6.03, ease of use at 5.99, ease of learning at 6.42, and overall satisfaction at 6.04. In contrast, males provided lower average ratings, with 5.73 for usefulness, 5.68 for ease of use, 5.97 for ease of learning, and 5.75 for satisfaction. These findings suggest that female users perceive the system to be more beneficial, user-friendly, easier to learn, and more satisfactory overall, indicating a more favorable user experience among female respondents compared to males. This disparity highlights the need to explore and address the factors contributing to the differing experiences between genders to ensure the system meets the needs of all users effectively.

Aspect	Gender		
	Male	Female	
Usefulness	5.73	6.03	
Ease of Use	5.68	5.99	
Ease of Learn	5.97	6.42	
Satisfaction	5.75	6.04	

#### Table 6.44: Average ratings of USE questionnaire components by gender

Table 6.45 illustrates that respondents aged 20-29 consistently reported the highest average scores for usefulness (6.39), ease of use (6.27), ease of learning (6.75), and satisfaction (6.20). Those aged 40-49 also provided relatively high scores, especially in satisfaction (6.29) and ease of learning (6.50). Conversely, respondents above 60 reported the lowest average scores across all components, indicating a less favorable experience with the system. Respondents aged 50-59 also showed lower scores, particularly in ease of use (4.86) and usefulness (5.16). Overall, younger respondents (under 50) tended to have a more positive perception of the system's usability and effectiveness compared to older respondents. This trend suggests that the system might be better aligned with the preferences and capabilities of younger users, highlighting a potential area for improvement to enhance the user experience for older individuals.

			Age	Aspect			
ove 60	Above	50-59	40-49	30-39	20-29	Under 20	E
5	3.15	5.16	6.07	5.92	6.39	6.13	Usefulness
3	3.18	4.86	5.97	5.97	6.27	5.91	Ease of Use
)	3.00	5.00	6.50	6.39	6.75	5.75	Ease of Learn
)	4.29	5.04	6.29	5.93	6.20	5.86	Satisfaction
-			A				

Table 6.45: Average ratings of USE questionnaire components by age

Table 6.46 shows a clear trend where respondents with higher education levels generally reported higher average scores across all components of the USE Questionnaire. Respondents with a Master's degree reported the highest average scores for usefulness (6.50), ease of learning (6.88), and ease of use (6.23). Those with a Diploma also provided high ratings, particularly for ease of learning (6.60) and satisfaction (6.37). In contrast, respondents with only a Primary School education reported significantly lower scores across all components, with usefulness (3.13), ease of use (3.18), and ease of learning (3.00) being the lowest. Overall, the data indicate that the system is perceived more positively by respondents with higher educational levels, highlighting a potential need for enhanced support and usability improvements for users with lower educational backgrounds.

Aspect	Education Level									
	Primary	Secondary	Diploma	Bachelor	Master					
	School	School	_							
Usefulness	3.13	5.17	6.25	5.76	6.50					
Ease of Use	3.18	5.17	6.26	5.95	6.23					
Ease of Learn	3.00	5.21	6.60	6.49	6.88					
Satisfaction	4.29	5.53	6.37	5.95	5.79					

Table 6.46: Average ratings of USE questionnaire components by education level

Table 6.47 indicates that respondents with 6-10 years of tenure reported the highest average scores across all components of the USE Questionnaire. Specifically, they rated usefulness at 6.35, ease of use at 6.18, ease of learning at 6.71, and satisfaction at 6.19. Respondents with 3-5 years of tenure also provided relatively high scores, particularly in ease of learning (6.69) and usefulness (6.16). Those with 1-2 years of tenure reported moderate scores across all components, with ease of learning (5.59) being the lowest among their ratings. Conversely, respondents with more than 10 years of tenure reported the lowest average scores in usefulness (5.43) and ease of use (5.46), although their ratings for ease of learning (5.67) and satisfaction (5.77) were slightly higher. Overall, the data suggest that respondents with mid-range tenure (3-10 years) perceive the system more positively compared to those with shorter or longer tenure. This trend highlights a potential area for improvement in supporting both newer and more experienced users to enhance their overall satisfaction and usability experience.

Aspect	Tenure (years)								
	1-2	More than 10							
Usefulness	5.83	6.16	6.35	5.43					
Ease of Use	5.64	6.08	6.18	5.46					
Ease of Learn	5.59	6.69	6.71	5.67					
Satisfaction	5.62	5.98	6.19	5.77					

Table 6.47: Average ratings of USE questionnaire components by tenure

Table 6.48 shows that both admin and customer roles reported similarly high average scores across most components of the USE Questionnaire, with customers rating usefulness (6.14) and ease of learning (6.54) slightly higher than admins, who rated ease of use (6.09) and satisfaction (5.87) slightly higher. Logistic role respondents, however, reported consistently

lower scores compared to admins and customers. They rated usefulness at 5.31, ease of use at 5.28, ease of learning at 5.45, and satisfaction at 5.79, indicating a less favorable perception of the system. These findings suggest that the system is generally well-received by users in admin and customer roles, while those in logistic roles may find the system less useful, more difficult to use, and harder to learn. Addressing the specific needs and challenges faced by logistic role users could enhance their overall experience and satisfaction with the system.

Aspect	Role									
	Admin	Customer	Logistic							
Usefulness	6.10	6.14	5.31							
Ease of Use	6.09	6.02	5.28							
Ease of Learn	6.50	6.54	5.45							
Satisfaction	5.87	5.71	5.79							

Table 6.48 Average ratings of USE questionnaire components by user role

## **6.6 Conclusion**

In conclusion, testing is one of the important phases in the development of a system. The purpose of conducting testing is to validate and make sure that the system meets the specific requirements mentioned in the project. Another importance of testing is to help the developers to identify bugs and errors before the system is deployed or published. In testing, we usually use more than one technique to make sure that the system works perfectly from every aspect such as user interaction and runs logically from the coding aspect.

#### **CHAPTER 7**

### CONCLUSION

# 7.1 Introduction

This chapter will provide an overall conclusion for the Cement Company Logistics Management System (CCLMS), including an analysis of its strengths and weaknesses. Additionally, it will present recommendations for improvements based on the identified strengths and weaknesses, as well as outline the contributions of this project.

#### 7.2 Observation Weakness and Strengths

Each system has different strengths and weaknesses. An illustration in section 7.2.1 clearly explains the strengths of CCLMS while the weaknesses of this system was discussed on section 7.2.2.

## 7.2.1 Strengths

The strengths of CCLMS are:

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a) Elimination of Paperwork

The system significantly reduces the reliance on physical documents, digitizing records such as purchase orders, sales orders, invoices, and delivery receipts. This not only minimizes the risk of document loss but also contributes to a more environmentally friendly operation by cutting down on paper usage.

b) Automated Billing and Invoicing

The system automates the generation of invoices and billing statements, reducing manual errors and speeding up the financial process. This automation ensures timely invoicing, improves cash flow, and enhances the overall efficiency of the company's financial operations.

c) Proof of Payment OCR

The integration of Optical Character Recognition (OCR) technology for processing proof of payment streamlines the validation process. This automation allows for faster

and more accurate verification of payment receipts, reducing the time spent on manual checks and minimizing the risk of errors.

d) Route Optimization

The system includes a route optimization feature, which helps logistics managers plan the most efficient delivery routes. This reduces fuel costs, shortens delivery times, and improves overall operational efficiency, contributing to cost savings and enhanced customer satisfaction.

# 7.2.2 Weakness

The weaknesses of CCLMS are:

a) OCR Accuracy Limitations

The OCR technology implemented in the system currently only works effectively with Maybank receipts. This limitation can be a significant drawback for customers using other banks.

b) Lack of Mobile Responsiveness

The system is not fully optimized for mobile devices, which can hinder users who need to access the platform on smartphones or tablets.

c) User Training and Adoption

Some users, especially those not tech-savvy or older employees, might find it challenging to adapt to the new system. This could lead to slower adoption rates and potential resistance to using the system effectively.

## 7.3 Propositions of Improvement

The following are statements of position for improving CCLMS base on strengthens and weakness above.

a) Enhance OCR Technology for Broader Compatibility

To address the limitations of the current OCR technology, the system should undergo updates to support a wider range of receipt formats from various banks. Investing in advanced OCR solutions that can accurately recognize text from different types of receipts will enhance the system's functionality. Additionally, conducting thorough testing with receipts from multiple banks can help identify and rectify any issues.

b) Develop a Mobile-Optimized Version

The system should be redesigned to include a mobile-responsive interface. This would ensure that users can easily navigate and utilize the platform on smartphones and tablets without compromising functionality.

c) Comprehensive Training Programs and Support

To facilitate smoother adoption of the system, the company should implement comprehensive training programs tailored to different user groups, particularly focusing on those who may not be as tech-savvy. Offering workshops, hands-on training sessions, and user manuals can help familiarize employees with the new system. Additionally, establishing a dedicated support team to assist users with questions or technical difficulties can improve confidence in using the system.

#### 7.4 Contribution

The CCLMS project contributes significantly to enhancing and automating the operational workflow of the cement company, addressing inefficiencies in manual processes. By eliminating paper-based documentation, the system reduces administrative overhead and enhances accuracy across order management, billing, and logistics coordination. The integration of OCR technology automates the proof of payment process, improving transaction speed and reliability. Furthermore, the system's route optimization feature enhances delivery efficiency, reducing transportation costs and ensuring timely deliveries. Despite some initial limitations, such as OCR accuracy and mobile responsiveness, the project lays a strong foundation for future enhancements, improving productivity, customer satisfaction, and the overall competitiveness of the company.

#### 7.5 Conclusion

In conclusion, the objective and scope that was stated in Chapter I has been achieved. The Cement Company Logistic Management System (CCLMS) successfully achieved all its objectives, including streamlining order processing, inventory management, and delivery logistics to enhance operational efficiency, implementing an automated reporting function for generating sales reports, and developing an automated invoicing and billing system to reduce manual efforts, minimize errors, and expedite financial transactions. The Database Life Cycle (DBLC) was selected as the development methodology, encompassing the phases of database initial study, design, implementation and loading, training and evaluation, and operations and maintenance. The testing phase was conducted to identify any bugs and defects within the system. Ultimately, the Cement Company Logistics Management System (CCLMS) successfully met both its functional and non-functional requirements. However, some weaknesses remain that need to be addressed for future improvements. Overall, the system has been successfully completed and fulfills the requirements for a Bachelor of Computer Science (Database Management) with Honours.



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## REFERENCES

Database Systems Development Life Cycle. (n.d.). LibreText Engineering. https://eng.libretexts.org/Courses/Delta\_College/Introduction\_to\_Database\_Systems/01%3A Introduction\_to\_Database\_Systems\_and\_SQL/1.09%3A\_Database\_Systems\_Development\_ Life\_Cycle#:~:text=The%20database%20life%20cycle%20(DBLC,%2C%20operation%2C %20maintenance%20and%20evolution.

Sayallar, C., Sayar, A. & Babalik, N. (2020). An OCR Engine for Printed Receipt Images using Deep Learning Techniques. *International Journal of Advanced Computer Science and Applications*, 14 (2), 833-840.

Huber, S. & Rust, C. (2016). Calculate travel time and distance with OpenStreetMap data using the Open Source Routing Machine (OSRM). *The State Journal*, *16*(2), 416-423.

Purwinako, A., Subajag, M & Yanuarto, A. (2020). The Evaluation of Final Assignment System Using the USE Questionnaire Approach. *Scientific Journal of Informatics*, 7(2), 257-264.

Talekattu, A., Katiyar, A., & Sahana, B. (2024). Design of Web Applications in ASP.NET. *International Journal for Research in Applied Science & Engineering Technology*, *12*(5), 536-541.

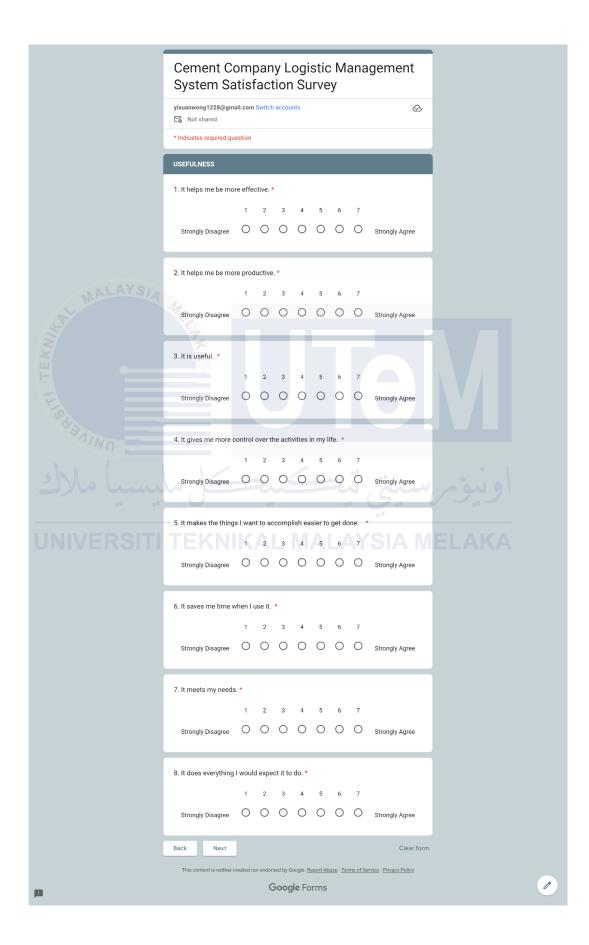
Sucipto, S. & Resti, N. (2019). Transactional database design information system web-based tracer study integrated telegram bot. *Journal of Physics: Conference Series, 1381*(2), 1-8.

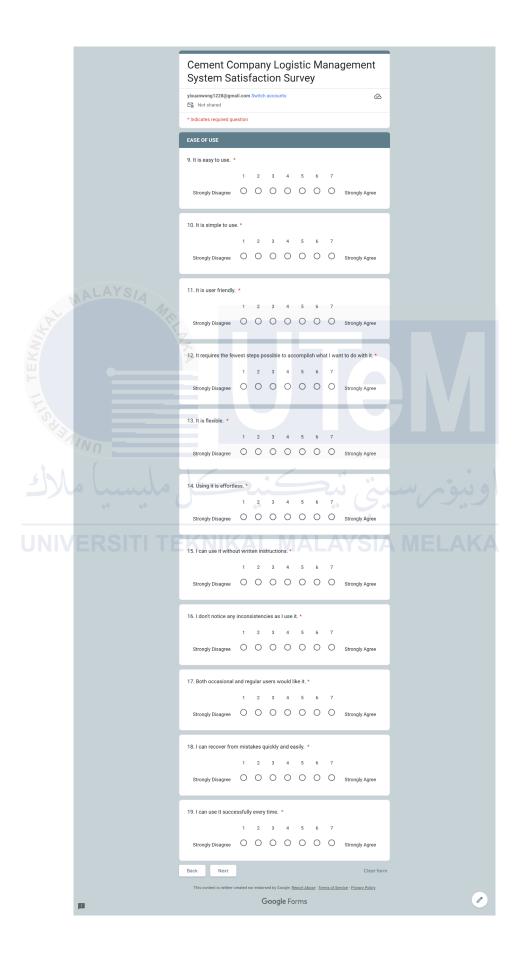
# **APPENDIX A**

# **USE** Questionnaire

# Cement Company Logistic Management System Satisfaction Survey

The purpose of this survey is to gather insights and understand your experience with the Cement Company Logistic Management System, which will help us enhance its functionality and usability. This survey is divided into five sections: Demographic Respondent, Usefulness, Ease of Use, Ease of Learning, and Satisfaction. Please answer all questions honestly. Your responses will be kept confidential. yixuanwong1228@gmail.com Switch accounts ⊘ Not shared Next Clear form This content is neither created nor endorsed by Google. Report Abuse - Terms of Service - Privacy Policy **Google** Forms Cement Company Logistic Management System Satisfaction Survey ng1228@g Not shared What is your gender? O Male O Female UNIVERSITI What is your age? O Under 21 0 20-29 0 30-39 0 40-49 0 50-59 60 and Over What is your education level? O Primary School O Secondary School O Diploma O Bachelor O Master O PhD How long have you been working at your current company? O Less than 1 year 1-2 years O 3-5 years 6 10 years O More than 10 years What is your role in the Cement Company Logistic Management System? Cement Company Ad O Logistic O Custome Next 1 Google Forms





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	EASE OF LEARNING	EASE OF LEARNING									
	20. I learned to use it	20. I learned to use it quickly. *									
		1	2	3	4	5	6	7			
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TEKNIA	22. It is easy to learn	to use	e it *					7			
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WN											
	23. I quickly became							•			
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	24. I am satisfied wit	h it. *										
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		1	2	3	4	5	6	7				
	Strongly Disagree	0	0	0	0	0	0	0	Strongly Agree			
	26. It is fun to use. *	Г	Т	T	T							
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	Strongly Disagree	0	0	0	0	0	0	0	Strongly Agree			
	29. I feel I need to ha	ve it. *										
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	Strongly Disagree	0	0	0	0	0	0	0	Strongly Agree			
	30. It is pleasant to u	se. *										
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