

**INVENTORY CONTROL MANAGEMENT SYSTEM FOR
WHOLESALE BUSINESS**

By
Ng Hock Li

**A REPORT
SUBMITTED TO**
Universiti Tunku Abdul Rahman
in partial fulfillment of the requirements
for the degree of
BACHELOR OF INFORMATION SYSTEMS (HONS)
INFORMATION SYSTEMS ENGINEERING
Faculty of Information and Communication Technology
(Perak Campus)

JANUARY 2015

DECLARATION OF ORIGINALITY

I declare that this report entitled “ Inventory Control Management System For Wholesale Business ” is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : _____

Name : _____

Date : _____

ACKNOWLEDGEMENT

First of all, I wish to deeply thank to my supervisor, Mr. Chee Chin Hoong for his demonstration of guidance, providing useful advice, conceptualize the project which enabled me to more understand the requirement of the final year project, and supervise me in completing the final year project.

In addition, I would like to thank to Mr Su Lee Seng for his useful suggestion which enable me to more understand about the business process of a real world company which is useful in completing the final year project.

Other than that, I also wish to express my thanks to employee and employer of Kar Ho company who willing to spend their time with me for providing the useful information about the flow line of operation of Kar Ho company carry on, which enabled me to more understand about the operation of the company that useful to completing this final year project.

Besides that, I would like to thanks to my family members and my friends for who are giving caring, supporting, and useful advice to me that inspired me a lot to coming out new ideas that useful to complete the final year project.

Lastly, thanks again to all who are helped me a lot in completing this final year project.

ABSTRACT

The purpose of this project is going to develop a computerized inventory control management system for Kar Ho Sdn Bhd Company. The current system that using by the Kar Ho Company is the traditional file based system which means all transaction records, and documentation is recorded through human manual work and it is consists of a large amount of paper work that is not efficiency. Hence, the computerized inventory control management system is needed for the company. The computerized inventory control management system is designed to help the company have better data management as well as easier and a lower cost solution on data storing.

The target user of this system is limited to the employees who are working in Kar Ho Sdn Bhd. The chosen methodology for this system is incremental prototyping methodology. This is because the target user of this system is the people that never use the computerized inventory control management system before. They are new to computerized system which means they are required through a learning phase after only able know how to manipulate the system. With this methodology, the target user able to review, evaluate, and learn how to operate the system before the actual implementation of the final system. Furthermore, the design of the system would be as simple as possible which allow the target user learn and familiar it in short period of time.

The special feature of this proposal system is the system able support in mobile platform, there is no more limited to desktop based. With this feature, the target user is able to access to their database at anywhere else inside company. This because of target user's client mostly is stay at low internet connection area which is area without 3G or higher speed. Hence, the database is stored at the local server side. However, on mobile platform, it only can support to view stock detail.

Other than that, this system also able to use the smartphone device acts as the barcode scanner to scan the barcode of the product. Thus, the company able to save cost since there is no need to purchase the barcode scanner which is costly. Since the system is able to allow multiple users at the same time, the database is stored at the server side so that able to allow the user access from different platform at the same time.

TABLE OF CONTENTS

TITLE	i
REPORT STATUS DECLARATION FORM	ii
DECLARATION OF ORIGINALITY	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi - xi
LIST OF FIGURES	xii - xiii
LIST OF TABLES	xiv
CHAPTER 1 INTRODUCTION	1
1.1 Kar Ho Sdn Bhd Background	1
1.2 Project Background	1
1.3 Problem Statement	2 - 3
1.4 Objectives	3 - 4
1.5 Project Scope	4 - 6
1.6 Innovation and Contribution of the Project	6
CHAPTER 2 LITERATURE REVIEW	7
2.1 Study & Review on Existing Inventory System	7
2.1.1 Inventory Management System	7 - 8
2.1.2 The Use of RFID and Web 2.0 Technologies	9
2.1.3 Wal-Mart Inventory System	10
2.1.4 Automated Fingerprint Identification System	10 - 11

2.1.5 Inventory Management System	11
2.1.6 Oracle Retail Store Inventory Management	12
2.2 Study on Fact Finding Methods	13
2.2.1 Interview	13
2.2.1.1 Guidelines to Perform Interview	13 - 14
2.2.1.2 Advantages & Disadvantages of Interview	15
2.2.2 Questionnaires and Surveys	15
2.2.2.1 Advantages & Disadvantages of Surveys	15
2.2.3 Observation	16
2.2.3.1 Advantages & Disadvantages of Observation	16
2.3 Comparison between Fact-Finding Methods	16 - 17
2.4 Data Collection	17 - 19
CHAPTER 3 PROPOSED METHOD/APPROACH	20
3.1 Methodology Involved (Incremental Prototype)	20 - 22
3.2 Technologies Involved	22 - 24
3.3 System Requirement	24
3.3.1 Hardware Requirement	24
3.3.2 Mobile Requirement	24
3.3.3 Software Requirement	25
3.4 System Performance Definition	25
3.5 Implementation Issues and Challenges	26

3.6 Timeline	27
3.6.1 Gantt Chart	27 – 30
CHAPTER 4 SYSTEM DESIGN AND ANALYSIS	31
4.1 System Design/Overview	31
4.2 Graphic User Interface Design	32
4.2.1 Login Screen for Manager and Normal Staff	32
4.2.2 Dashboard for Manager	32
4.2.3 Dashboard for Normal Staff	33
4.2.4 Dashboard for Mobile Platform	33
4.3 Entity Relationship Diagram (ERD)	34
4.4 Business Rules	35
4.5 Data Dictionary	36
4.5.1 Customer Entity	36
4.5.2 Sales Order Entity	37
4.5.3 Sales Order Detail Entity	37 – 38
4.5.4 Payment Entity	38
4.5.5 Cheque Entity	38 - 39
4.5.6 Ship Order	39
4.5.7 Shipment Outward Entity	39 – 40
4.5.8 Product Entity	40
4.5.9 Employee Entity	40 - 41
4.5.10 Purchase Order Entity	41 – 42

4.5.11 Purchase Order Detail Entity	42
4.5.12 Supplier Entity	42 – 43
4.5.13 Shipment Inward Entity	43
4.5.14 Vehicle Entity	44
4.6 Data Flow Diagram	45
4.6.1 Context Diagram	45
4.6.2 DFD Level 0	46
4.6.3 DFD 1.0 Process Order	47
4.6.4 DFD 2.0 Ship Order	47
4.6.5 DFD 3.0 Payment	48
4.6.6 DFD 4.0 Handling Inventory	48
4.6.7 DFD 5.0 Process Inward Delivery	49
4.6.8 DFD 6.0 Maintenance	49
4.6.9 DFD 8.0 Generate Report	50
4.6.10 DFD 9.0 Login	50
DFD Level 2	51
4.6.11 DFD 6.1.0 Manage Employee	51
4.6.12 DFD 6.2.0 Manage Product	51
4.6.13 DFD 6.3.0 Manage Customer	52
4.6.14 DFD 6.4.0 Manage Supplier	52
4.7 Flow Chart Diagram	53
4.7.1 Flowchart Diagram of Login Module	53
4.7.2 Flowchart Diagram of Sales Order Module	54

4.7.3 Flowchart Diagram of Customer Module	55
4.7.4 Flowchart Diagram of Shipment Outward	55
4.7.5 Flowchart Diagram of Payment Module	56
4.7.6 Flowchart Diagram of Product Management	57
4.7.7 Flowchart Diagram of Generate Reorder List	58
4.7.8 Flowchart Diagram of Shipment Inward	58
4.7.9 Flowchart Diagram of Management Module	59
4.7.10 Flowchart Diagram of Employee Module	60
4.7.11 Flowchart Diagram of Supplier Module	61
4.7.12 Flowchart Diagram of Report Module	62
CHAPTER 5 SYSTEM IMPLEMENTATION AND INSTALLATION	63
5.1 System Implementation	63
5.2 System Installation	64
5.2.1 Netbeans IDE Requirements	64 - 65
5.2.2 iReport Requirements	65
5.2.3 MySQL Requirements	66
CHAPTER 6 SYSTEM TESTING	67
6.1 Unit Testing	67 - 72
6.2 Functional Testing	73 - 76
6.3 Integration Testing	77
6.4 System Testing	77

CHAPTER 7 CONCLUSION	78
REFERENCES	79 - 80
APPENDIX A: THE SAMPLING OF SURVEY	A - 1

LIST OF FIGURES

Figure Number	Title	Page
Figure 2.4.1	Result of interview	19
Figure 3.1.1	Incremental Method	20
Figure 3.2.1	Netbeans IDE Logo	22
Figure 3.2.2	Eclipse ADT Logo	23
Figure 3.2.3	MySQL Logo	23
Figure 3.6.1.1	Gantt Chart Table (Activity 1 - 50)	27 – 29
Figure 3.6.1.2	Gantt Chart Diagram (Activity 1 - 30)	29
Figure 3.6.1.3	Gantt Chart Diagram (Activity 30 – 50)	30
Figure 4.2.1	Login GUI	32
Figure 4.2.2	Dashboard design for manager	32
Figure 4.2.3	Dashboard design for normal staff	33
Figure 4.2.4	Dashboard design for mobile platform	33
Figure 4.3	ERD Diagram	34
Figure 4.6.1	Context Diagram	45
Figure 4.6.2	DFD Level 0	46
Figure 4.6.3	DFD 1.0 Process Order	47
Figure 4.6.4	DFD 2.0 Ship Order	47
Figure 4.6.5	DFD 3.0 Payment	48
Figure 4.6.6	DFD 4.0 Handling Inventory	48
Figure 4.6.7	DFD 5.0 Process Inward Delivery	49
Figure 4.6.8	DFD 6.0 Maintenance	49
Figure 4.6.9	DFD 8.0 Generate Report	50
Figure 4.6.10	DFD 9.0 Login	50
Figure 4.6.11	DFD 6.1.0 Manage Employee	51
Figure 4.6.12	DFD 6.2.0 Manage Product	51

Figure 4.6.13	DFD 6.3.0 Manage Customer	52
Figure 4.6.14	DFD 6.4.0 Manage Supplier	52
Figure 4.7.1	Flow Chart Diagram of Login Module	53
Figure 4.7.2	Flow Chart Diagram of Sales Order Module	54
Figure 4.7.3	Flow Chart Diagram of Customer Module	55
Figure 4.7.4	Flow Chart Diagram of Shipment Outward	55
Figure 4.7.5	Flow Chart Diagram for Payment Module	56
Figure 4.7.6	Flow Chart for Product Management	57
Figure 4.7.7	Flow Chart for Generate Reorder List	58
Figure 4.7.8	Flow Chart for Shipment Inward	58
Figure 4.7.9	Flow Chart for Management Module	59
Figure 4.7.10	Flow Chart for Employee Module	60
Figure 4.7.11	Flow Chart for Supplier Module	61
Figure 4.7.12	Flow Chart for Report Generation Module	62

LIST OF TABLES

Table Number	Title	Page
Table 3.3.1	Hardware requirement for system end-user	24
Table 3.3.2	Mobile requirement for system end-user	24
Table 3.3.3	Software requirement for system end-user	25
Table 5.2.1.1	Hardware Requirements for Netbeans IDE	64
Table 5.2.1.2	Software Requirements for Netbeans IDE	65
Table 5.2.2.1	Hardware Requirements for iReport	65
Table 5.2.2.2	Software Requirements for iReport	65
Table 5.2.3.1	Hardware Requirements for MySQL	66
Table 5.2.3.2	Software Requirements for MySQL	66
Table 6.1.1	Unit Testing 1 – Login as system user	67 - 68
Table 6.1.2	Unit Testing 2 – Register new customer information into system	68
Table 6.1.3	Unit Testing 3 – Register new supplier information into system	69
Table 6.1.4	Unit Testing 4 – Creating new sales order	69 - 70
Table 6.1.5	Unit Testing 5 – Creating new purchase order	70
Table 6.1.6	Unit Testing 6 – Creating new product information	70 - 71
Table 6.1.7	Unit Testing 7 – Payment for each sales order	71
Table 6.1.8	Unit Testing 8 – Creating new product information	72
Table 6.2.1	Functional Testing 1 – Login using different roles	73
Table 6.2.2	Functional Testing 2 – Customer sales order debt	73 - 74
Table 6.2.3	Functional Testing 3 – Company purchase order debt	74
Table 6.2.4	Functional Testing 4 – Vehicle delivery order	75
Table 6.2.5	Functional Testing 5 – Print report	75
Table 6.2.6	Functional Testing 6 – Make payment	76
Table 6.2.7	Functional Testing 7 – Product quantity checking	76

CHAPTER 1 INTRODUCTION

1.1 Kar Ho Sdn Bhd Background

The Kar Ho Sdn Bhd is a wholesales company that focused on selling and distributing the product to the retailer, industrial, other wholesalers and also the individual customer. The Kar Ho Sdn Bhd is owned by Mr. Ng Peng Soon who are started this company on 1993. At beginning, the main target customer of the company is the shops that located around the Kuala Kangsar. As the businesses grow bigger, the target customer is turned to the distributor and wholesales which located further away from Kuala Kangsar. There is various type of product are selling by the Kar Ho Sdn Bhd, however, it can divided into three main categories which product for human, animal and plant.

However, for Kar Ho Sdn Bhd, they are refuse to use the new technologies (computerized inventory control system) and still using the old system which is the Traditional File Based system to record and track their company's transaction records that consist of a large amount of paper works, such as filing of the data and it takes up a lot of spaces for storing those files. In addition, they are still using the man power to determine the level of stock remaining.

Other than that, for the owner of the Kar Ho Sdn Bdn, Mr. Ng Peng Soon, in his impression the computerized inventory control management system is hard to use and required a lot of professional skill only able to handle the system due to the graphic user interface of the existing inventory control management system is complicated. Moreover, they also having the mindset about transform from the old system to new system will spend a lot of money and the differences between the current system and the new system is unlikely.

1.2 Project Background

The purpose of this project is to develop a computerized inventory control management system for the Kar Ho Sdn Bhd. This proposed system will enables the employees of target company to manage their transaction and stock control in a more effective and efficient way. Next, the purpose of this project is to help the Kar Ho Sdn Bhd to fully transform from the traditional-file based system into computerized inventory control management system.

1.3 Problem Statement

The Kar Ho Company is a wholesale company that still using the Traditional File Based system to record and track their company's transaction records. There are some problems domains and drawbacks facing by the Kar Ho Company which are:

a) Space Consuming & Difficulty in Finding Specify Files

As the company getting grows, the documentation (customers' records, suppliers' records, transaction records and etc.) increase at the same time. Hence, there is more file cabinets is required by the company in order to keep those document files, meanwhile more space needed for place the file cabinets which may led to increase cost on expand the office. In addition, since those files were located separately in different file cabinets, as result it will increase the difficulty in finding the specify file when needed.

b) Poor Security & Short Durability of Data

For the Traditional File Based system, all documentations are kept in hardcopy; it is easily lost or gets stolen by other. Furthermore, once the files been stolen, there is no backup to restore the missing files which may cause loss of profit earned (e.g. missing of the record of customer's unpaid bill). Besides that, since the record is recorded on paper, which unable to hold the data for more than 20 years, as the papers are biodegradable, or being destroyed by pests. The paper also easily damaged by the disasters (e.g. fire disaster, flood and etc.)

c) Poor Management of Inventory

Since the current system using by the company is the Traditional File Based System, which mean the quantity of the stock left is counted by man power. Hence, it may miscalculate on the remaining stock or oversight the stock that already is out of stock. Therefore, it can cause the current customer move to another company which is able to supply the products their requested.

d) Data Inconsistency

The new stored data maybe will same as previously entered data by the owner or other workers. This is because the Traditional File Based System does not allow the user to check for the availability of the data before entering the duplicated data and

the data inserted are not bind together; as all data are consist of one single file folder and without any connection. Thus, there may have a lot of duplicated data exist in the records that can lead the manager to make wrong decision.

e) Inefficiency on Report Generation

Since all record is stored in hardcopy, it is rely to human power to generate report which is required a lot of time to process and produce. Moreover, there also easily generate wrong detail report since all document are put separately that may cause missed of certain important information.

1.4 Objectives

The main objective of this proposed system is to deliver a comprehensive, all-rounded system and more user friendly graphic user interface for the target user, which enable the target user have a better data management as well as easier and a lower cost solution on data storing.

a) Reduce the searching time

The proposed system enabled the user to store the data into system with a better management of the data and details of the inventory. With using the new system that is computerized, all the documentation is transform into softcopy and stored inside computer. With this, it enable the user more easily search the specify information through entering the specify detail (e.g. name, date and etc.).

b) Protect the important information

Since the proposed system is computerized system, it enabled the user (manager) to set the restriction for their employees about that which part of the information the employees have the right to access through. With this, the employees only can view the specify data that they should be see. Furthermore, since all documentation is stored in softcopy, it can easily make backup for the information as prevent any important information lost due to the incident happened. The company also not need to worry about the expiry of the data, as the data will not destroyed by nature disaster or pest, unless the data has been removed or deleted.

c) Avoid stock-outs

Through using the inventory control management system, the user can easily keep track the level of the stock left, and manage to make order on the product without excess or only out of stock only make order. Furthermore, when the product is reached the reorder level, the system will alert the specify role of user for notice them that the specific product is reached the reorder level.

d) Keep track on sales record

The proposed system enabled the user the keep track customers' transaction record. When a customer that is still owing the company money for few month and he/she is coming to purchase, the system will track out the record of the customer by entering their name or the IC. Moreover, it also able to determine which product is the best sell product that can bring profit to the company.

1.5 Project Scope

This proposed system is restricted only to the employees of Kar Ho Company and it includes several important modules that each of it is functioning with unique functions. There modules are listed as below:

a) Report Module

This module is to generate the desired report for the user, for instance the sales report, staff report, customer report, monthly report and end of report. User is able to choose which kind of report to be generated. For example, through generate the weekly report can expose the high demand for one specific product that is not being stored in the quantities required. However, this module only allows the user that position is manager to use. The user login with the normal staff position is unable to perform this feature.

b) Inventory Management Module

This module is to handle the product availability in the warehouse. The feature of this module is to keep track on the inventory levels for all products that available in the warehouse. Once the product is reached the reorder point, the system will prompt out

the message to show that which product is reached the reorder point and the details of the suppliers that is selling this product.

c) Delivery Module

This module is used to handle the order of the customer to deliver the product to them. With this module, the user able to use the system to keep tracks the delivery status of the customer order. It also will record down which employees is in charge for this delivery. This can prevent the error happen that deliver the ordered product to customer that has been delivered before.

d) Payment Module

This module is to handle the payment made by customer for instance the amount and mode of the payment. The system is able to list out the payment that done by the customer and the customer still owe how much. Other than that, the user is able to search the customer through their name or IC to determine that the customer still owing to company or not.

e) Sales Order Module

This module is to handle the order made by the customer. The system will record the order made by customer, and its details e.g. shipping address, the ordered product and etc. With this, the company won't miss up any customer.

f) Purchase Order Module

This module is to handle the order that to make to supplier. With this feature, the user able to keep track the order made to supplier and the product is supplied by which supplier. Other than that, once there are two suppliers is providing same product, the system will list detail out like the day required from being order until the product arrived and the cost of product and etc.

g) Login Module

This module is to handle user who can access to the system. The staff with different position will have different accessibility. For example, if the user is login as the manager, the system is allows the user to update the price of product, generate the

report and etc. Besides that, if user is login as normal staff, the system will not allow the user to alter the price of product.

1.6 Innovation and Contribution of The Project

Compare to other existing inventory system, there is some innovations can be included in this project. First of all, the system able to access through mobile platform, as it is not platform depending, the user can access to the data in database by using the terminal or the mobile devices such as the Android smartphone or the Android powered tablet. This is because nowadays smartphone device is become a common object in life and it always close at hand. With this features, the user is able to check the stock quantity and make order to the suppliers without going back to the office to open the terminal for checking purpose.

Besides that, the system also able to use the Android device acts as the barcode scanner to scan the barcode of the product. This able to let the company to save cost from being purchase the expensive barcode scanner. The Android OS will be the first considering platform because it is an open source which will not cause any use of money. Other than that, there is a lot of solution in the Internet about the Android platform in which the developer will easily search for solution. In additions, Android platform is now a most widely used mobile platform in which the user can easily get the Android device and start to use it with the Android platform.

Lastly, the system is allows the staff to search the product through the Android device. The user enter the name of product and the information about the product will immediately be sent over a digital network to the company's inventory database and the result will sent back to the Android device. Everything can be done portable as long as the user smartphone is in a connection enable mode. The system will be develop in the most cheapest way as almost everything that use in developing this software is open source which cause the developer invest in zero.

CHAPTER 2 LITERATURE REVIEW

Before start to develop the proposed system, study and review on previous existing inventory control management system is important which enabled the developer to develop a more useful and efficient inventory control management system. Besides that, the proper development tools are also one of the important factors that will affect the quality of system. Other than that, another factor is the users' requirements gathering techniques which enable the developer more understand and know about the system's features required from aspect of user. Therefore, there are some studies and researches have been done and shown at below:

2.1 Study & Review on Existing Inventory Control Management System

Through the journal and article that had studied, there are several existing system has been chosen to compare for getting a better understanding about the inventory control management system. There are some problems or features that can be improve and some of the features were considering as perfect for current global technology.

2.1.1 Inventory Management System

Firstly, the first benchmarked system that has been chosen is the "Inventory Management System" (Arina et al., 2006). The main purpose of this system is to create a system that is able to connect to a multiple stores and warehouses by using server and client. Based on the system that they created, one of the strengths of this system is the cash register interface will be work with the barcode inputs. Besides that, the connection between the client and server is provided with this system that enables the client to make an order through the inventory system. Other than that, to prevent the data from getting hack, the Secure Socket Layer (SSL) is used to secure their internet connection. This system can be used by multiple stores or warehouses since they can connect to each other. However, the weaknesses of this system are the theft may break the synchronization between the inventory and database. The level of the security to secure the data was depending on the accuracy of restocking procedure. It enable the theft may take a chance in restocking procedure to steal the data.

Since this existing system is more focused on the security between server and client, there are some solutions or recommendation to improve its features. In the cash registers interface, there is some extra features can added on it. Some of the barcode is hard to scan by the barcode hardware and it may cause frustration to the customer who waiting for long times. However, the user still can manually enter the barcode to get the correct description and price of the product but it may take longer times if every barcode is facing same problems. The solution suggested for this problem is voice input. The voice input can be disabled and only enable when the users need it. Microphone is needed for this feature. The user can speak out the barcode through microphone into the system and the system will record the number that user speaks out to get the related items from the database. For an example, the user are trying to speak '12345' then the system interface will prompt out the number for users to confirm whether the barcode is correct and belong to that product. With this feature, it is able to save time when the barcode hardware is having problem and unavailable to scan the barcode and can avoid the user from manually typing. However, there are some weaknesses for this feature which is the surrounding situation can't be too noisy as it will influence on the voice input. By the way, it should not be a big problem if the surrounding situation is silent or not so noisy. To overcome this problem, headphone will be a good choice since it able to reduce the noise of the situation. Next, according to the article that had been reviewed, they have provided a connection between server and client, and a link between multiple stores or warehouses. Based on their features, there is some enhancement can makes on their features. First, improve the system to able to connect every branch. By doing so, every branch can to connect with each other's. Sometimes one of the branches might be out of stock and they can use the system to contact with other branch in order to borrow stock. They send the information through the features provided by the system. The receiver will get an alert once the received the request. Other than that, the transmitted data is encrypted when being transmitting and the data will decrypted by the system once is reached to other branch. However, the weakness for this system which is the data transfer may become slow due to the huge process. This problem can be overcome by using faster internet connection.

2.1.2 The Use of RFID and Web 2.0 Technologies to Improve Inventory Management

According to another article that had been reviewed and related to the inventory management system which entitled “The Use of RFID and Web 2.0 Technologies to Improve Inventory Management” (Sizakele et al., 2011), they have conducted the investigation on the inventory management system for the purpose of understanding the current technology. Due to their research that had been done on inventory management system, they have listed out the most problem faced by current inventory system which is inventory running using paper-based systems, excel files, and traditional enterprise software that make the whole operation become costly and inefficiency.

By the way, in order to improve the inventory system, Radio Frequency Identification (RFID) have been introduced and has bring out the result that shown to be the top available technology in order to improve the inventory management for most enterprise nowadays. RFID technology enables real-time reading of products, eliminating of counterfeiting, product misplacement, reduce the theft cases, replenishment of stock on shelves, and etc. However, they have found out some weaknesses of RFID which is that if the inventory products have accidentally misplaced on other shelves or the quantity on hand of the products is low, inventory worker may identified it late or found out after they have make a check through the stand-alone database or server in an organization which will lead to time consuming and delay of work. Besides that, RFID technology does not provide features that give notification and update to the inventory manager on what is happening on their inventories through their cell phones. So, they have proposed a solution regarding to the problem they have found out during their research which is integrated the use of Web2.0 Tool such as Twitter with RFID technology to make sure that the inventory managers will be informed and get updated at anytime and anywhere on the Internet using cell phones. Through this solution, the inventory manager able to make immediate decision without having physical involvement of the problem happens to their inventory. With this feature provided, it will help to improve the process and management of the inventories anywhere anytime as well as the analysis on the top sales products and low sales products.

However, there is drawback of the solution provided by them which is the cost of the development of the combination technology of RFID and Web 2.0 Tool. The budget to develop such system is big and once the system had done, they might hard to earn back the profit since the budget may over the profit.

2.1.3 Wal-Mart Inventory System

According to another article that had reviewed, it has talked about the computer system that used by the “Wal-Mart Inventory System” (Nara Mondigo, 2008). They have mentioned that current system that used by them will auto alert when the product balance drops to the recorder point. This feature seems like attractive and it still can be improved. The system can be improved by using auto order. For an example, once the product balance drops to the recorder point, the system will alert the user and prompt out the message to request the user to make a restock from supplier. The user is allow to change the setting to the auto order which mean that the order request will automatic send to the supplier when the product balance drops to the recorder point.

However, there is a limitation for this features which is the system will need to read the information in the database and if the system failure occur, the alert will not be prompt out. For the solution to overcome this problems, user is highly recommend to checks their stock from time to time. Other than that, the system also won't able to select different supplier that providing same good with different price. To solve this problem, the system can set to will compare which cost will be lower and only that will send the order request to supplier.

2.1.4 Automated Fingerprint Identification System (AFIS)

Next, according to the research that had been done by the Kenneth R. Moses about the “Automated Fingerprint Identification System (AFIS)” article, AFIS nowadays are widely used in the global. It is a biometric system which the main purpose is developed to control the crime rates, criminal, and so on. Due to the era technologies that is changing from time to time nowadays, the biometric has widely used and some of the company has already applied this method into their system. Mostly such biometric system is used to control the attendance or limit the access of the staff for some purpose. Because of this, the staff nowadays will use their fingerprint to check in to their workplace for record down the attendance. This system had also integrated into the inventory control system. The staff will have to use their fingerprint to access to the system and make some operation. By doing so, it is very secure and the company system will not easily hack by outsider. Since everything is secure by the AFIS, it makes everything easily to be control.

However, not many of the system will preferred this features since it need the additional hardware and installation. Staff has to use their staff card to check in first and after the staff card had been identified, fingerprint is needed to match the two records. By doing so, it can prevent from cheating. Staff has to apply for the leaves if they can't go to work and cheated will not work since this features is use. Next, biometric system is well-known as one of the most expensive type system in which not every company can afford it. Although the security is very strong, but since the crime rates is increase nowadays, people might scare that their part of body will be very dangerous as people will do anything to achieve what they want.

2.1.5 Inventory Management System

According to the article that had been view and make investigation which entitled "Inventory Management System" (Thomas Bronack, 2012), he has make an investigation about the inventory management system. The inventory system that had been reviewed by him is all about the Centralized Inventory Repository. It has stated that the inventory control system is very important for the company. It is because the inventory control system will help in ensuring the efficiency and effectiveness in managing the inventory. It has the strength in controlling the data since it is integrate with the database which makes everything in well controlled. Next, the systems will automatic help in filter the different roles of user in which they will only able to use the features based on their roles. The successfully inventory control system should have three things in which the system will be known as successful system when this three things exists in the system. The three things that included consists of the history details about the asset, the criticality is defined for each of the asset, and the system has provide the financial details which is related to the company asset. Because of this, the system proposed by him included these three things and make the developed system satisfied by user who used the system.

However, there are several weaknesses exists in the Centralized Inventory Repository. The inventory management is performed by too many various groups which make the database is hard to plan. By using this method, the database must be plan nicely and time consuming. Since everything performed through the automated system, the staff may to depend on the system which sometimes the system down will cause everything become out of control and the accuracy of the data cannot be guarantee.

2.1.6 Oracle Retail Store Inventory Management

Based on the article that had been review and make investigation which entitled “Oracle Retail Store Inventory Management” by the Oracle Retail, they have makes an investigation about the inventory management system. They realized that the problem that faced by retailer nowadays is the out of stock problems which cause the retailer is unable to provide the items to the buyer. Because of this, they had develop the system for the purpose of overcome this problems. The developed system has stated to maintain the accuracy of tracking the information of the products, purchase order, and sales order. The system used is connected to the cloud server database which make everything is backed up to the system and more secure compare to local database. Next, it consists of some strength in their system in their system in which the main purpose is to prevent out of stock and overstock problems in the specific store. It also helps in increasing the accurate of the inventory in which the stock count capability is applied.

However, it consists of some weaknesses in their system in which the system has limitation in performing some function. The system has no provide the stock delivery features in which the user cannot set the schedule for the vehicle to deliver the stock in the specific time. Most of the inventory company nowadays will need the stock delivery feature which is currently needed by every business. Other than that, the system provided by them is not so friendly interface since it is too many data displayed in one page. For those who not good in using the computerized system may refuse to use it due to the complicated of the user interface.

2.2 Study on Fact Finding Methods

Without knowing the requirements, it is difficult to build a solution (Tom Mochal, 2008). It means that the researcher or developer will have to know the customer requirement before they started to develop something. According to the article entitled “10 Techniques for Gathering Requirements” (Tom Mochal, 2008), it had mentioned that it is very important to perform the requirement gathering in each project. There are 10 recommended steps which includes the face-to-face interviews method, group interviews, facilitated sessions, joint application development, questionnaires, prototyping, use cases, following people around, proposal of the project, and brainstorming. By referring to the steps, there are quite several steps that had been implemented in this project in order to get the complete image of the project requirements. Hence, with using a good and proper requirements gathering method, it is able to help in extracting the accurate needs of the users on how the software should be. Next, the small investigation has been made to make sure that which of the methods should be used in gather the requirements. There are a lot of existing methods to collect the users’ requirement in which the most common methods includes the interview, questionnaires, observation, and survey. The comparison among methods has been made to choose the most suitable methods for this project.

2.2.1 Interview

The interview is the fact-finding method that is most frequently be used to collect the required information. It enabled the developer to communicate with the end user face-to-face in order to collect the information which can help to figure and more comprehend about the process workflow (O’Brien, 2003).

2.2.1.1 Guidelines to Perform Interview

There is few step is included to perform the interview which is:

Step 1: Decide who be the interviewee

This is important step to get accurate information. By selecting different interviewee, it will help in gathering different information which is benefit to us. In order to collect the information, the key user must be selected to interview.

Step 2: Design and create suitable questions for interview

There are several types of questions can be designed in the interview in order to get the information. It can be divided into three category which are open-ended, closed-ended and question with range of responses. For the open-ended question, it is the question that encourages spontaneous and unstructured responses from the interviewees. While for the close-ended question, is will limit the response such as the question with multiple choices and only one of them is answer. Next, the range of response questions is the types of closed-ended question. However, the question provided will only have limited answers that allow respondents to choose. Normally the question will consists of a numeric scale for each question that asked respondents to respond on it.

Step 3: Plan for interview session

The interview must be plan well once the previous step had done. The things that need to be plan and prepare in this step will be an arrangement of schedule with the interviewee. The interviewer will need to inform the interviewee about the planned schedule by using the communication methods such as make a call to the interviewee, emailing, SMS, and so on. Other than the planned schedule, the location where the interview conducted will also need to inform to the interviewee.

Step 4: Conduct the interview

After everything had settled down, the interview will begin as planned in previous step. The interview will need an interviewer to begin by introducing themselves before start to questioning the interviewee. The question should be asked in the order in which the question had prepared. The interviewer should record down every important point that given by the interviewee so that every important points can be summarize at last.

Step 5: Document and evaluate the interview

Document the gathered information and summarize it to become useful information that the project development needed. By doing so, the developer will know what actually the interviewee wants and it will give the developer benefits while developing the software.

2.2.1.2 The Advantages and Disadvantages of Interview

The table below is showing about the advantages and disadvantages of the interview which is adopted from e-note that prepared by Dr. Sokyna Alqataweh from Bradford College of Management on 2011.

Advantages	Disadvantages
Interviewee able to respond freely and flexibly to question.	Time-consuming.
Allow the interview to more understand the need and request of the interviewee.	Successful of the interview is dependent on communication skills of interviewer and willingness of interviewees to join.

2.2.2 Questionnaires and Surveys

The questionnaires and surveys is the fact-finding method that is not in a formal form. It is a good fact-finding method in gathering the requirements from the stakeholders. This method is normally used on the people who have only the minor input into the overall requirements. Other than that, this method allows the developer to get information from a dozens of people in quickest way.

2.2.2.1 The Advantages and Disadvantages of Questionnaires and Surveys

The table below is showing about the advantages and disadvantages of the questionnaires and surveys which is adopted from e-note that prepared by University of Portsmouth on 2012.

Advantages	Disadvantages
Quickest in gathering information from large number of respondents.	Low response rate while not conducting by face to face.
Replicable and the gathered information can be used for later studies.	Respondents may misunderstand the meaning of provided question.
Less expensive way that allow user to cover the large geographical area.	Weak in delivering the meaning behind the response.
Allow respondents to have enough time in considering the questions.	

2.2.3 Observation

The observation is the fact-finding method that is based on the direct observation of phenomena. In this fact-finding method, it consists of three types which are participant observation, nonparticipant observation, and time allocation studies. By using observation method, it allows the observer to get the information that they want and those information that might not be able to collect through the others fact-finding methods.

2.2.3.1 The Advantages and Disadvantages of Observation

The table below is showing about the advantages and disadvantages of the observation.

Advantages	Disadvantages
Data can be collected at anywhere and anytime where an event is occurring.	Does not improve the understanding of people about the way they do
The process does not rely on the people's willingness in providing needed information.	People will perform better when they know they are being observed by someone.
Observe is much better than word in which everything can be directly observe that better than relying on what they do.	

2.3 Comparison Between Fact-Finding Methods

After making an investigation about the several fact-finding methods, it has found out that the interview method is the most suitable method for this project. It is because interview method allows the developer to directly gather the information from the owner of the inventory company. Because of this, the information gathered from the interview will directly allow the developer to understand about what the company needed. By following the requirement gathered from the interview, the developer will have clear points about how to start to plan and design the system. By using face-to-face interview, the interviewer and interviewee can have a chance in building a good relationship which will bring benefits for incoming future. It will make the communication between two people become easier if build a good relationship with each other.

Next, since the proposed system will use by the company itself, it is good to have an interview with them rather than using other methods. Although questionnaire method allow developer to get a lot of fact-finding result, but sometimes the respondents may not be able to give personal opinion since everything is fixed at questionnaires. Because of this, interview methods might be much better as they can have chance and freedom in giving opinions. Besides that, the observation may also not a best solution in gathering information. It need a lot of time in observing something. The collected result may not accurate too since everyone will have their different ideas in which sometimes the observer might judge on something based on their personal thinking.

As a result, the interview method will be chosen as a main method in gathering information. It is good if the developer can directly communicate with the respondents as it can bring a lot of benefits to each other. The system can be developed based on the respondents answer and may reduce the misunderstood of the user requirements.

2.4 Data Collection

The data collected from the fact-finding is the interview method. The result is collected from the interview that conducted to the Kar Ho Sdn Bhd. Since data collection is a very important stage, the process need to be serious. It is because no matter how good the system developed by the developer, it may still not be able to meet the user requirement since no information that gathered from the user. Based on the answer given by the respondent, the developer is understood what is their requirement and how to work on the system.

Based on the research that has been done in Chapter 2, the interview is selected as the requirements gathering techniques since it is most suitable for this project.

There is an interview has been conducted to the Kar Ho Sdn Bhd which located at Kuala Kangsar, Perak. Below are the details of the survey:

Interview Target: Mr. Ng Peng Soon, Owner of Kar Ho Sdn Bdn

Date: 27/11/2014

1. Do you willing to share with me about the method that yours company used to manage the customer's orders without computerized management system?

ANS: When customer come to make an order, we will record down the order details into ordered book which included customer details such as name, contact number, and address. If the customer have any previous order that haven't make payment, the unpaid amount of previous order with the order id will be wrote at beside page for purpose of easy refer back. However, if the sales order is consider small amount, our company sometimes will not record down the record. Since it is not a big deal or only deal with individual customer, we will not record it down. It is because normally such customer will make fully payment in which we don't need to record down the debt into sales order book.

2. How yours company handle the payment made by the customer?

ANS: We will review back the record that is recorded in the ordered book to check the total amount of unpaid order. After the payment is made, at the record will mark the "PAID" with the day. In additional, if the customer pay the total amount by using cheque method, the cheque details will be record down in another book with the cheque number, amount of payment and the order id that the payment refer to.

3. How yours company determine the customer that have bad records?

ANS: Normally we will look into ordered book to check whether that the customer has any bad records such as unpaid order that is hold more than one month. However, some of the record might not be accurate since the record may lost or unfound due to the bunch of record that recorded into the ordered book every day. Some of the customer's debt may not be remembered by us if the record is lost and we are based on our impression and memory to remember the customer face.

4. How yours company manage the stock and how to determine which stocks are reached reorder level?

ANS: Normally we will count the remaining stock when near to 4pm, if found any product are reached the reorder level, we will record down it into a small piece of paper. After all stock is checked we only will contact those suppliers to make the order.

5. Does your company allow return of product from customer? How do you manage those returned product?

ANS: Depending on the situation, we allow the customer to return product, but normally our customer will not return the product since the product is confirmed with good condition before delivered to customer. However, if there is a returned product, we will check the condition of the product and the reason why the customer requests to return. Furthermore, if successful to return or exchange the product, we are not storing any information.

6. How does your company handle the situation when one or more ordered items are not enough to deliver to customer but customer has already made the order?

ANS: We will contact the customer and inform them which ordered items are not enough to deliver, and we will modify the order details in the order book.

7. How does your company track the delivery of order? If failed to deliver it to customer, how will you solve it?

ANS: We track the delivery of order. There are 2 copies of order details given to the driver and once the customer receives the ordered product, one of the order details copies is given to the customer and requested to sign on another one of the order details as proof of receipt. However, if failed to deliver to the customer, we will try to contact the customer for further delivery. Normally we will try to deliver again on the next day after confirmed with the customer.

Figure 2.4.1: Result of interview

CHAPTER 3 PROPOSED METHOD/APPROACH

3.1 Methodology Involved (Incremental Prototype)

The methodology chosen for the system development must be appropriate and suitable for the system and the developer must follow the step-by-step as mention in the guideline for able to deliver the system successfully and on time (Kim, 2011).

3.1 Methodology Involved

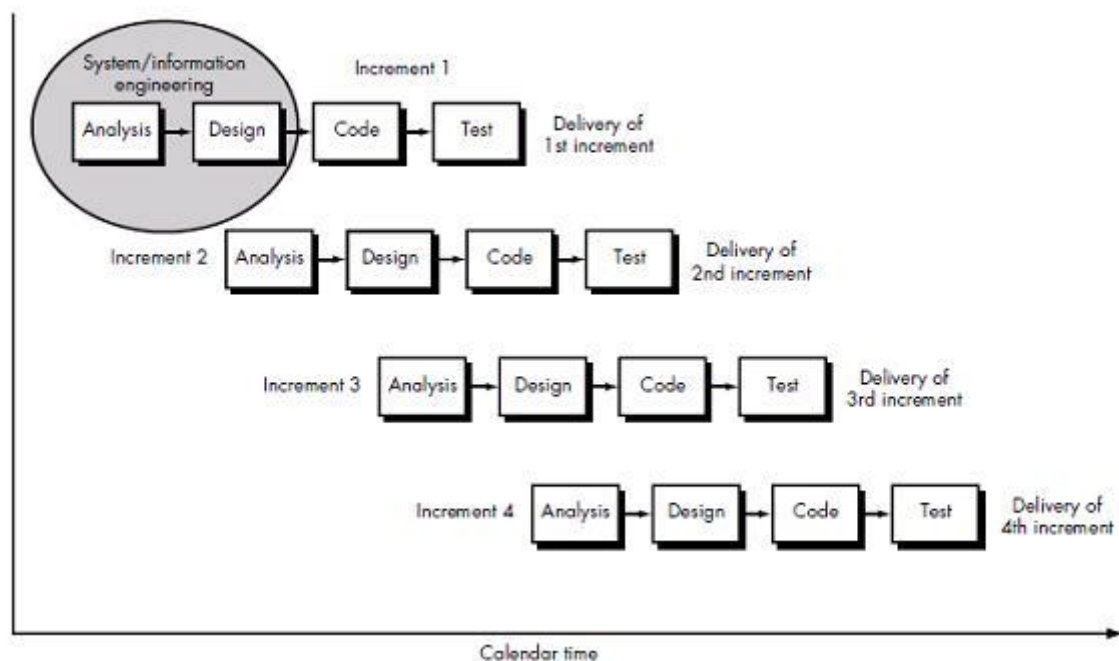


Figure 3.1.1: *Incremental Method [ONLINE]*. Available at:

<https://njrathod.wordpress.com/2013/02/15/sdlc-model/> [Accessed 30 March 2015]

After done through some research, the methodology has been selected for this system is incremental prototyping from prototyping. The incremental prototyping is refers to the final system is being built by subsystem, and that displays the functionality of the product under development, and present to the user for checking and reviewing purpose, and at the end the all the prototypes will be combined and become a complete system. The incremental prototyping methodology is chosen because of the target user of this system is first time exposure to computerized system and they maybe not clearly about what they able get from the system. It consists of four phases which these four phases will keep on repeat and repeat in order to make the system done. With this methodology, the target user is able to review

and evaluate the developed proposal and try it before the actual implementation of the final system. Meanwhile, at the same time the user is able to experience the how was the system able to support in their business and they may able to skip training courses for learning how use the system when the final system is developed. It is also helping the developer to understand the user requirement which are more specific and the particular requirement may not been considered by the developer during the design of the product.

Following are the steps and approaches to design a software prototype:

a) **Basic requirement identification**

In this stage, few of the inventory control management software that done by other programmer will be reviewed to get the basic understanding about the requirements of inventory control management software, especially the user interface. The complicated details of the internal design of the system, and the external features like performance and security may be ignore at this stage. Other than that, the requirement also gathered from the target user about what is the expectation of the system from them.

b) **Developing the initial prototype**

In this stage, the first prototype of the system is developed and the basic requirements of the system will be showing out. Yet, the functions of the system may not perform exactly same to the actual software. It is used to give the visual look and feel to the customer how the system will going be.

c) **Review of the prototype**

The designed prototype that has been developed is present to the customer, and other important stakeholders. After that, the feedback from them is collected and will be used as further improvement of the system under development stage.

d) **Revise and enhance the prototype**

In this stage, the reply and comments from the user will be analysed to more understand about the user requirement and the aspect of the user toward the system. However, there may will having some negotiations between the customer and developer due to the required time and budget limitation and technical feasibility of

the actual implementation. The new prototype being develops and cycle repeatedly until fulfil the user requirement and achieve user satisfaction.

3.2 TECHNOLOGIES INVOLVED

The technology that involved in this particular system will be Java language and also the Android language, since the system will build on NetBeans IDE platform for the terminal, as well as the Eclipse ADT for Android tool that build the part for the mobile devices, and Microsoft Azure.



Figure 3.2.1: *Netbeans IDE Logo [ONLINE]*. Available at

<https://github.com/Team254/FRC-2013/wiki/Installing-Java-and-NetBeans> [Accessed 30 March 2015]

Netbeans IDE

Netbeans is the IDE which means Integrated Development Environment. The program acts like a text editor that allows the developer to edit the code, compiles, and deploys the code. It is a software development platform that allow user to create a system using Java. It is popular software that the Java developer always used for the development purpose. Next, it is a freeware which the developer can use it without paying any money. It will be a main software platform in this project for developing the Java desktop-based application. Thus, there will be the other software platform use to support the development.



Figure 3.2.2: *Eclipse ADT Logo [ONLINE]*. Available at <https://eclipse.org/downloads/>
[Accessed 30 March 2015]

Eclipse ADT

Eclipse is a software platform that allows Android developer to develop their own Android apps by using it. It is a freeware which the developer can use it without paying any money. It will be a main software platform use to develop the Android-based application. Other than that, Eclipse itself is integrated together with Java 8 which the Java 8 will be a support for the Eclipse.



Figure 3.2.3: *Microsoft Azure Logo [ONLINE]*. Available at <http://www.sitepoint.com/save-mysql-sign-petition/> [Accessed 31 March 2015]

MySQL

MySQL is a well-known relational database management system. Since it is an open source and friendly user, majority of the developer will choose to use MySQL in developing their system. Official websites is provided for everyone to go to download the MySQL installer. MySQL can support or integrate with other development software in a perfect way. Other than that, MySQL so far can support different platform in which will helps in easier the work for developer.

Software and Hardware Requirements for Development Platform

The software and hardware that required for develop this system are as follow:

- ✓ Platform: NetBeans IDE 8.0 version, Eclipse and Eclipse ADT for Android.
- ✓ Language: Java, Android languages.
- ✓ Hardware: Laptop / Desktop that has minimum 1GB memory, 256GB disk space, mobile devices such as smart phone or tablets that powered by Android platform.
- ✓ Database: MySQL

3.3 SYSTEM REQUIREMENT**3.3.1 Hardware Requirement**

Description	Minimum Requirements
Processor	I3 processor with 2.0GHz or higher
Memory	1GB RAM or higher
Storage	Minimum 1GB of available storage space
Video Card	DirectX 9 or higher
Resolution	1024 x 768 or higher

Table 3.3.1 Hardware requirement for system end-user

3.3.2 Mobile Requirement

Description	Minimum Requirements
Operating system	Android platform with 2.3.6 or newer
Processor	Dual-core processor or higher
Memory	512MB or higher
Storage	Minimum 20MB available storage space
Camera	5Megapixel or higher

Table 3.3.2 Mobile requirement for system end-user

3.3.3 Software Requirement

Description	Tools
Operating system	Windows 7 or newer
Server program	Azure SQL Server
Java Runtime Environment(JRE)	Version 6.0 or newer

Table 3.3.3 Software requirement for system end-user

3.4 System Performance Definition

According to the research that had been done on this project, it improve the company benefits in which the system helps in reduce workload, increase accuracy, better time management, and so on. Because of this, the proposed system will be better compare to the current used system.

Firstly, the new system will help in reduce the workload of the staff in recording down the record of every processing. The system will be recorded down into the system which make the record will be easily get and prevent the record from lost. Therefore, the debt that owed by the customer will also recorded down to the system in which the customer will not have change to skip the debt. If using traditional-file based system, the company staff may be forgot the debt record and let the customer continue to purchase stock from them which cause the current system become very inconvenience and ineffectiveness. Next, new technology help in improving the accuracy of the data in which the mistake of the record can be reduce to minimum. Every of the record will be backed up to the server and which better than record down the record in the paper only.

Last but not least, the proposed system will also help in giving the user an experience of better time management. By using the proposed system, user can simply record down the record into the system. The record will directly store into the system which can save a lot of times. If using traditional-file based system, the staffs still need to think on where to keep all of the record.

3.5 Implementation Issues and Challenges

Based on the research and investigation, each of the projects that existed will have its own challenges and issues. Most of the developer will face an issues and challenges when every time the project reaches at the implementation stage.

There are some problems and challenges facing during implementation of this system. First of all, the concurrency problem that may occur during the process of updating the record. Since the proposed system is able to support in different platform which is running in computer (desktop and laptop) and the mobile device that running Android operating system, there have the chance that the multiple user will update the same row of record at the same time. With this problem, the record maybe will become inconsistent and deliver wrong information to the end-user. After searching the solution from online, the solution that suitable to solve this problem is matching the data before update it. Once the data is retrieved from the database, the one copy of original data will stored at buffer storage, and when the user is clicked the update button, the query will match the stored original data with the original data inside database, the update action only will perform after the stored original data is matched with the data in database.

Apart from this, another challenge that facing is developing the mobile apps. This is because the Android code is still new for the developer and never tried it before. By solving this problem, the developer can learn the Android code through online since nowadays the Android code is famous and can easily found on websites. However, the developer will need to consume some time in order to fully understand how the Android code is work.

Moreover, there is a challenge for the synchronization between the databases. Once the system is lost the connection to the server database, the system will store the record on local and once is reconnected to the server; the record will be synchronized between the local databases with the server databases.

3.6 Timeline

In the timeline part, it is mostly talk about the time management for this project. The Gantt chart will be used as a tool to show the time schedule of the project. Because of this, the Gantt chart will be clearly stated the time planning from the FYP1 to FYP2.

3.6.1 Gantt chart

Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
Manually Scheduled	Student Attendance Management System	221 days	Wed 28/5/14	Wed 1/4/15		
Manually Scheduled	1.0 Planning	7 days	Wed 28/5/14	Thu 5/6/14		
Manually Scheduled	1.1 Weekly Meeting	1 day	Wed 28/5/14	Wed 28/5/14		
Manually Scheduled	1.2 Study Project Background	1 day	Thu 29/5/14	Thu 29/5/14	3	
Manually Scheduled	1.3 Define Problem Statement	1 day	Fri 30/5/14	Fri 30/5/14	4	
Manually Scheduled	1.4 Define Project Scope	1 day	Mon 2/6/14	Mon 2/6/14	5	
Manually Scheduled	1.5 Define Project Goals	1 day	Tue 3/6/14	Tue 3/6/14	6	
Manually Scheduled	1.6 Define Project Objectives	1 day	Wed 4/6/14	Wed 4/6/14	7	
Manually Scheduled	1.7 Identify Impact, Significance, and Contribution	1 day	Thu 5/6/14	Thu 5/6/14	8	
Manually Scheduled	2.0 Analysis	14 days	Fri 6/6/14	Wed 25/6/14		
Manually Scheduled	2.1 Literature Review	4 days	Fri 6/6/14	Wed 11/6/14		
Manually Scheduled	2.1.1 Benchmarking	2 days	Fri 6/6/14	Mon 9/6/14	9	
Manually Scheduled	2.1.2 Define Strength and Weaknesses of Previous Works	2 days	Tue 10/6/14	Wed 11/6/14	12	
Manually Scheduled	2.2 Define Fact-Finding Methods	3 days	Thu 12/6/14	Mon 16/6/14		
Manually Scheduled	2.2.1 Observation	2 days	Thu 12/6/14	Fri 13/6/14	13	
Manually Scheduled	2.2.2 Survey	3 days	Thu 12/6/14	Mon 16/6/14	13	
Manually	2.3 Analyze Data	2 days	Tue	Wed	16	

CHAPTER 3 PROPOSED METHOD/APPROACH

Scheduled	Collection Gathered		17/6/14	18/6/14		
Manually Scheduled	2.4 Comparison of Benchmarking System	1 day	Thu 19/6/14	Thu 19/6/14	17	
Manually Scheduled	2.5 Proposed Methodologies	1 day	Fri 20/6/14	Fri 20/6/14	18	
Manually Scheduled	2.6 Define System Performance Definition	1 day	Mon 23/6/14	Mon 23/6/14	19	
Manually Scheduled	2.7 Identify Technologies Involved	1 day	Tue 24/6/14	Tue 24/6/14	20	
Manually Scheduled	2.8 Identify Implementation Issues and Challenges	1 day	Wed 25/6/14	Wed 25/6/14	21	
Manually Scheduled	3.0 Design	47 days	Thu 26/6/14	Fri 29/8/14		
Manually Scheduled	3.1 Develop Gantt Chart	1 day	Thu 26/6/14	Thu 26/6/14	22	
Manually Scheduled	3.2 Develop Diagrams	10 days	Fri 27/6/14	Thu 10/7/14		
Manually Scheduled	3.2.1 Develop Context Diagram	1 day	Fri 27/6/14	Fri 27/6/14	22	
Manually Scheduled	3.2.3 Develop DFD Description	3 days	Mon 30/6/14	Wed 2/7/14	26	
Manually Scheduled	3.2.2 Develop Flowchart Diagram	2 days	Thu 3/7/14	Fri 4/7/14	26	
Manually Scheduled	3.2.4 Develop Grapichal User Interface Layout	3 days	Mon 7/7/14	Wed 9/7/14	27	
Manually Scheduled	3.3 Submit Report	0 days	Thu 10/7/14	Thu 10/7/14		
Manually Scheduled	3.4 Database Design	35 days	Fri 11/7/14	Thu 28/8/14		
Manually Scheduled	3.4.1 Develop Entity-Relationship Diagram (ERD)	1 day	Fri 11/7/14	Fri 11/7/14	30	
Manually Scheduled	3.4.2 Identify Attribute and Entity for Each Table	2 days	Mon 14/7/14	Tue 15/7/14	32	
Manually Scheduled	3.4.3 Identify Data Dictionary	2 days	Wed 16/7/14	Thu 17/7/14	33	
Manually Scheduled	3.5 Develop System Prototype	30 days	Fri 18/7/14	Thu 28/8/14	34	
Manually Scheduled	3.6 System Prototype Presentation	1 day	Fri 29/8/14	Fri 29/8/14	35	
Manually Scheduled	4.0 Implementation	55 days	Mon 12/1/15	Fri 27/3/15		
Manually Scheduled	4.1 Develop the System	54 days	Mon 12/1/15	Thu 26/3/15		
Manually Scheduled	4.2 Develop User Manual	1 day	Fri 27/3/15	Fri 27/3/15		
Manually Scheduled	4.2.1 User Manual for Lecturer	1 day	Fri 27/3/15	Fri 27/3/15	38	

CHAPTER 3 PROPOSED METHOD/APPROACH

Manually Scheduled	4.2.2 User Manual for Student	1 day	Fri 27/3/15	Fri 27/3/15	38	
Manually Scheduled	5.0 Testing	1 day	Tue 31/3/15	Tue 31/3/15		
Manually Scheduled	5.1 Unit Testing	1 day	Tue 31/3/15	Tue 31/3/15	40,41	
Manually Scheduled	5.2 Integration Testing	1 day	Tue 31/3/15	Tue 31/3/15	40,41	
Manually Scheduled	5.3 System Testing	1 day	Tue 31/3/15	Tue 31/3/15	40,41	
Manually Scheduled	5.4 User Acceptance Testing	1 day	Tue 31/3/15	Tue 31/3/15	40,41	
Manually Scheduled	5.5 Provide Demonstration	1 day	Tue 31/3/15	Tue 31/3/15	40,41	
Manually Scheduled	5.6 Collect Feedback	1 day	Tue 31/3/15	Tue 31/3/15	40,41	
Manually Scheduled	6.0 Closing	1 day	Wed 1/4/15	Wed 1/4/15		
Manually Scheduled	6.1 End Project	1 day	Wed 1/4/15	Wed 1/4/15	40,41	

Figure 3.6.1.1: Gantt Chart Table (Activity 1 - 50)

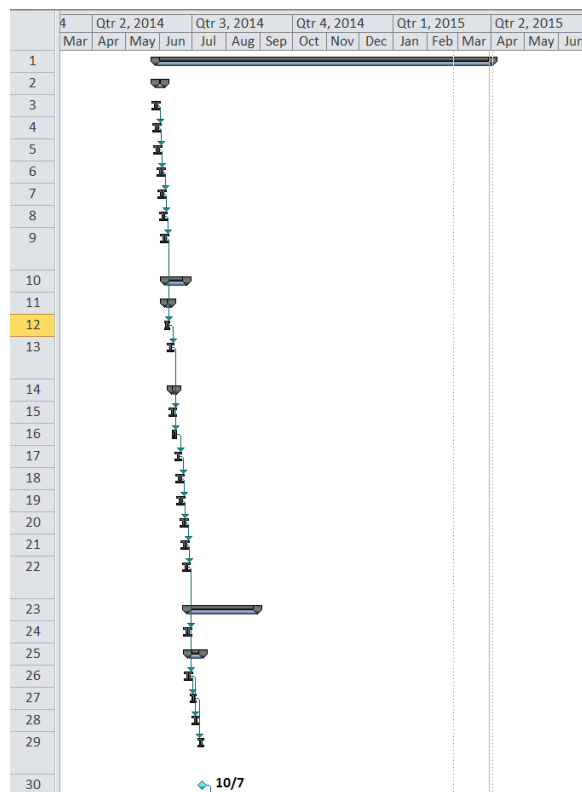


Figure 3.6.1.2: Gantt Chart Diagram (Activity 1 - 30)

CHAPTER 3 PROPOSED METHOD/APPROACH

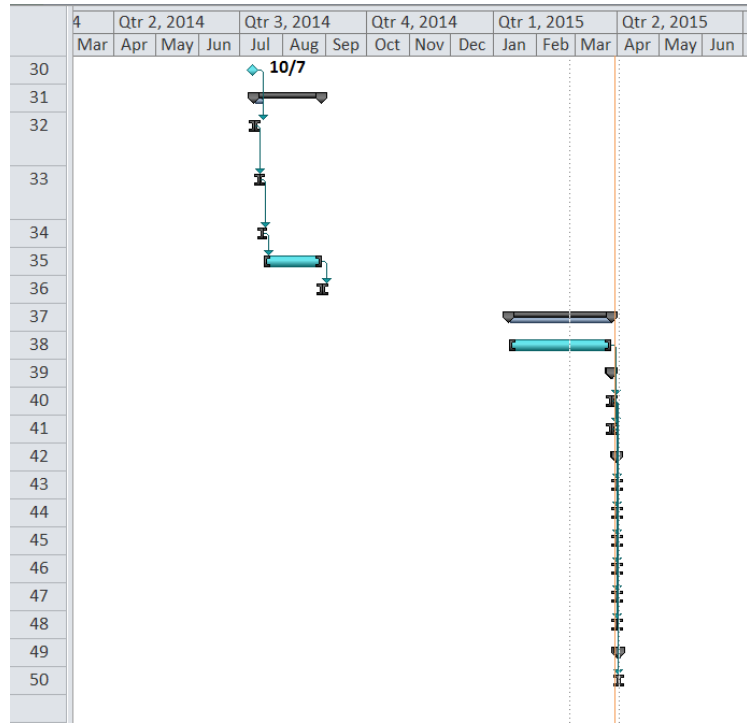


Figure 3.6.1.3: Gantt Chart Diagram (Activity 30 – 50)

CHAPTER 4 SYSTEM DESIGN AND ANALYSIS

4.1 System Design/Overview

In the system design and overview, it is mostly about the diagram and the data that related to how the system works. The diagram that consists in this documentation will be used to describe how the project workflow determines the system. The data values are also one of the system design parts which used to briefly describe the image of the database. Most of the components are related to the database in which it help in describing how the system will work with the database in order to make the system operates. The diagram that used by the developer are mostly used to describe the database information and its system workflow. The component that used to describe the design of system includes graphical user interface (GUI) design, Entity-relationship diagram (ERD), business rules, data dictionary, context diagram, and data flow diagram (DFD).

Other than that, the other component that provided will use to explain and declare about the function provided by the system for every role. Every staff will have their own features while using the system. Their permission will be set and their features will be restricted based on the permission. Because of this, every role that declared will have its own function and features.

4.2 GRAPHIC USER INTERFACE DESIGN

4.2.1 Login Screen for Manager and Normal Staff

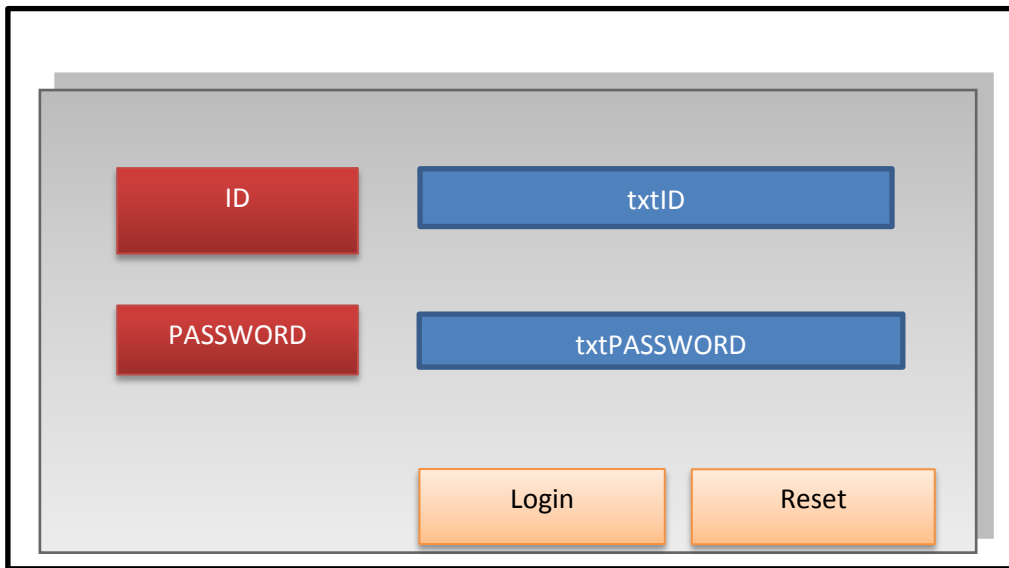


Figure 4.2.1 Login GUI

4.2.2 Dashboard for Manager

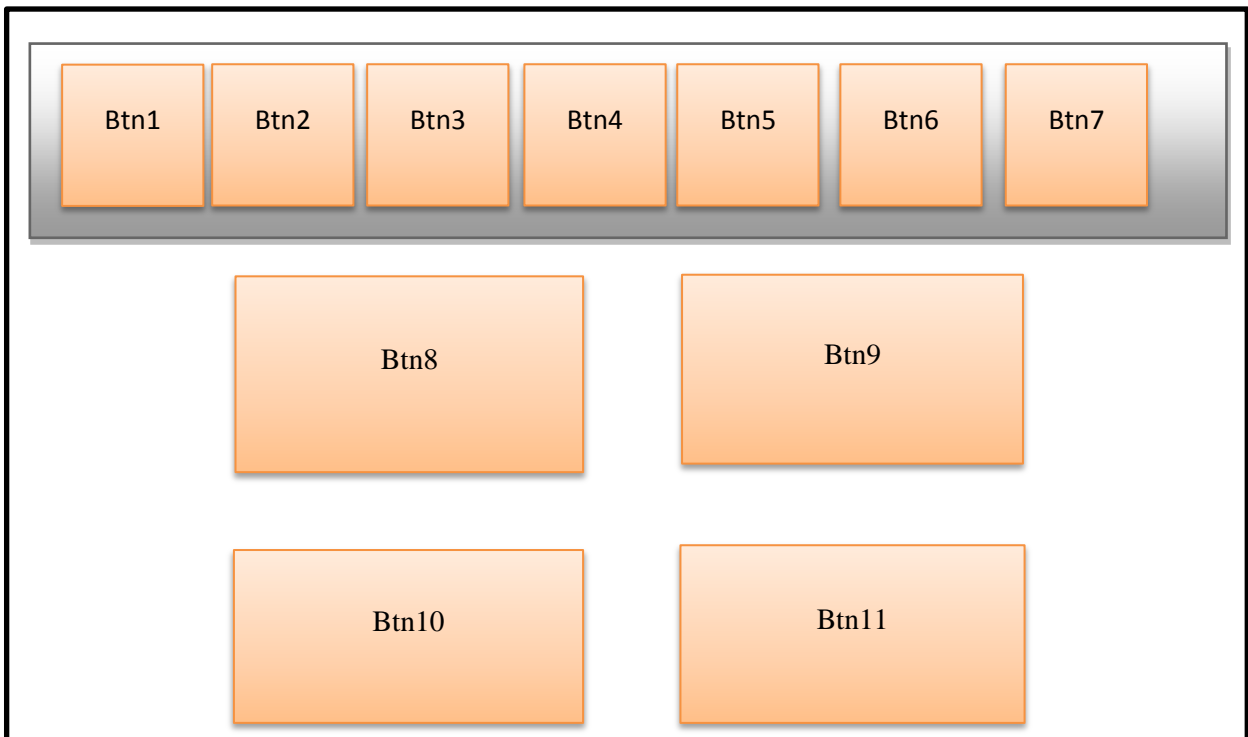


Figure 4.2.2 Dashboard design for manager

4.2.3 Dashboard for Normal staff

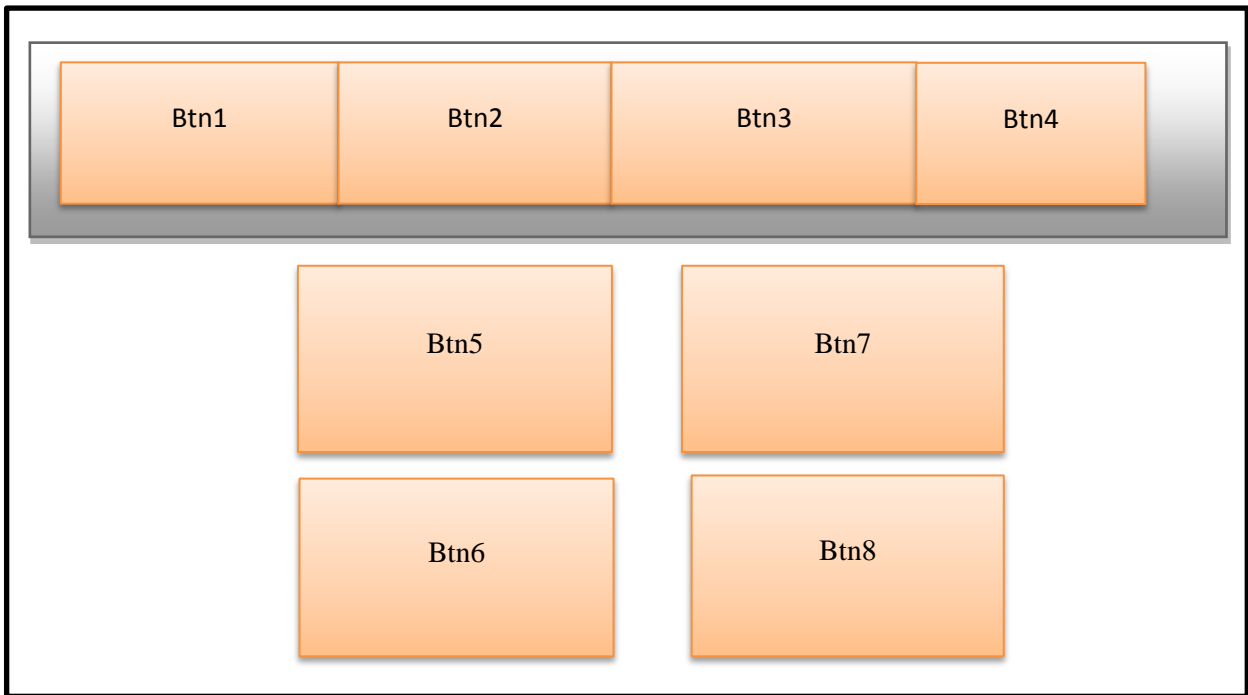


Figure 4.2.3 Dashboard design for normal staff

4.2.4 Dashboard in mobile platform

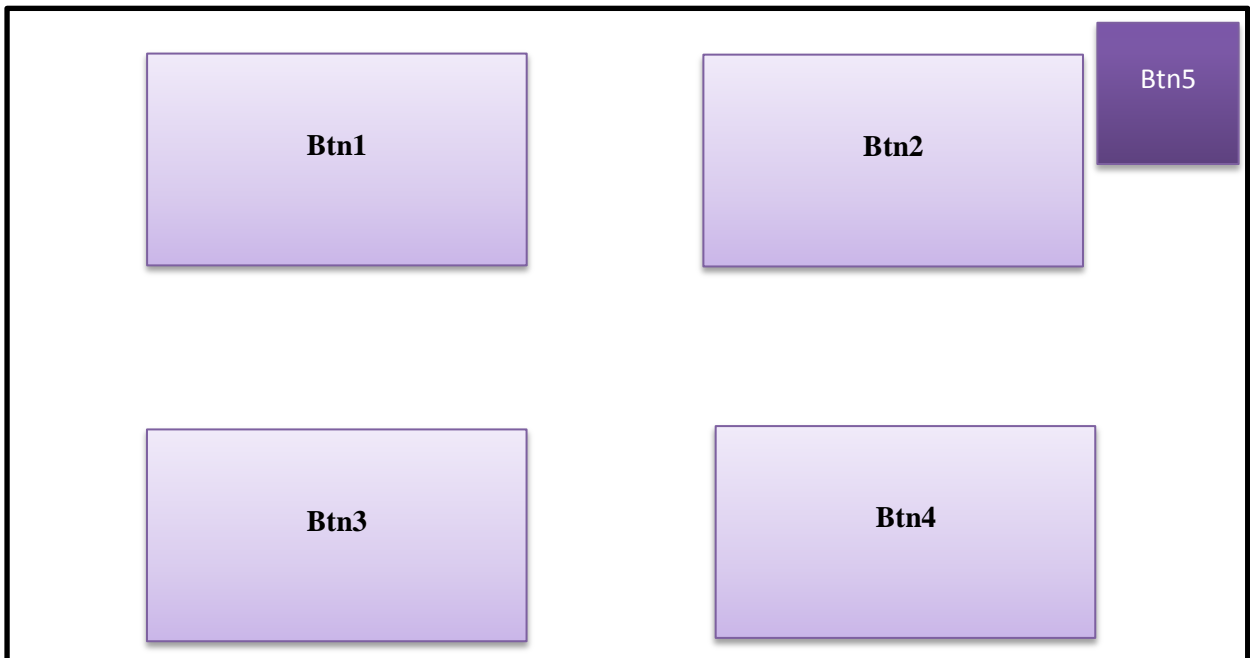


Figure 4.2.4 Dashboard design for mobile platform

4.3 Entity Relationship Diagram of Inventory Control Management System

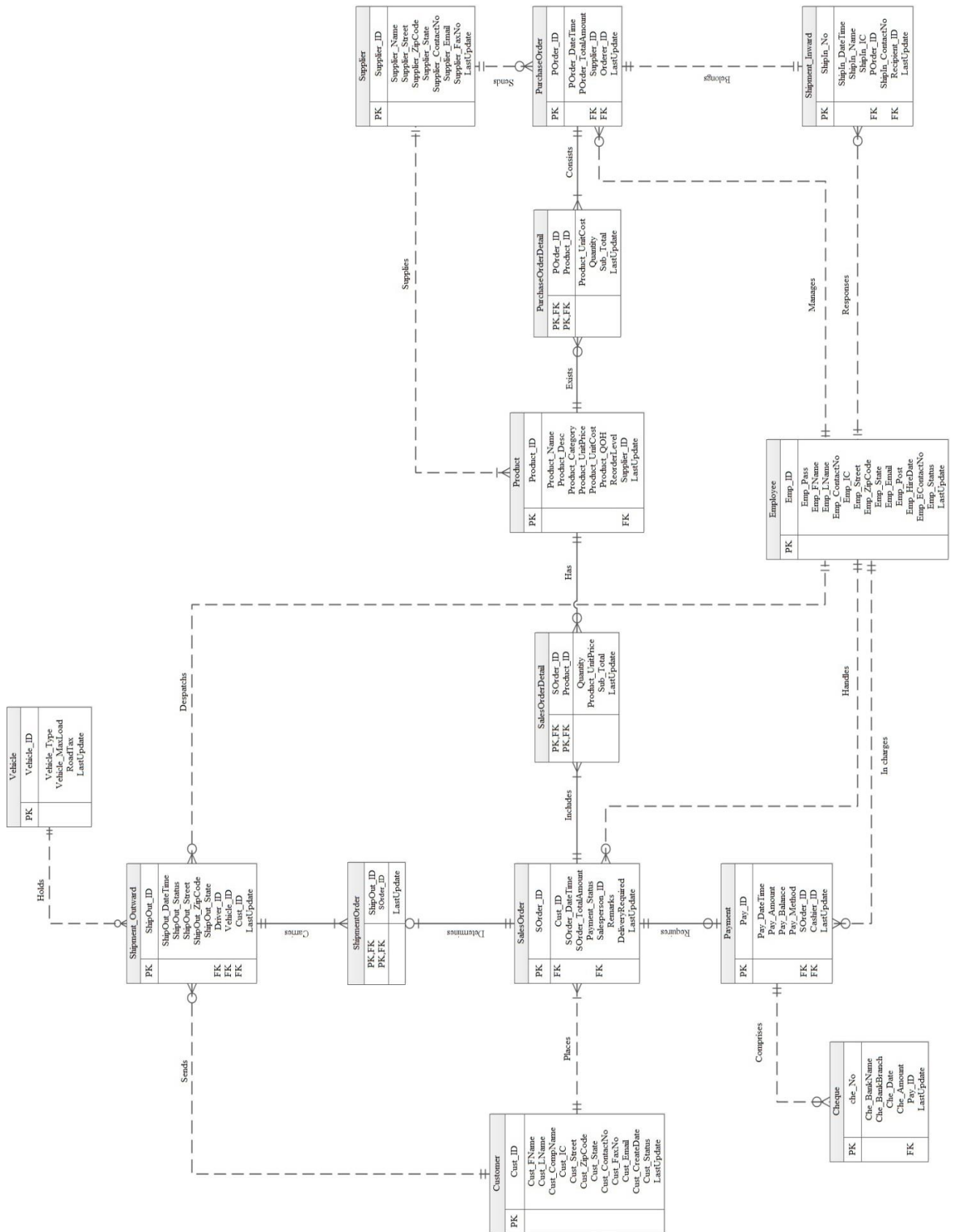


Figure 4.3 ERD Diagram

4.4 Business Rules

1. One customer can place many sales order.
2. Each sales order must place by one and only one customer.
3. One sales order can have zero or one shipment outward.
4. Each shipment outward only belongs to one and only one sales order.
5. One vehicle can hold zero or many shipment order.
6. Each shipment order only can hold by one vehicle.
7. One sales order can include many sales order details.
8. Each sales order details must belong to one and only one sales order.
9. Each sales order can have zero or one payment record.
10. Each payment must belong to one and only one sales order.
11. One payment can comprise with zero or many cheque.
12. Each cheque must form one and only one payment.
13. One product can be used in zero or many sales order detail.
14. Each sales order detail must have one and only one product.
15. One supplier can supply one or many product.
16. Each product only supplied by one and only one supplier.
17. One product can be exists in zero or many purchase order detail.
18. Each purchase order detail only exist one and only one product.
19. One purchase order can consist of one or many purchase order detail.
20. Each purchase order detail must belong to one and only one purchase order.
21. One supplier can receive zero or many purchase order.
22. Each purchase order must send to one and only one supplier.
23. One purchase order has one and only one shipment inward.
24. One shipment inward belongs to one and only one purchase order.
25. One employee can manages zero or many purchase order.
26. Each purchase order must managed by one employee.
27. One cashier can in charge zero or many payment.
28. Each payment must in charge by one and only one cashier.
29. One driver can dispatch zero or many shipment outward.
30. Each shipment outward must dispatch by one and only driver.

4.5 DATA DICTIONARY

4.5.1 Customer Entity

Entity Name	Attributes	Description	Data Type	Null
Customer	Cust_ID	Identify customer uniquely	Nvarchar(50)	No
	Cust_FName	First name of customer	Nvarchar(50)	No
	Cust_LName	Last name of customer	Nvarchar(50)	No
	Cust_CompName	Customer's company name	Nvarchar(MAX)	Yes
	Cust_IC	Customer's IC	Nvarchar(50)	No
	Cust_Street	Customer's street	Nvarchar(50)	No
	Cust_ZipCode	Zip code of customer house	Integer	No
	Cust_State	Customer living state	Nvarchar(50)	No
	Cust_ContactNo	Customer's contact number	Nvarchar(50)	No
	Cust_FaxNo	Customer's fax number	Nvarchar(50)	Yes
	Cust_Email	Customer's email address	Nvarchar(50)	Yes
	Cust_CreateDate	Customer's first buy date	date	No
LastUpdate	Identify the date and time of last update of record	Datetime	No	

CHAPTER 4 SYSTEM DESIGN AND ANALYSIS

4.5.2 SalesOrder Entity

Entity Name	Attributes	Description	Data Type	Null
SalesOrder	SOrder_ID	Identify sales order uniquely	Nvarchar(50)	No
	Cust_ID	Identify customer uniquely	Nvarchar(50)	No
	SOrder_DateTime	Date and time of sales order created	DateTime	No
	SOrder_TotalAmount	Total Amount of sales order	Money	No
	Payment_Status	The payment status of sales order	Nvarchar(50)	No
	Salesperson_ID	Identify employee that in charge for this sale order	Nvarchar(50)	No
	Remarks	Any specific requirement needed from the customer	Nvarchar(MAX)	Yes
	DeliveryRequired	Delivery service is needed or not (Yes/No)	Boolean	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.3 SalesOrderDetail Entity

Entity Name	Attributes	Description	Data Type	Null
SalesOrderDetail	SOrder_ID	Identify sales order uniquely	Nvarchar(50)	No
	Product_ID	Identify product	Nvarchar(50)	No

		uniquely		
	Quantity	Quantity of product	Integer	No
	Product_UnitPrice	Price of product per unit	Money	No
	Sub_Total	Total price of this product (unit price * quantity)	Money	No
	lastUpdate	Identify the date and time of last update of record	Datetime	No

4.5.4 Payment Entity

Entity Name	Attributes	Description	Data Type	Null
Payment	Pay_ID	Identify payment uniquely	Nvarchar(50)	No
	Pay_DateTime	Date and time of payment created	DateTime	No
	Pay_Amount	Total amount paid by customer	Money	Yes
	Pay_Balance	Balance remaining	Money	Yes
	Pay_Method	The payment is paid by cash or cheque	Nvarchar(50)	No
	SOrder_ID	Identify sales order uniquely	Nvarchar(50)	No
	Cashier_ID	Identify employee that in charge for this payment	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.5 Cheque Entity

Entity Name	Attributes	Description	Data Type	Null
Cheque	Che_No	Identify cheque	Nvarchar(50)	No

		uniquely		
	Che_BankName	Bank name of cheque	Nvarchar(50)	No
	Che_BankBranch	Branch of bank of cheque	Nvarchar(50)	No
	Che_Date	Date of cheque able to bank-in	Date	No
	Che_Amount	Cheque amount	Money	No
	Pay_ID	Identify payment uniquely	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.6 ShipmentOrder

Entity Name	Attributes	Description	Data Type	Null
ShipmentOrder	ShipOut_ID	Identify shipmentOrder uniquely	Nvarchar(50)	No
	SOrder_ID	Identify shipmentOrder uniquely	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.7 Shipment_Outward Entity

Entity Name	Attributes	Description	Data Type	Null
Shipment_Outward	ShipOut_ID	Identify shipment uniquely	Nvarchar(50)	No
	ShipOut_DateTime	Date and time of shipment	DateTime	No
	ShipOut_Status	Status of shipment	Nvarchar(50)	No
	ShipOut_Street	Street of shipment	Nvarchar(50)	No
	ShipOut_ZipCode	Zip code of shipment	Integer	No
	ShipOut_State	State of shipment	Nvarchar(50)	No
	Driver_ID	Employee who in charge of	Nvarchar(50)	No

		this shipment		
	Vehicle_ID	Identify vehicle uniquely	Nvarchar(50)	No
	Cust_ID	Identify customer uniquely	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.8 Product Entity

Entity Name	Attributes	Description	Data Type	Null
Product	Product_ID	Identify product uniquely	Nvarchar(50)	No
	Product_Name	Name of product	Nvarchar(50)	No
	Product_Desc	Description of product	Nvarchar(MAX)	No
	Product_Category	Differentiate the product to different category	Nvarchar(50)	No
	Product_UnitPrice	Price of product	Money	No
	Product_UnitCost	Cost of product	Money	No
	Product_QOH	Quantity available of product	Integer	No
	ReorderLevel	Reorder level of product	Integer	No
	Supplier_ID	Identify supplier uniquely	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.9 Employee Entity

Entity Name	Attributes	Description	Data Type	Null
Employee	Emp_ID	Identify employee uniquely	Nvarchar(50)	No
	Emp_Pass	Password of employee account	Nvarchar(50)	No
	Emp_FName	First name of employee	Nvarchar(50)	No
	Emp_LName	Last name of employee	Nvarchar(50)	No
	Emp_IC	Employee's IC number	Nvarchar(50)	No
	Emp_ContactNo	Contact Number of	Nvarchar(50)	No

		employee		
	Emp_Street	Street of employee's house	Nvarchar(50)	No
	Emp_ZipCode	Zip code of employee's house	Integer	No
	Emp_State	State of employee living	Nvarchar(50)	No
	Emp_Email	Email address of employee	Nvarchar(50)	No
	Emp_Post	Position of employee	Nvarchar(50)	No
	Emp_HireDate	Hire date of employee	DateTime	No
	Emp_EContactNo	Emergency contact number of employee	Nvarchar(50)	No
	Emp_Status	Status of employee (Vacation, fired, Hiring)	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.10 PurchaseOrder Entity

Entity Name	Attributes	Description	Data Type	Null
PurchaseOrder	POrder_ID	Identify purchase order uniquely	Nvarchar(50)	No
	POrder_DateTime	Date and time of purchase order created	DateTime	No
	POrder_TotalAmount	Total amount of purchase order	Money	No
	Supplier_ID	Identify supplier uniquely	Nvarchar(50)	No
	Orderer_ID	Employee who in charge of this purchase order	Nvarchar(50)	No
	LastUpdate	Identify the date and	DateTime	No

		time of last update of record		
--	--	-------------------------------	--	--

4.5.11 PurchaseOrderDetail Entity

Entity Name	Attributes	Description	Data Type	Null
PurchaseOrderDetail	POrder_ID	Identify purchase order uniquely	Nvarchar(50)	No
	Product_ID	Identify product uniquely	Nvarchar(50)	No
	Product_UnitCost	Cost of product per unit	Money	No
	Quantity	Quantity amount needed of product	Integer	No
	Sub_Total	Total cost of this product (quantity * unit cost)	Money	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.12 Supplier Entity

Entity Name	Attributes	Description	Data Type	Null
Supplier	Supplier_ID	Identify supplier uniquely	Nvarchar(50)	No
	Supplier_Name	Supplier Name	Nvarchar(50)	No
	Supplier_Street	Street of supplier's company	Nvarchar(50)	No
	Supplier_ZipCode	Zip code	Integer	No
	Supplier_State	State of supplier's company	Nvarchar(50)	No
	Supplier_ContactNo	Contact number of	Nvarchar(50)	No

		supplier		
	Supplier_Email	Email address of supplier	Nvarchar(50)	No
	Supplier_FaxNo	Fax number of supplier	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.13 Shipment_Inward Entity

Entity Name	Attributes	Description	Data Type	Null
Shipment_Inward	ShipIn_No	Identify shipment uniquely	Nvarchar(50)	No
	ShipIn_DateTime	Date and time of shipment arrived	DateTime	No
	ShipIn_Name	Name of the people who deliver this shipment	Nvarchar(50)	No
	ShipIn_IC	IC of the people who deliver this shipment	Nvarchar(50)	No
	POrder_ID	Identify purchase order uniquely	Nvarchar(50)	No
	ShipIn_ContactNo	Contact number of who in charge of deliver this shipment	Nvarchar(50)	No
	Recipient_ID	Employee who is in charge on receive this shipment	Nvarchar(50)	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.5.14 Vehicle Entity

Entity Name	Attributes	Description	Data Type	Null
Vehicle	Vehicle_ID	Identify vehicle uniquely	Nvarchar(50)	No
	Vehicle_Type	Type of vehicle	Nvarchar(50)	No
	Vehicle_MaxLoad	Max load of vehicle	Integer	No
	RoadTax	Expire date of road tax	Date	No
	LastUpdate	Identify the date and time of last update of record	DateTime	No

4.6 Data Flow Diagram

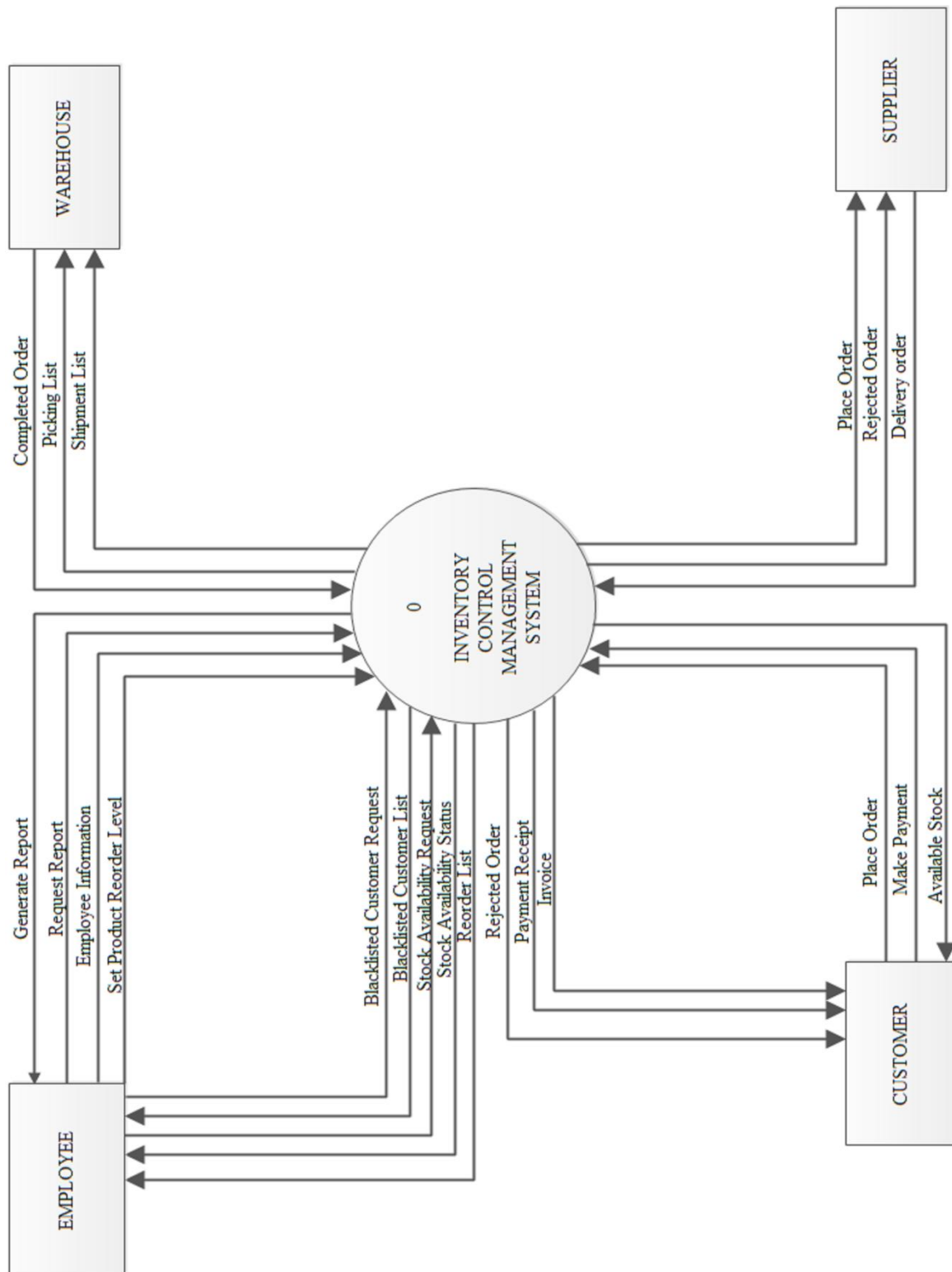


Figure 4.6.1 Context Diagram

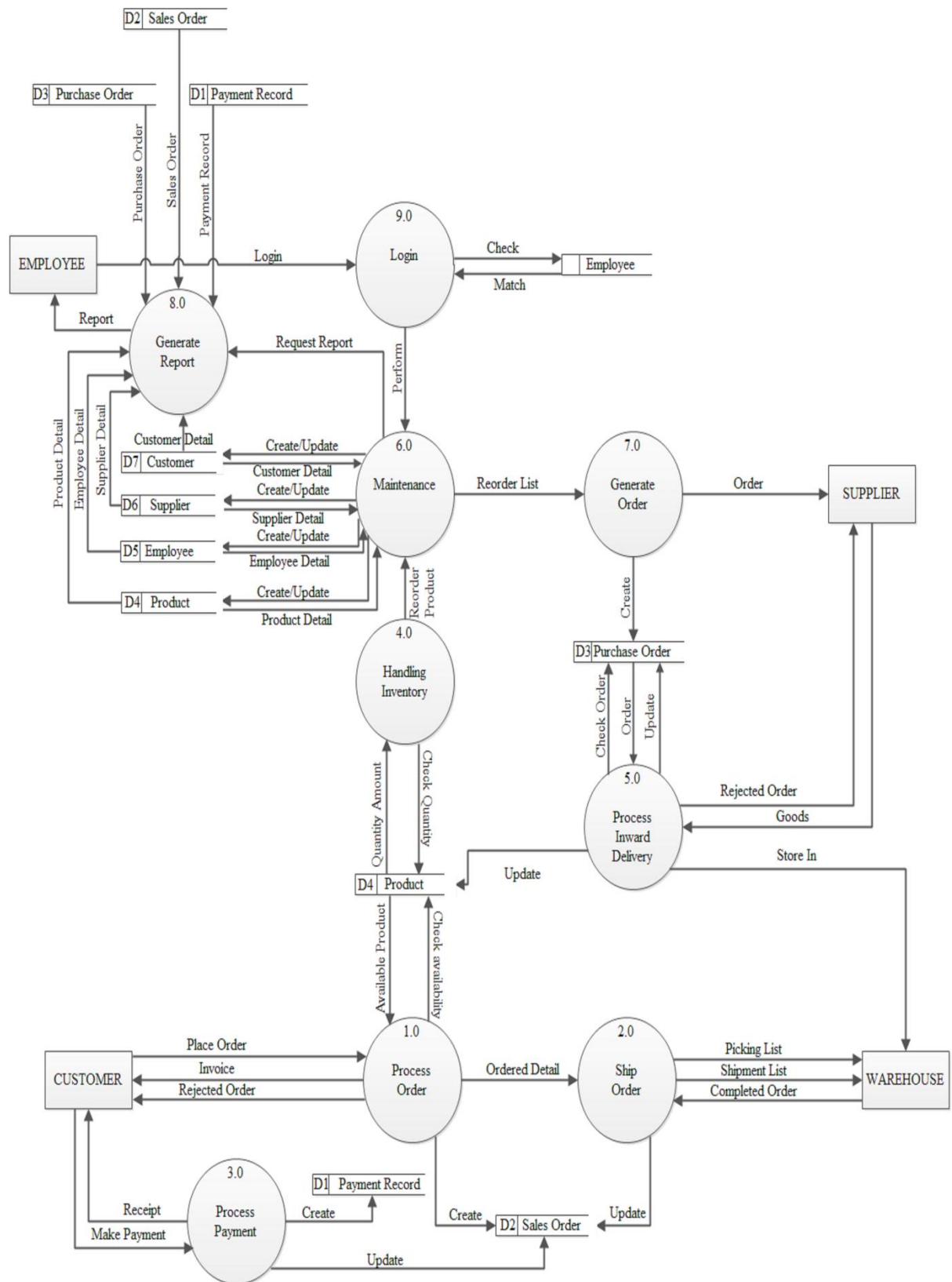


Figure 4.6.2 DFD Level 0

Figure 4.6.3 DFD 1.0 Process Order

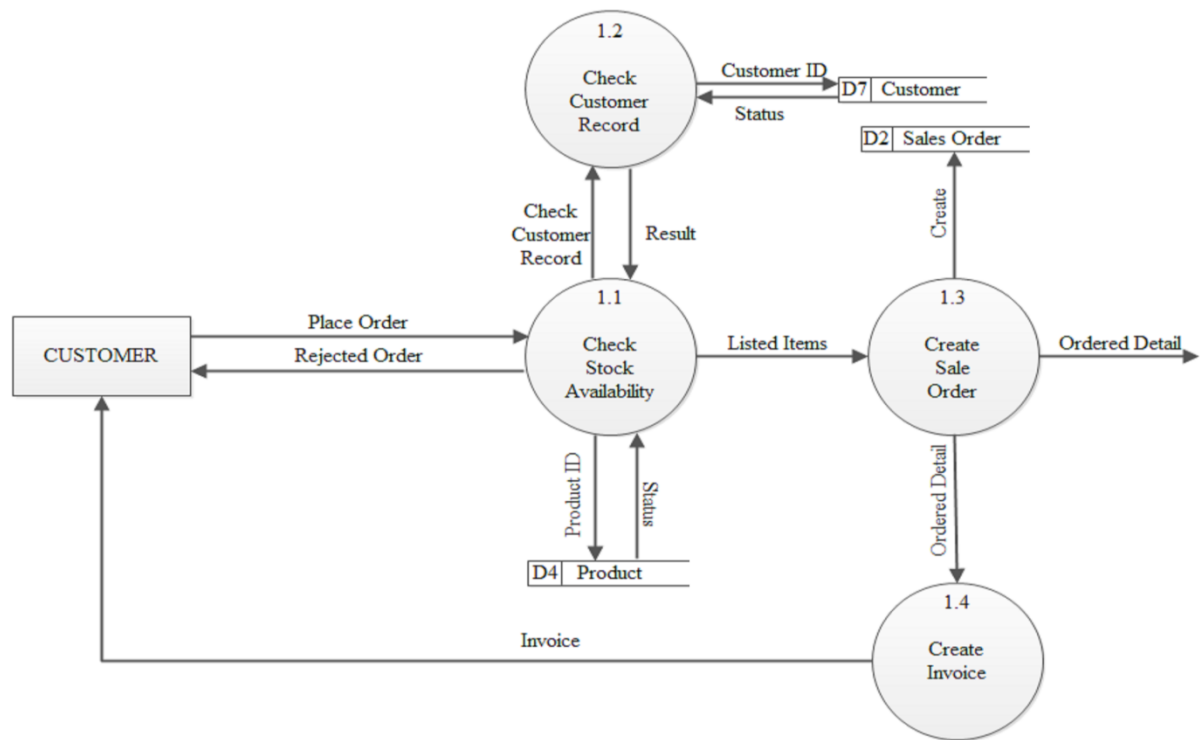


Figure 4.6.4 DFD 2.0 Ship Order

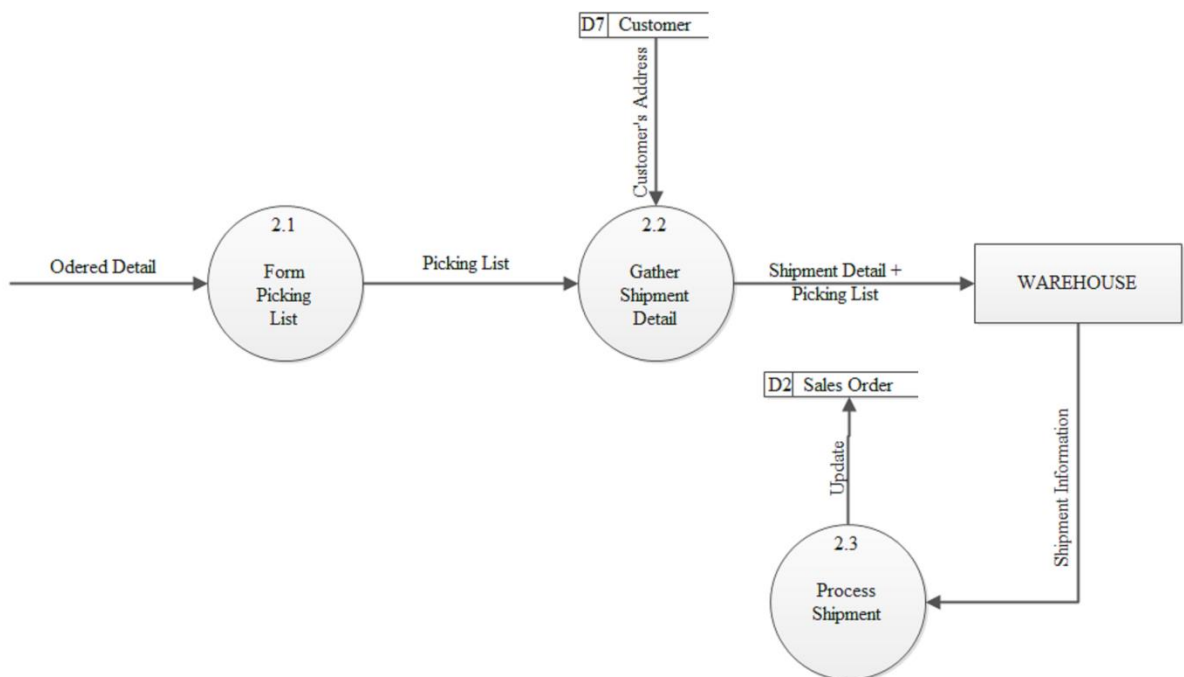


Figure 4.6.5 DFD 3.0 Payment

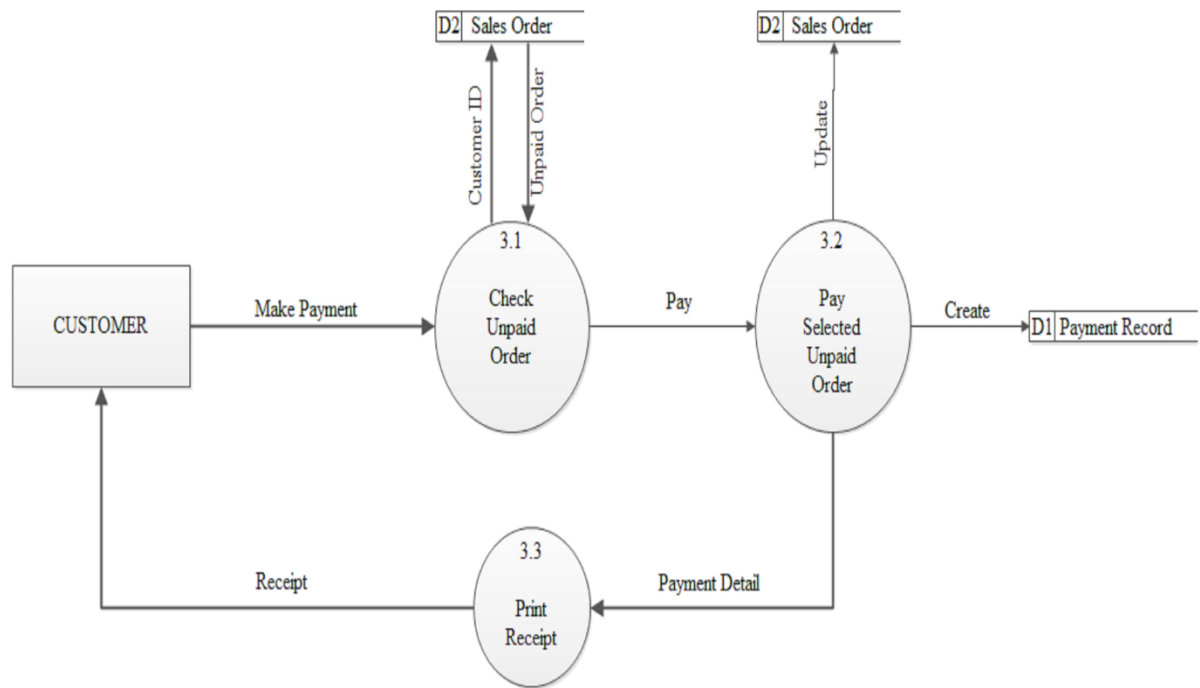


Figure 4.6.6 DFD 4.0 Handling Inventory

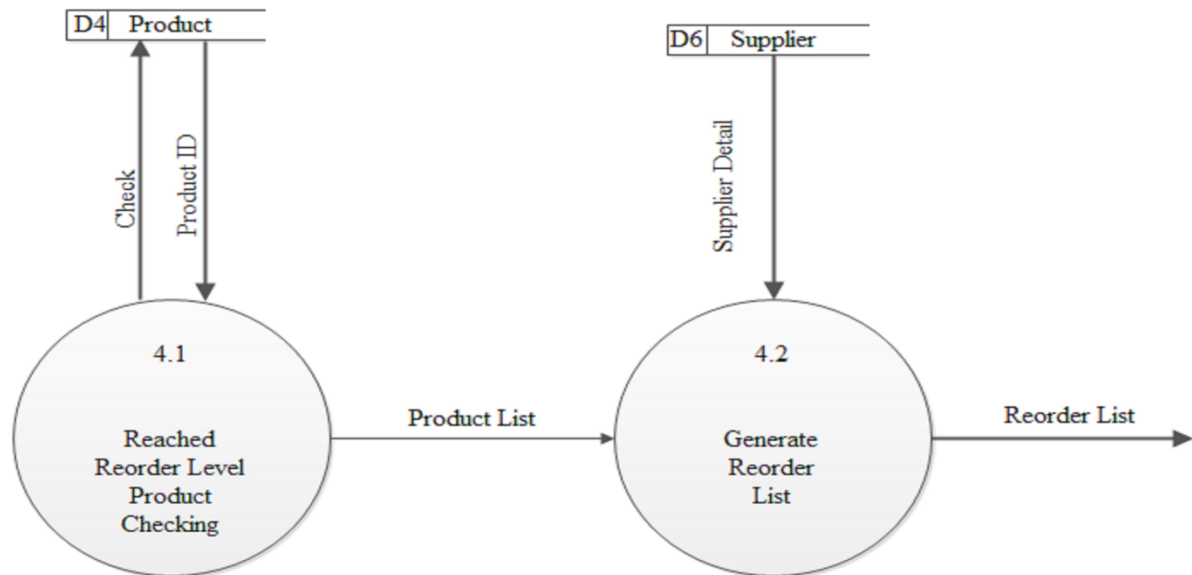


Figure 4.6.7 DFD 5.0 Process Inward Delivery

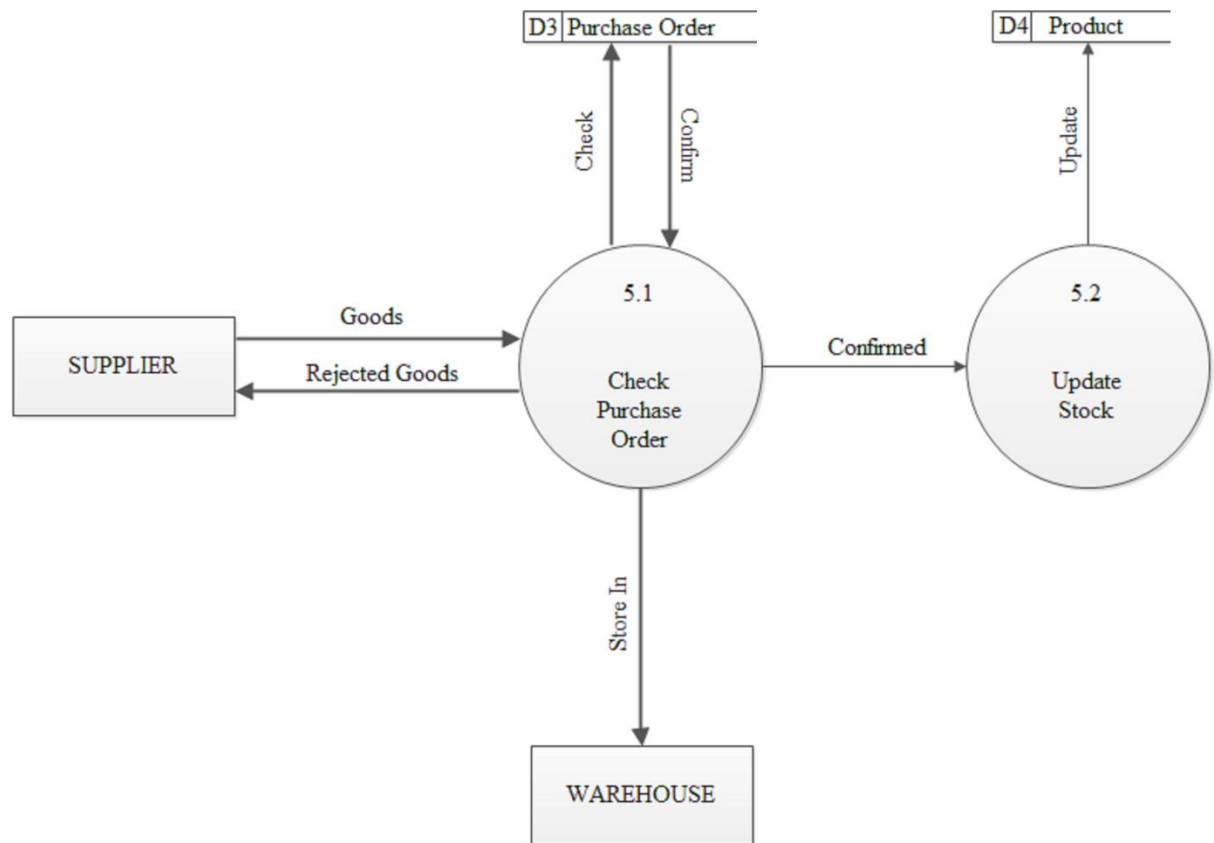


Figure 4.6.8 DFD 6.0 Maintenance

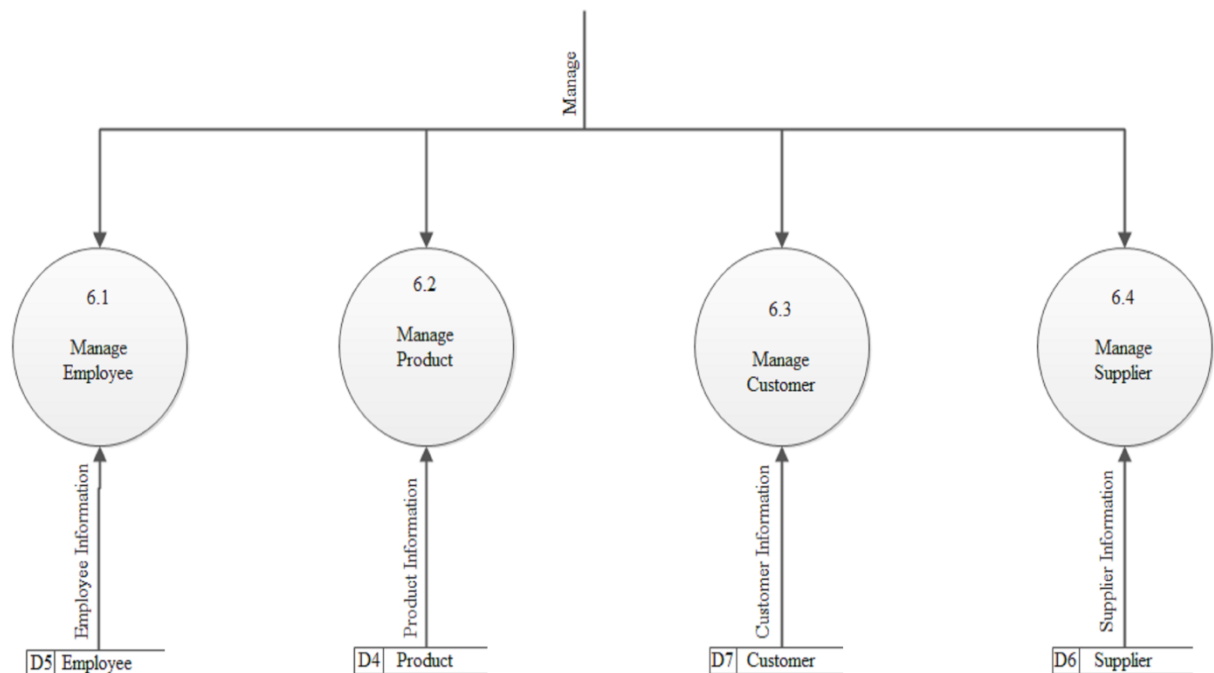


Figure 4.6.9 DFD 8.0 Generate Report

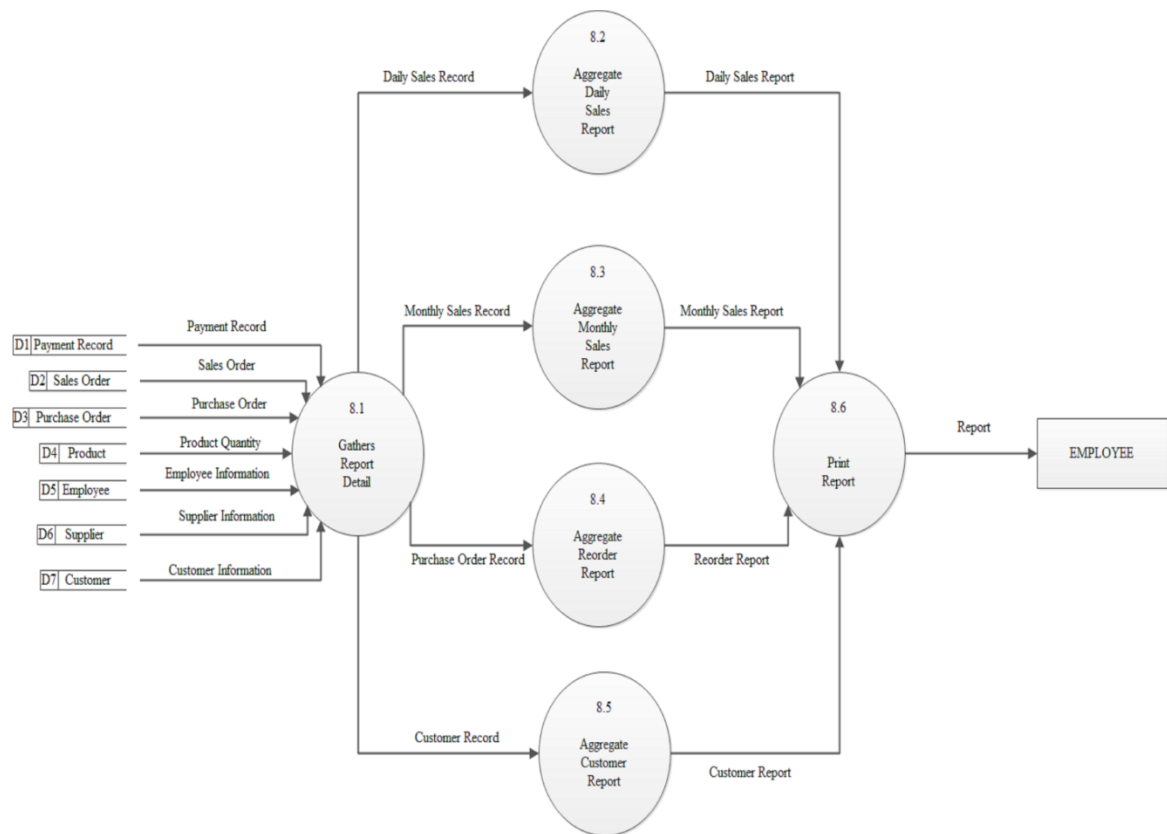
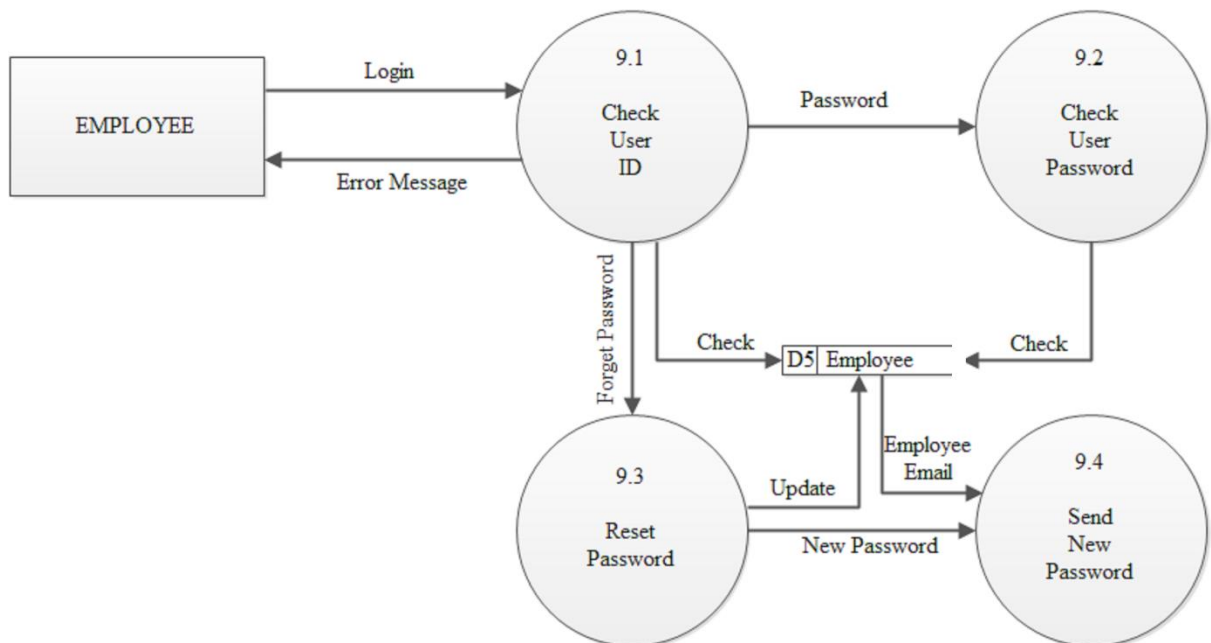


Figure 4.6.10 DFD 9.0 Login



DFD Level 2

Figure 4.6.11 DFD 6.1.0 Manage Employee

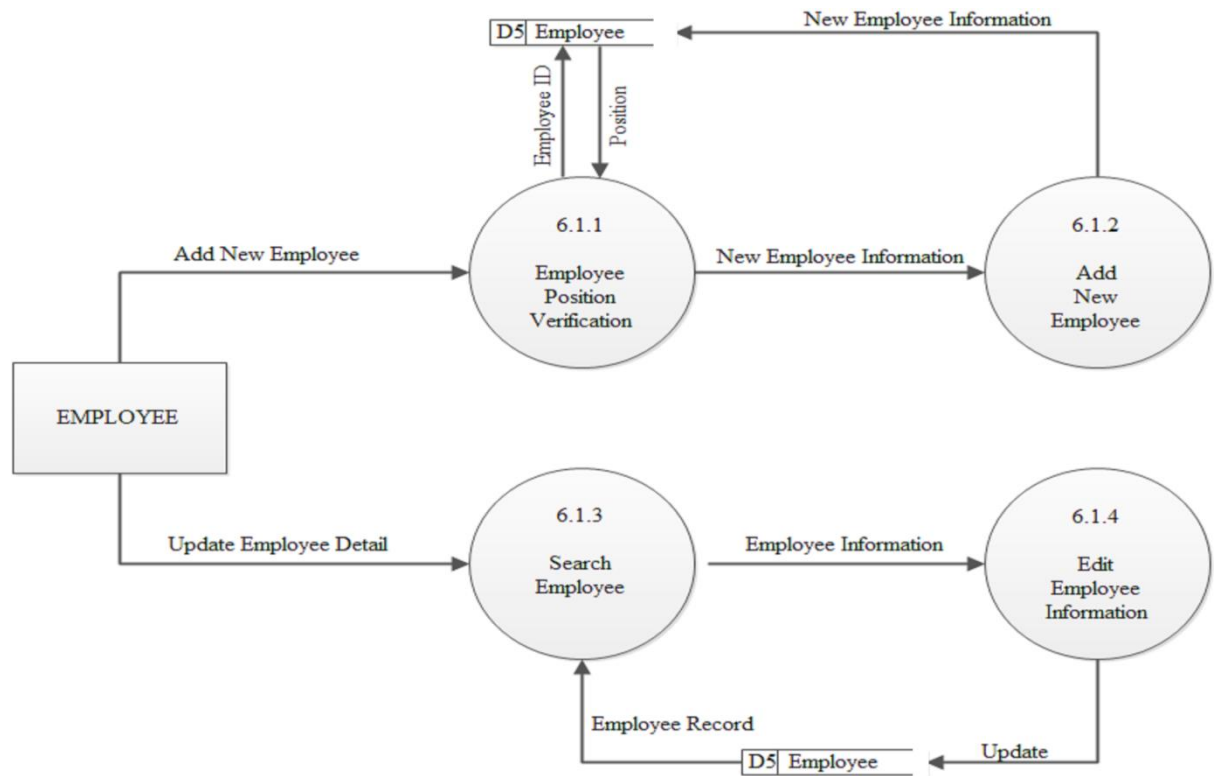


Figure 4.6.12 DFD 6.2.0 Manage Product

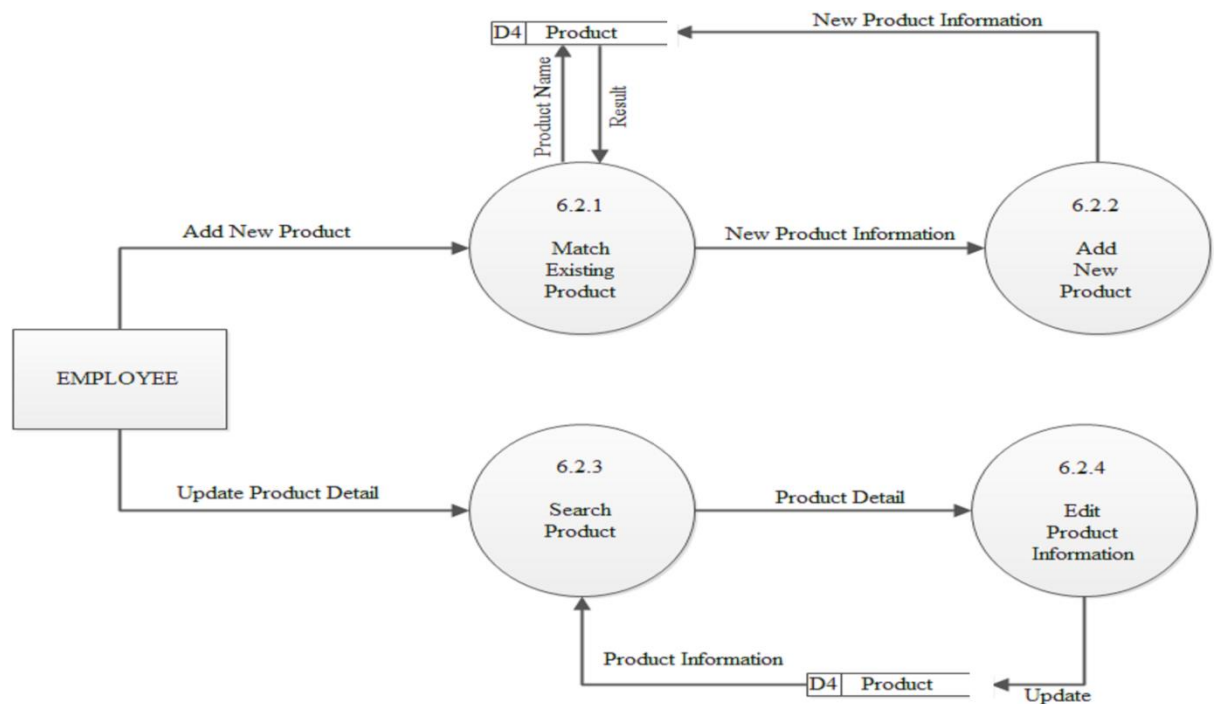


Figure 4.6.13 DFD 6.3.0 Manage Customer

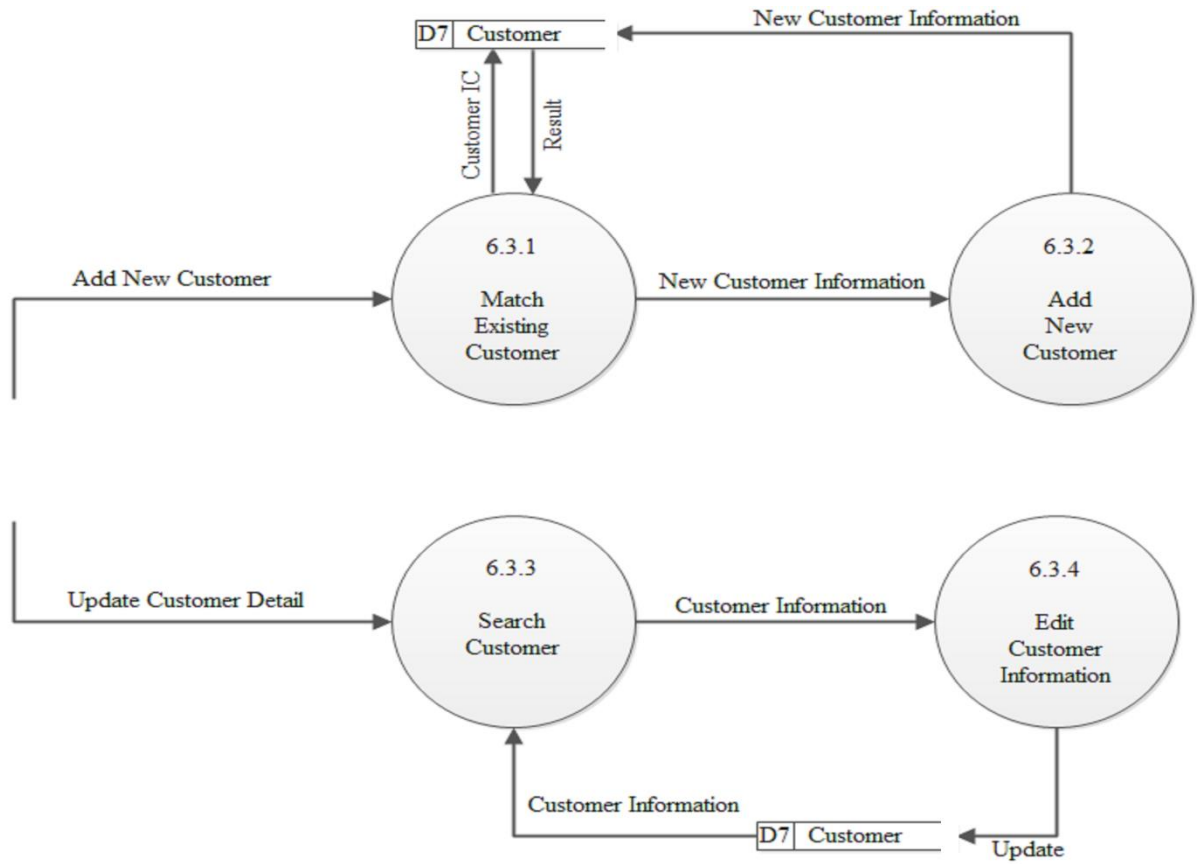
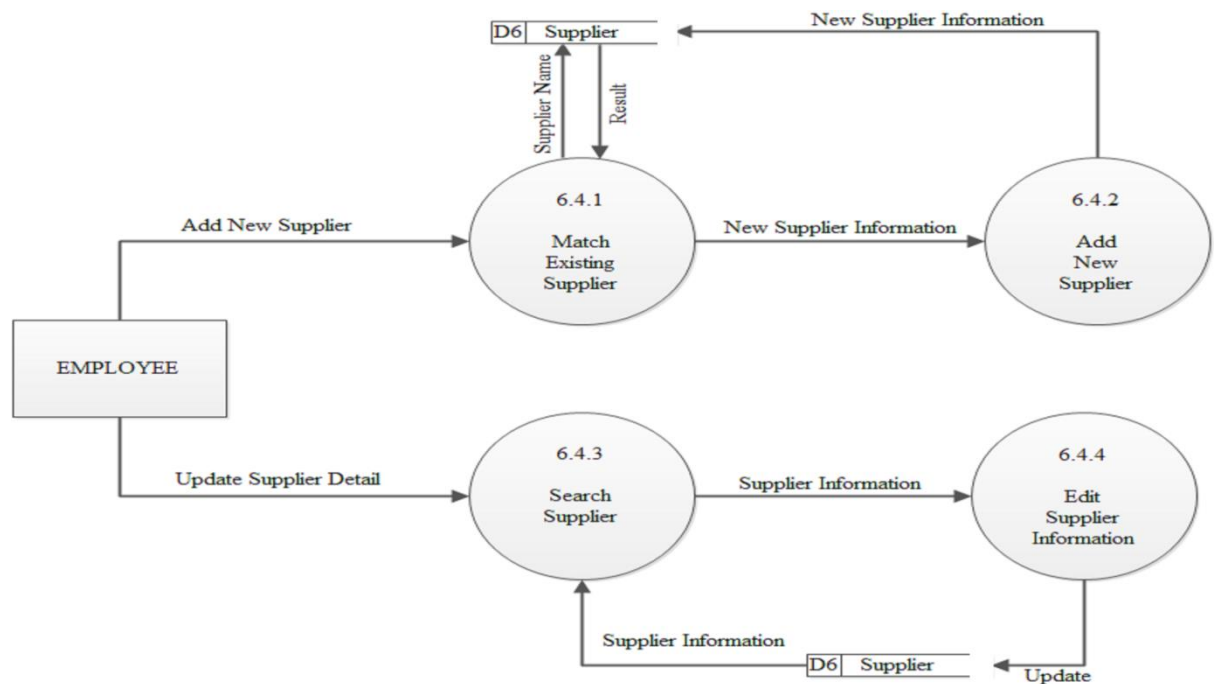
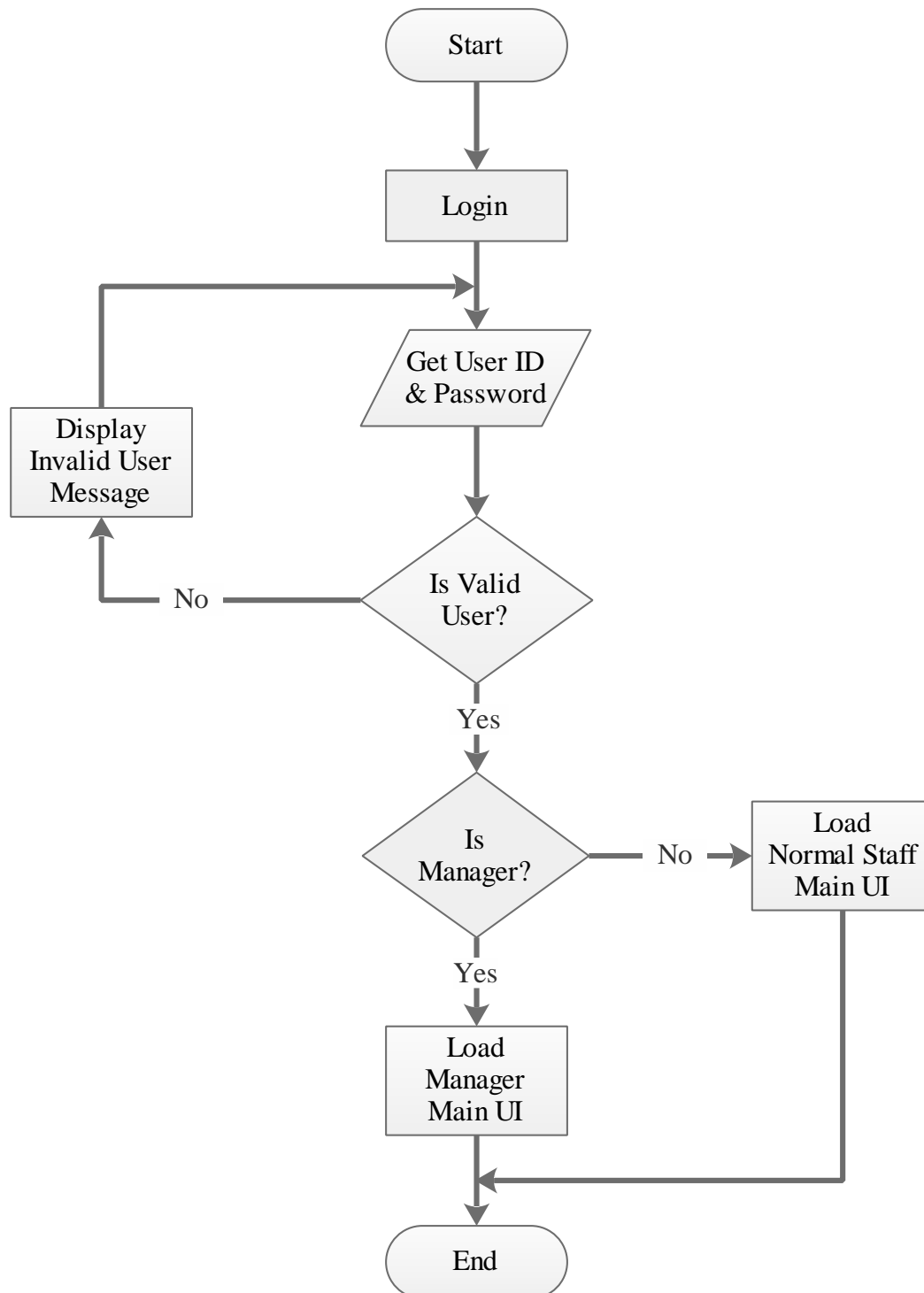


Figure 4.6.14 DFD 6.4.0 Manage Supplier

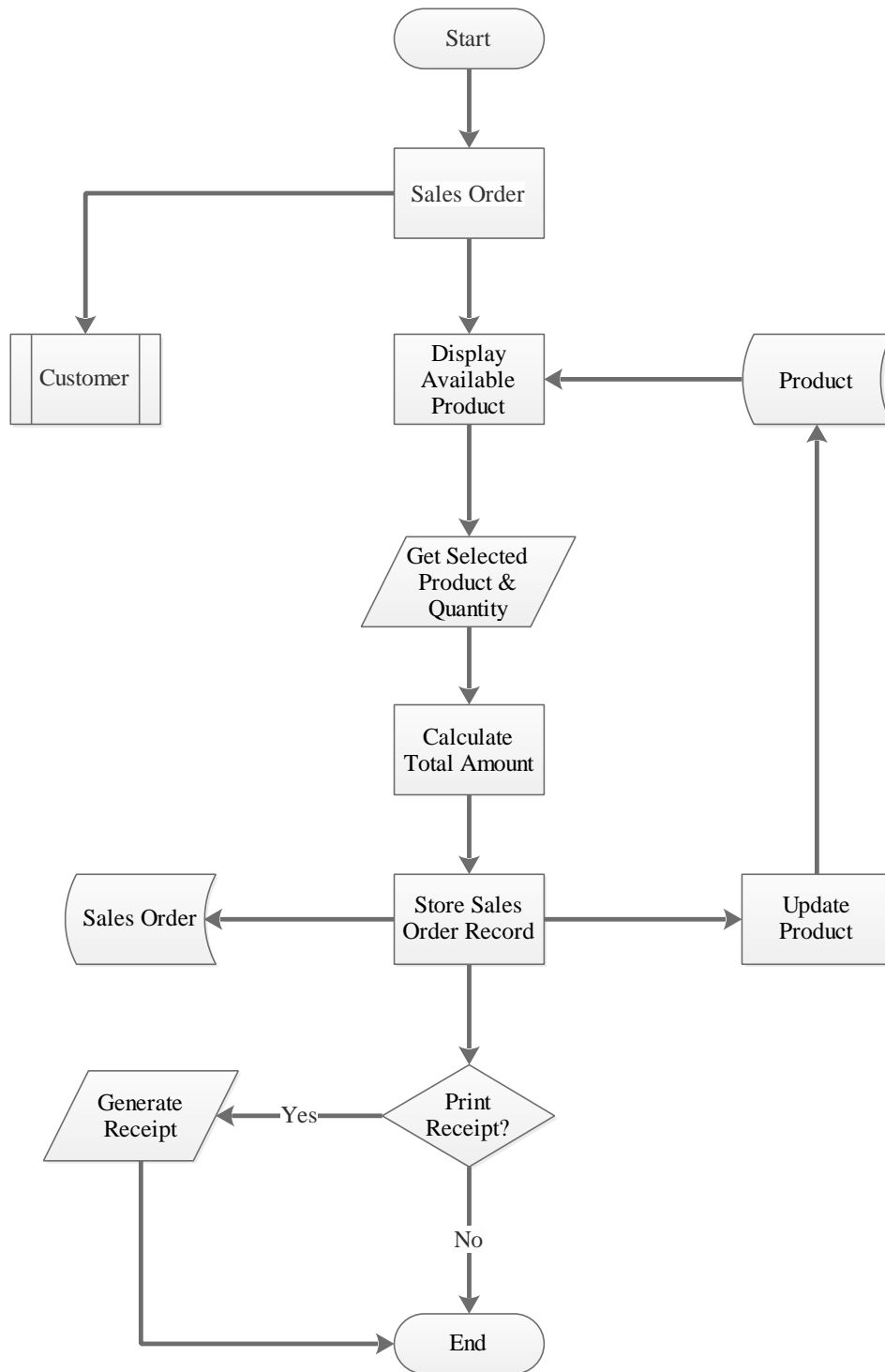


4.7 FLOW CHART DIAGRAM

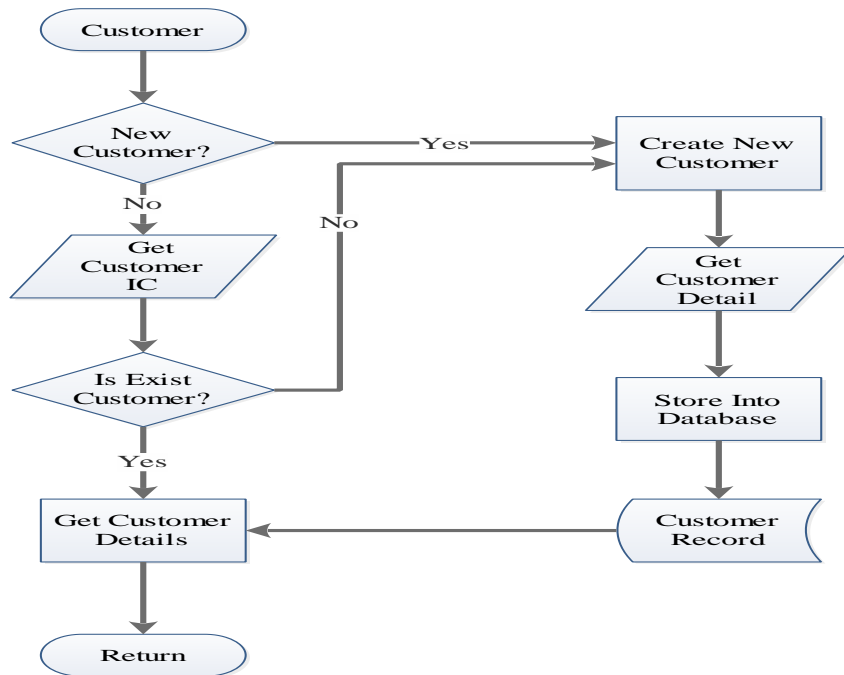
4.7.1 Flow Chart Diagram of Login Module



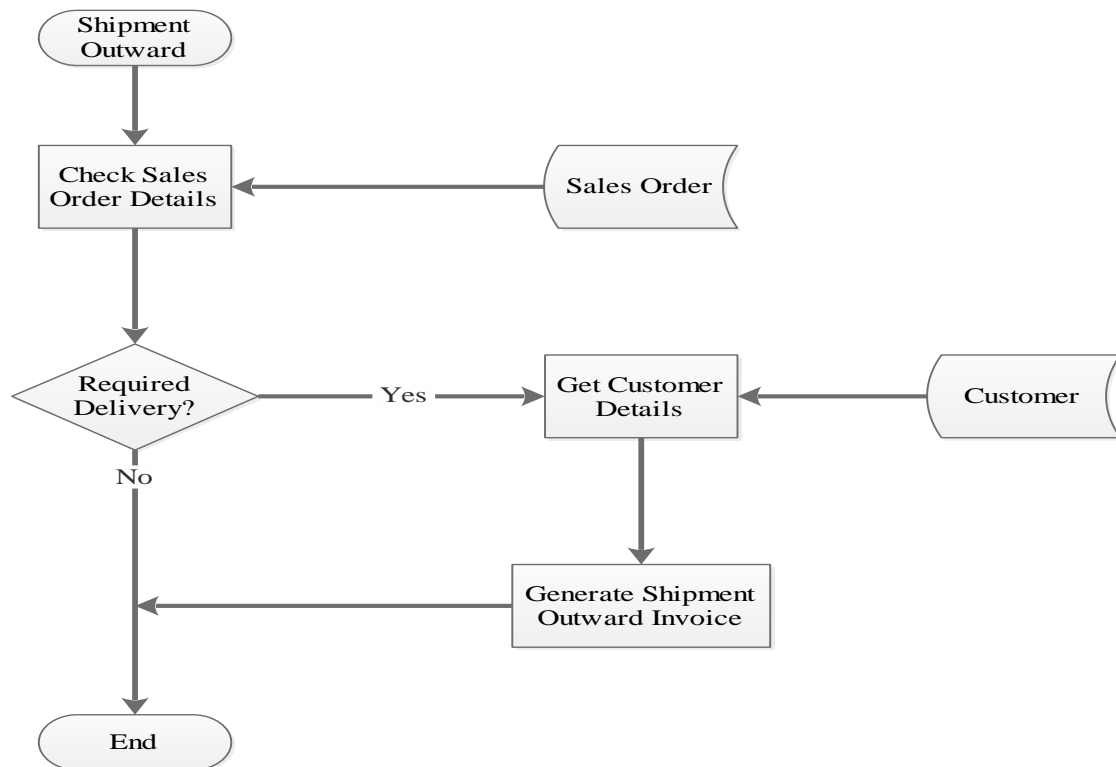
4.7.2 Flow Chart Diagram of Sales Order Module



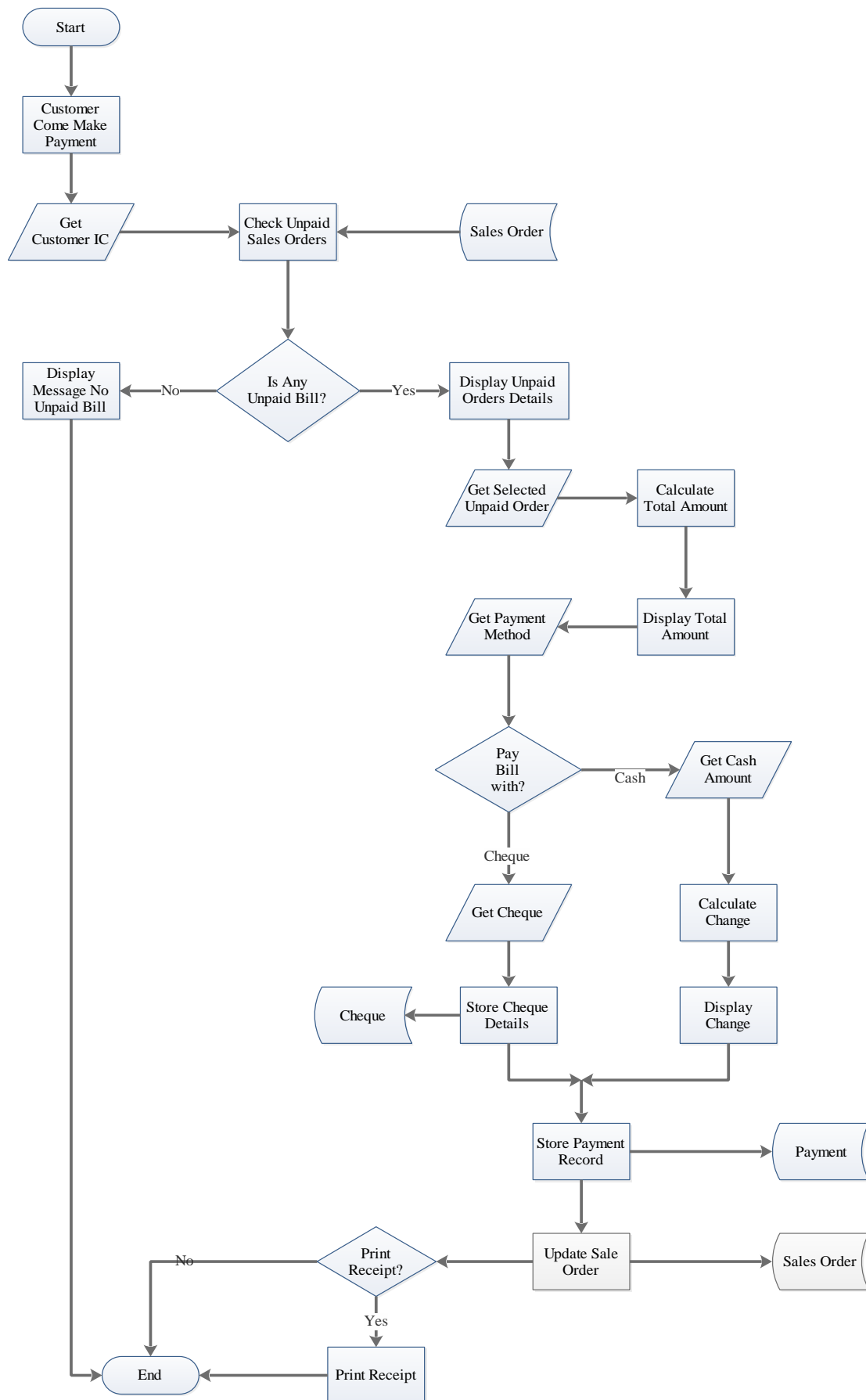
4.7.3 Flow Chart Diagram of Customer Module



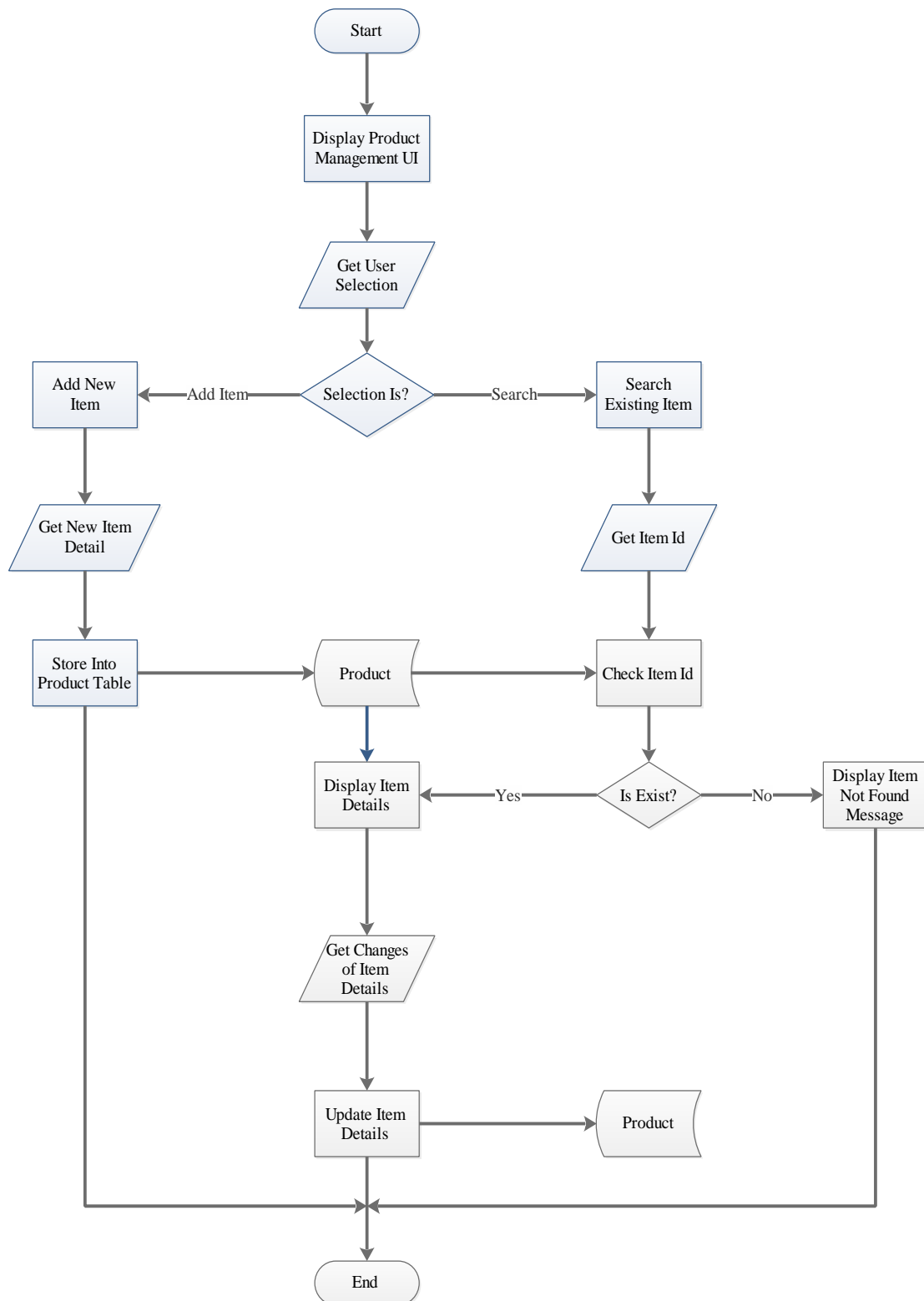
4.7.4 Flow Chart Diagram of Shipment Outward



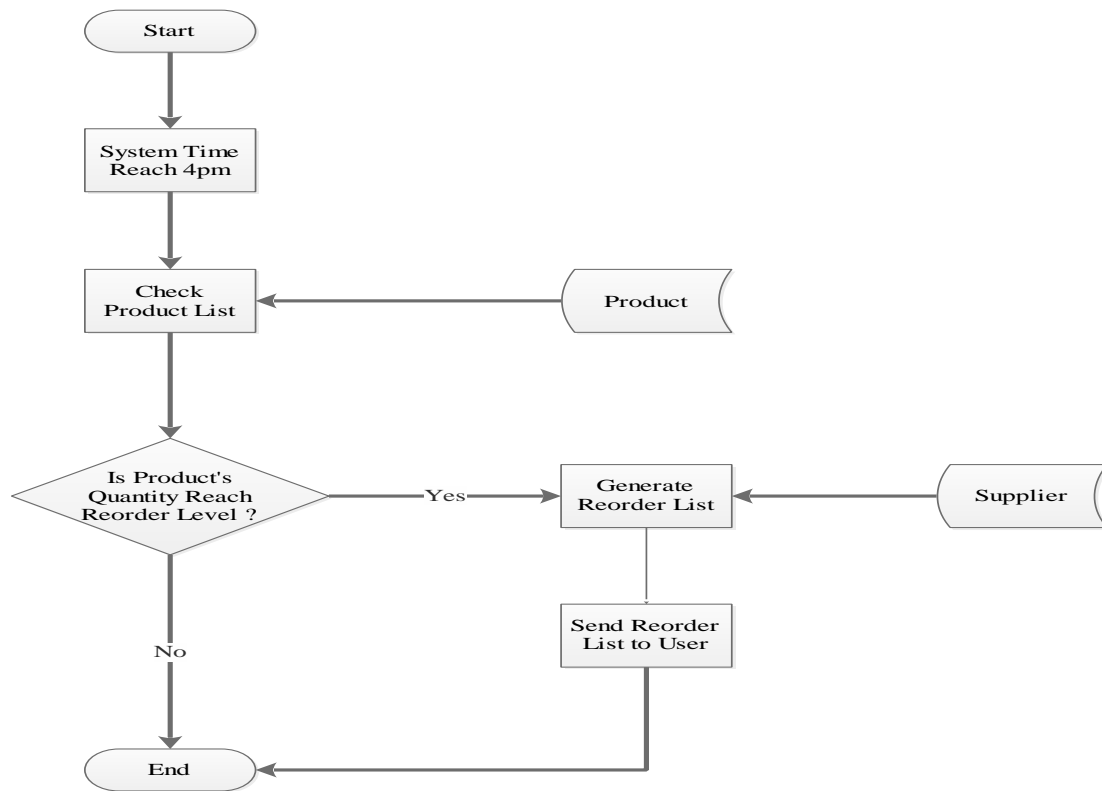
4.7.5 Flow Chart Diagram for Payment Module



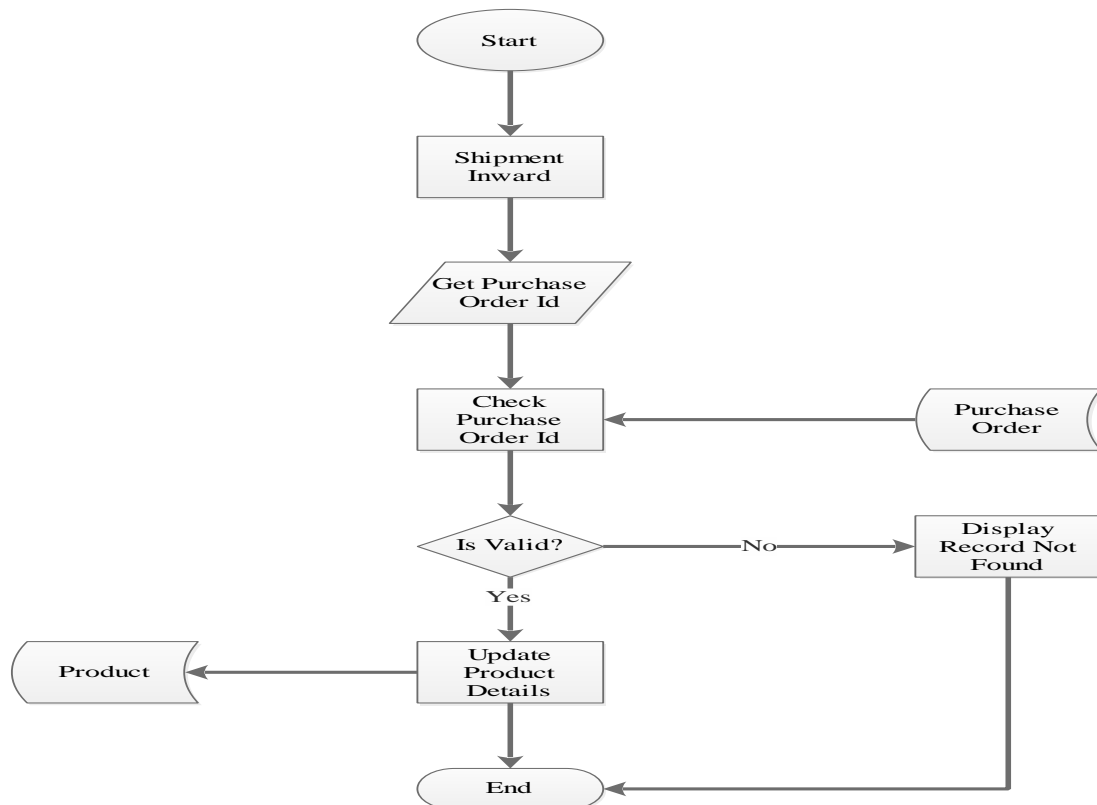
4.7.6 Flow Chart for Product Management



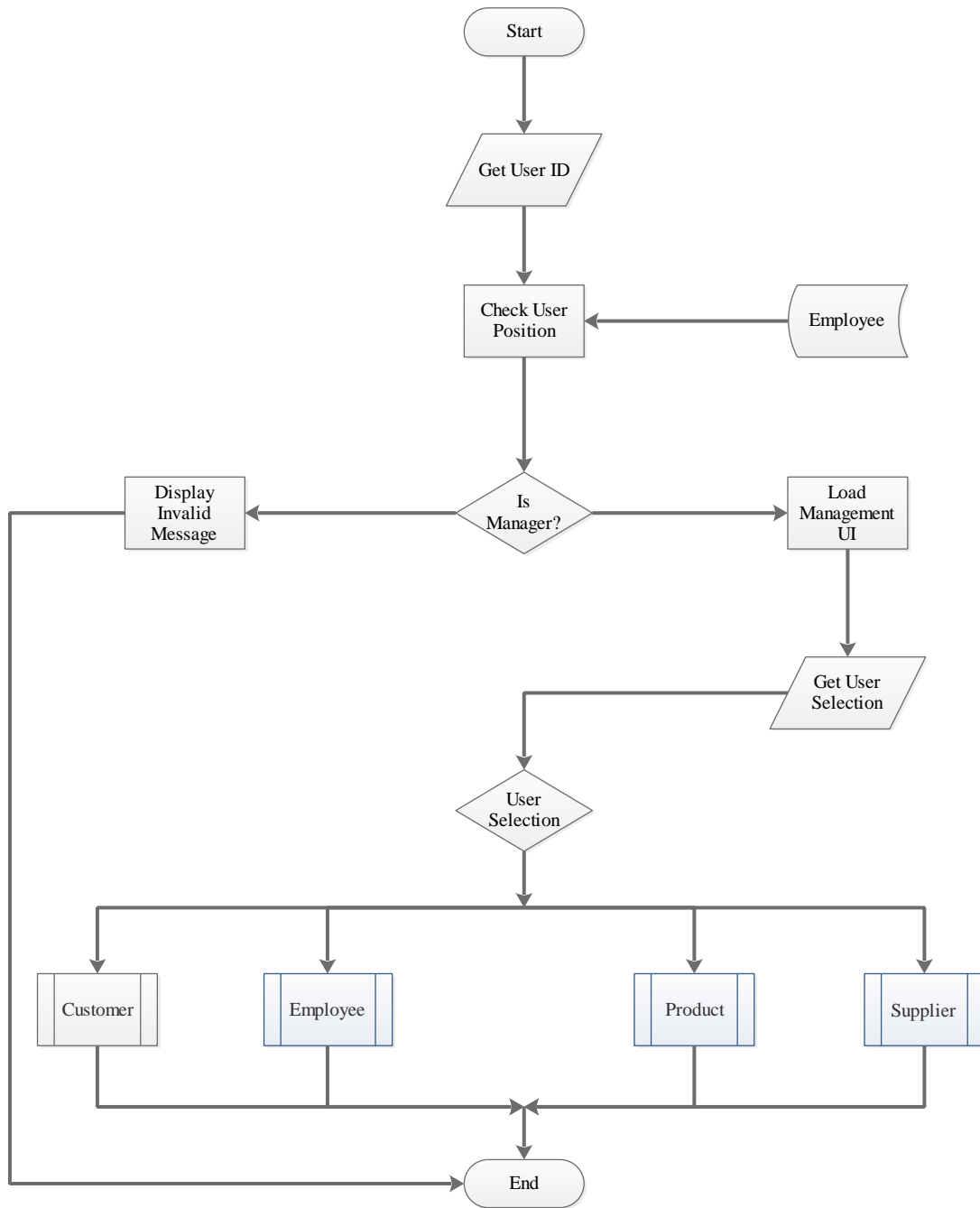
4.7.7 Flow Chart for Generate Reorder List



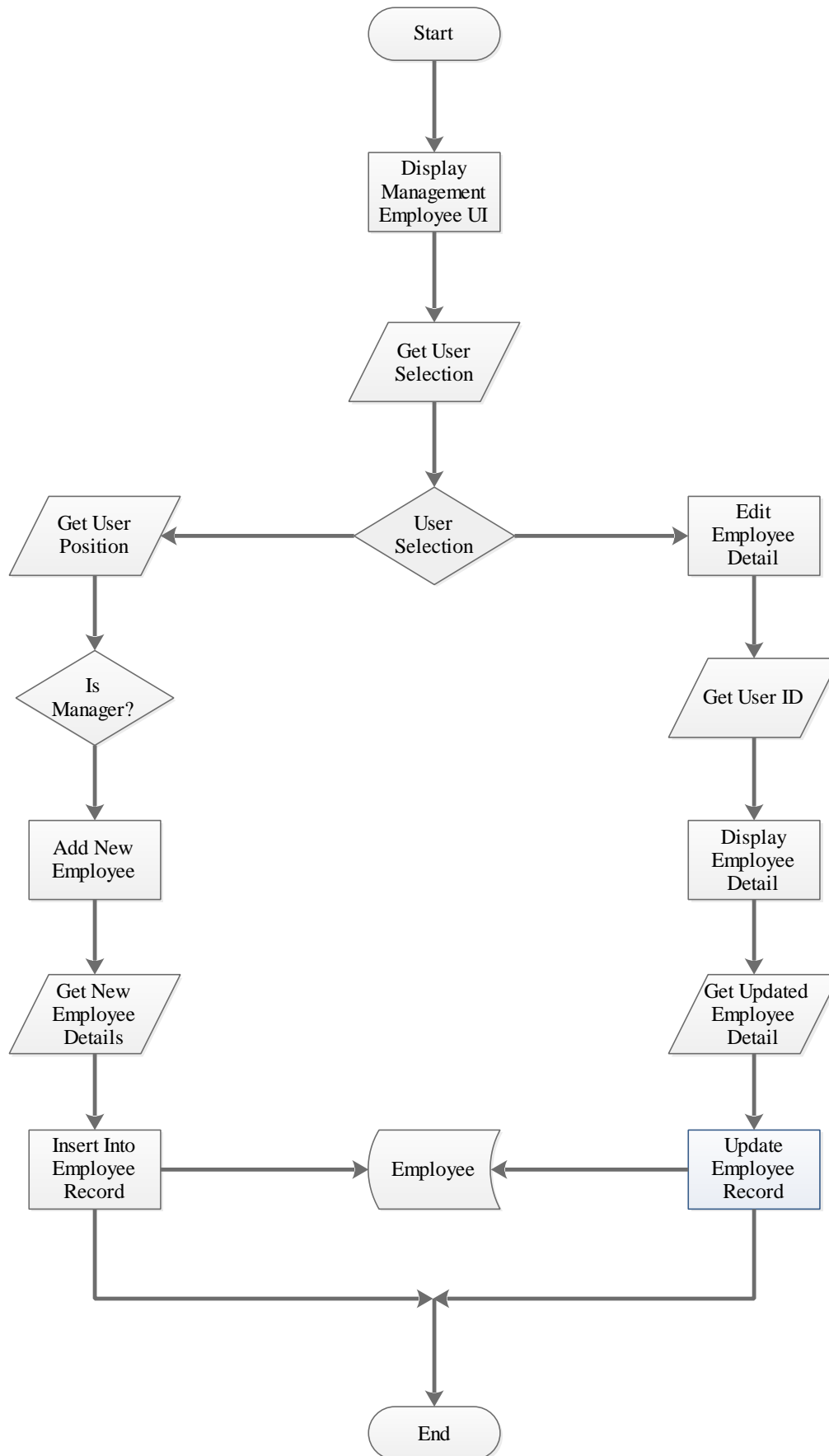
4.7.8 Flow Chart for Shipment Inward



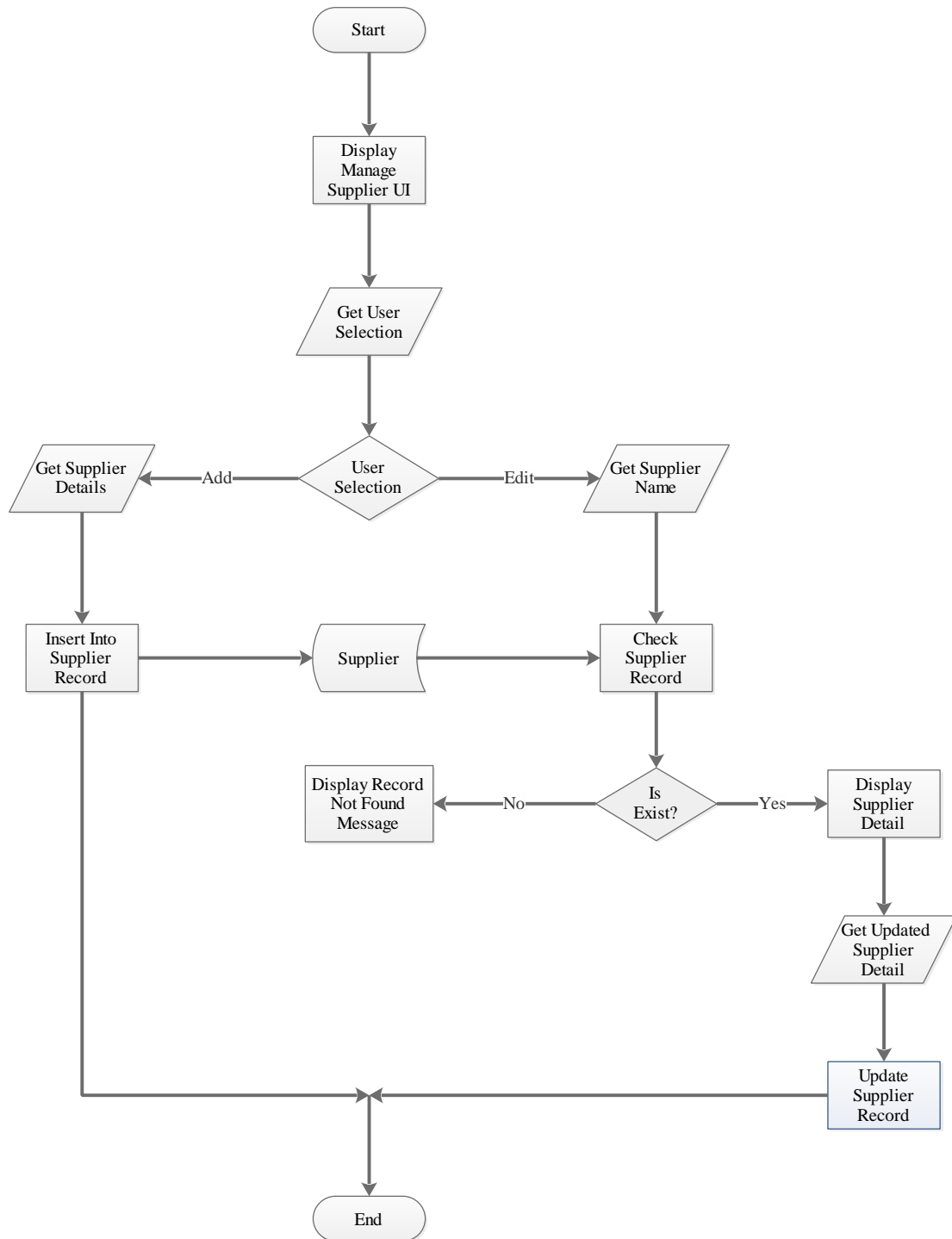
4.7.9 Flow Chart for Management Module



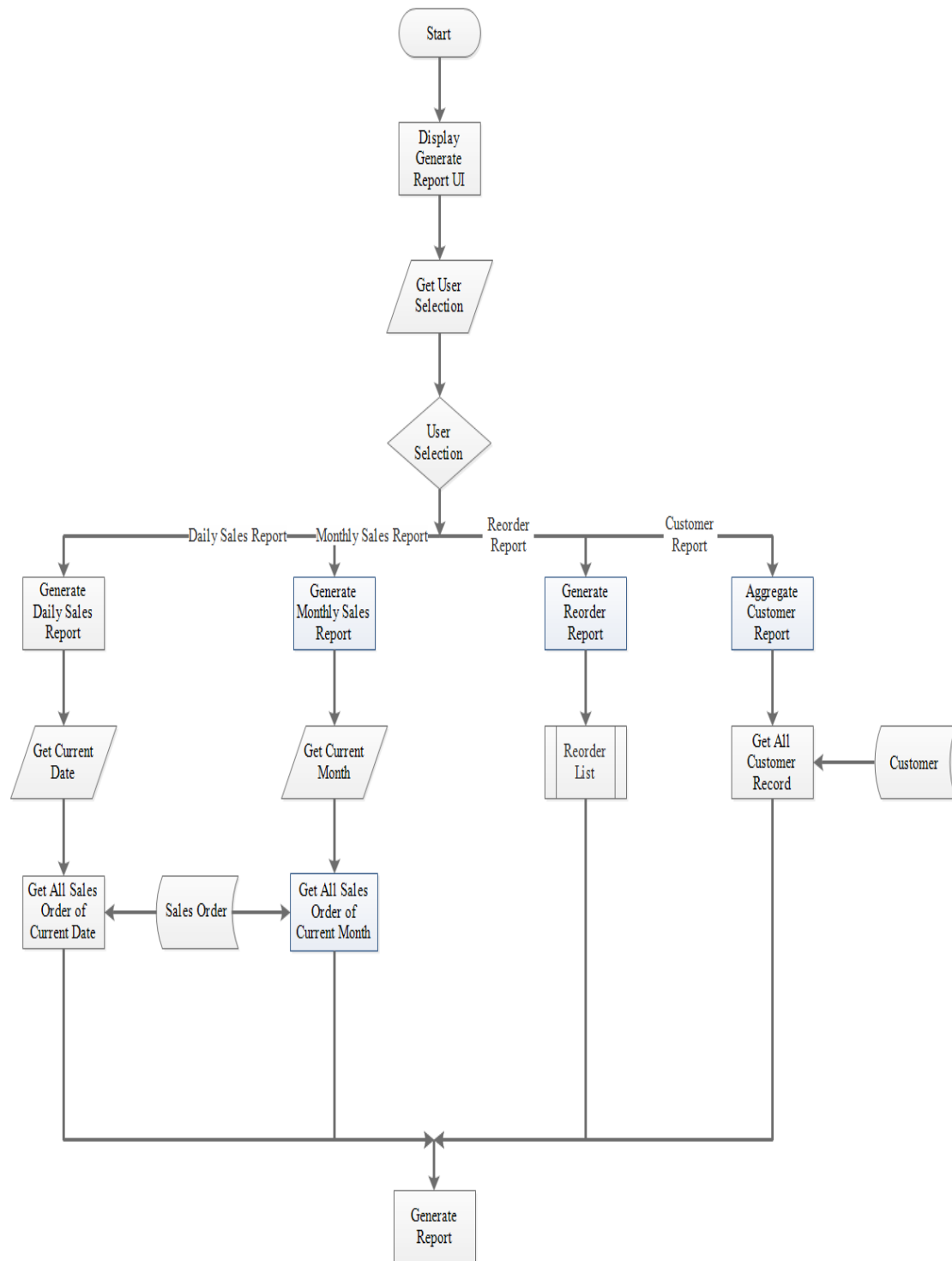
4.7.10 Flow Chart for Employee Module



4.7.11 Flow Chart for Supplier Module



4.7.12 Flow Chart for Report Generation Module



CHAPTER 5 SYSTEM IMPLEMENTATION AND INSTALLATION

Once everything is done, the system will reach on the implementation and installation stage. All of the tools that need by the system will be prepared and double check before implement the system in order to make sure everything is well-prepared. The developed system will be implemented to the machine and once complete, this stage will be considered complete. The specific server must be installed to the machine in order to make the system work properly.

5.1 System Implementation

The Java has been used as a main language in this project. The system will be developed in full Java based since it has a lot of library and solution existed in the Internet which allows developer to easily find those solutions. The Netbeans IDE is chosen to develop the system. Since Netbeans IDE provide the “drag and drop” features which fasten the process of designing the interface. Because of this, it helps the developer to reduce the time and more focus on the function code. Other than that, Java allow the interface and the function to be done in different Java files which makes the code look clean and easy to understand by everyone. Other than that, Netbeans IDE can integrate with the software called iReport which the developer can use it to generate the specific report that related to the system and it is a freeware which will not causes the developer to spend any money. Next, the MySQL is used in this project in which the MySQL database is well-known and famous to use among the software developer. It is also friendly user which the developer can easily understand the software. All of the data dictionary that created in early stage will be converted and implement into the MySQL database. All of the validation and data types will be set at the database since MySQL provided such features to the developer. When everything needed is ready to be use by the developer, system development will be started by the developer by using those related tools. All permission will be set at the database to control permission for every different role. The coding for GUI and function will be starting to develop by the developer. Once all the require pages is completed, the validation and the permission will be set nicely to control the authentication and authorization issues. Lastly, the report features will also work properly based on the data in the database.

5.2 System Installation

Since the main software that used to develop the system was the Netbeans IDE, most of the features and function will be test and deploy under this software. Everything that had complete will be test during the development. Since the system is not yet integrated, user will only run the system through the Netbeans IDE. It is very convenient since the Netbeans IDE itself providing the build applications features in which it allow user to build and run the specific page and test it. It shows the page with the GUI and functions which is same with the final system. Because of this, it allows developer to have an image about how the final system looks like soon.

Next, the iReport will only be used for the report generation part. It is easier to use and there are several report template that prepared for the developer to use. The developer can choose either design the report view by themselves or just using the provided templates. The specific library files are needed to integrate with the Netbeans IDE. Lastly, MySQL is installed for the purpose of managing the database in which the data will be stored inside the MySQL database for the usage of the system.

5.2.1 Netbeans IDE Requirements

✓ Hardware Requirements

Description	Minimum Requirements
Processor	800MHz Intel Pentium 3 or equivalent
Memory	512MB
Hard Drive	750MB of free disk space

Table 5.2.1.1: Hardware Requirements for Netbeans IDE

✓ Software Requirements

Windows	Architecture
Windows XP Professional SP3	32 bits (x86)
	64 bits (x64)
Windows Vista SP1	32 bits (x86)
	64 bits (x64)
Windows 7 Professional	32 bits (x86)
	64 bits (x64)

Table 5.2.1.2: Software Requirements for Netbeans IDE

5.2.2 iReport Requirements

✓ Hardware Requirements

Description	Minimum Requirements
Processor	2 core minimum
Memory	4GB
Hard Drive	10 GB free

Table 5.2.2.1: Hardware Requirements for iReport

✓ Software Requirements

Windows	Architecture
Windows XP	32 bits (x86)
	64 bits (x64)
Windows Vista	32 bits (x86)
	64 bits (x64)
Windows 7	32 bits (x86)
	64 bits (x64)
Windows 8	32 bits (x86)
	64 bits (x64)

Table 5.2.2.2: Software Requirements for iReport

5.2.3 MySQL Requirements

✓ Hardware Requirements

Description	Minimum Requirements
Processor	2 CPU cores
Memory	2GB
Hard Drive	500MB free

Table 5.2.3.1: Hardware Requirements for MySQL

✓ Software Requirements

Windows	Architecture
Windows XP	32 bits (x86)
	64 bits (x64)
Windows Vista	32 bits (x86)
	64 bits (x64)
Windows 7	32 bits (x86)
	64 bits (x64)
Windows 8	32 bits (x86)
	64 bits (x64)

Table 5.2.3.2: Software Requirements for MySQL

CHAPTER 6 SYSTEM TESTING

After everything is done, the system will reach on system testing. The system that was developed will need to install on the related devices for the testing purpose. Once everything is prepared, the system testing will perform by different roles of users. There are four types of testing which includes unit testing, integration testing, system testing, and acceptance testing. The testing that performed is to find the error or bug as many as possible in order to find a solution and fix it. Every testing is normally done by the developer before it reached to the system testing. Developer itself will be the tester of the system and the user will only have chance to test it while reach to the system testing.

6.1 Unit Testing

Unit testing is a testing that tests a part of the system that has not yet been integrated. This testing normally will test on the part of system one by one. It is because unit testing will allow developer to more easily to find out the error since finding the error through unit part of system will more easier than finding in complete system. However, unit testing only allow developer to test on some parts only which mean the unit testing will have its own limitation. In this part of testing, the developer will only test on the validation and the correctness of data value. Every part of the system will be test by the input value by inserting the valid, invalid, and so on to ensure every process will get the expected result. Thus, it ensure the system and database are work in correct way.

Unit Testing 1: Login as system user

Testing Objective: To ensure every user can login into system correctly.

No	Event	Attribute and Value	Expected Result	Result
1	Verify valid value inserted by user and matching the data in database after user click on "Login" button.	Login ID: user1 Password: password1	Successfully log in to the expected page.	Pass

2	Verify invalid value inserted by user and matching the data in database after user click on “Login” button.	Login ID: user12 Password: wrongpass	Login failed and prompted out the expected messages.	Pass
3	Verify null value inserted by user and matching the data in database after user click on “Login” button.	Login ID: null Password: null	Login failed and prompted out the expected messages.	Pass

Table 6.1.1: Unit Testing 1 – Login as system user

Unit Testing 2: Register new customer information into system

Testing Objective: To ensure customer page is working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Create new customer personal details.	Customer information.	Prompt successful message, customer detail successfully store into database.	Pass
2	Create new customer details without entering at least one field.	Customer information with blank field.	Prompt error messages.	Pass
3	Verify duplicate customer to ensure no same record stored in the database.	Duplicate customer information.	Prompt error messages.	Pass
4	Search inserted customer details.	Search through table that provided in the pages.	Successfully retrieve selected customer details.	Pass
5	Update existing customer details.	Edit and replace customer current details. Eg. Name: Yap Ah Loy to Name: Loy Ah Yap	Successfully updated customer details into system.	Pass

Table 6.1.2: Unit Testing 2 – Register new customer information into system

Unit Testing 3: Register new supplier information into system

Testing Objective: To ensure supplier page is working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Create new supplier personal details.	Supplier information.	Prompt successful message, supplier detail successfully store into database.	Pass
2	Create new supplier details without entering at least one field.	Supplier information with blank field.	Prompt error messages.	Pass
3	Verify duplicate supplier to ensure no same record stored in the database.	Duplicate supplier information.	Prompt error messages.	Pass
4	Search inserted supplier details.	Search through table that provided in the pages.	Successfully retrieve selected supplier details.	Pass
5	Update existing supplier details.	Edit and replace supplier current details. Eg. Name: Jonniohohoh to Name: Hohohojonnioh	Successfully updated supplier details into system.	Pass

Table 6.1.3: Unit Testing 3 – Register new supplier information into system

Unit Testing 4: Creating new sales order

Testing Objective: To ensure sales order page is working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Create new sales order details.	Sales order information.	Prompt successful message, sales order detail successfully store into database.	Pass
2	Create new sales order details without entering at least one field.	Sales order information with blank field.	Prompt error messages.	Pass
3	Verify duplicate sales order to ensure no same record stored in the database.	Duplicate sales order information.	Prompt error messages.	Pass
4	Search inserted sales details.	Search through table that provided in the pages.	Successfully retrieve selected sales details.	Pass

5	Update existing sales order details.	Edit and replace sales order current details. Eg. Product Quantity: 5 to Product Quantity: 6	Successfully updated sales order details into system.	Pass
---	--------------------------------------	---	---	------

Table 6.1.4: Unit Testing 4 – Creating new sales order

Unit Testing 5: Creating new purchase order

Testing Objective: To ensure purchase order page is working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Create new purchase order details.	Purchase order information.	Prompt successful message, purchase order detail successfully store into database.	Pass
2	Create new purchase order details without entering at least one field.	Purchase order information with blank field.	Prompt error messages.	Pass
3	Verify duplicate purchase order to ensure no same record stored in the database.	Duplicate purchase information.	Prompt error messages.	Pass
4	Search inserted purchase details.	Search through table that provided in the pages.	Successfully retrieve selected purchase details.	Pass
5	Update existing purchase order details.	Edit and replace purchase order current details. Eg. Product Quantity: 5 to Product Quantity: 6	Successfully updated purchase order details into system.	Pass

Table 6.1.5: Unit Testing 5 – Creating new purchase order

Unit Testing 6: Creating new product information

Testing Objective: To ensure product page is working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Create new product details.	Product information.	Prompt successful message, product detail successfully store into database.	Pass

2	Create new product details without entering at least one field.	Product information with blank field.	Prompt error messages.	Pass
3	Verify duplicate product to ensure no same record stored in the database.	Duplicate product information.	Prompt error messages.	Pass
4	Search inserted product details.	Search through table that provided in the pages.	Successfully retrieve selected product details.	Pass
5	Update existing product details.	Edit and replace product current details. Eg. Description: Poison to Description: Toxic	Successfully updated product details into system.	Pass

Table 6.1.6: Unit Testing 6 – Creating new product information

Unit Testing 7: Payment for each sales order

Testing Objective: To ensure payment make by customer store and working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Verify sales order record belong to which customer and calculate the debt.	Customer information and sales order record information.	Prompt successful message, successfully retrieve specific customer sales order details.	Pass
2	Verify the amount of the debt.	Check data for the total amount.	Prompt expected message, successfully retrieve total amount of debt.	Pass
3	Verify the calculation of the system is correct.	Total Debt: RM 1000 Payment Make: RM500 Total Debt Left: RM500	Prompt successfully messages, store data into database.	Pass
4	Verify the date of the debt for every sales order with specific customer.	Date: 12/12/2007 Status: Expired	Prompt expected message.	Pass

Table 6.1.7: Unit Testing 7 – Payment for each sales order

Unit Testing 8: Creating new vehicles information

Testing Objective: To ensure vehicle page is working properly.

No	Event	Attribute and Value	Expected Result	Result
1	Create new vehicle details.	Vehicle information.	Prompt successful message, vehicle detail successfully store into database.	Pass
2	Create new vehicle details without entering at least one field.	Vehicle information with blank field.	Prompt error messages.	Pass
3	Verify duplicate vehicle to ensure no same record stored in the database.	Duplicate vehicle information.	Prompt error messages.	Pass
4	Search inserted vehicle details.	Search through table that provided in the pages.	Successfully retrieve selected vehicle details.	Pass
5	Update existing vehicle details.	Edit and replace product current details. Eg. Road tax Expired Date: 30/2/2015 to Road tax Expired Date: 31/3/2016	Successfully updated product details into system.	Pass

Table 6.1.8: Unit Testing 8 – Creating new product information

6.2 Functional Testing

It will come to functional testing after everything is done at unit testing. The functionality testing is almost same with the unit testing. It also tests the system in individual part. In this part of testing, the developer will test on the functionality of the system. Every part of the system will be test by the input value by inserting the valid, invalid, and so on to ensure every process will get the expected result. Thus, it ensure the system and database are work in correct way.

Functional Testing 1: Login using different roles

Testing Objective: To ensure different roles will have different features and function which already set based on their permission.

No	Event	Attribute and Value	Expected Result	Result
1	Login as “Normal Staff”	Normal Staff Login Information.	Prompt successful message, successfully login. Redirect to normal staff page.	Pass
2	Login as “Manager”	Manager Login Information.	Prompt successful message, successfully login. Redirect to manager page.	Pass
3	Login as “Boss”	Boss Login Information.	Prompt successful message, successfully login. Redirect to boss page.	Pass

Table 6.2.1: Functional Testing 1 – Login using different roles

Functional Testing 2: Customer sales order debt

Testing Objective: To ensure every customer debt is controlled.

No	Event	Attribute and Value	Expected Result	Result
1	Check customer debt.	Search by customer id.	Prompt successful message, successfully retrieve data.	Pass

2	Check customer debt period.	ID: King Kong Status: Active Debt Expired Date: 30/3/2055	Customer is able to continue buy stock as the limit for the debt is not yet reached.	Pass
3	Check customer debt period.	ID: King Kong Status: Expired Debt Expired Date: 30/3/2000	Customer is unable to continue buy stock as the limit for the debt is reached. Debt must be pay instantly.	Pass

Table 6.2.2: Functional Testing 2 – Customer sales order debt

Functional Testing 3: Company purchase order debt

Testing Objective: To ensure every company debt must be clear before time expired.

No	Event	Attribute and Value	Expected Result	Result
1	Check purchase order debt.	Search by purchase order id.	Prompt successful message, successfully retrieve data.	Pass
2	Check purchase order debt period.	Company ID: 123 Company Name: King Status: Debt Total: RM1 Debt Expired Date: 30/3/2055	Company is able to continue buy stock from others company as the limit time for the debt is not yet reached.	Pass
3	Check purchase order debt period.	Company ID: 123 Company Name: Kong Status: Expired Debt Total: RM1000000 Debt Expired Date: 30/3/2000	Company is unable to continue buy stock as the limit for the debt is reached. Debt must be pay instantly.	Pass

Table 6.2.3: Functional Testing 3 – Company purchase order debt

Functional Testing 4: Vehicle delivery order

Testing Objective: To ensure every vehicle is use properly.

No	Event	Attribute and Value	Expected Result	Result
1	Check vehicle status.	Vehicle ID: AJX1111 Status: Available	Prompt successful message, successfully retrieve data.	Pass
2	Check vehicle status.	Vehicle ID: AJX1112 Status: Not Available From: 12/12/2015 10am To:13/12/2015 8.25pm	Prompt successful message, successfully retrieve data.	Pass
3	Choose Vehicle for specific sales order to perform delivery.	Sales Order ID: SO111 Vehicle ID: AJB12 From: 15/12/2015 10am To:15/12/2015 8.25pm	All available vehicles are display using drop down list.	Pass
4	Assign specific vehicle to deliver specific delivery order.	-	Successfully assign vehicle for the specific delivery.	Pass

Table 6.2.4: Functional Testing 4 – Vehicle delivery order

Functional Testing 5: Print report

Testing Objective: To ensure every report is generate properly.

No	Event	Attribute and Value	Expected Result	Result
1	Login as Boss.	Boss Login ID and password.	Prompt successful login message, successfully retrieve data.	Pass
2	Generate report by click on the “Generate” button in report page.	Select the specific type report to be generated out.	All available report is display using drop down list.	Pass
3	Report generated and waiting for print out command.	Click on the button to print report.	Printed out expected report.	Pass

Table 6.2.5: Functional Testing 5 – Print report

Functional Testing 6: Make payment

Testing Objective: To ensure every payment is make properly.

No	Event	Attribute and Value	Expected Result	Result
1	Check customer account.	Customer ID: 12345	Prompt successful message, successfully retrieve data.	Pass
2	Check purchasing or order record.	Navigate to the record page.	Prompt successful message, successfully retrieve data.	Pass
3	Insert number to make calculation and record down the payment make by customer.	Debt: RM10000 Payment: RM3000 Total Debt: RM7000 Status: Active	All record is store into database as updated information.	Pass

Table 6.2.6: Functional Testing 6 – Make payment

Functional Testing 7: Product quantity checking

Testing Objective: To ensure every product quantity is available properly.

No	Event	Attribute and Value	Expected Result	Result
1	Check customer account.	Customer ID: 12345	Prompt successful message, successfully retrieve data.	Pass
2	Check purchasing or order record.	Navigate to the record page.	Prompt successful message, successfully retrieve data.	Pass
3	Insert number to make calculation and record down the payment make by customer.	Debt: RM10000 Payment: RM3000 Total Debt: RM7000 Status: Active	All record is store into database as updated information.	Pass

Table 6.2.7: Functional Testing 7 – Product quantity checking

6.3 Integration Testing

It will come to integration testing after everything is done at unit testing and functional testing. The integration testing is slightly different from the previous testing. In this part of testing, the developer will test on the system which is already integrated. Thus, it ensure the system and database are work in correct way. It is very important since the system may work nicely at the previous testing, but after the integration, it may occurs error in which all of the part will going to work together. Because of this, this part may need several testers to find out the existing error. Everything that had done in the previous testing will be repeated in this testing to ensure everything work fine after a big integration work had done by the developer. However, the errors might not be fully fixed and it still needs a final user to identify the error incoming future. It is because the final user is the one who use the system frequently and they will be the one who easy to recognized the errors. By letting the final users to discover the errors, the developer can wait for the feedback. Once the error is detected, then the developer will start to review the error and find a solution to fix it. Anyway, the final user will only tested the final system in system testing which means that the user will test the system while using it.

6.4 System Testing

System testing is the final testing which the tester will be the final user. The system will be maintained if the final user has encountered an error while using the system. Because of this, everything that related to the graphical user interface (GUI) will not be able to make changes anymore. However, the technical error will be fixed as soon as possible when the final user has encountered the error. The system will be tested on different hardware to ensure it work fine at different machine. The system testing is almost similar with the integration testing. Because of this, there is not much need to do at this part for the developer. The differences between the integration testing and system testing are the integration testing is tested by developer while the system testing is tested by the final user. If there is no errors detected by the final user while using the system for the long period, the job of developer is consider complete and the system will be a complete final system.

CHAPTER 7 CONCLUSION

CHAPTER 7 CONCLUSION

In this era, the computerized inventory control management system has become a common system that able to help the wholesalers to have a better management on their business. Without the computerized inventory control management system, there will be a lot of paper work is required to be done and longer time is needed to perform a simple task. However, in Malaysia still have some wholesale company unwilling to change to use the computerized inventory control management system and keep on using the old system. One of the problems that may face for who are using the old system is about the difficulty in finding the documents. The person who is finding the document may different to who is storing that document. Even is the same person, he/she also may forget where the document stored since there is a lot of files and other documentation are stored together.

Regardless, most of the traditional businessman having the mindset that the computerized inventory control management system is difficult to use and it required certain professional skill only able to handle the system since the graphic user interface of existing system is complicated. In additional, they also deem that the differences between the old system with the computerized is unlikely and transform from old system to new system will needed a lot of money. Therefore, in order to solve the problems, the proposed inventory control management system is developed with more user-friendly graphic interface that enables the user easily familiar with it and providing the features that included in other inventory control management system and with other extra feature. In short, the proposed inventory control management system is able to help the wholesale company to have better management as well as easier and more efficiency on data storing.

However, due to the limitation of times, the part for the mobile technologies is unable to complete in this project. Although the desktop based application is finished on time, but there is insufficient in complete the mobile based application. As a result, the time for doing the FYP2 is not enough for the student to do the system in two different programming languages. By the way, it will be no problems if the system is using a single programming language to develop. Last but not least, it is good if there are the others student who try to do the system in mobile based in the coming future.

REFERENCES

References

- SDLC Software Prototype Model:[Online].Available at:
http://www.tutorialspoint.com/sdlc/sdlc_software_prototyping.htm Accessed on 1st June 2014, 12.40pm.
- SDLC, Software Development Life Cycle:[Online].Available at:
<http://www.slideshare.net/swamy1431/sdlc-process-document> Accessed on 30th June 2014, 11.20am.
- Incremental Prototyping:[Online].Available at: http://www.sqa.org.uk/e-learning/IMAuthoring01CD/page_09.htm Accessed on 8th June 2014, 10.20am.
- *AFIS (Automated Fingerprint ID System) & Passport Tracking*. (2012). Retrieved from Cen Metrix System Integrators: [Online]. Available at
<http://www.cenmetrix.lk/afis-passport-tracking>. Accessed on 1st July 2014, 11.20pm.
- Anthony, I. I. (2007). *Design and Implementation of an Automated Inventory Control System For Nigerian Breweries*. [Online]. Available at
http://pubs.caritasuni.edu.ng/download.php?file=projects/2011-2012%20Projects/Computer%20Engineering/DESIGN_AND_IMPLEMENTATION_OF_AN_AUTOMATED_INVENTORY_CONTROL_SYSTEM_FOR_NIGERIAN_BREWERIES_PLC_ENUGU.pdf. Accessed on 2nd June 2014, 7.30pm.
- Arina Ramlee, D. H. (2006, 4 4). *Inventory Management System*. Retrieved 4 2, 2014. [Oline]. Available at
<http://courses.cs.washington.edu/courses/cse403/06sp/lco/chhayb/LCO.doc>. Accessed on 29th May 2014, 11.27am.
- Moses, K. R. (2011). *Automated Fingerprint Identification System*. Retrieved from National Criminal Justice Reference Service: [Online] Available at:
<https://www.ncjrs.gov/pdffiles1/nij/225326.pdf>. Accessed on 7th June 2014, 9.33pm.
- Wong, H. (2001). *FileApproach*. [Online] Available at
<http://www.cs.cityu.edu.hk/~helena/cs34622000B/FileApproach.pdf>. Accessed on 4th June 2014, 10.03pm.
- Creamer. N (2005) *Inventory Technology*. [Online] Available at
<http://www.lbmjournal.com/article/36>. Accessed on 27th June 2014, 7.27pm.

REFERENCES

- Sparrow. P (2011) *Prototype Model: Advantages and Disadvantages*. [Online] Available at <http://www.ianswer4u.com/2011/11/prototype-model-advantages-and.html#axzz2ylZWmmtF>. Accessed on 25th June 2014, 8.20pm.
- Bill C. H... (2007) *Does RFID Reduce Out of Stocks? A Preliminary Analysis*. [Online] Available at <http://rfid.uark.edu/papers/ITRI-WP058-1105.pdf>. Accessed on 6th July 2014, 7.30pm.
- Thomas. P (2012) *Inventory Management System*. [Online] Available at <http://dcag.com/images/INVENT01.pdf>. Accessed on 29th March 2015, 1.23pm.
- Copyright (2010) Oracle Retail Store Inventory Management. [Online] Available at <http://www.oracle.com/us/products/applications/047105.pdf>. Accessed on 29th March 2015, 2.45pm.

APPENDICES

FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: 1 , 3	Study week no.: 2
Student Name & ID: Ng Hock Li 1300545	
Supervisor: Mr. Chee Chin Hoong	
Project Title: Inventory Control System For Wholesale Business	

1. WORK DONE

Done review on the previous preliminary report and final year report 1. Start to state out the part that needs an improvement and plan a schedule.

2. WORK TO BE DONE

Review previous final year project 1 and make improvement on the previous work. Start work on FYP2 Chapter 1: Introduction.

3. PROBLEMS ENCOUNTERED

Found that the content in the final year project 1 report are not done well. Need to redo a lot of work to make improvement.

4. SELF EVALUATION OF THE PROGRESS

Plan a schedule for myself to make sure everything is finish on time. Try best to reduce grammar error and use simple for easy read and understand. The work is finished on time as planned.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: 1, 3	Study week no.: 4
Student Name & ID: Ng Hock Li 1300545	
Supervisor: Mr. Chee Chin Hoong	
Project Title: Inventory Control System For Wholesale Business	

1. WORK DONE

Weekly meet with my supervisor, Mr. Chee Chin Hoong. We have conduct the discussion. The normal discussion regarding FYP1 during the meeting. Finished Chapter 1: Introduction.

2. WORK TO BE DONE

Get full explanation and guidelines from supervisor and start to work on remaining part by following the guidelines. Start to do benchmarking on existing system.

3. PROBLEMS ENCOUNTERED

Hard to make appointment with supervisor since the class schedule almost crashes with the supervisor free time. Internet connection weak at hometown and slow down the progress of work.

4. SELF EVALUATION OF THE PROGRESS

Work very hard on study and research the existing system. Find out and mark down all the strength and weaknesses of current system to make sure it is useful for my system.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT*(Project I / Project II)*

Trimester, Year: 1, 3	Study week no.: 6
Student Name & ID: Ng Hock Li 1300545	
Supervisor: Mr. Chee Chin Hoong	
Project Title: Inventory Control System For Wholesale Business	

1. WORK DONE

Finished most of the document part. Interview is conducted to specific company. Read back others taken subject to revise how to draw the diagram.

2. WORK TO BE DONE

Start to work on system design. Start to draw the relevant diagram. Complete Gantt Chart.

3. PROBLEMS ENCOUNTERED

Submission date is near and there is a lot of thing need to be completed. Consume time on planning how the system works. Feel like not enough time to complete Android based program. Due to CNY holiday, a lot of things need to be done.

4. SELF EVALUATION OF THE PROGRESS

Do research and learn very hard on the programming language. Searching study material for long time through the Google, Youtube, etc.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT*(Project I / Project II)*

Trimester, Year: 1, 3	Study week no.: 11
Student Name & ID: Ng Hock Li 1300545	
Supervisor: Mr. Chee Chin Hoong	
Project Title: Inventory Control System For Wholesale Business	

1. WORK DONE

Finished all of the documentation part. Prepared to meet Mr. Chee Chin Hoong for submission on next week.

2. WORK TO BE DONE

Summarize whole project, do a conclusion. Arrange the the report. Sectioning the report according to FYP guideline. Submit project proposal for plagiarism checking. Print 2 set of project report. Submit to the supervisor with two set of project report with softcopy. Do the last weekly report.

3. PROBLEMS ENCOUNTERED

No problem encountered in the documentation since the project had done. Time is limit for the coding parts.

4. SELF EVALUATION OF THE PROGRESS

Put in a lot of effort for final checking the content of the project documentation report to make sure no big mistake.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: 1, 3	Study week no.: 12
Student Name & ID: Ng Hock Li 1300545	
Supervisor: Mr. Chee Chin Hoong	
Project Title: Inventory Control System For Wholesale Business	

1. WORK DONE

Finished 80% of the coding parts.

2. WORK TO BE DONE

Almost complete the Java desktop based application.

3. PROBLEMS ENCOUNTERED

Time is limit for the coding parts. Have to abandon the Android based since not much time left. Need to have better time management on next time.

4. SELF EVALUATION OF THE PROGRESS

Put in a lot of effort for the coding parts. However, it is not enough time for one people to do the system with different programming language.

Supervisor's signature

Student's signature