SALES AND INVENTORY MANAGEMENT SYSTEM

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BUSINESS INFORMATION SYSTEM

UNIVERSITY TECHNOLOGY OF PETRONAS

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Sales and Inventory Management System

By

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Dissertation submitted in partial fulfillment of the requirements of the

Bachelor of Technology (Hons)

(Business Information System)

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CERTIFICATION OF APPROVAL

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University Technology of PETRONAS
in partial fulfillment of the requirements for the
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Approved by,

……………………….
(Dr. P. DhanapalDurai Dominic)

UNIVERSITY TECHNOLOGY OF PETRONAS
TRONOH, PERAK
September 2013

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements and that the original work contain herein have not been undertaken or done by unspecified sources or persons.

………………………….

(RAHMAT BEE BT. ABDUL ALEEM)

ABSTRACT

The retail business vision is to maximize profit from customer satisfaction and loyalty towards the store by providing more personalize service for the customer. However, retail business also easy to lose its possible customer if they do not have sufficient stocks in the store. Thus, in this paper, the developer had identified problem related with inventory that exists in a one of oldest retail store in Taman Majuknown as Rahmath Store. The major problem of the store is they do not have proper inventory control system in guiding and managing their sale and inventory level of the store.

By proposing Sale & Inventory Management System to the store as the replacement of old manual ways, the project aims in providing system with enhanced and more flexible functions to the store. The objective of the system is to provide functions in managing goods in the store more efficiently. In order to achieve the objectives derived, the scope of the project will focus on the aspects such as database, report generating, quality control (QA) and point of sale of the store. Besides, the development of system will be based on offline system or window based.

In developing the system, phase development prototype is chosen. This methodology wii perform the development stage in according to modules underlines in the scope of the project. Thus, version by version of the system will be developed before the whole complete system is ready to use. The expected result of the system is that the user interface to be developed will be user-friendly so that it can be handle easily by people with no IT background. Besides, the system is also expected to serve its functions and helps Rahmath Store in reducing time and paperwork in managing their inventory.

ACKNOWLEDGEMENTS

Firstly, I would like to thank God for giving me the chance to be able to engage in this project. With Him, all things are possible.

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CHAPTER 1

INTRODUCTION

1.1   PROJECT BACKGROUND

The retail industry is one of the industries that is growing in fast pace where the number of retail business keep on increasing from time to time in order to meet the demand from consumers of specified areas. There are different types of retail shops available for consumer to choose ranging from hypermarket to mini market according to their convenience. Most of the shops can be found in residential areas, streets, or in a shopping mall. Basically, retail store sells wide range of goods and services from wholesaler or supplier to the end-user. Thus, the nature of retail business required a good management of inventory level in order to meet the demand of the customers.

The traditional way retailer keeps their sales and inventory details is in spreadsheets which are not effective anymore when the size of the shop gets bigger. This is because more items will be made available in a larger quantity, thus tracking the sales made with inventory level in the shop would be complicated and time consuming for the retailer. Besides, the situation gets worst when the retailer does not have proper method to determine items purchased by their customers.

Thus, this project will provide solution for retailers that are still using traditional way in keeping their inventory data like 'Rahmath Store' in Taman Maju, Tronoh by creating inventory system.Sales and Inventory Management System is a computer- based system that provides the shop structure for maintaining and controlling goods to be stocked. The approach of Sales and Inventory Management System is commonly used to avoid product overstock or outrages by integrating daily 'Point of Sales' with store's inventory level.

1.2   PROBLEM STATEMENT

1.2.1   Problem Identification

Inventory is one of the important departments that must be well managed in order to ensure daily business activities run smoothly. However, Rahmath Store still does not realize the important of inventory management as they are not equipped with computerized system in running their business. As a result, the security level of all data, documents and anything that related to daily transaction and inventory is very low. A lot of documents have been keep for each goods and for each supplier which consume a lot time and not effective for future references. In addition, due to poor sales and inventory management, Rahmath Store also face problem in identifying the quantity sold for each items per day and available inventory level of the items. Existing inventory management also does not provide any means in detecting expired date for food based products such as milk, bread, flour and etc. Failure to identify the expired date of certain products causes the store to incur losses on those items.

As current system used just acts as calculated to calculate the total amount of each customer purchases and does not any database link with it, the system does not have the capability of generating report on point of sales at the end of the day. Thus, there is no proper guideline in making reports in the store's log book which result in different kind of reports being prepared each time. The simple report which is about the total sales of the dayis determined based on amount of money in the cashier deck does not provide any input for the owner to make the right decision regarding the business operation.In case of there is short of cash in the cashier desk or any stolen cases, the owner cannot detect it as the current system does not have database to store the total sales of the day.

Another identified problem is that the customers who made their purchases at the store usually do not receive proper receipt as references. Instead only receipt contains prices being generated by the system. Thus, customer face problem when they wanted to change the items bought due to damage, expired or wrongly purchase as the receipt does

not indicate the name of items which makes it hard for the customers to prove that they bought it within 3 days in Rahmath Store.

1.2.2   Significance of the project

This new system that will be developed will contain database that enable data storage and retrieving of each transactions and data about inventory of each items in the store, manage the product releases and storage and summarize point of sales. This would generate a faster improvisation of work with less time and effort. As the concept of Sales and Inventory Management System is to reduce paper works and ineffective ways of managing inventory, this system is expected to assist in making the right decision in the process of managing inventory aligned with the sales level in the store.

1.3   OBJECTIVES

As the available existing system provides limited functions to the user, thus this project will contain enhanced and more flexible functions to the store. The objectives include:

i.   To provide function to manage goods in the store more efficiently. Basic functions such as 'add', 'delete', and 'update' for data management will be made available.

ii.   Filling system in managing all transactions and documents that are relevant as the aid in the stock tracking routines.

iii.   To automatically generate weekly report on sales and inventory activities

iv.   To provide notifications on the goods' expiring date for clearance activity.

v.   To generate receipt with proper format for customer references

vi.   To provide point of sales for each day

vii.   To reduce time and cost to control and manage inventory

1.4   SCOPE OF STUDY

Within the boundary of this project, the system aims in having the following aspects:

- Database - has two parts in it, temporary transaction database and master database. The data in a master database will be updated according to the temporary database at the end of each day.
- Report- generates daily and weekly report to know the number of inventory in the products.
- Quality control (QA) - is to check the expired date of the products.
- Point of Sales- facilitate the transaction of each customer

The development of the system will be based on offline system or window based system which does not require any internet connection to operate it. In order to implement the system, the first thing is to collect information about the products and requirements from the owner to see the feasibility of developing the system for Rahmath store. Then the process of identifying the methodologies and tools to be used will takes place in the first half of the project. Together with that, the interface of the system also will be developed.

The second half of the project will be mainly on implementing and testing the system until it is completed. It is estimated to take around 8 months to complete this project.

1.5   RESEARCH LIMITATION

Due to time constraints, the project has the following limitations:

- Lack of new request status checking

The system does not provide any means in checking request for new products and this makes the requesting process incomplete where the user have to check it manually.

- Lack of decision support element

The system does not analyze the data in capture in the database such as provide the patterns of customer buying behavior to the user but just have the capacity of retrieving the data in the form of report.

1.6   THE RELEVANCY OF THE PROJECT

Sales and Inventory Management System is relevant to Rahmath Store as the store offers wide range of household products to the customers around Taman Maju areas. In fact, Rahmath Store is the oldest groceries store in the area of nine years operation and they also had opened up new branches to gather growing customers. However, until now they does not use any computerized system in helping them with sales and inventory control. That explains the needs of having systematic inventory control system.

Increased proper management of inventory and efficiency are the main target of system which will overcome the weakness of the current manual ways of doing business.

1.7   PROJECT FEASIBILITY WITHIN SCOPE & TIME FRAME

Time and scope are interrelated constrains in a project development. In development the system, the scope has been narrowed down to only inventory control through daily sales and this has given the developer enough time to conduct preliminary research and develop the project. Research will be conducted only regarding Rahmath Store sales & inventory system and within the time frame, it is believed that can be done.

Research also includes analysis on the literature review for the developer to understand subject domain in detail with realistic time frame. Besides, experienced gained in handling sales & inventory system from part-time job in retail store known as '100 Yen' is very helpful in understanding the scope. It is estimated that preliminary research will take roughly three months and system development will take about four months. Keeping the project focused and having clear framework are important in minimizing the failure risks of the project.

CHAPTER 2

LITERATURE REVIEW

2.1   SALES AND INVENTORY MANAGEMENT SYSTEM: HISTORY AND CONCEPTS

Each day, millions of people take part in countless sales transactions across the globe, creating a constant flow of value which forms the backbone of our economies. In general, sales mean a transaction that takes place between two parties where the buyer receives goods (tangible or intangible), service or assets in exchange for money. Thus, the process requires each party to give up something in return for something valuable for them. On the other hand, inventory means the raw materials, work-in-process goods and finished goods that are considered to be the portion of a business's assets that are ready for sales. This explains that, business needs inventory available to make sales to the customer in return for money which will generate the profits.

There are two kinds of problem that are faced by business in managing inventory level which are high inventory and low inventory. Holding a high level of inventory for long periods of time is not usually good for a business due to costs incur for inventory storage, obsolescence and spoilage. On the other hand, low level of inventory is not good either as the business may face the risk of losing potential sales and potential market share as well. In an attempt of resolving inventory problems, the solution lies on efficient inventory management.

Tim Crosby (2012) in his study on 'How Inventory Management Systems Work' stated that inventory management system are the rule in knowing which products are selling and which are taking up shelf space for enterprises as well as smaller businesses and vendors. The system balance the goal of ensuring customers always have enough of what they want against a retailer's financial need to maintain as little stock as possible (Tim Zierden,2009). Thus, the ability to track sales and available inventory, communicate with

suppliers in near real-time and receive and incorporate other data such as seasonal demand must available in the modern inventory management systems .

According to Anton Dolinsky(2010) on his article about 'Barcodes, sales and inventory control' stated that in the earliest days of inventory keeping, in order to forecast future needs, the merchants wrote down purchases or looked down at how many units were gone at the end of the day. However, this practice seems to be difficult to carry out after the Industrial Revolution as the mass production became the main goals of business together with improving customer experiences at the point of sale. In the early 1930s, a team from Harvard University designed the first modern check-out system that used punch cards that corresponded with catalog items. In 1960s, the emerged of affordable laser technology development brought hope in reviving the concept. Then modern bar code or Universal Product Code (UPC) was born and caught on just before the 1970s. As a result, the power of UPC codes to help track and manage inventory improved exponentially when the computing power became better at the same time.

As the technology development advance, another new technology for inventory tracking has made its way into stores, warehouses and factories in recent years (Edward A. Silver, 2007). Radio frequency identification (RFID) uses a microchip to transmit product information to a scanner or other data collective device. Thus, the constant 'beep, beep,beep' of bar codes being scanned at the check-out lane represents the modern inventory management systems of stock tracking.

2.2 ASSESSING THE BENEFITS OF THE BARCODE TECHNOLOGY

Among data capture technologies that have been widely used in almost every industry is the bar code system as stated by EvrenSahin& Yves Dallery (2010), in their research paper on 'The Impact of the use of Bar Code Technology on Supply Chain Operations'. The grocery industry for example was able to realize the hard and soft savings of 2.67% and 2.89% respectively of the revenue by leveraging the barcode industry. Reduce the data capture errors, the capture of timely data for inventory control, an enhanced communication between buyers and sellers and the improvement of customer service are the typical goals in using the barcode system. Besides, the system allows businesses to monitor operations, manage resource and also to flag anomalies before they impact throughput by acting as the major source of real-time feedback.

How supply chains can benefits from barcode applications have been studied several times. One of the researches includes the qualitative research that explains the concept of the bar code technology and develops conceptual methods in an effort to better understand it. Based on case studies carry out in distribution and manufacturing companies, barcode system play an important role in enhancing inventory management performance. Results that shown by the studies are less capital tied up in inventory, enhanced inventory control, enhanced customer service and empowered employees. The integration of inventory and marketing information system using barcode technology is an enabler for effective supply chain.

From the studies, it is proven that Rahmath Store should leverage on the technology in order to gains from the benefits. By using barcode technology, Rahmath Store will be able to control its store inventory in more manageable manner and increase the customer satisfaction by anticipating to the demand faster.

2.3 ADVANTAGES OF SALES AND INVENTORY MANAGEMENT SYSTEM

As the advantages of switching to modern inventory control system clearly proven by many businesses, it is the time for Rahmath Store to start implementing it in their store to see the differences will be brought to the store. In Donald Reimer (2008) in his study with the title of 'Computerization is the key in maintaining proper inventory levels' identified few benefits as follows:

- *Inventory management increases profitability*

Activities such as forecasting, controlling and managing inventory increase sales and productivity of the store resulting in greater profitability. Besides, accuracy improvements on the inventory level will result in reduction of fixing costly mistakes. Spend management also will be improved as the system provide quick access to current and historical pricing, cross-referenceable product codes and tools set for managing purchasing activities (Zipkin, P.H., 2000).

- *Inventory management improves cash flow*

Purchasing the correct inventory in the right amount to meet customer demand and at the same time eliminating slow-moving, obsolete inventory leads to better cash flow and eventually to higher profits.

- *Inventory management improves decision-making*

Real-time business intelligence across all areas of the store is possible with rapid, accurate data collection. Not only that, issues and events integrated with the system enables to proactively identify and solve the issues.

- *Inventory management increases customer satisfaction*

Anticipating in seasonal promotion and changing marketing conditions by having the right products in stock for customers.

2.4 POINT OF SALE (POS) CONCEPTS AND USAGE

Tim Bajarin (Jun, 2013) writes on his article '*Bringing the Checkout Counter to You*' that station or aisle where individuals transport and place products they have chosen to purchase from the location is a checkout counter or cashier stand. The typical process that occurs at checkout is that cashier scans and rings up each item on the cash register and obtains the total. The transactions at the checkout are process using POS system that the retail store adopts according to its needs. According to Kaplan, Karen in his article on Los Angeles Times entitle of "Do-It-Yourself Solution: Small Grocery Chain Has Big Plans for Its Retailing Software", stated that POS term is applicable for a retail shop or store, the checkout counter in the store where transactions between customer and store can occur.The term Point of Sale is often used in connection or relative with the hardware and software for checkouts POS systems are being utilized in many different industries since its technology merge ranging from restaurants, hotels & hospitality businesses, casinos, salons and as well as retail environments.

Currently, most of retail POS Systems were the most sophisticated, powerful and user friendly computer networks in commercial usage. Moreover, the POS systems carry out more than just POS tasks where POS solutions available that include fully integrated accounting, inventory tracking & management, open-to-buy forecasting, customer relation management (CRM), service management, rental services, operation reporting and payroll modules (Quorion,2011). POS software is as only good as its integration with the many different popular software and services nowadays. For example accounting programs, where all of the daily activities and transactions would automatically imported into accounting without any labor input.

CHAPTER 3

METHODOLOGY

3.1   RAPID APPLICATION DEVELOPMENT (RAD) METHODOLOGY

In developing the system, author chooses to use one of 'rapid application development (RAD)' – based methodology categories in ensuring smooth user and developer with different IT background. RAD- based methodology allows in adjusting the SDLC phases in getting some part of the system being developed quickly and into the hands of the users. In this way, the users can better understand the system and suggest revisions that bring the system closer to what is needed.
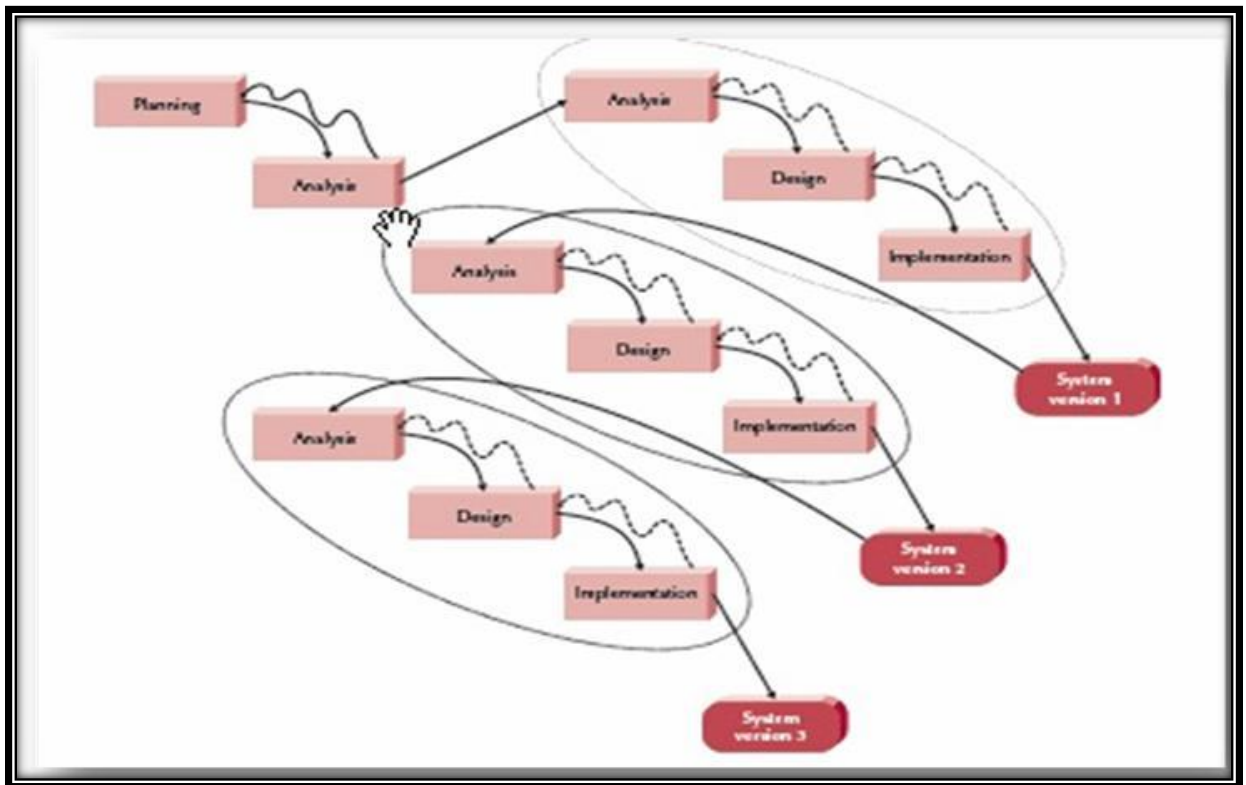
Source: *Taken from (Dennis, Wixom, & Roth, 2006, p. 14)*

Figure 1: Phased Development-based Methodology

As the system contains many module binds together to work as a complete application, phased development- based is the best methodology to anticipate this problem where it breaks an overall system into a series of versions, which are developed sequentially. Thus, system prototype will be developed based on one module after another. The analysis phase identified the overall system concept then categorizes the requirements into a series of versions. Besides, visibility of layout in window based application is one of critical part. This allow author to identify navigation and usability problems when developing one of the modules before spending a lot of time developing the entire system completely. Once version 1 is implemented, work begins on version 2. Additional analysis is performed based on the previously identified requirements and combined new ideas and issues that arose from the user's experiences with version 1.

The advantage of phased development- based methodologies of quickly getting a useful system into the hands of users provides business value sooner to the user. Moreover, because users begin to work with the system sooner, they are more likely to identify important additional requirements sooner. These are some of the reasons why the author chooses this methodology for development process.

3.2 PROJECT PHASES

There are basically four phases in the project activities which compriseof:

i. *Planning:*
- The problem faced by chosen shop is identified and the solution is proposed
- The objectives and scope of project are defined clearly
- The project activities are planned according to the time frame

ii. *Analysis:*
- Data is gathered and analysis on literature are done
- Interview session with Rahmath Store are conducted for requirements collection purposes

iii. *Design:*
- Project model and prototype are designed
- UML diagrams are designed

iv. *Implementation:*
- Coding of project is initiated until the system is completed
- Testing is carried out to test the usability of the project
- Make it available for the user

3.3 DATA COLLECTION METHODS

In the first part of the project, research and gathering information play a role. Two research methods used in the project are:

i. *Interview* : conducting interviews with the owner of Rahmath Store to see whether the system is useful for them as well as gathering information on the requirements of the system

ii. *Searching on the Internet*: basic information about existing Sales and Inventory System and how to develop inventory tracking system in general.

3.4   TOOLS, MECHANISMS AND SOFTWARE

In the second part of the project, tools that are used to develop the system are as follows:

i.   *Microsoft Visual Basic*

Microsoft Visual Basic is an integrated development environment (IDE) from Microsoft. It is used to develop console and graphical user interface applications in both native code and managed code for all platforms supported by Microsoft Windows, Windows Mobile, Window CE, .NET Framework, .NET Compact Framework and Microsoft Silverlight.

ii.   *Microsoft Access*

Microsoft Access also known as Microsoft Office Access is a database management system from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of application included in the Professional and higher editions. Microsoft Access is used to develop application software and supported by Visual Basic for Applications.

iii.   *Online Project Management (Smartsheet.com)*

iv.   *Diagram Tools (Draw.io)*

v.   *Microsoft Project Professional Office*
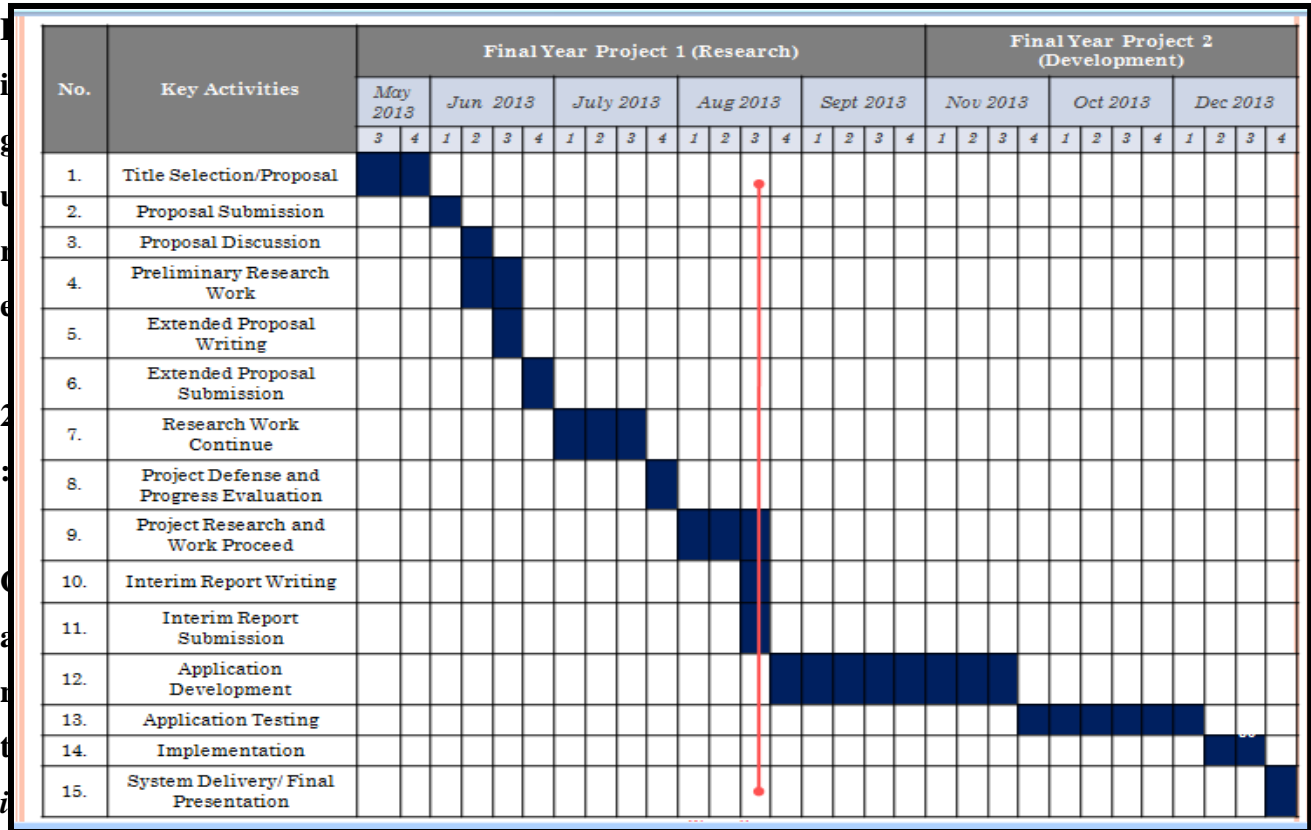
3.5   PROJECT DELIVERABLE

3.5.1 Gantt Chart

No.	Key Activities	Final Year Project 1 (Research)																		Final Year Project 2 (Development)											
		May 2013		Jun 2013				July 2013				Aug 2013				Sept 2013				Nov 2013				Oct 2013				Dec 2013			
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.	Title Selection/Proposal	■	■																												
2.	Proposal Submission			■																											
3.	Proposal Discussion				■																										
4.	Preliminary Research Work				■	■																									
5.	Extended Proposal Writing							■																							
6.	Extended Proposal Submission								■																						
7.	Research Work Continue									■	■																				
8.	Project Defense and Progress Evaluation											■																			
9.	Project Research and Work Proceed												■	■																	
10.	Interim Report Writing																														
11.	Interim Report Submission													■																	
12.	Application Development															■	■	■	■	■											
13.	Application Testing																							■	■	■	■				
14.	Implementation																											■	■		
15.	System Delivery/ Final Presentation																														■

Figure 2: Gantt chart of Project Main Activities

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3.5.2 Key Milestones

No.	Key Activities	Final Year Project 1 (Research)																					Final Year Project 2 (Development)										
		May 2013		Jun 2013				July 2013				Aug 2013				Sept 2013				Nov 2013				Oct 2013				Dec	
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
1.	Planning Phase	■	■	■	■	■																							
	Research on Preceding Studies			▓	▓																								
	Identify Problem & Propose Solution			▓																									
	Defined Scope & Objectives			▓	▓																								
	Plan for Project Activities					●																							
2.	Analysis Phase					■	■	■	■																				
	Analysis on Literature Reviews					▓	▓																						
	Prepare System Requirements						▓	▓																					
	Conduct Interview								●																				
	Analyzes System Requirements							▓	▓																				
	Analyzes User Needs from Interview							▓																					
3.	Design Phase								■	■	■	■																	
	Develop System Framework								▓																				
	Develop UML Diagrams									▓	▓																		
	Design User Interfaces										▓																		
	Familiarize with VB.Net Programming Language											▓																	
	Coding the User Interface											▓	▓																
4.	Implementation Phase													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Prototype Development												We are Here	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓				
	Usability Testing																							▓	▓	▓	▓		

Figure 3: Key Milestones on Project Activities

● : Project Key Milestones

3.6   PRELIMINARY STUDY

3.6.1   Interview and Observations

i.   *Background of Interview*

Interview and observation had been conducted on 18th July 2013 at Rahmath Store in Taman Maju. The interviewee is the owner of the Store who started the business nine years back named Mr. Mohd. Rahmath Bin Kadir. He has 20 years of experiences in doing retail business.

ii.   *Purpose of Interview*

- To uncover further problems regarding inventory management using manual ways
- To understand the current methods and approach being used in doing daily sales transaction by the staffs
- To identify the main features or functionalities to be integrated into the project prototype

iii.   *Summary of Interview Results*

- More than 50 types of goods range are available in the Rahmath Store. Most of it is from food based products, stationary, medicine, newspaper and many more.
- Due to wide range of products being offered to the customers, they are having difficulties in handing their inventory.
- The main problem in their store is that they do not have any means in detecting which products are moving out from the store. Thus, they have to check the inventory manually or sometimes customers will notice that some products are out of stock. This can cause loss for them as the possible customers could not get the products they want and make sale at the store.
- Besides, they also could not keep track on expiring date of food-products based as each products have different expire date. This also had cause the store to be stack up with expired products.

- They also do not issue receipt to customers but rather a simple calculation the total receipt. This means that they rely on the Rahmath price tag on the products as the proof if customers wish to exchange the products.
- Current transaction method used is basically a machine that store moneys and calculation the total sales of each customer.
- Even the machine do serve its purpose as calculator, however it fails to solve inventory problem of Rahmath Store
- The performances of the store is viewed in a very simple ways by ignoring other important aspects does not give them a clear vision in expanding the business further.
- They also do not use any computerized system because they scared to change their ways of doing business since long time ago. Besides, they also scared that their workers do not know how to handle and use the system.
- Needs from Rahmath Store are taken into consideration and for further analysis in solving the problem faced by the store.

3.7   PLANNING

An interview was conducted with Rahmath Store's owner about his opinion on need of Sales & Inventory Management System. The interview also hints about the proposed system of how they would respond if system is available.

3.7.1 System Request- Sales and Inventory Management System

- **Project Sponsor**

The person who initiates the project is the owner of Rahmath Store and the workers together with the owner serves as the primary point of contact for the project.

- **Business Need**

This project has been initiated to develop Sales and Inventory Management System to provide a better way of inventory control and tracking therefore store can manage the movement of goods more efficiently.

- **Business Requirement**

The system will be the first system used by Rahmath Store thus it will be made as offline system. The system provides enables the owner to keep track on the inventory level of each goods with presents of database. The functionalities that the system should have are as follows:
- ✓   User log in
- ✓   Admin log in
- ✓   Process sales
- ✓   Update inventory database based on POS
- ✓   Generate report on Sales
- ✓   Notification on low inventory level

- **Business Value**

Author expected that with this system, the users able to process customer transaction easily with minimal error or zero error. Furthermore it is going to be more efficient in managing inventory and sales data because all data in available in database.

- **Special Issues or Constraints**

Rahmath Store needs to familiarize in using the new system in their day to day business activities

3.7.2   Feasibility Analysis

i.   **Technical Feasibility**

Technical aspect is the most important part in the system development. As the system is offline based, visual basic will be used to develop the interface and the functions of the database. For the database aspect, Microsoft Access will be used which will link the system interface with the data storage.

The exposure gain in 'Business System Development' subject through course curriculum has given the author the credibility to develop the program as specified. Moreover, online tutorial on system development also vastly available on the internet which will helps author in development stage.

ii.   **Economical Feasibility**

Basic analysis has been done in investigating the economical feasibilities of the project. The financial analysis demonstrates that the new system will reveals a positive economic feasibility. In term of software designing and license, it can be found on open source in the Internet thus, owner does not need to purchase the software from the vendor.

New system will be requiring extra cost on the hardware implementation part. Looking at current situation of the store, the owner has to purchase a desktop to use the system and also bar code scanner to scan the barcode of the products.

In term of special staff training, the new system will not need any extra cost. Normally, newly develop system will need for special training for the user, however in this case the system the handling part is very easy and eliminate the need for training. Besides, a friendly interface makes staff work with less stress.

Even though initial cost of implementation is quite high, the owner will enjoy the benefits of switching to the new system in a long term in term of efficiency and effectiveness of business operation. Firstly, they can reduce the cost or the loss incur due to overstock of food based products that have expired date. Secondly, the system also reduces the risk of having products that out of stock in the store will eventually cause the customers to find the products in other store. Besides, customers satisfactions also expected to increase as the system will provide them with proper receipt for references upon implementation.

Turnover rate of each items reported by the system also helps the owner to make appropriate inventory level decision of the item precisely. Apart from all the benefits, costs related to manual works and documents required to maintain the inventory level will be reduce and eliminated gradually as all the data will be stored in the database.

iii.　　　　Operational Feasibility

The risk of familiarity with the application is medium because the users/staff never used to computerized system. Thus, there is a need for brief introduction on handing the system in order to implement the system. Besides, as most of the staffs in the store are not IT literate, the to-be system will be user-friendly and easy to operate.

Administrator:　The administrator will have easier access of inventory data and update it. He prints out daily and weekly statistical report to check on the store business performance.

The Staff: The to-be system will ensure the transaction handle by them will directly send to database. Thus, the staff will gain advantage upon the implementation of the system as this can reduce the human-error by calculating the transaction manually and compare it with the amount of money in the cashier and the inventory level available.

3.8   ANALYSIS

3.8.1 Non-Functional Requirements

- **Operational Requirements**

The system is required to be operated in the computer. Since Rahmath Store does not have one, they have to purchase in order to install the system. It has to be able to update database based on point of sale of each customers. Moreover, the system can generate daily, weekly and monthly report on sales performance.

- **Performance Requirements**

This system should not take more than 5 seconds to load information and it should not delay more than 2 seconds for user respond.

- **Security Requirements**

Not all staff can access the system apart from the staffs that are responsible in processing customers' sale at the cashier. The sales information is confidential and only accessible by the admin.

- **Cultural and Political Requirements**

No special cultural and political requirements are anticipated

3.8.2 Functional Requirements

- Log In
- Process sale

Allow user to scan items purchase by each customer. The system will display the description of the items and process the total sales and generate receipt for the customers.

- Tracking inventory level

Admin able to track the inventory level of each items in line with the sales made.

- Update database

Allow admin to update the inventory data in the database that will be used when processing sale.

- Generate report

Reports on daily, weekly and monthly sales of the store will be generating so that the owner can view the performance of the business and take appropriate actions

CHAPTER 4

RESULTS AND DISCUSSION

4.1   THE FRAMEWORK OF THE SYSTEM
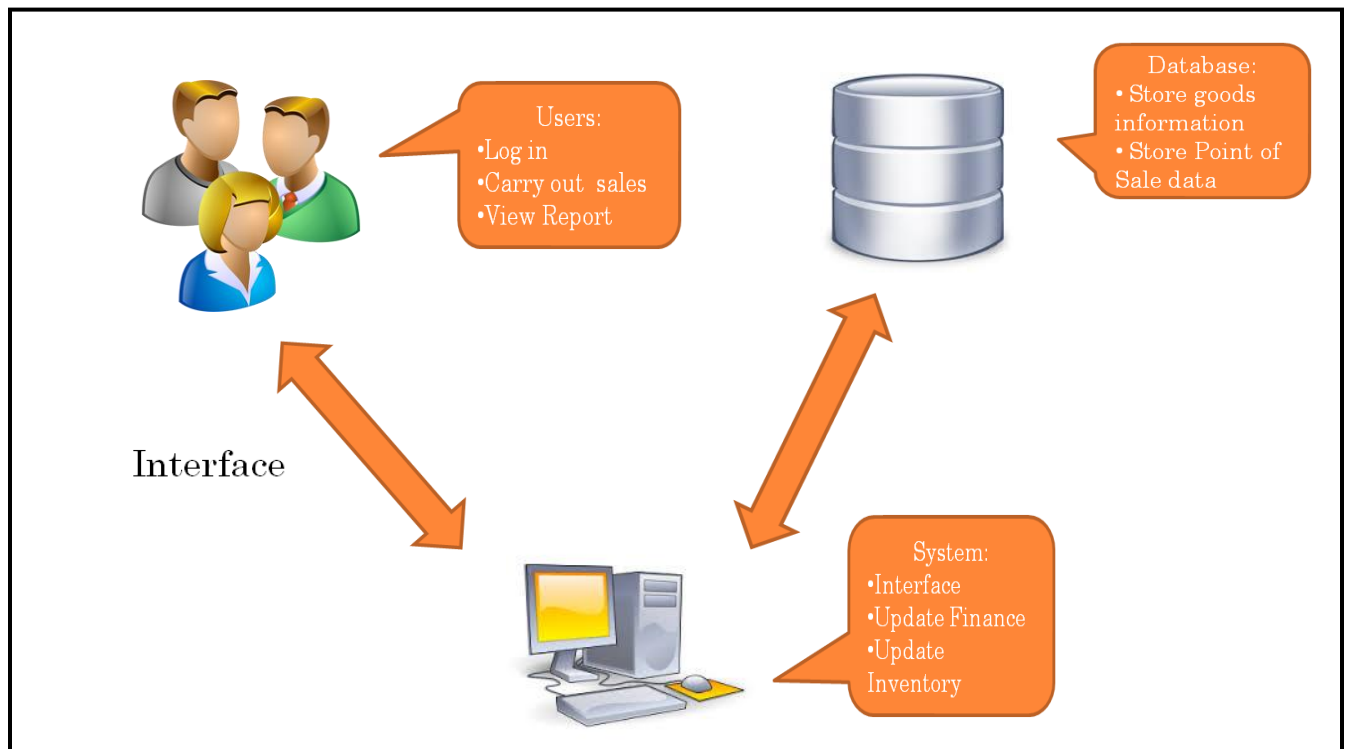
Figure 4: Framework of the system

The users here include:

- Administrators of the system who can log in and modify the information of goods
- Staff who are responsible for processing sale

The system will include:

- A user friendly interface
- A database: to store all the information

The users will interact with the system through an interface by giving inputs. The input then will then be processed by the system, giving the information needed by on the input given. The system also stores the processed information from the user in the database.

4.2   FUNCTIONAL MODEL
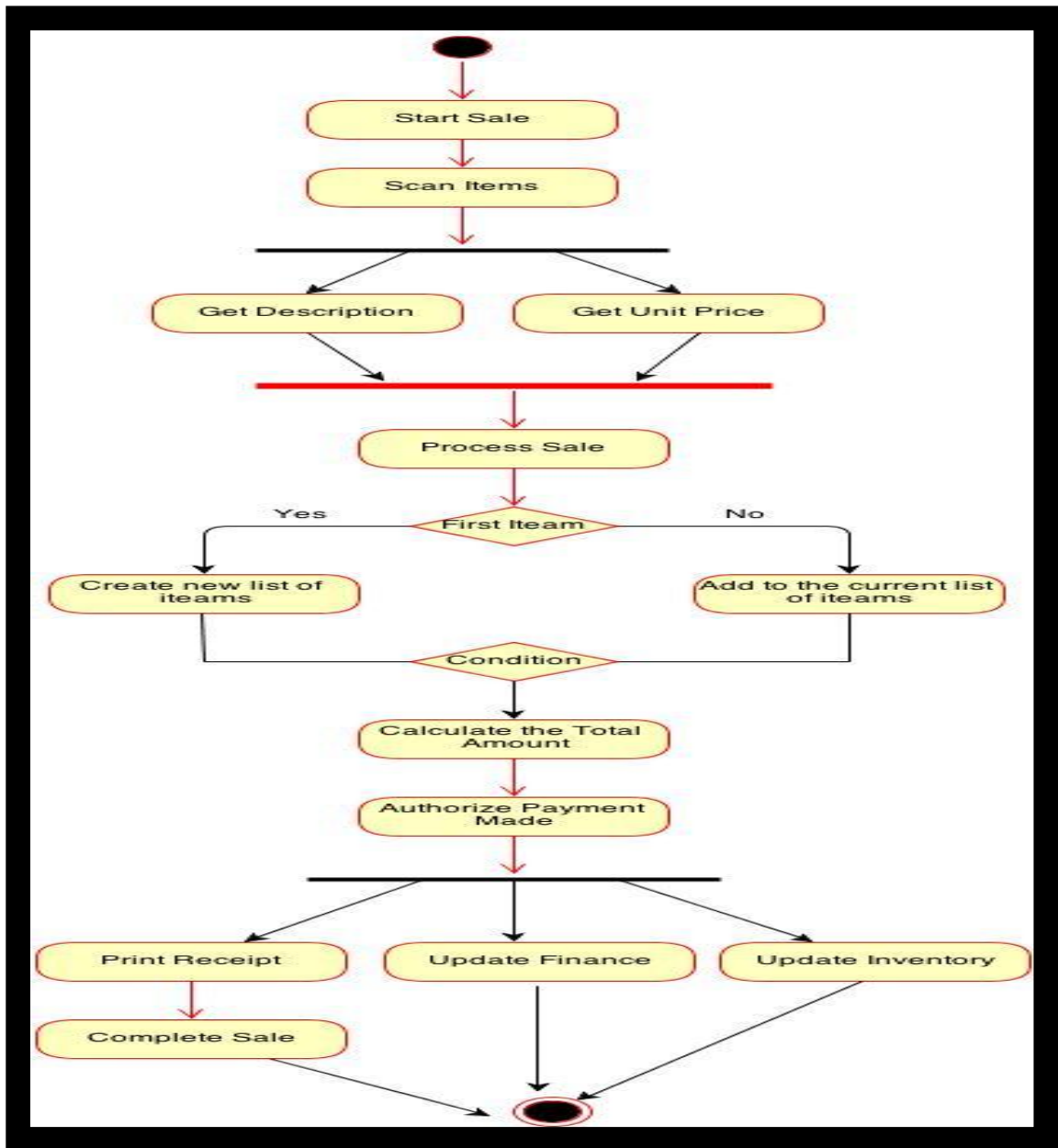
Figure 5: Activity Diagram of Point of Sale
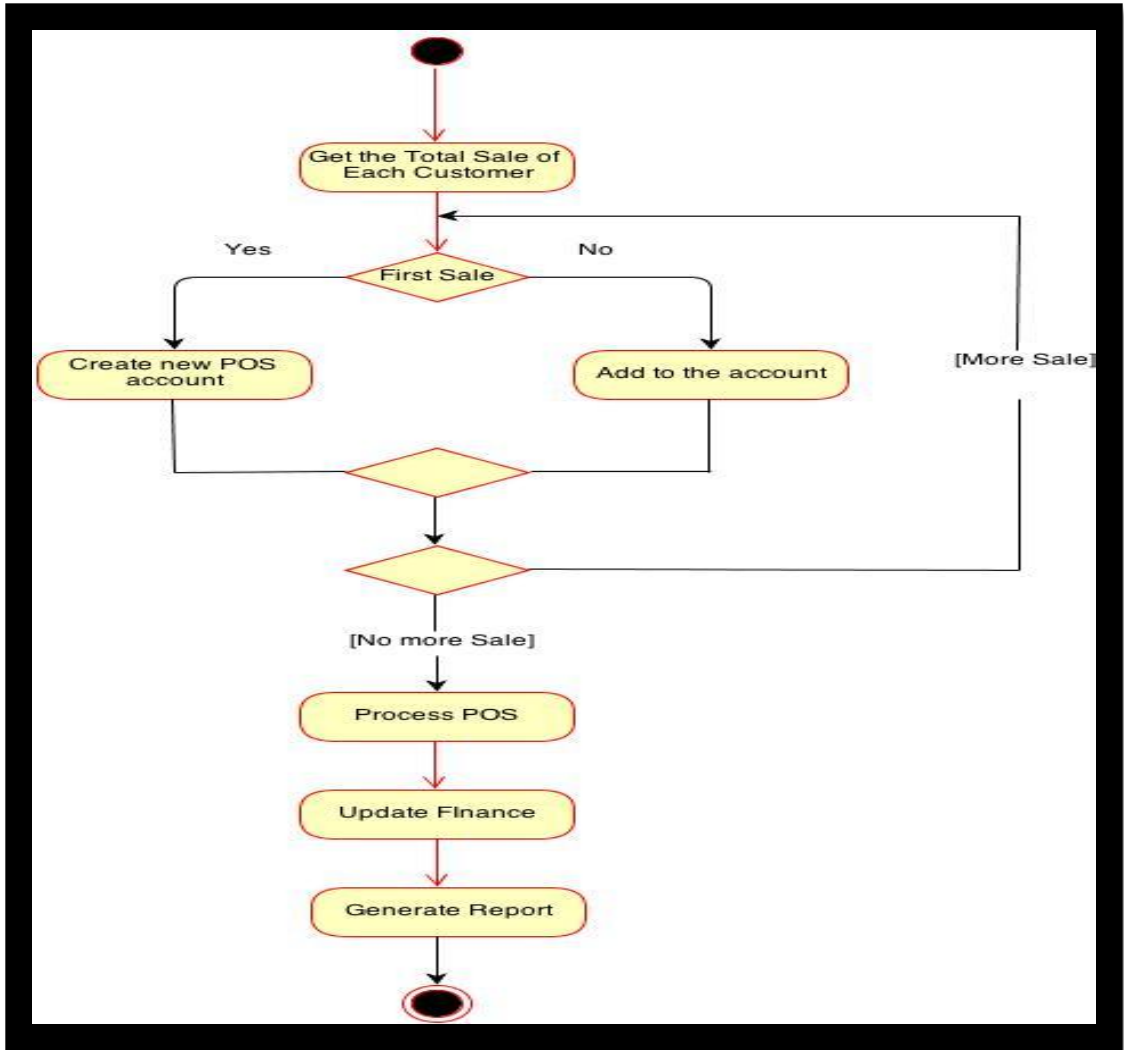
Figure 6: Activity Diagram of Finance Update
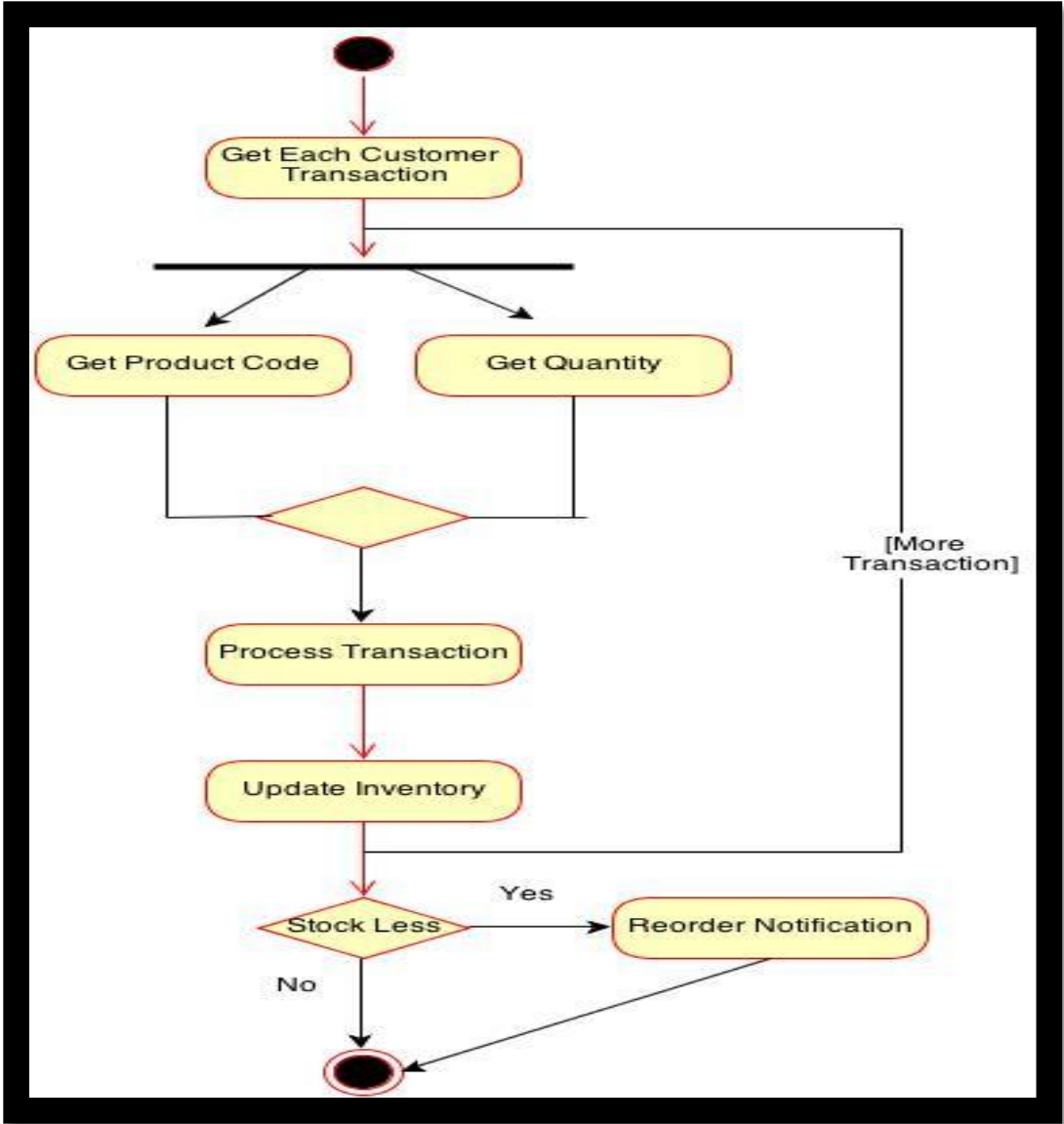
Figure 7: Activity Diagram of Inventory Update

Basically for proposed Sales & Inventory Management System have one main activity diagram as shown in Figure 5 and leads to another two activity generated from the main activities. The activity started with customer selects products and bring to cashier for payment to start the sale for that transaction. The user will process the sale by scanning the barcode of each items and system will retrieved the description and price of items and present it on the Point of Sale. List of items also will be created and subsequent items will be added into the list. Finally the total will be calculated by system and payment will be received from the customers.

When payment is made, the transaction receipt will be print and given to the customer. At the same time, another two activities will takes place upon the sales is done which is updating the inventory and updating the finance part. As shown in Figure 6 the finance part of the store is updated in the system by capturing the total sale made by each customer. The update will take part on temporary table on daily basis before update on main database at the end of day. On Figure 6, the inventory is being updated by capturing the details of each transaction from each customer. Notification will pop up if the stock level of the items is below the minimum level. This indicates end of activities that takes place on the system operation.

Sales & Inventory Management System
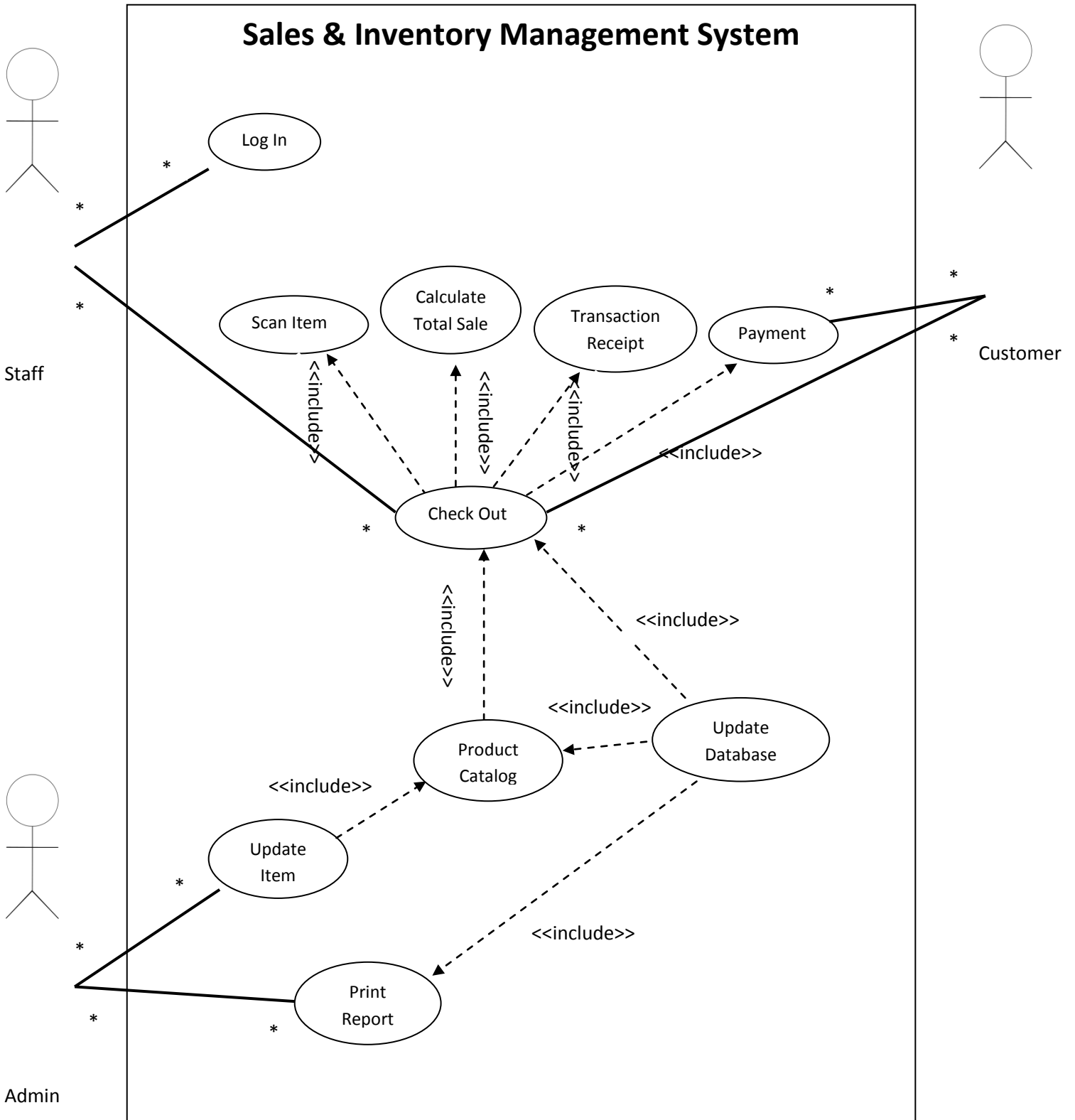
Figure 8: Use-Case Diagram of Sales & Inventory Management System

Figure 8 shows the use-case diagram which are graphical overview of the set of use cases contained in the system. The diagram illustrates the main functionality of a system and the actors that interact with the system. The diagram basically has three main actors which are the users, admin and customers that derive value from the system and the use case represent the functionality of the system. The functions that operate on the front end basically handle by the use and the back end or information adding is done by the admin. Customer present to support the function that links with user.

Figure 9 shows the Entity Relationship Diagram where its represent the database that will be developed for the system. Each class will capture and store information that will be used for the operation of Rahmath Store. Each class contains attribute that describe the properties and state of the object. Some of the class also contains actions or functions that the class can perform. The diagram also illustrates the relationship of one class with another class.
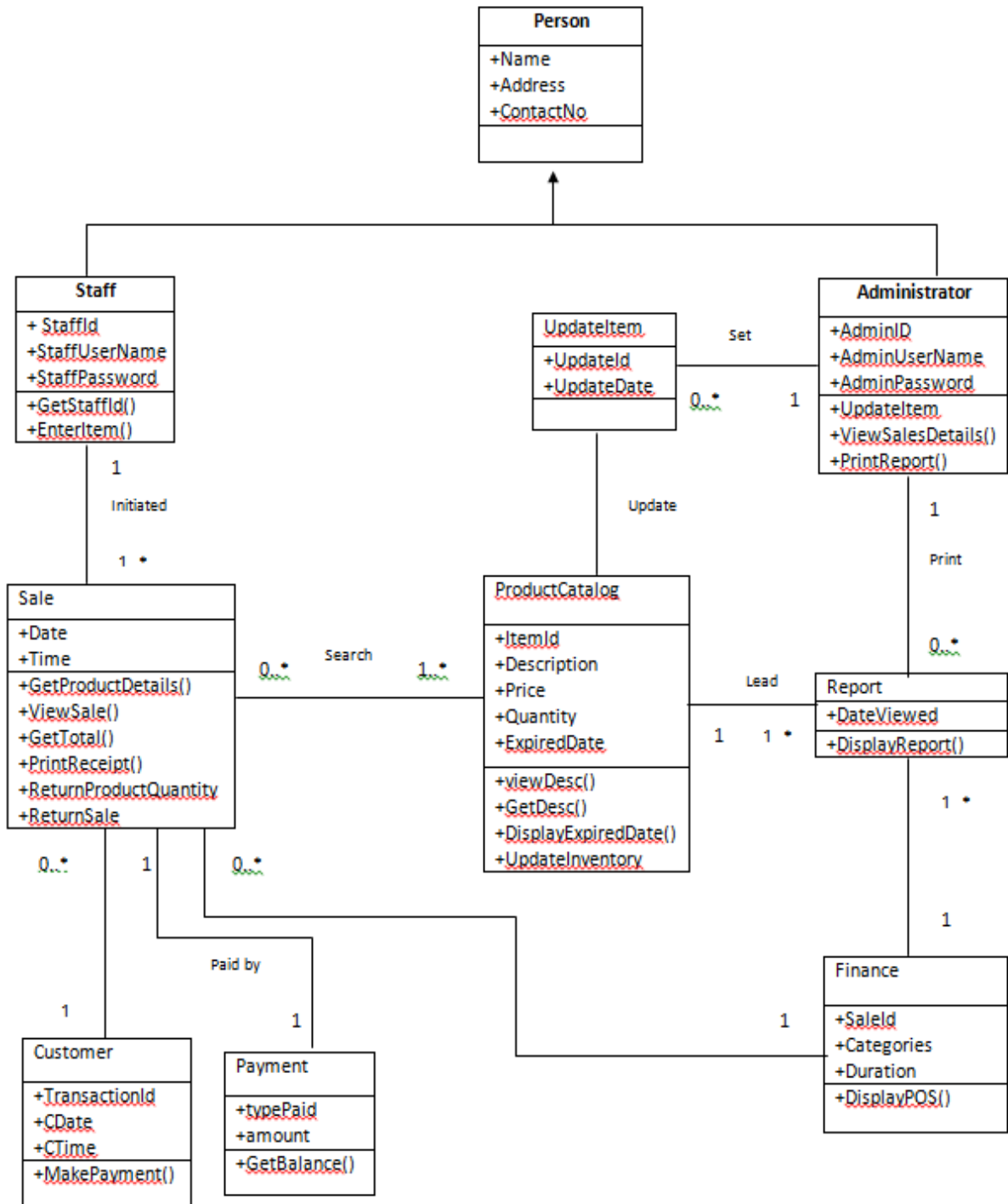
Figure 9: ERD Diagram of Sales & Inventory Management System

4.3   PROTOTYPE APPLICATION

Sales and Inventory Management System is a window based application designed to run on desktop. The application is designed in such a way even non-technical skills people also can use it by simplifying the function in the application. Figure10 shows the main page which is the login. The user and admin login will differentiate the functions enable in using the application. Once login success, the users are will be directed to content menu interface.
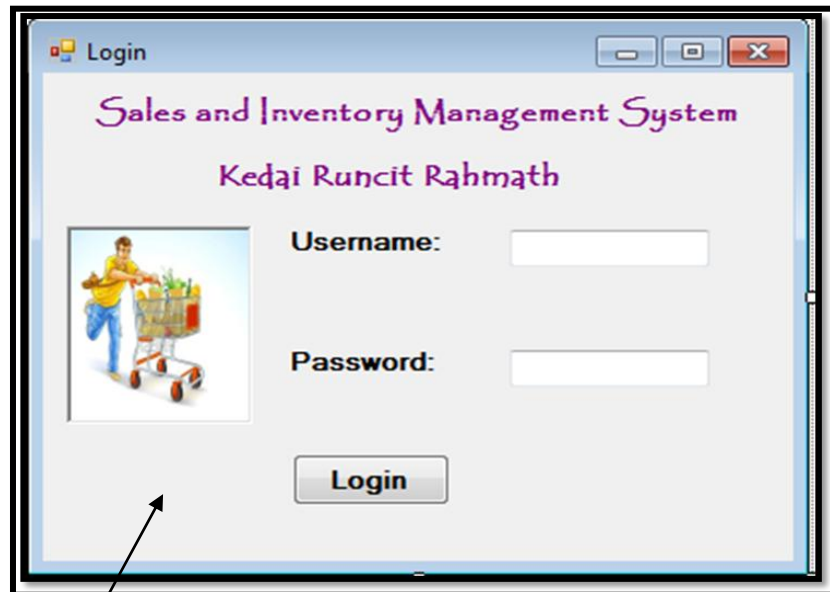
Figure 10: User Login Page

This is the homepage of the system. The users sign into the system using their 'Username' and password. If they do not log in. they can't use the system

Figure 11 shows the content interface for admin view. Admin are allowed to choose all four functions on the menu page which are POS, Notifications, Inventory and Report. However, for user login, only POS button is enabled due to security purpose on store information.

Figure 11: Content Page (Admin View)

When admin click on the POS button it will lead to POS page as shown in Figure 12. In this page, sales ID will be display for each new point of sale. When user scans on the product's barcode, the details will be display on the table. When all the items done process, the total will be display at the bottom of the page. Then the user must click on the payment button to finish up the transaction. Figure 13 shows the payment page that will require user to key in total amount receive from customer and select the method of payment either cash or credit card. The balance to be given to the customer will be display on the page. The user then can click on the 'print receipt' button to be given to the customers as references of purchases made. Figure 14 shows the examples of receipt.
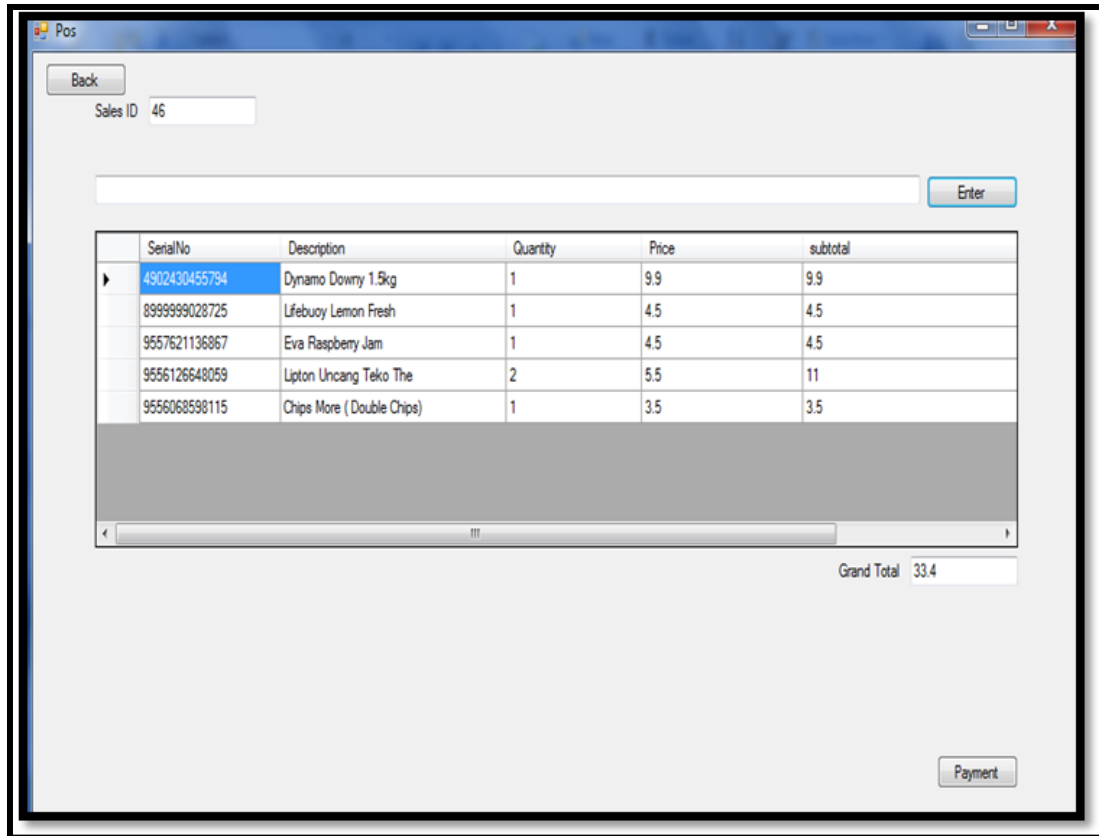
Figure 12: Point of Sale Page

Figure 13: Payment Page

Figure 14: Customer Receipt

Next, when admin click on the Notification module, the choice interface will be display as shown in Figure 15. The admin can choose whether to view notification on expiring product or product stock. If admin choose 'Expiring Product', next interface will be load as shown in Figure 16(a). When admin select date, products that are expiring prior to the date will be display. On the other, if 'Product Stock', the stock interface will be display as shown in Figure 16(b). By clicking on the checkbox of product categories, products that reach the min stock balance of the categories will be display.
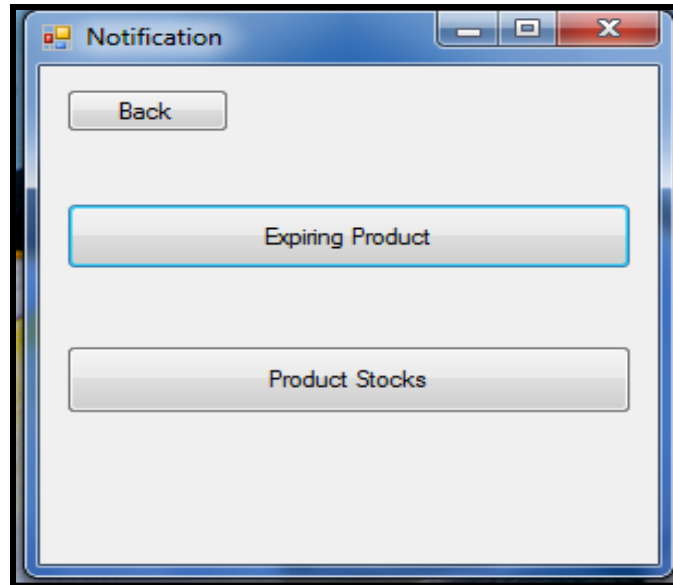
Figure 15: Notification Menu
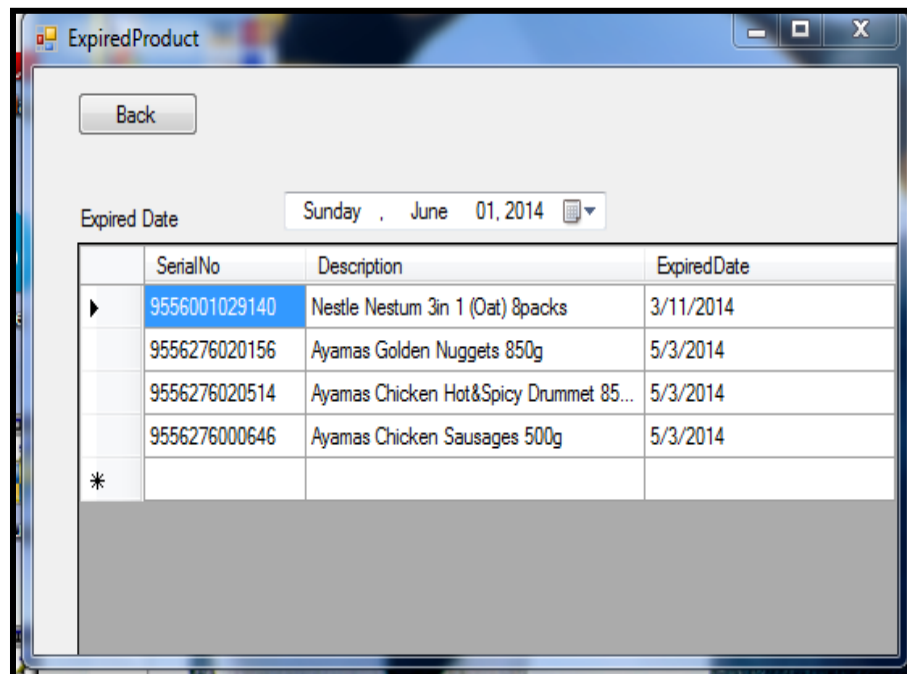
(a)
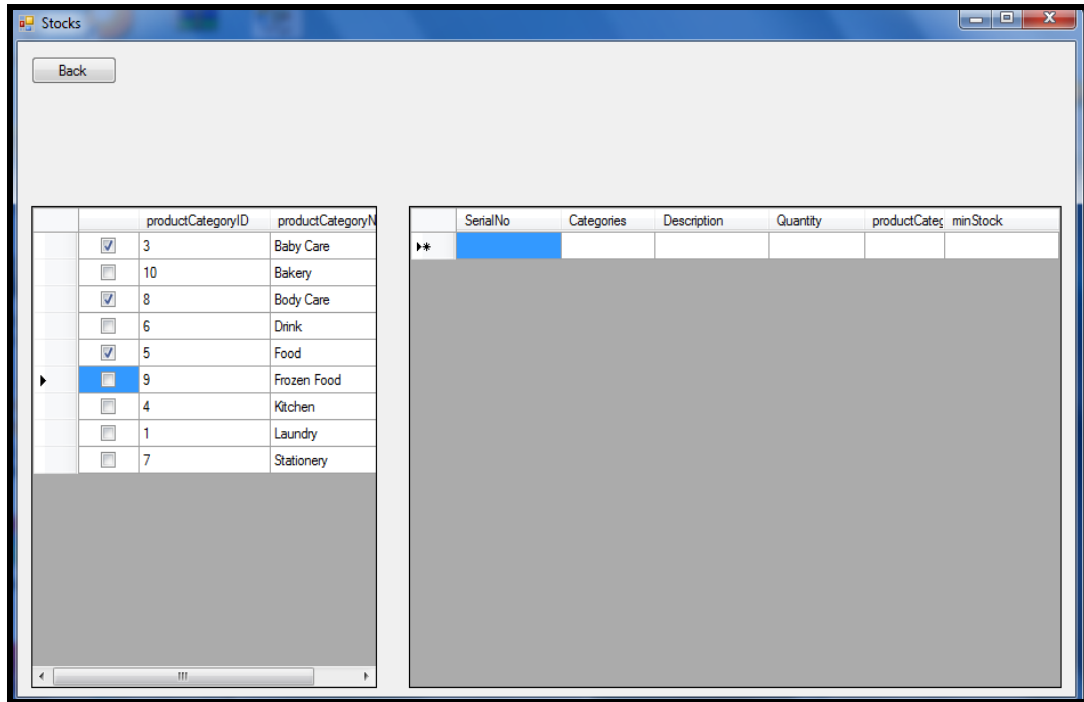
(b)

Figure 16: Notifications Page

The third module is the inventory modification. When admin enter the inventory module, he will be directed to the interface where he can make changes as shown in Figure 17. In this module, there three main functions namely add, edit and delete. If the admin wish to add new item, then he must click on add button on the bottom of the page. Then, add item interface will be load for the admin to key in details of the product as shown in Figure 18(a).

In contrast, when admin wishes to edit the product, he has to choose the item from the database first and choose edit button, then the edit page will display to make any changes as Figure 18 (b). Lastly, if want to delete the item, choose the item and click on the delete button. Confirmation message box will be display to confirm the deletion of the item as Figure 19.

Figure 17: Inventory Page

(a)   *(b)*

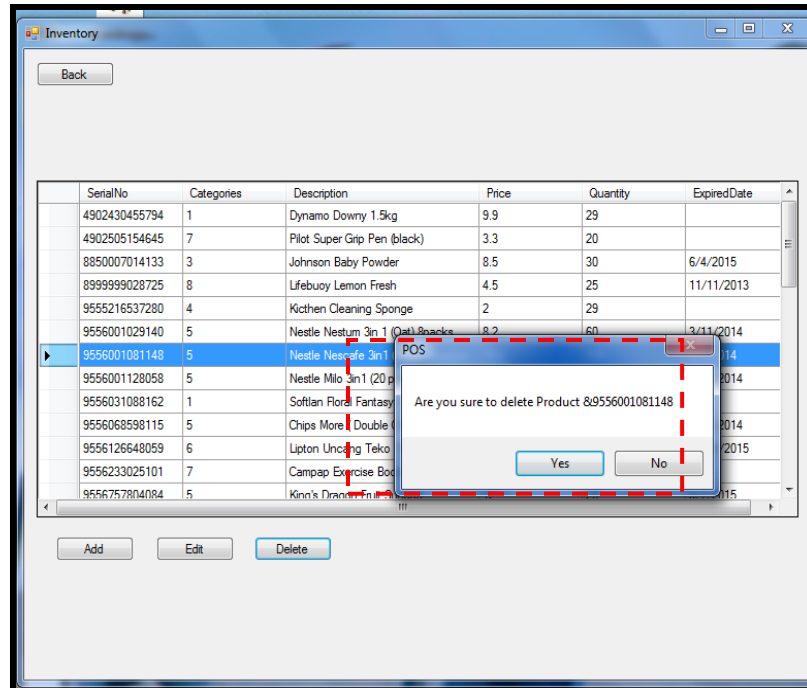**Figure 18: Product Add /Edit Page**

Figure 19: Confirmation Message

The last module is the Report. This module will display report on the sales made of the store daily, weekly and monthly basis. The report will be display in the form of bar char that shows sales amount based on product categories. Figure 20 shows examples of report on daily basis.
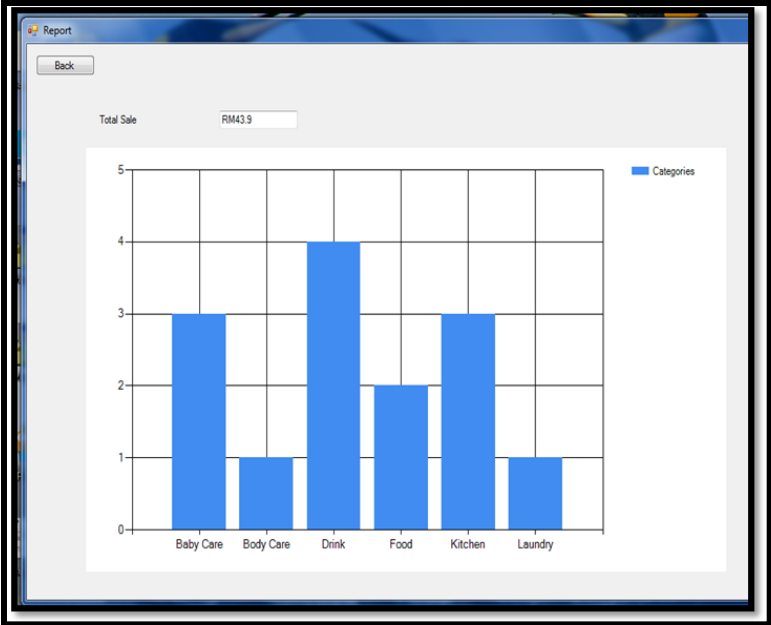
Figure 20: Report Page

4.4   **SYSTEM TESTING**

System testing was divided into three parts, which are developer testing, user testing and customer testing. The testing comes with the intent to ensure that the system meets identified requirements stated in the early stage.

A. *Developer Testing*

The data enter by admin and user is stored in Microsoft Access database. Since the transactions involve a lot of the database interactions, it is important to test the performance of the database used. A group of 50 to 100 records of products were inserted to measure the reliability of the developed database. Besides, the testing also involves syntax, functionality and logical errors. No major problem found in this testing.

B. *User Testing*

This testing is done after the development of the software is completed. The users were brief on how to operate the system and interact with the interface. The users' comments appropriate to the system such as errors related to the software interface, functionality errors, command structure and entry errors were recorded. It was done to the selected target users which are the owner and staff of Rahmath Store. This testing was done to compare the effectiveness of controlling inventory through POS using this system.

The procedure taken in conducting the user testing as below:

- The users were divided into two groups namely SystemI and TraditionalI. The SystemI were trained and instructed in using the Sales and Inventory Management System to process sales using the system.
- SystemI group then attend to customer transactions using system while TraditionalI users attend the customers using the current way. The total transactions process in a given time period were captured in the testing.

- A set of questionnaire were given to the users to obtain information about their satisfactions and the performances of using the system after the user completed the testing. The users' comments on the Sales and Inventory Management System were recorded.

Q1: Based on the experience using the Sales and Inventory Management System, are you satisfied with the interface?
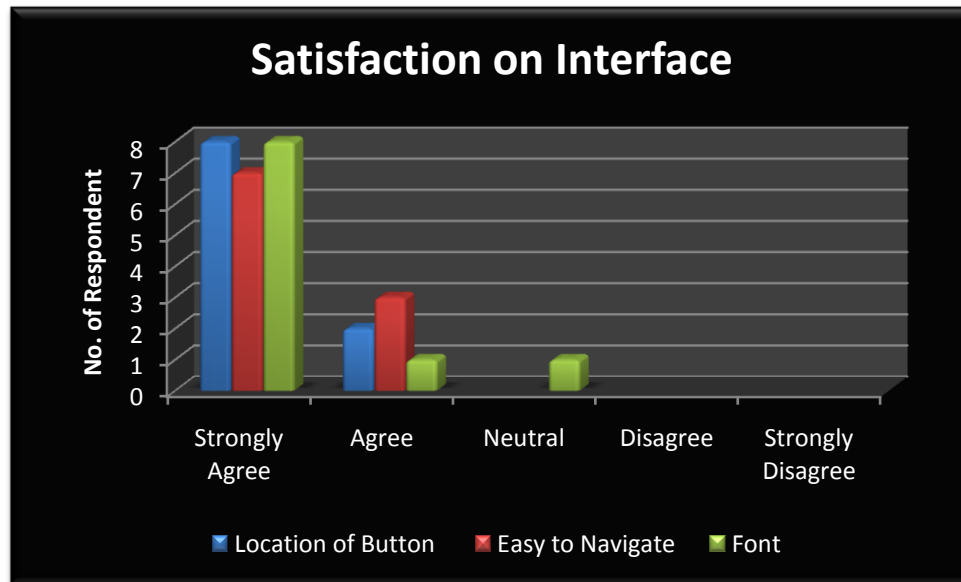

Figure 21: Satisfaction on Interface

Figure 21 illustrate testers toward the system interface. Users experienced the system function and the interface. It is to identify whether the system is user-friendly. The question includes the location of button, easy to navigate within the system and the font used in the system. From the survey, it is viewed that most of the user are strongly satisfied with the interface of the system with 8 to 7 respondents. These statistics support the main objective of the project

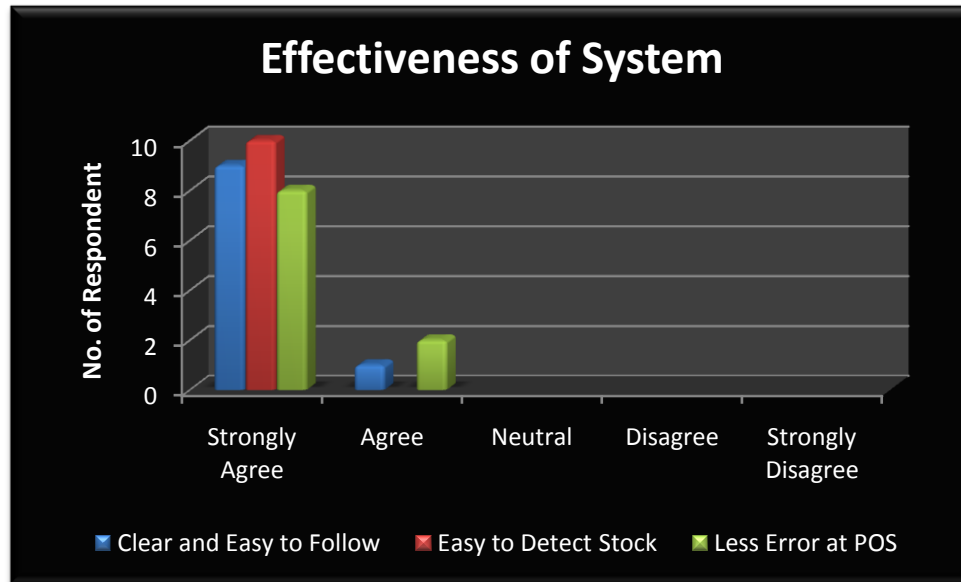*Q2: What do you think about the system?*

Figure 22: Effectiveness of System

Figure 22 shows the result on effectiveness of system. Based on the figure above, all user believe that the system make it easy to detect stock level. A total of 9 users say that the steps clearly stated and easy to follow and 8 users say that by having the system, error occur at POS can be reduced.

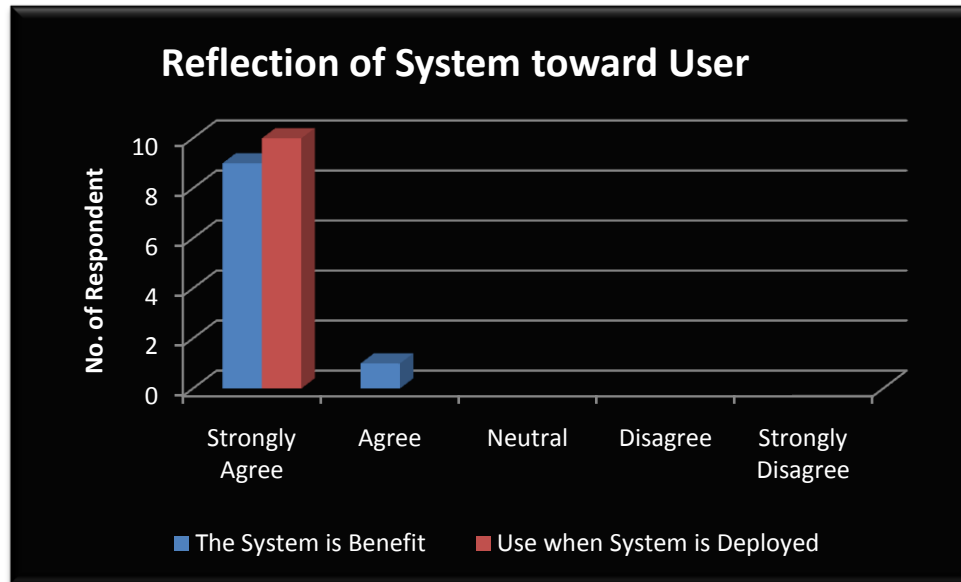*Q3:From your opinion, how does the system reflect the user?*

Figure 23: Reflection of System toward User

Another area being investigated is the reflection of system toward user. This is important to see whether the system is really useful and needed when it is really launched in the future. From 10 users, 9 believed that the system would benefit them and the store. Next, all users very agreed that they will definitely use the system when it is really deployed. From these statistics, majority of the users support the implementation of the system. It is proved that the system really needed and welcome by the users.

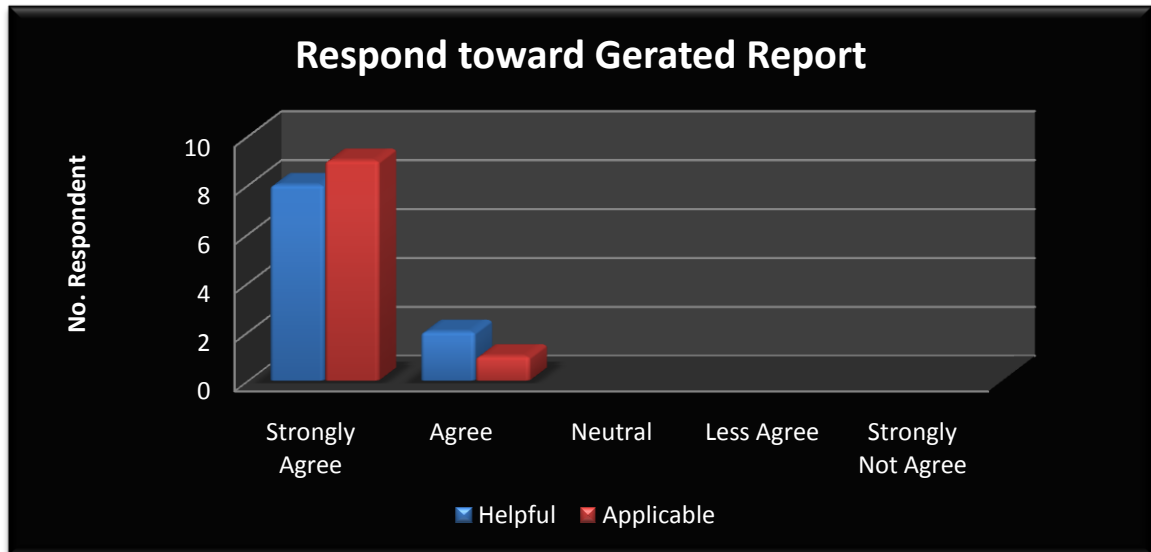*Q4: What do you think about the sale report generated by the system?*

Figure 24: Respond toward Generated Report

Figure 24 illustrate the users respond toward generated report produced by the system. About 8 users believed that the report generated by the system is very helpful and a total of 9 users believed that the report produced by the system is applicable in doing further decision on the product promotion in the real world.

C. *Customer Testing*

On customer, testing is done to get their feedback on the new application of sales system. Basically they are given set of feedback form on how they rate the performance and speed of processing the transaction at the counter using the system. Besides, the satisfaction level of customers also taken into account during the testing.

Customer Testing Outcome

No. of Customers

Performance   Satisfaction

Figure 25: Customer Testing Outcome

Figure 25 shows the result of the customer testing. The rating is from scale of 1-5. Rating 1 signifies strongly agree and 5 signifies strongly disagree. The findings shows the customers are satisfied with the system as in producing proper receipt and generating correct amount of total. Besides they also strongly agree on the performance of the system as in reducing the time of processing the sale at the counter.

CHAPTER 5

CONCLUSION

In summary, the project works is relevancy to the objectives set. The project is designed based on preliminary study that had been carried on with Rahmath Store. Thus activities of developing the system which is planning and analysis is based on the result retrieved from the interview on observation. Not only that, as this would be the first computerized system that will be used by the store, the functions only focused on solving major problem which is inventory management problem. The interfaces design is also categorized as user friendly due to lack of IT background of the workers which means the system can be handle by people not even from IT background.

Due to time constraints, it is not possible for the developer to implement many functions in the system, thus the developer have few future works suggestion for continuation. Firstly, the development of integration between the system with the supplier system of Rahmath Store. By integrating the both systems, Rahmath Store system can directly send the request of inventory order to the supplier when the stock level is low. Thus, Rahmath Store does need to order manually from the supplier which can cause delay in the delivery of the products. By having this integration, Rahmath Store can practices Just-In-Time inventory where the store does not need to hold many stocks which is not a good practice of inventory control.

Secondly, the implementation of decision support functions in the system. For examples, data mining techniques or approach can be used to study the pattern of sales made. From the pattern analysis, Rahmath Store can be used it to do marketing strategies to its customer or even stock arrangement management can be done from the result. All this action is believed to boost the sales of the store greater than the current.

Finally, Rahmath Store have to shift its ways of operating business in order to stay competitive in the industry and against supermarket which is growing in Taman Maju area such as Tesco and Billion

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APPENDICES

Interview Questions:

1. **What is your name?**
2. **How long Rahmath Store is in operation?**
3. **What is current method of recording inventory level?**
4. **What is the method used in carrying out customer sales?**
5. **What problems faced by the store in managing inventory?**
6. **Did customers complain of the products that out of stock?**
7. **How do you monitor the performance of the store?**
8. **What if the customer wish to exchange the item purchased?**
9. **How you detect the expired products in the store?**
10. **Why never use any system in doing business?**
11. **Will you use system that will help you in managing the inventory?**
12. **What are your requirements in the system to be developed?**

Sales and Inventory Management System (USER)

This questionnaire is to evaluate the satisfaction and reactions to the new developed system

Instruction: Please tick your answer

1-   Strongly Agree ;   2- Agree ;   3- Neutral ;   4- Disagree ;
5-   Strongly Disagree

	(1)	(2)	(3)	(4)	(5)
User Friendliness					
1. *Based on the experience using the system, are you satisfied with the interface?*					
a. The location of button is suitable					
b. It is easy to navigate within the system					
c. The font can be easily read					
Effectiveness of System					
2. *What do you think about the system?*					
a. Steps clearly stated and easy to follow					
b. Staff/Admin can easily detect stock level					
c. Staff/Admin encounter less error during POS					
Use Intention					
3. *From your opinion, how does system reflect the user?*					
a. I believe that the system would benefit the store					
b. I intend to use the system when it is deployed					

	(1)	(2)	(3)	(4)	(5)
Generated Report					
4. *What do you think about the sale report generated by the system*					
a. The result generated by system is very helpful					
b. The report is applicable					

Sales and Inventory Management System (CUSTOMER)

This questionnaire is to evaluate the satisfaction and reactions to the new developed system

Instruction: Please tick your answer

2-   Strongly Agree ;   2- Agree ;   3- Neutral ;   4- Disagree ;
5-   Strongly Disagree

	(1)	(2)	(3)	(4)	(5)
1. Performance					
a. Is the system perform better than older method used					
2. Satisfaction					
a. It is more organized in processing my sale					