Perceptive Loyalty System

by

Ku Izrul Hadi Bin Ku Hilmy

Dissertation submitted in partial fulfillment of
the requirements for the
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Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

TABLE OF CONTENTS

LIST OF FIGURES

ABBREVIATIONS AND NOMENCLATURES

UTP	:	Universiti Teknologi PETRONAS
CRM	:	Customer Relationship Management
DBMS	:	Database Management System
ICT	:	Information Communication Technology
WPA	:	Wireless Protocol Application

CERTIFICATION OF APPROVAL

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Ku Izrul Hadi B Ku Hilmy (3497)

A project dissertation submitted to the
Information Communication Technology Programme
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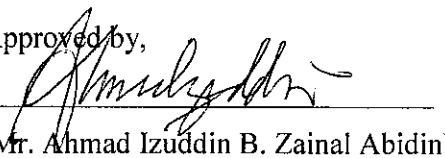
Approved by,

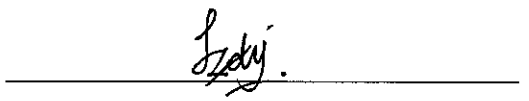


(Mr. Ahmad Izuddin B. Zainal Abidin)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
June 2006

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 contained herein have not been undertaken or done by unspecified sources or persons.



KU IZRUL HADI BIN KU HILMY

ABSTRACT

This document is to study the compatibility and usability of a perceptive loyalty system using data mining technique. This system is an easy-to-use web-based business management solution that is designed to foster communication between Business Company and their customer. The perceptive loyalty system can be used daily, employs cost-effective technology to help advance business and transaction processes.

It is a key tool for enabling data-driven decision-making. Business information such as customer's shopping habit can now be saved directly, via a standard web-browser, for ease of printing and electronic archival and later on can be used to make decision in marketing for example new product in the future.

The report generated by the system will show customer's buying habit and pattern. It purposes is just to simplify and organized the work strategist of a company and also the marketing department as well as the top management in guiding to a better decision making. With the system business can monitor the sales they are making throughout the year and also the pattern generate by the customer's shopping activities.

ACKNOWLEDGEMENT

Bismillah ar-Rahmani Ar-Raheem

In the Name of Allah, The Most Compassionate, the Most Merciful

First and foremost I would like to recite my greatest gratitude to the Most Merciful Allah for giving me the opportunity in completing this manuscript on time and without much hassle or problem. Without His observance in giving me the chance in finishing the report, there might be major problem which can resulted in delay of turning in the report in the time constrain.

In completing this preliminary report, there are some people that had been the backbone of the activities done in the complete of this text. I wouldn't have been able to finish up without their assistance, encouragement, and support either in terms of material, or spiritual. With this I would like to put some credit to them who has helped me through this time duration. They are as listed as beneath:

1. **Mr Ahmad Izuddin Zainal Abidin**– my supervisor (for giving me the guidelines and ways in producing a good output and full support in terms of knowledge input along this project)

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3. **Universiti Teknologi PETRONAS** – all UTP staff (for the full cooperation and providing me very convenient places to complete the project with the provided utilities)

4. **Parents and families** (for giving the full moral support in completing the report in addition to the consultation they have given during my troubled times)

5. **Friends** (as they have been there for me during the good and bad times as we stay together under the same varsity)

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND OF STUDY

Malaysia implemented the first computer system in 1966. Since then, the Government has introduced various initiatives to facilitate the greater adoption and diffusion of ICT to improve capacities in every field of business, industry, education, and life in general. These measures include the enhancement of education and training programmes, provision of an environment conducive to the development of ICT, provision of incentives for computerization and automation, and creation of venture capital funds. Currently, Malaysia is in full gear to steer the economy towards a knowledge-based one. On July 2001, the Deputy Prime Minister announced that Malaysia's K-Economy Master Plan was in the final stages of formulation.

Malaysia also has a long-term vision, usually referred to as "Vision 2020" which calls for sustained, productivity-driven growth, which will be achievable only with a technologically literate, critically thinking workforce prepared to participate fully in the global economy of the 21st century.

This document is to study the usage and compatibility of a system that could be use as a management tool to learn more about customers' needs and behaviors in order to develop stronger relationships with them. After all, good customer relationships are at the heart of business success. The idea is for the perceptive loyalty online system to helps businesses uses technology and human resources to gain insight into the behavior of customers and the value of those customers. The system can be used daily, employs cost-effective technology to help advance business processes.

With the deployment of the system customer would no longer have to seek for good opportunity to shop instead the business will reach to them thus strengthen the relationship between company and customer.

1.2 PROBLEM STATEMENT

1.2.1 Problem Identification

Currently it is difficult to measure the customer's loyalty and also the customer buying habits therefore it is hard for the management to determine their marketing strategy. With the system being applied it is hope that it could be a toll in providing sufficient information for strategist in determining which strategy need to be implemented an also this could be as a reference for the future.

1.2.2 Significant of the project

The advantages of using perceptive loyalty system are as listed below:

- **Providing a User friendly Platform**
  Research shows that number of click required directly affect response rate. There fore a platform will be designed to show functions and rewards in a clear and easy to response way.

- **Provide secure data transaction**
  To reduce workload, wireless security protocol like WPA can be use. E-cert can also be applied for identification. Meanwhile, the transaction should fit with chosen security standard.

- **Accurate Personalization Engine**
  Base on real or sample user data set including biographic, visiting habit and transaction information. The system should be able to suggest suitable service for each single customer base on their current location.

1.3 OBJECTIVE OF THE PROJECT

1.3.1 Objectives

These are the objectives of implementing the portable perceptive loyalty system:

Outputs to achieve:

- **Identify customer's shopping trend**

  One of the system's main function is to record every user's physical and shopping habit. Save into database and provide user friendly part tracing and reporting system.

- **Target marketing**

  The system can tailor promotions to the individual shopper. It helps customers to find information regarding product while at the same time allowing the business to target customers with promotion like store discount and free parking related to location and user preference in the customer's immediate vicinity.

- **Coupon sending**

  By analyzing the visiting pattern by shoppers in a store, the system can send costly coupon and gift to high value and loyalty customers. Interested customer can redeem coupon or confirm gifts through user friendly mobile platform software. CRM with personalization should imply in this module to ensure right gift given to right customer.

1.4 SCOPE OF THE PROJECT

Scope of study will be focusing on the

- implementation of portable perceptive loyalty system in economy sector(e.g. company) which is equipped with ICT platform ,
- The usage of a system as a tool for Customer Relationship Management (CRM) that could be use by a company in increasing their business productivity and profit.
- The software integration with most of the existing DBMS.

Simple access to Databases, flexibility and integration with development framework provided make portable perceptive loyalty system a very powerful and versatile tool for integration of complex business processes through a unique, intuitive web-based and also wireless application.

1.5 FEASIBILITIES ASSESSMENT

Feasibilities study of this project will be inspected from 3 different perspectives:

- Economic feasibility
- Technical feasibility
- Operational feasibility

1.5.1 Economic Feasibility

In a more general term, economic feasibility refers to the analysis of cost vs benefits in the development of this project. Both the cost and the benefits can be categorized under tangible, which mean the result can be measured in term of certain value and intangible which means result that cannot be view and measured but can be seen as a direct effect from the cause of it.

1.5.2 Technical Feasibility

There is no unforeseen technical limitation for the system to operate from both the system hardware and configuration requirement as well as the technical skills needed to develop the system.

Technical skills needed are in term of web pages development and system configuration. We need a system developer specialized in

- HTML for web pages creation
- ASP and ASP. NET for the server pages creation and system configuration
- Microsoft Office package knowledge in Access database as well as SQL server
- Java and Visual Basic programming skills for custom written features
- Web- client server knowledge in setting up the web server

Since the program is loaded into the hosting web-server will be mostly consist of reading material and databases, a minimal requirement for a server is required. As for the client and staff company access workstation, a minimal personal computer with networking access is required.

From the technical perspective, this system is categorized under low technical risks project as it does not depends on any critical skills that we are not able to acquire from the ready market.

1.5.3 Operational Feasibility

To operate this system, we need to have a staff that is skillful in system handling such as data retrieval, data updating if needed and report generating. The technical support portion od it can be maintain by any third party or outsource service specialized in hardware support. The system administrator need to work together with the development team in the course of the system implementation to better understand the system operability and subsequently trained to do first level trouble shooting shall operations problem arise.

On accessing the degrees to which this system meets the operating requirements, we need to develop a system that has the following qualities:

- **Efficiency and system performance**

  Stability of the system to run its intended features, the uptime and the processing time of the system is within the acceptable threshold. In this case, targeted uptime is 100% and processing time is almost instantly.

- **Information**

  The system provide accurate, organized information as pre-defined format

- **Lifetime validity**

  The technology used will not obsolete before the expiry of the system lifetime to ensure return of investment.

- **Security and control**

  System is controllable by only authorized party and not vulnerable to outside threat such as data spoofing, alteration, hacking and virus attack. This can be achieved by putting in place substantial security on access control to the database, to the web server and through the intranet firewall. The antivirus software to combat virus threat too needed to be updated on regular basis.

CHAPTER 2
LITERATURE REVIEW

Nowadays, companies gain competitive advantage by developing and deploying applications that provide unique business services. Two main aspects that are important for long term viability are portability or mobility and also scalability. These applications must scale from small working prototype that is accessible all the time by multiple clients simultaneously [1]. This can be interpreted as the sign for marketability of web based systems.

Organizations today are seeing the value in informed and happy customers. Therefore implementing a seamless 360-degree view of your customers is crucial for the organization. Customer Relationship Management (CRM) has become the industry name and calling card associated with this type of solution. An effective CRM solution will allow an organization to capitalize on communication efficiencies, one-stop access to real time data, and the insurance that customer service is focused and handled correctly.

It is now a cliché that in the days of the corner market, shopkeepers had no trouble understanding their customers and responding quickly to their needs. The shopkeepers would simply keep track of all of their customers in their heads, and would know what to do when a customer walked into the store. But today's shopkeepers face a much more complex situation. More customers, more products, more competitors, and less time to react means that understanding your customers is now much harder to do. A number of forces are working together to increase the complexity of customer relationships:

- Compressed marketing cycle times. The attention span of a customer has decreased dramatically and loyalty is a thing of the past. A successful company needs to reinforce the value it provides to its customers on a continuous basis. In addition, the time between a new desire and when you must meet that desire is also shrinking. If you don't react quickly enough, the customer will find someone who will.
- Increased marketing costs. Everything costs more. Printing, postage, special offers (and if you don't provide the special offer, your competitors will).
- Streams of new product offerings. Customers want things that meet their exact needs, not things that sort-of fit. This means that the number of products and the number of ways they are offered have risen significantly.
- Niche competitors. Your best customers also look good to your competitors. They will focus on small, profitable segments of your market and try to keep the best for themselves.

Successful companies need to react to each and every one of these demands in a timely fashion. The market will not wait for your response, and customers that you have today could vanish tomorrow. Interacting with your customers is also not as simple as it has been in the past. Customers and prospective customers want to interact on their terms, meaning that you need to look at multiple criteria when evaluating how to proceed. You will need to automate:

- The Right Offer
- To the Right Person
- At the Right Time
- Through the Right Channel

The right offer means managing multiple interactions with your customers, prioritizing what the offers will be while making sure that irrelevant offers are minimized. The right person means that not all customers are cut from the same cloth. Your interactions with them need to move toward highly segmented marketing campaigns that target individual wants and needs. The right time is a result of the fact that interactions with customers

now happen on a continuous basis. This is significantly different from the past, when quarterly mailings were cutting-edge marketing. Finally, the right channel means that you can interact with your customers in a variety of ways (direct mail, email, telemarketing, etc.). You need to make sure that you are choosing the most effective medium for a particular interaction.

The objective of CRM is to learn more about customers' needs and behaviors in order to develop stronger relationships with them. After all, good customer relationships are at the heart of business success. There are many technological components to CRM, but thinking about CRM in primarily technological terms is a mistake. The more useful way to think about CRM is as a process that will help bring together lots of pieces of information about customers, sales, marketing effectiveness, responsiveness and market trends.

Flexible Internet architecture is a practical way for a CRM application to be built. Firstly, the architecture is coded so that we can re-use components throughout the solution. For example, stored customer support questions can be displayed for our employees on the Intranet side of our CRM solution and it will also display that same data in a different format on the public web site. All tools beneficial to a company internally, should be turned around and given to its customers.

Secondly, as the business landscape changes, customers needs will change. Consequently the front-end processes will need to change. When we have an application built with a flexible Internet architecture, we can benefit from being able to change the look and feel and the flow of the CRM solution without going through a huge ordeal of completely redesigning your solution.

Thirdly, using flexible Internet architecture at the start will allow the organization to capitalize on its ease of adding new tools and components. The company can save time with programming and testing because all the units are separate and work individually.

This architecture will allow you to build new applications in short time periods and will not hurt the budget.

The idea of CRM is that it helps businesses use technology and human resources to gain insight into the behavior of customers and the value of those customers.

According to Michael D. Johnson, a D. Maynard Phelps Collegiate Professor of Business Administration and a Professor of Marketing at the University of Michigan Business School answer in a question where by what role business managers and IT should play? In other words, does business managers should lead the efforts strongly relying on IT. And the answer to the question

The CEO of Boise Office Solutions suggests that giving customers greater economic value might just lead to a better ending.

CHAPTER 3
METHODOLOGY

3.1 SYSTEM METHODOLOGY

Custom Methodology (Combination and Variation of Different Methodologies)
Due to the limited time frame and large coding area to be done, custom methodology is used to complete this dissertation. This methodology will take a combination and variation of the existing methodologies and apply it to suit the time frame condition and the huge amount of programming activities as needed.

The first part of this methodology will be the research and fact-finding process. This part will cover mostly on comparison between the traditional way of conducting discussion with suggested online discussion and how to eliminate all the possible weaknesses. Duration of 1 week will be allocated for this part to ensure the smoothness of the project flow.

After all the information and researches have been done, the development process will take place. As for this project, the object oriented programming language such as Java and Visual Basic. NET will be used as well as Dreamweaver MX software.

The testing phase will take place concurrently with the development process to speed up the completion of this dissertation. These involve module testing, module integration testing and multiple system testing. The modules developed in this dissertation's model will be tested individually and later on as integrated modules. The dissertation demo will be conducted on Windows XP platform using Internet Explorer 6.0.

3.2 TOOL(S) REQUIRED

Hardware and software used

The size and effectiveness of this system determines the selection of the hardware and software to be used. As this system compromises of images, animation and HTML web-pages, we need to put into consideration a terminal and a development kit that is powerful enough to ensure smooth performance when the huge source program and its linkages to database and other web-pages being executed.

For optimum performance, the minimum specification is recommended:

- A client computer **hardware requirement** covers a personal computer, desktop or laptop equipped with video monitor, sufficient memory of 128MB RAM or above, processor of Pentium I or above and most importantly network connectivity to the Internet or Intranet.
- A client computer **software requirement** would be a minimum of a Window 98 operating system. However, Window 2000, NT and XP are more preferred.
- **Development** and **testing platform** to build the system make use of Microsoft Access 2000 or above, SQL server, Microsoft Visual Studio .NET, HyperText Markup Language, Macromedia Dreamweaver MX and Javascript.
- A web server for hosting the **system hardware requirement** covers a server computer, with memory of 128MB RAM or above and processor of Pentium II or above (recommended)
- A web server for hosting the **system software** requirement recommendation will be Window NT with basic Microsoft Office package, Internet Explorer 5 or above and support ASP, ASP. NET, VB scripting, Java scripting and HTML.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 SYSTEM ANALYSIS

4.1.1 PROPOSED SYSTEM

Customer Relationship Management application has found its popularity in the western business world. Many companies have introduced the customer relationship management concept and application to evaluate and analyze its customer's performance.

Currently in Malaysia, the customer relationship management is still in infant stage. Recognizing the manual and traditional approach may be found as tedious and stressful to some company, this system is analysis and studied if it can be introduced and be implemented as part of the higher business perceptive.

To be successful, database marketers must first identify market segments containing customers or prospects with high-profit potential. They then build and execute campaigns that favorably impact the behavior of these individuals.

The first task, identifying market segments, requires significant data about prospective customers and their buying behaviors. In theory point of view, the more data the better. In practice, however, massive data stores often impede marketers, who struggle to sift through the minutiae to find the nuggets of valuable information.

Recently, marketers have added a new class of software to their targeting arsenal. Data mining applications automate the process of searching the mountains of data to find patterns that are good predictors of purchasing behaviors.

After mining the data, marketers must feed the results into campaign management software that, as the name implies, manages the campaign directed at the defined market segments.

In the past, the link between data mining and campaign management software was mostly manual. In the worst cases, it involved "sneaker net," creating a physical file on tape or disk, which someone then carried to another computer and loaded into the marketing database.

This separation of the data mining and campaign management software introduces considerable inefficiency and opens the door for human errors. Tightly integrating the two disciplines presents an opportunity for companies to gain competitive advantage.

4.1.2 ACTIVITIES IN PROPOSED SYSTEM

Below are the lists of activities that can occur in the proposed system:

- Customer or client can registered their account through the counter setup by the company management by fulfilling an appropriate form. A database of registered customer is established.

- System administrator or the company's staff can generate report regarding customer's database and also update any information in the database if necessary.

4.2 SYSTEM ACTIVITY – USE CASE DIAGRAM

Use case diagram is used to model the activity to be done from a user perceptive. The system has 3 main groups of user; the Customer, Staff and System Administrator

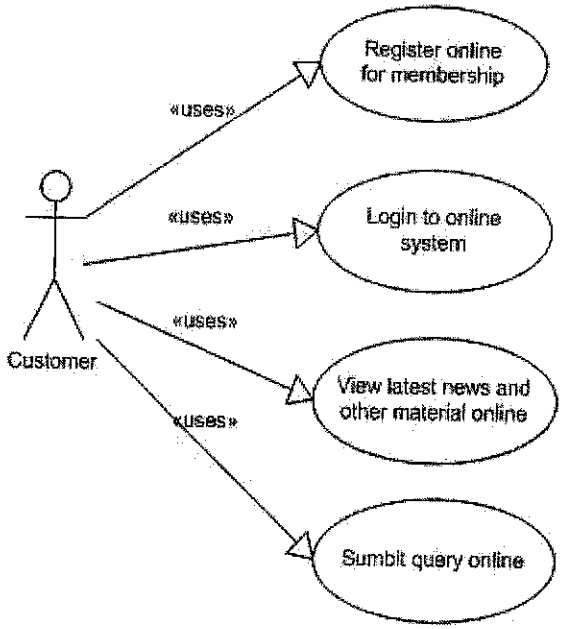

Figure 4.2.1: Customer Activity

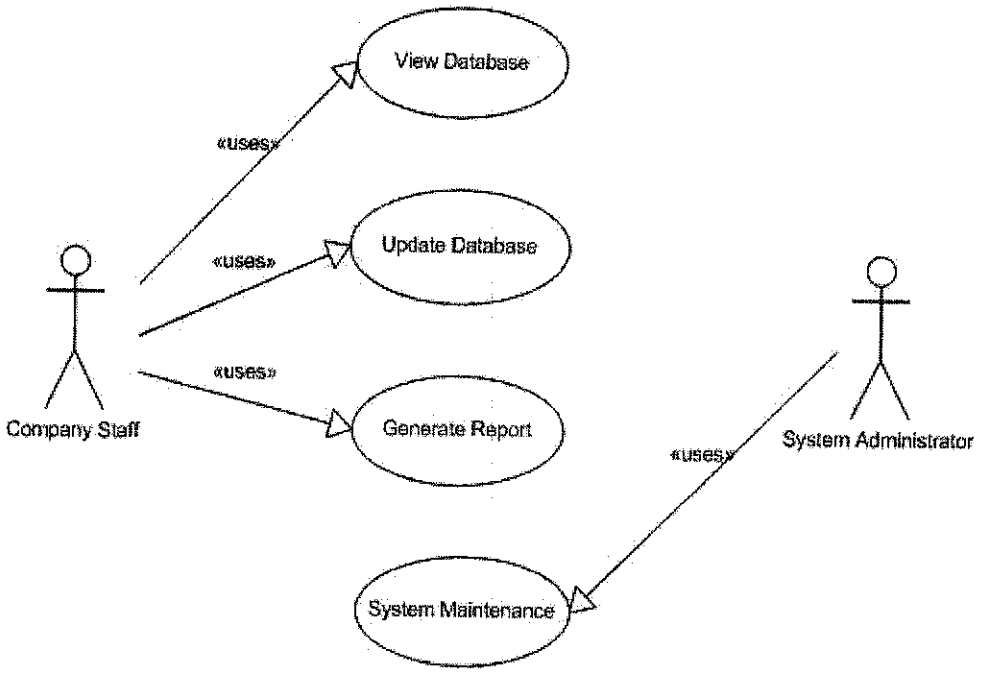

Figure 4.2.2: Staff and system administrator activities

4.3 OBJECT INTERACTION – SCENARIO AND SEQUENCE DIAGRAM

Below are the scenarios and sequence diagrams for the use cases

Use Case: *Recording physical customer transaction*

Scenario: A data owner recording a customer's transaction to be saved into the database

- Data owner key in customer ID
- System check for valid customer ID and upon success verification, data owner key in product ID and quantity bought by customer
- System check with database for product price and display total purchase value
- System request for confirmation of product purchased
- Upon confirmation, system stored in database the purchase transaction

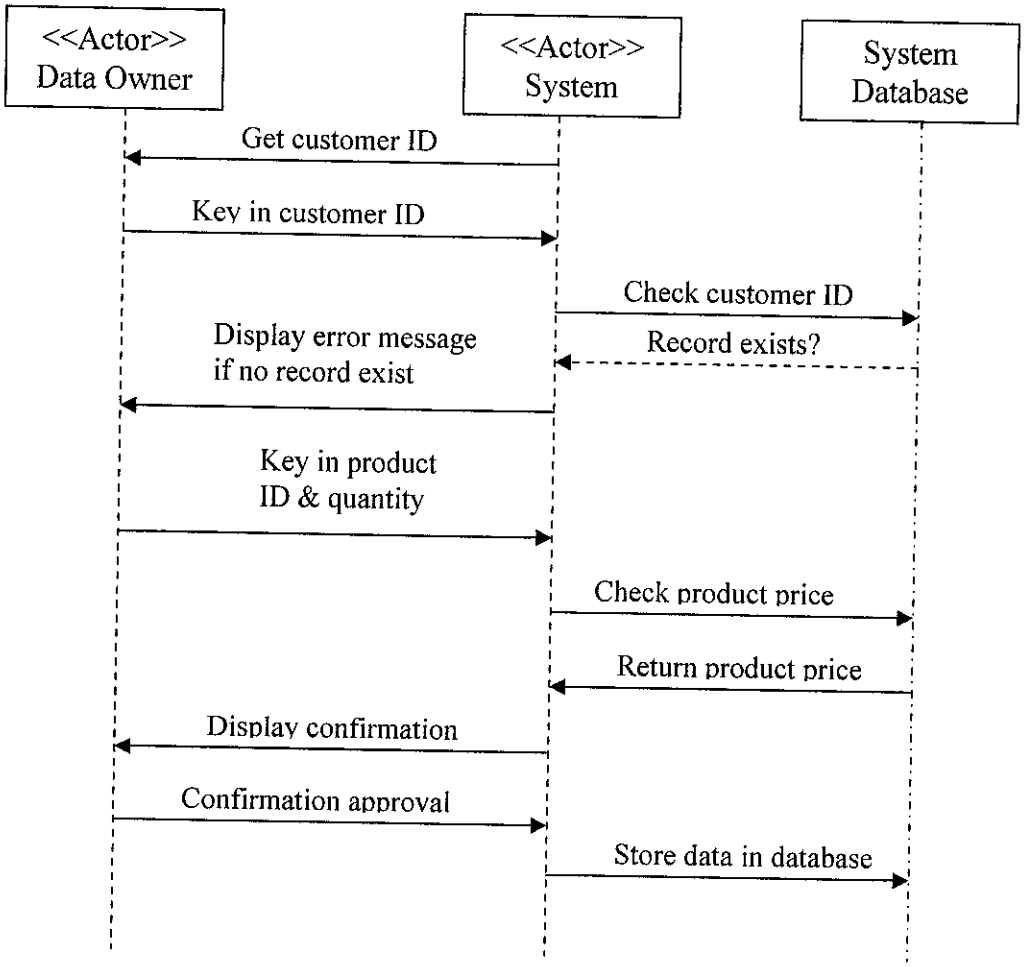

Figure 4.3.1: Sequence diagram for recording customer transaction

Use Case: *Request for a login account to the system*

Scenario: A staff of the company registers for a user account of the system

- Employee select to register for new account
- System request for employee details for verification
- System check in database for a valid employee
- Upon successful verification, system request for new account details such as user ID and password
- New account record is stored in the database

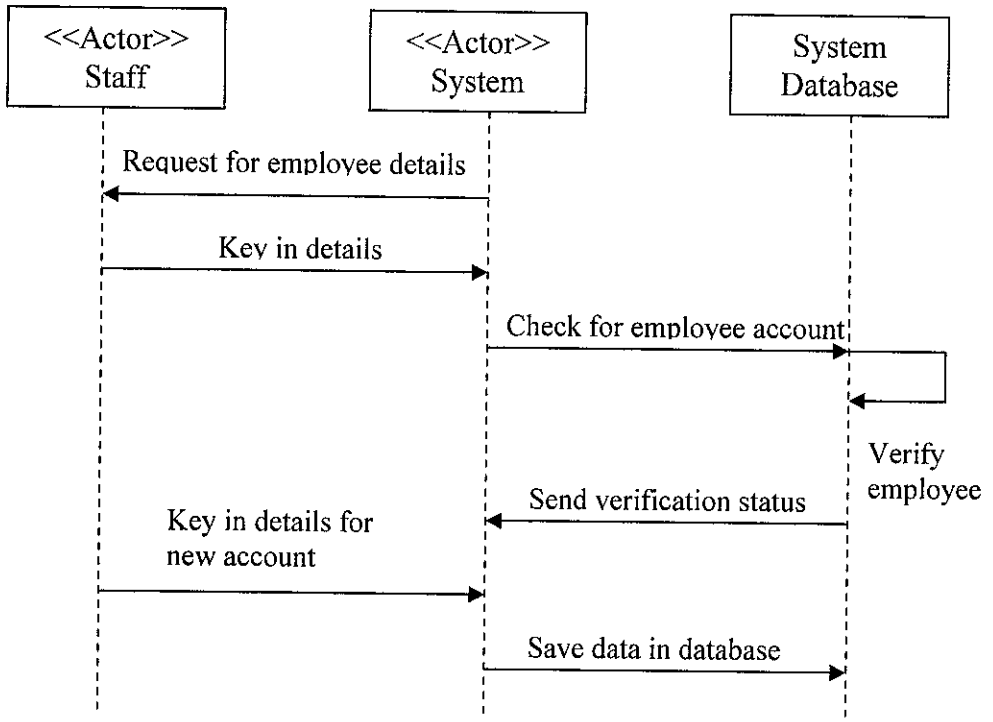

Figure 4.3.2: Sequence diagram for request a login account

Use Case: Login to restricted session

Scenario: A system user login to the system to view report or perform other function

- User login to restricted session
- System request for user's ID and password
- User provide details needed
- System verify on login, granted permission access and display page

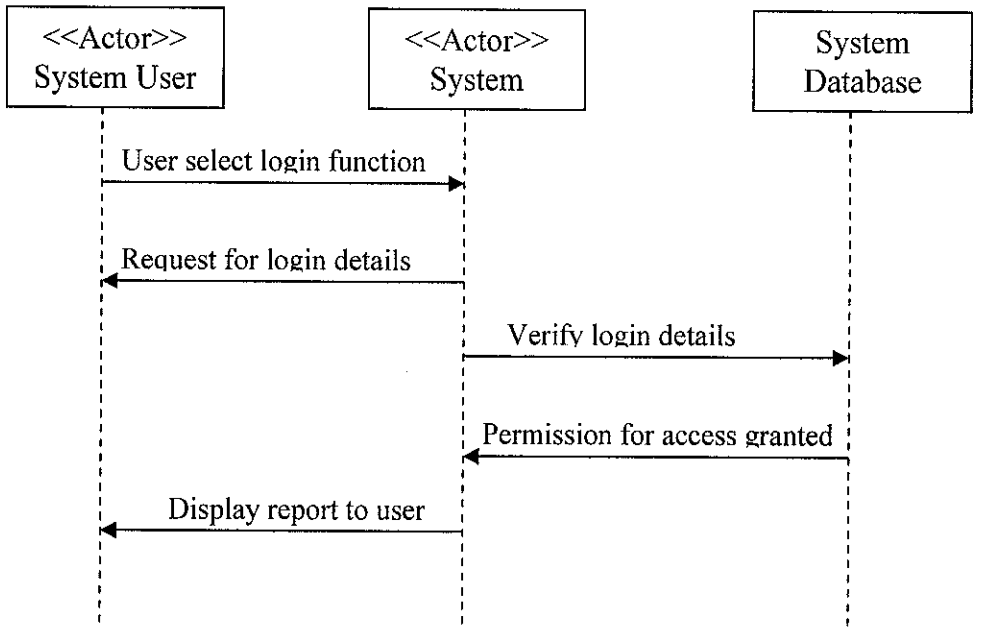

Figure 4.3.3: Sequence diagram for login to restricted session

Use Case: Login attempt with error

Scenario: A system user login to restricted session of the system and error is displayed on invalid login.

- User login to restricted session
- System request for user's ID and password
- User provide details needed
- System verify on login and not able to find a match on database
- System display login account error

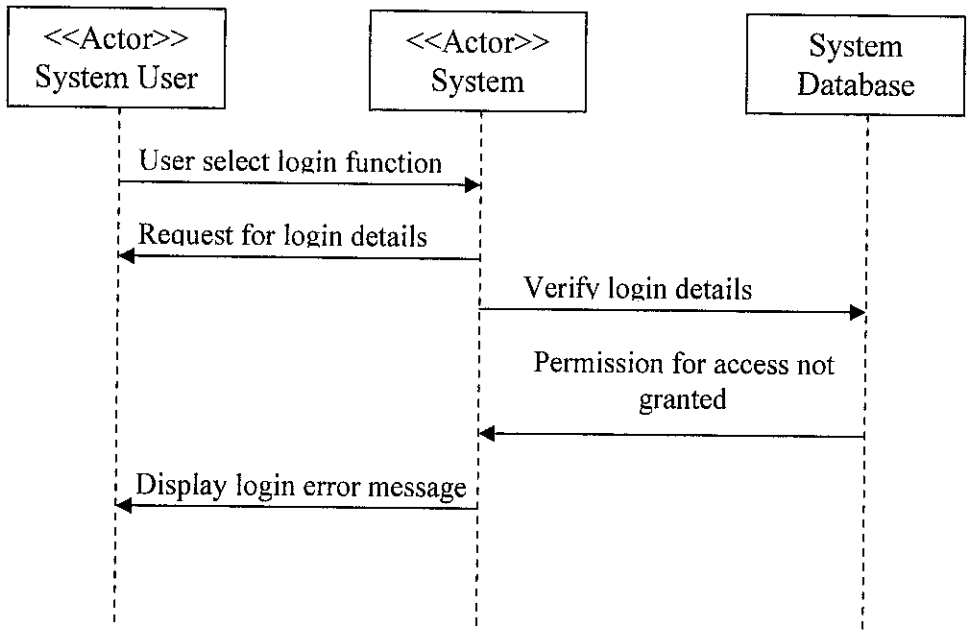

Figure 4.3.4: Sequence diagram for login attempt with error

Use Case: System administrator maintain user's account

Scenario: System administrator login to restricted session of the system to modify user's account such as adding new account, delete account, reset account or update account.

- User login to restricted session
- System request for user's ID and password
- User provide details needed
- System verify on login
- On validity, system administrator is forward to administrator page to perform function

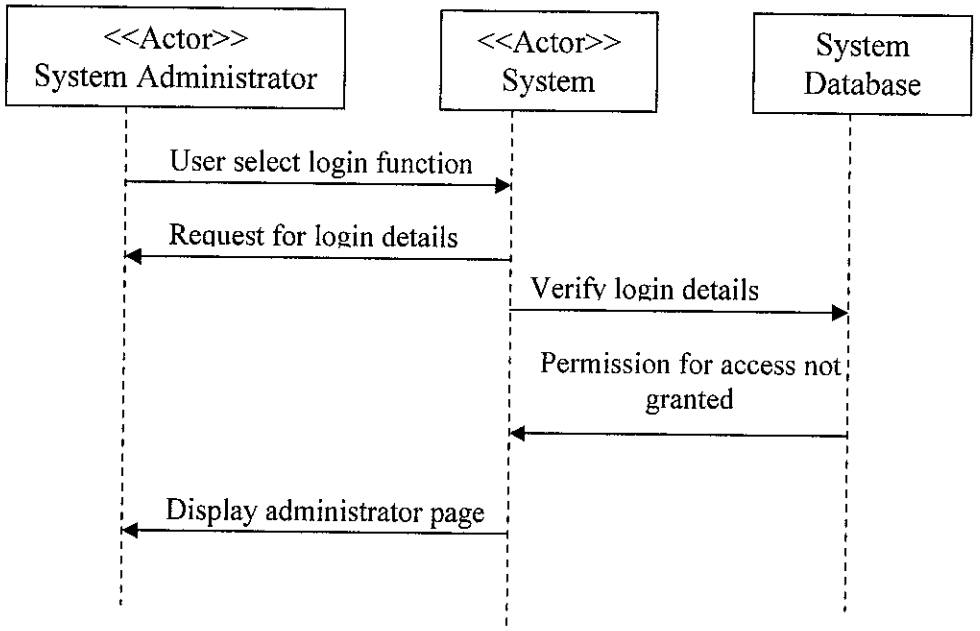

Figure 4.3.5: Sequence diagram for maintaining user's account

4.4 OBJECT BEHAVIOR – STATE CHART DIAGRAM

State chart illustrate on object states which transition to another form is involved. Below charts illustrate 3 basic state changes for the system:

- A web page transit from its empty state to updated state when data is being updated.
- A user login and access is granted to restricted session and subsequently logout from the session.
- A user without a login account registers for an account to log on to the system.

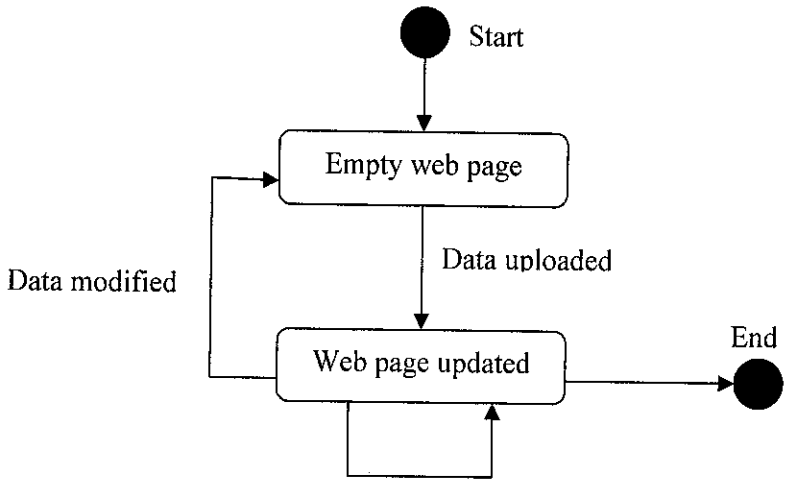

Figure 4.4.1: Web page transit from its empty state to updated state when data is being updated

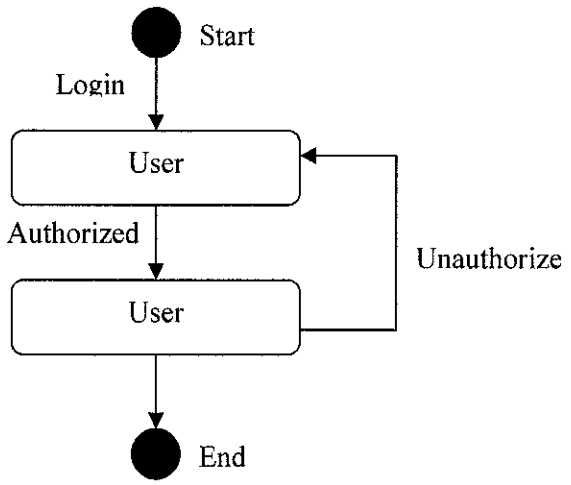

Figure 4.4.2: User login and access is granted to restricted session and subsequently logout from the session

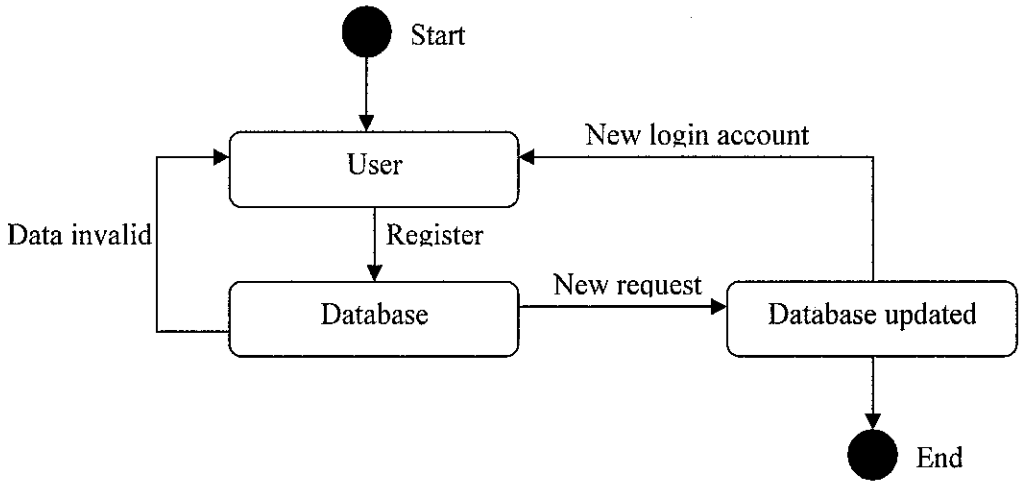

Figure 4.4.3: User without a login account registers for an account to log on to the system

4.5 System Testing

The testing is done throughout system development, not just at the end. It is meant to turn up heretofore unknown problems not to demonstrate the perfection of programs, manuals or equipment. Testing is accomplished on sub-systems or program modules as work progresses. The testing is done on many different levels at various intervals. Before the system is put into production, all functions must be desk-checked, checked with test data, and checked with to see if the modules work together with one another as planned.

The system as a whole is then tested. Included are testing the interface between pages, the correctness of the output, and the usefulness and understandability of system documentation and output.

4.6 System screenshot

Upon browsing to the system, the user would first be brought to the landing page. Through this page, the user can log in to the system, register for a new login account or they can prompt for password retrieval if they forgot their password.

Figure 4.6.1: Landing page

When a user logs in into the system, the system will check whether there is a match in the database. If not match were found, then the system will display an error message to the user

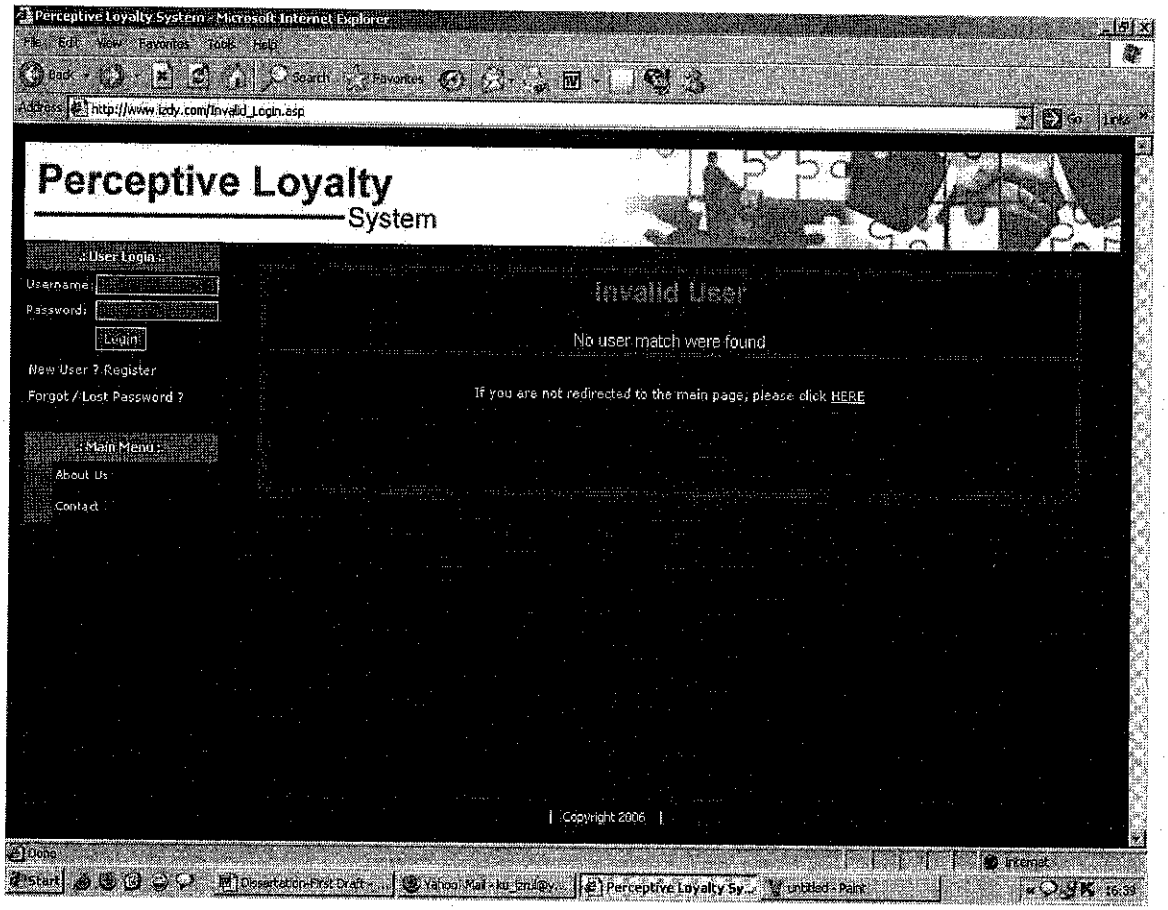

Figure 4.6.2: System displaying error in login to user

Upon successful login, the user would then be directed to their appropriate page in which it had been classified according to their level to access the system. There are 3 categories which are administrator level, managerial level and operating level. Those in the operating level is called data owner of the system since they are the one who will be in charge in recording the customer sales into the system.

Below is the administrator page if a system administrator login to the system. The system administrator would then be able to view reporting details and also perform administration function such as adding new user to the system, edit a current user's record, delete an existing user account and reset a user account.

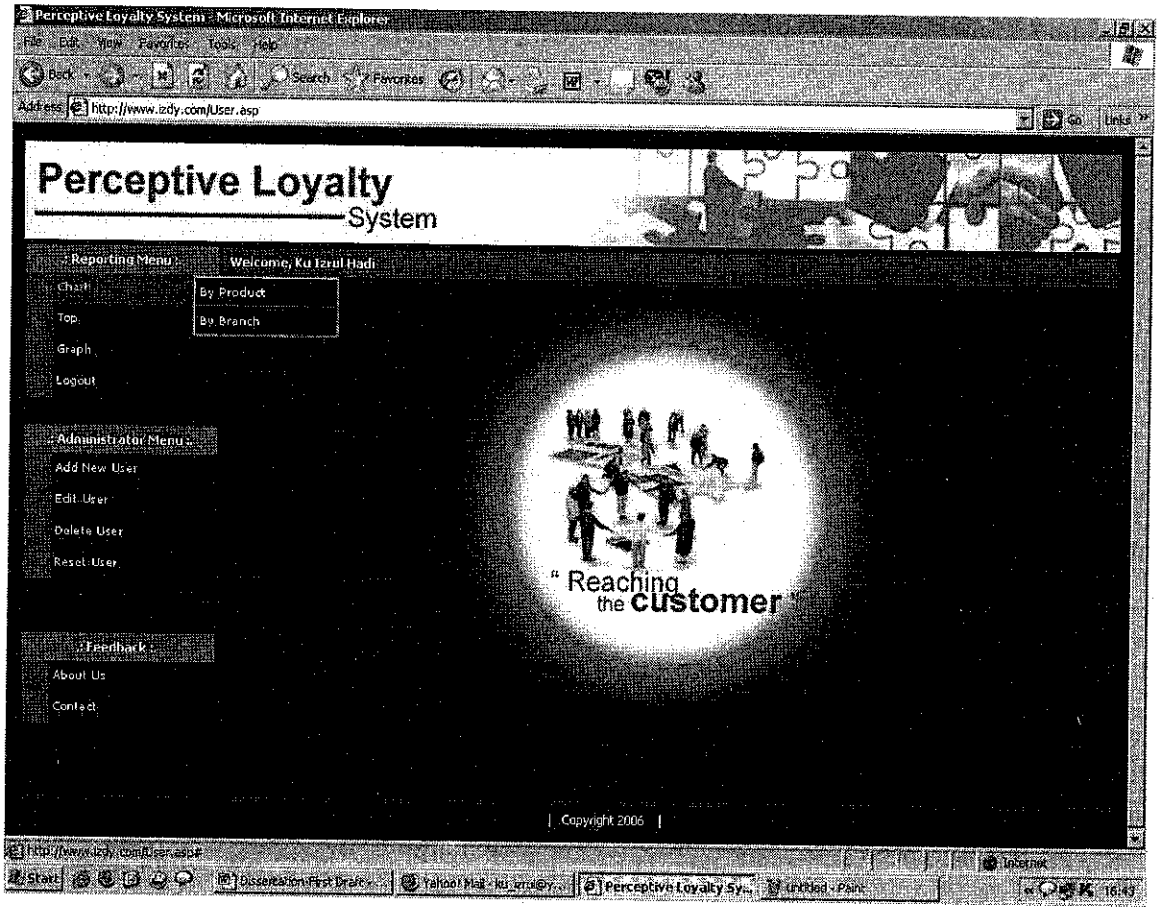

Figure 4.6.3: System displaying the administrator page

Below is the data owner page, when a data owner login into the system. From this page, the data owner could access the function in recording customer's sale by selecting the left navigation menu which is '*Add Customer Sale*' function.

Figure 4.6.4: System display data owner page

The data owner would then be guided step by step at first by entering the customer's ID and upon validation, the data owner would then need to select which product the customer is buying and after that confirm the purchasing transaction thus the record would the be added to the database which will later be use in data mining and target marketing.

As for the user from managerial level, they can only access the reporting menu since they will be using the information to make decision in marketing strategy in order to strengthen the customer relationship between the company and the customer.

Figure 4.6.5: System displaying the page for managerial level user

Below is the page for the reporting function in which all the user of the system can access.

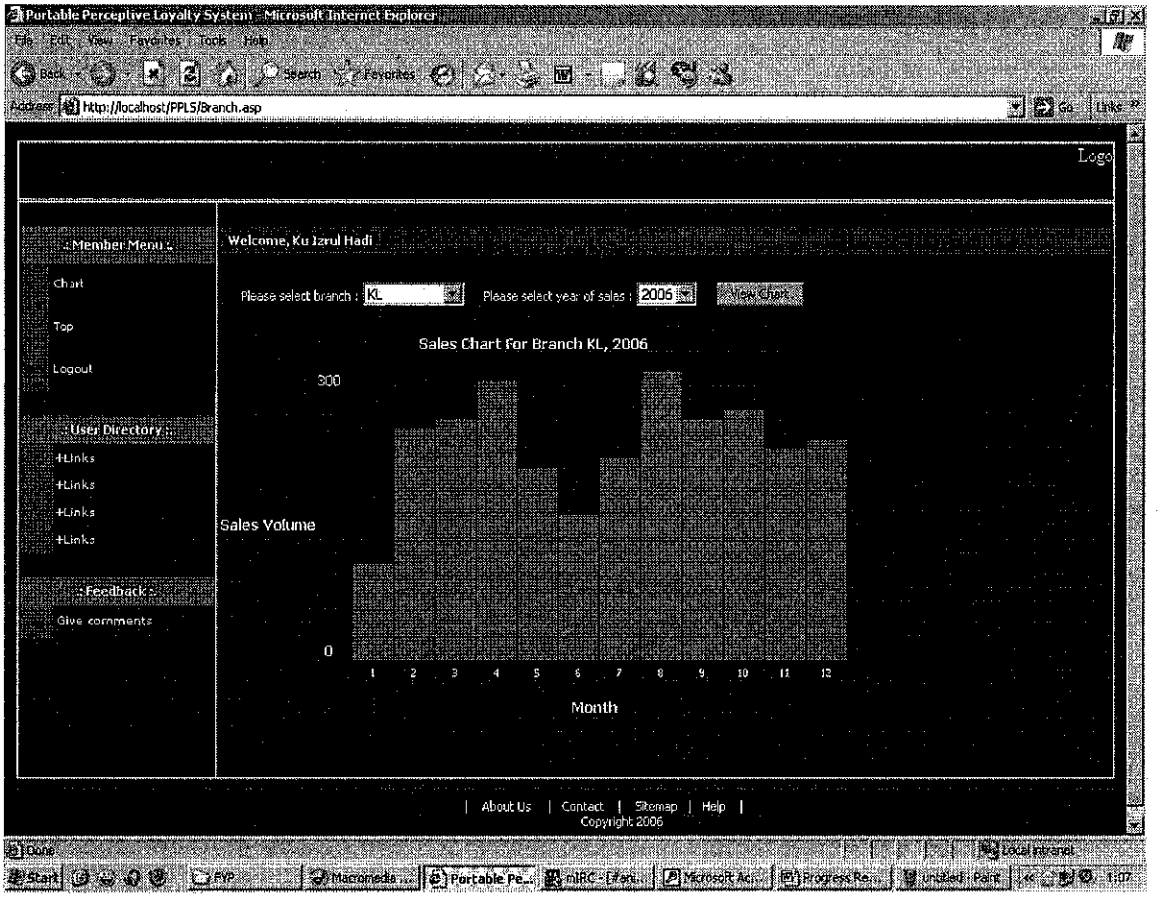

Figure 4.6.6: Chart for branch sale page

From this page the user could see the pattern of sale based on a particular branch and the sales for each month in a particular year according to the user's selection.

Figure 4.6.7 below shows the sale chart pattern based on a particular product in a particular year. From this chart we can see how the selling pattern for that product is in that particular year.

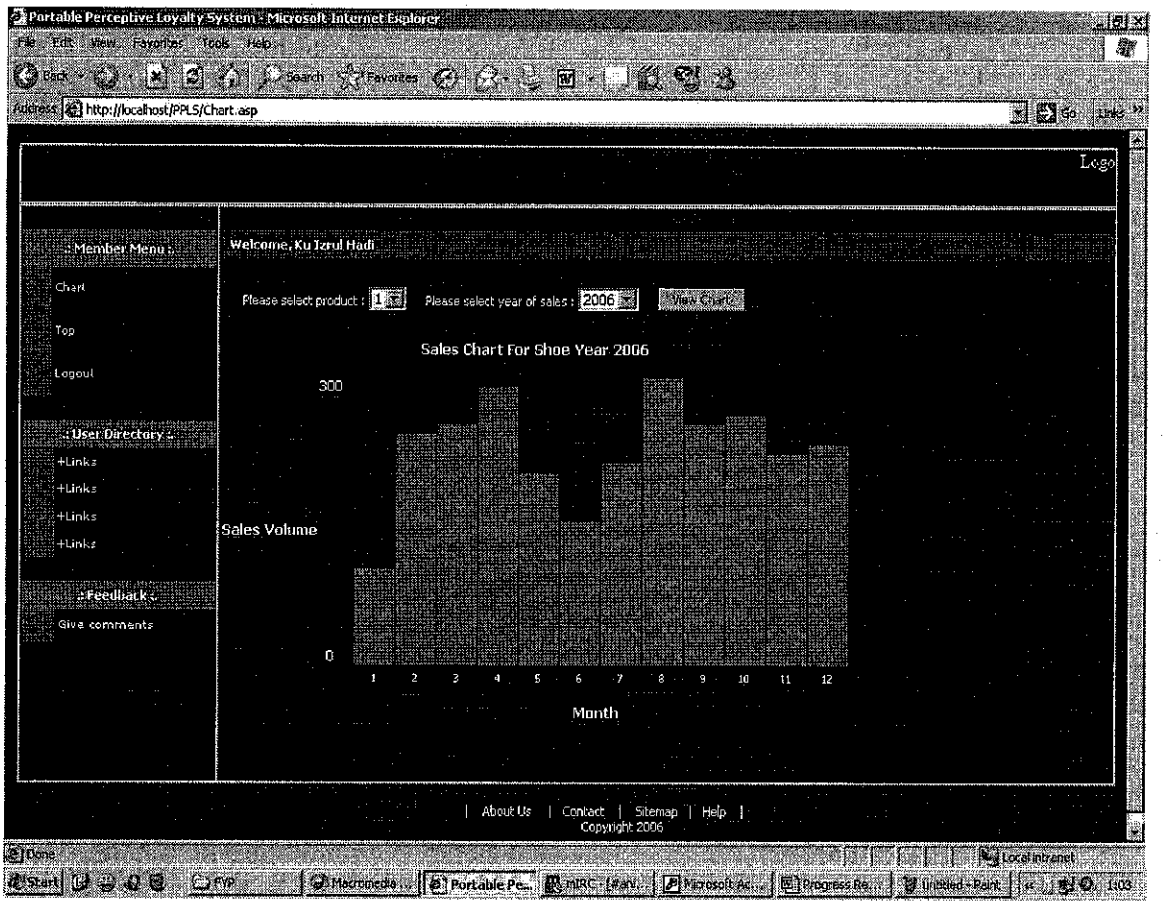

Figure 4.6.7: Chart for product sale page

Below is the table for top of branch making sale in a particular year in descending order based on the sales volume.

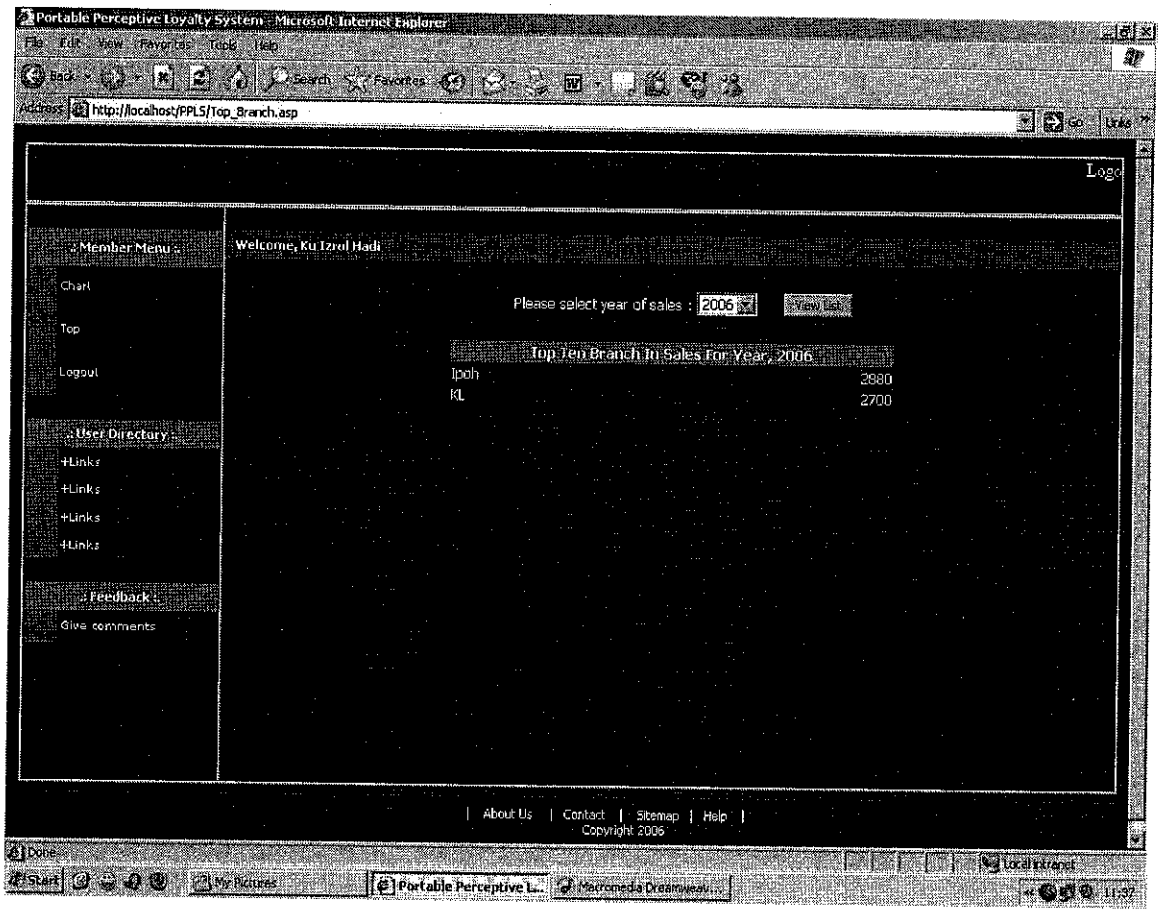

Figure 4.6.8: Table for top branch in sale page

Based on the table, we can see which branch is making the most sales in that year and which is making the least therefore necessary action could be taken to overcome the problem.

As for figure below, the system is showing the top product making sales in a particular year in descending order starting from the most best selling product to the most least selling product.

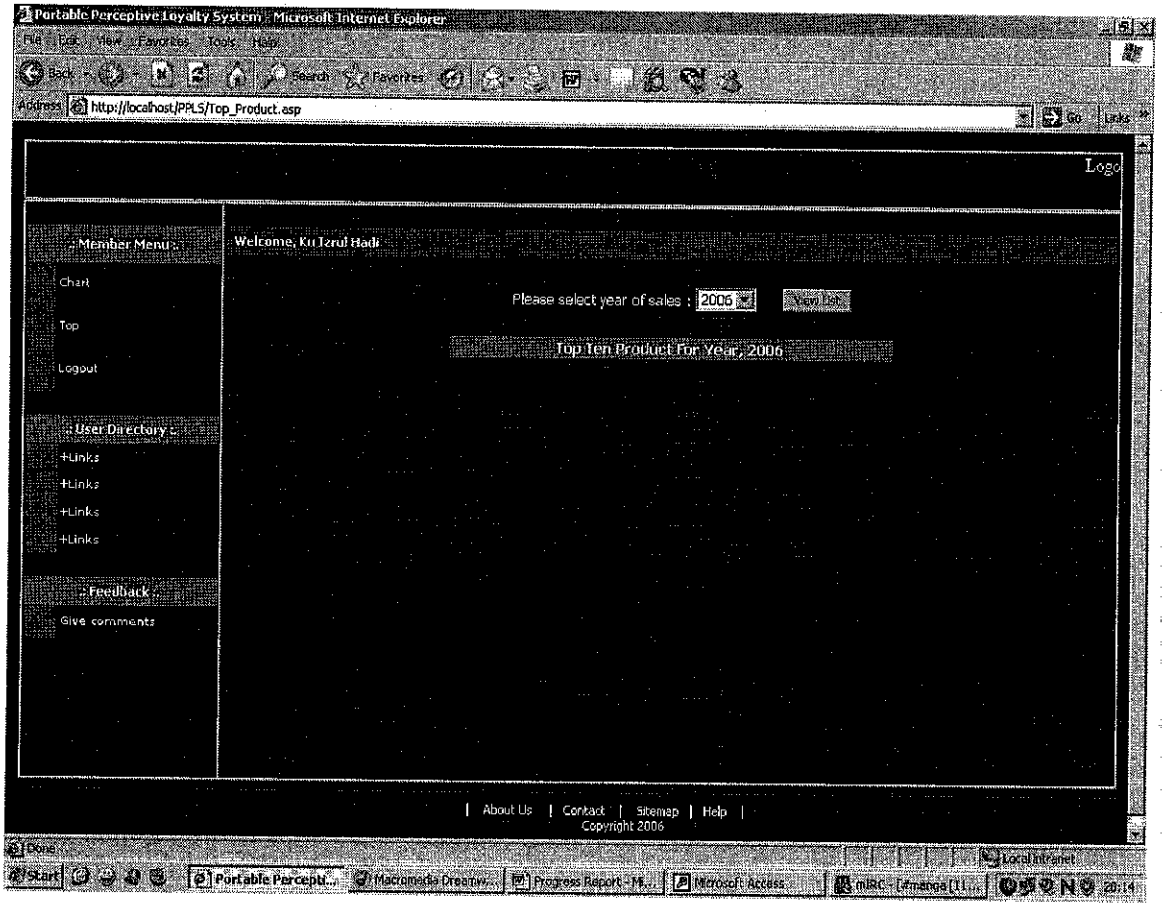

Figure 4.6.9: Table for top product in sale page

Necessary action could then be taken in order to boost up the sale for the most least selling product either by making a target marketing to our profitable customer in buying the product.

After all necessary function had been performed by the user, the user can log out of the system by clicking the logout button on the left navigation panel and they will then be directed to the logout page where all session and cookies will be deleted.

Figure 4.6.10: Logout page

CHAPTER 5
CONCLUSION AND RECOMMENDATION

Perceptive loyalty system is a web-based application intended to help in customer relationship management of a company. It is hoped that by implementing the system company could helps businesses use technology and human resources to gain insight into the behavior of customers and the value of those customers.

If the system works as hoped, a business can:

- provide better customer service
- cross sell products more effectively
- help sales staff close deals faster
- simplify marketing and sales processes
- discover new customers
- increase company's revenues

Overall, the end product is intended to show the audience of the functionality of the suggested mechanism. Further enhancements and any relevant elements can be added in order to implement a better working product in the future. This will make the system more interesting and not only focusing on one scope.

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APPENDICES

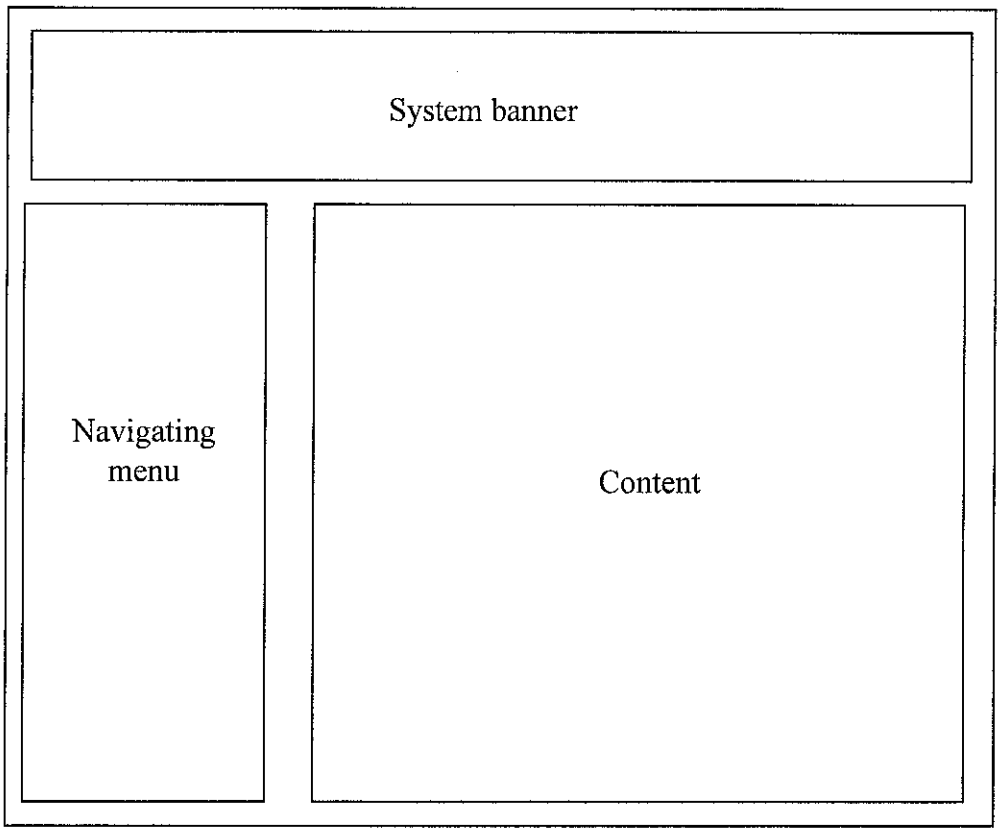

Figure 5: Story board for template of the system page