



Retail Management Online

by

Ms. Pattaraporn Fusiripong

A Final Report of the Six-Credit Course
IC 6998 E-Commerce Practicum

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Internet and E-Commerce Technology
Assumption University

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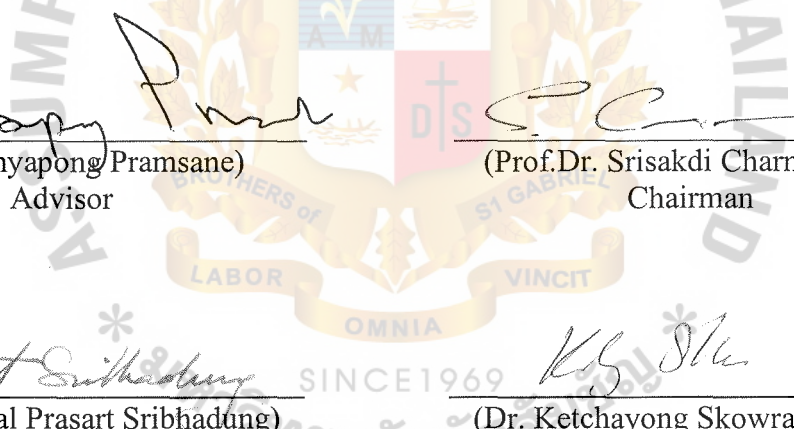
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Academic Year	March 2003

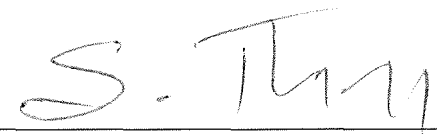
The Graduate School of Assumption University has approved this final report of the six-credit course, IC 6997 and IC 6999 E-Commerce Practicum, submitted in partial fulfillment of the requirements for the degree of Master of Science in Internet and E-Commerce Technology.

Approval Committee:



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ABSTRACT

Retailing encompasses businesses and people and people to transfer goods and services from suppliers to customers, through distribution channels. The channels are linked as a complex network. The important key for retailers' profitability is network management to satisfy retailers' customers, and employee.

Nowadays, many and more retailers are improving their network operation by using information technology. However, improper implementation creates extra delivery cost, information transfer cost, and customer service cost.

Retail Management Online System (RMOS) is proposed to enhance retail business efficiency while lower costs. All necessary retailer functions will be systematically linked in RMOS to illustrate a clear business paradigm. By employing Internet technology, including E-commerce, information transfer will be accurate, reliable, and cost-efficient, resulting in not only less customer service problem but also tighter customer relationship.

ACKNOWLEDGEMENTS

One of the more pleasurable tasks is to thank all the people who have contributed to develop this project. First of all, I would like to sincerely thank Dr. Saranyapong Pramsane, my project advisor, and Rear Admiral Prasart Sribhadung, my project co-advisor, for their help, useful suggestions, and support.

I would like to thank all members of the committee who have taken time to read and check the grammar this project and attend the oral examination.

A special word of thanks is due to Miss Uncharee pongkwen, senior Auditor (Official level 8), Office of the auditor general, as she explained retail business operations and accounting to me. Finally thanks to my family for their patience, encouragement and support.

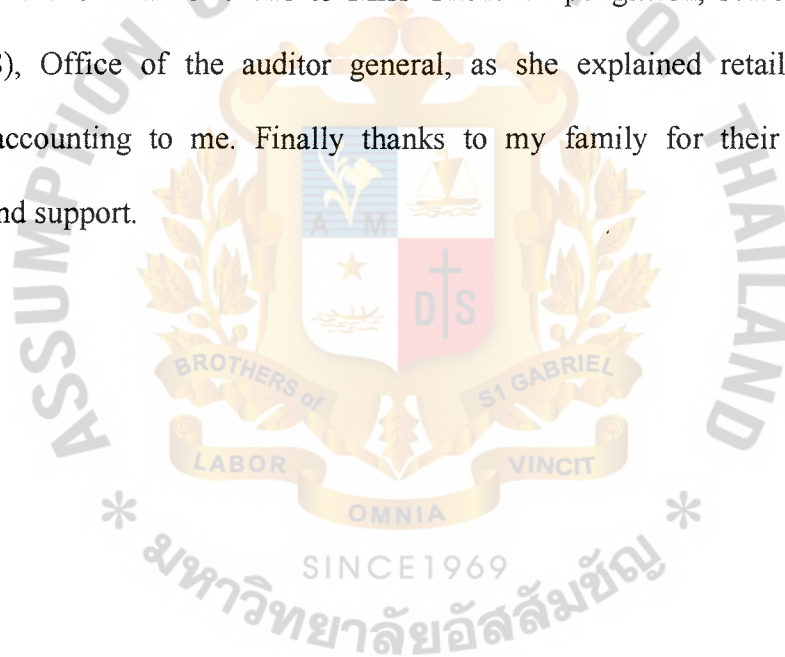


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I. INTRODUCTION

1.1 Background of the Retail Business

The concept of retailing is based on a four-pronged mission: The right product in the right place at the right price at the right time. With this essential mission in place, issues like customer service, technology, and fulfillment are tangential. The key to success and profitability lies in the understanding and application of the elements of retailing: strategies, assortment planning, merchandising, inventory management, vendor negotiations, and so on. True, they are absolutely vital to successful business operations, but at the same time, they are not, in the tired language of our day, their core business. They are the essence to conduct retail operations successfully using computer system.

Historically, independent retailers first started computerizing in the 1995. The hottest hardware of the day was the personal computer. Software known as MS-DOS provided the operating system. Computer programs specifically designed for independent retailers were just starting to emerge.

By the late 90's even small retailers had the ability to extract valuable reports from computer systems. Such reports enabled them to zoom in on the most profitable and least profitable merchandise and many other valuable pieces of inventory information. But any information cannot be transferred in the real time to anywhere.

Since 1999, with the arrival of the Internet, we have been driven faster and faster to get operating, define strategies and business models, identify and prioritize customer wants and needs, and expand retail businesses. Using Internet to support an information access and collaboration-based economy in which value is created by the use of ubiquitous, low-cost communication networks to facilitate the exchange of information

and ideas between customers and retailer. Not only are processes being compressed, but also many shortcuts are being taken in the product development process. It would appear from the data that important retail management steps are missing in the new product development process.

Then the purpose of this project is to explore how to build a **retail management online system** logically based on this strategy. The system is called **RMOS**. The idea in creating the system should make it easier and not harder for operations, analysis and communication including exchange information between retailers and their customers.

The RMOS ideal should be a simple for clerks to operate, monitor any operation such as sales, purchasing, inventory control, finance and, accounting and so on. Their customers should transfer purchase order and see pricing via the Web site for quicker turnaround, and reduced cost, communication time, and chance of human errors.

Another idea is to develop in order to support small retailers and have a closer relationship with customers. So, RMOS can reduce budget, time cost, labor cost, communication cost and any operation cost, when the retailers operate their business successfully via RMOS.

1.2 Objectives of the Project

The objectives of the project are as follows:

1.2.1 Provide Easy Management Tools.

RMOS consist of sales, purchasing, inventory control, finance, and accounting and decision making information, for any kind of retailers such as grocery stores, drugstores, book stores, restaurants, stationary stores and so fourth.

1.2.2 Create E-retailers in order to Distribute Retailers Advertising, Promotion, and Customer Service.

RMOS create retailers Web site (E-retailer) in order to distribute any their product catalogs to customers including customer service over the Internet in anywhere and anytime.

1.2.3 Support Transferred Information between Headquarters, any Department, and Their Customers in Anywhere.

Branches and warehouses of each retailer have low cost for sharing information with headquarters. Headquarters is easily able to exchange information and control any operation of each branch and warehouse though the Internet. RMOS is web-based application system, so it can reduce telecommunication cost for transferring information to any departments in organization. Another benefit is that the organizations can reduce paper-based document cost for exchanging information to any departments in their organization, and their customers in anywhere.

1.3 Scope of the Project

The scope of the project is to build Web-based application system in order to make the existing key operation functions of retail businesses such as sales, purchasing, inventory control, making accounting, finance, and customer service including E-retailer. This project supports operation of any small retailers and customer service for their customer via the Internet.

Scope of the RMOS is following that:

- (1) Control, maintain, and calculate accounting record to provide a broad picture of the firm financial condition including transferring cash and check transaction, accounts receivable, and accounts payable.

- (2) Control, plan and calculate collection and operation of merchandise information in the retailer's inventory and inventory analysis.
- (3) Generate any statistics or graphic analysis such as the top 10 sales products, the least 10 sales products, and so forth.
- (4) Generate invoice vouchers, purchase order forms, and any reports to support retailers' business operation.
- (5) Control financial organization about cash flow for running in any kinds of retailer.
- (6) Show retailers' product in E-retailer for customers who would like to consider pricing of each project in the real time.
- (7) Controls, monitors, maintain, and provide any customer service in the E-retailer efficiently.

1.4 Deliverables

The deliverables of the project are following that:

1.4.1 RMOS (Web-based application system)

- (1) ASP, and JavaScript for building RMOS.
- (2) SQL Server 2000 and/or MS accesses to manage database system.

1.4.2 To Design Database System.

- (1) Data Flow Diagram
- (2) Data Dictionary
- (3) ER Diagram

1.4.3 Report and Forms

- (1) Sales forms, and reports
- (2) Purchase forms, and reports
- (3) Inventory forms, and reports

- (4) Finance forms
- (5) Accounting forms

1.5 Project Plan

The plans of the project are as follows:

1.5.1 Study and Analyze the Existing Retail Business Function

The key functions are sales, purchase, tracking inventory, finance, and accounting.

1.5.2 Requirement Analysis

Analyze any aspects of requirement to support our system efficiently consists of hardware, software, architecture, software and database security, and database recovery.

1.5.3 Workflow, Data Flow, and Database Design are divided into 3 parts as:

- (1) Analysis and design user interface including Web pages, and reports.
- (2) Analysis and design implementation, installation, maintain, and training the web-based application and database.
- (3) Building RMOS includes both front office (E-retail web-site) and back office (Operation web-site) for retail businesses.

1.6 Project Schedule

Table 1.1. Project Schedule.

Section	Plan	Period (days)
1	Research requirement of operation in each department and find out the important processes for vary retailer stores.	30
2	Draw flow diagram, and analyze and write each process description	15
3	Design database system	10
4	Create RMOS (E-retailer and Back office)	45
5	Adjust and to improve the ROMS following by marketing plans and fix some bugs in the ROMS	10
6	Design implement, installation, and maintain the system	10
	Total Period	120

II. THE EXISTING SYSTEM

2.1 Background of the Retail Business System

The relationship between two merchandising business activities and the transferred information in Figure 2.1. The illustration explains the organization that buys goods from vendors and resells those goods to customer.

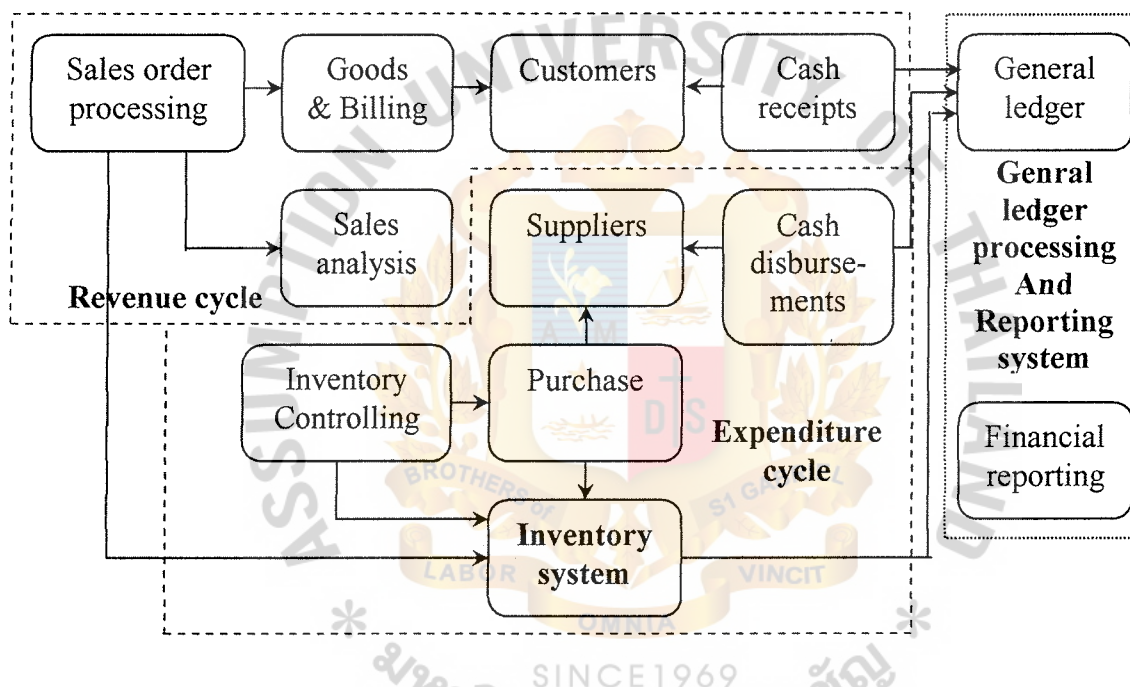


Figure 2.1. Relationships Each Activity of Retail Business.

2.1.1 The Revenue Cycle

The revenue cycle is a recurring set of business activities and related information processing operations associated with providing goods and services to customers and collecting cash in payment for those sales. In addition, internal information flows between the revenue cycle and the other accounting cycles. The revenue cycle is to support the performance of the organization's retail business activities by efficiently processing transaction data. The four basic revenue-cycle business activities: sales order

entry, shipping, and billing and cash collections. The revenue cycle is divided into 4 activities to following activities:

(1) Sales order entry

The first step in the revenue cycle is sales order entry. The sales department performs these activities.

The sales order form entry function obtains needed more information about inventory availability and customer credit status from the inventory department and accounting department. However, the financial department makes decisions concerning credit policies, including the approval of credit for new customers and increasing the credit limits of existing customers.

Customer inquiries may be handled directly by the sales department. Retrieving information from the customer (Credit sales) and sales orders reports answer inquiries about current account balances or the status of orders.

Inventory quantities on hand must also be checked, so that salespersons can be informed about availability and expected delivery dates. An acknowledgment may also be sent to the customer. If there is not sufficient inventory on hand to fill the order, a back order for those items must be created.

(2) Shipping or delivery

The second step in the revenue cycle involves filling customer orders and shipping the desired merchandise. Warehouse workers are responsible for filling customer orders by removing items from inventory. The shipping department is responsible for the actual delivery of the goods to customers.

One major decision that needs to be made when filling and shipping customer orders concerns the choice of delivery method.

The information is provided on the documents that it receives from the sales order and inventory department.

The shipping department compares the physical count of inventory with the quantities indicated on the picking ticket and with the quantities indicated on the packing slip that was sent directly to shipping from sales order entry.

The invoices and delivery vouchers are created when shipping department transfer the goods to customer. Customers will keep one copy to confirm the transfer the goods to them. And another one is kept in shipping department to track and confirm the transfer of goods to customers.

(3) Billing and Accounts Receivable (Customers)

Two activities are performed at this stage of the revenue cycle billing to customers and maintaining customer accounts.

This required information from the shipping department identifying the items and quantities shipped, and information about prices and any special sales terms from the sales department. The sale invoice voucher notifies customers of the amount to be paid and where to send payment.

Handling sales returns and allowances. Sale returns arise when unsatisfied customer sends back all or part of the ordered goods. Sale allowances are adjustment in prices granted to customers. In either case, credit memos are prepared to formalize the agreements reached.

To credit a customer account for returned goods, the credit manager must obtain information from the receiving dock that the goods were

actually returned and replaced into inventory. Upon notification from the receiving, department that the goods have been returned. The credit memo is sent to accounts receivable, to authorize an adjustment to the customer's account balance

(4) Cash collections

Because cash can be stolen so easily, it is important to take appropriate measures to reduce the risk of theft. One way to do this is to not let the billing and accounts receivable function, which is responsible for recording customer remittances, have physical access to cash or checks. To do this, the accounts receivable function must be able to identify the source of any remittances and the applicable invoices that should be credited.

2.1.2 The Expenditure Cycle

The expenditure cycle is a recurring set of business activities and related data processing operations associated with the purchase of and payment for goods and services. This cycle focuses on the acquisition of finished goods, supplies, and services.

In the expenditure cycle, the primary external exchange of information is with vendors. The expenditure cycle also sends expense data to the general ledger and reporting function for inclusion in financial statements and performance reports.

The expenditure cycle is divided into 4 activities to following activities:

(1) Request the purchase of needed goods

The key decisions made in this process are identifying what, when, and how much to purchase. These decisions are normally made by the inventory control function, although the need to reorder items is sometimes noticed by various user departments. Purchase requests are also sometimes

generated in the production cycle or arrive in the form of back orders from the revenue cycle.

Managing inventory is to maintain sufficient stock so that production can continue without interruption even if inventory use is greater than expected or if suppliers are late in making deliveries.

The request to purchase goods or supplies is triggered either by the inventory control function or by employees noticing a shortage of materials. Retail business use the items note when stock is running low and request that it be reordered.

The purchase requisition is a document that identifies the requisitioned. Approving the purchase requisition indicates the department number and account number to which the purchase should be charged.

(2) Ordering goods to be purchased

The second major business activity in the expenditure cycle involves the ordering of supplies and materials. Purchasing agents within the purchasing department usually performs the purchasing activity. The crucial operating decision in the purchasing activity involves the selection of vendors for inventory items. Several factors should be considered in making this decision: Price, Quality of goods, Dependability in making deliveries.

A purchase order is a document that formally requests a vendor to sell and deliver specified products at designated prices. It is also a promise to pay and becomes a contract once the vendor accepts it. The purchase order includes the names of the vendor and purchasing agent; the order and requested delivery dates; the delivery location and method of shipment; and information about the items ordered. Frequently, several purchase orders are

generated to fill one purchase requisition because different vendors may be the preferred suppliers for the various items requested.

(3) Receiving ordered goods

The third major business activity in the expenditure cycle involves the receipt and storage of ordered items. The receiving department is responsible for acceptance vendor deliveries. The inventory department is responsible for storage of the goods. Information about the receipt of ordered merchandise must also be communicated to the inventory control function, to update the inventory records.

The receiving department has two major responsibilities; deciding whether to accept a delivery, and verifying the quantity and quality of the goods delivered. To encourage the receiving clerk to accurately count what was delivered, many companies black out the quantity ordered field on the receiving department's copy of the purchase order.

The receiving report documents detail about each delivery, including the date received, shipper, vendor, and purchase order number. One of these accompanies the goods to the inventory stores department, where a clerk signs off to acknowledge transfer of the goods into inventory. This signed copy of the receiving report is then sent to accounts payable, where it is used to approve the vendor invoice.

Three possible exceptions to this process do not routine for this cycle as receiving a quantity of goods different from the amount ordered, receiving damaged goods, or receiving goods of inferior quality that fail inspection. In all three cases, the purchasing department must resolve the situation with the vendor.

(4) Approving vendor invoices for payment

This process is performed by the accounts payable department, which reports to the controller. The purchase transaction was authorized when the purchase order was issued; the accounts payable department records the obligation to pay the vendor. However, most retail business record accounts payable only after receipt and approval of the vendor's invoice.

There are 2 basic ways to process vendor invoices, referred to as non-voucher or voucher systems. In a non-voucher system, each approved invoice is posted to individual vendor records in the accounts payable.

The accounts payable clerk then enters the approved invoice to reflect the receipt of the vendor invoice.

(5) Paying for goods purchased

The final activity in the expenditure cycle is the payment of approved. This activity, referred to as the cash disbursement function is performed by the cashier, form the authorization and recording functions, performed by the purchasing and accounts payable departments, respectively.

Handling purchase returns and allowances. Purchase returns arise when a purchasing firm is unsatisfied with ordered goods. Purchase allowances are adjustments in prices granted to the purchasing firm as compensation for damaged goods, overages, or such specified deficiencies as over charges. The person who discovers the needed adjustment should notify the purchasing department. The buyer or purchasing manager prepares a renumbered debit memorandum, which notifies the selling firm and the accounts payable department that the account balance is to be reduced by a stated amount. The accounts payable department clerk pulls

the supplier's invoice and supporting documents. After comparing these documents, the clerk prepares a journal voucher to reflect the transaction. Other clerks post the adjustment to the accounts payable ledger and general ledger.

In the case of a return, copies of the debit memo are also sent to the inventory department. The goods being returned are then released to the inventory department, which counts the goods, notes the count on the debit memo, ships. The inventory department then forwards the debit memo to the financial department.

2.1.3 The Inventory System

In horizontal perspective, the inventory department interacts; selling, purchasing, financial, and accounting department.

(1) Prepare purchase requisition

Inventory must control sends purchase requisition to purchasing department. Inventory's function is to provide buyers with the data necessary to prepare a purchase order.

(2) Allocate inventory

Recall that when salesperson accept a customer's order, it is necessary to commit the ordered items so that these items cannot be sold to another customer. This process helps to maintain good customer relations by preventing the selling of the same items to two or more customers. It also expedites the reordering process by updating the inventory record from those inventory items that have been ordered by customers and are expected to be sold.

(3) Record inventory shipment

Thus, as goods are shipped to customers, the inventory department must be updated to reflect this activity.

(4) Record adjustment

Record adjustments handle the adjustments affecting the inventory department. Sale return informs the inventory system of those inventory items that have been returned by customers, often because of defects or inaccurate shipment. So, Inventory must return goods to customer again.

(5) The General ledger processing and reporting system

In the section, the general ledger processing is divided into 2 activities that are following:

(a) Update general ledger

The first activity in the general ledger system is to update the general ledger. Updating consists of posting journal entries.

Each of the accounting subsystems creates a journal entry to update the general ledger. The general ledger could be updated for each individual transaction.

The revenue cycle subsystem would generate a summary journal entry debiting accounts receivable and cash and crediting sales for all sales made during the update period. Similarly, the expenditures cycle would generate summary journal entries to record the purchase of supplies and inventories and to record cash disbursements in payment for those purchases.

The treasurer's office creates individual journal entries to update the general ledger for non-routine transactions such as the issuance of

retirement of debt, the purchase or sale of investment securities, or the acquisition of treasury stock.

(b) Post adjusting entries

The second activity in the general ledger system involves posting various adjusting entries. These adjusting entries originate from the controller's office, after the initial trial balance has been prepared.

(6) Reporting

The final activity in the general ledger and reporting system involves the production of various reports. In the sale departments are often evaluated as revenue centers; consequently, their performance reports should compare actual and forecasted sales, broken down by appropriate product and geographic categories. And another case, performance reports would appropriately compare actual revenues, expenses, and profits with their run business.

2.2 Background of the Existing Computer System

2.2.1 History of Retail's Computer System

Before 1990's, the retailers are performed manually suitable tasks. But in 1990's historically; independent retailers first started computerizing in the 1990's. The hottest hardware of the day was the IBM compatible XT personal computer. Software known as MS-DOS provided the operating system. Computer programs specifically designed for independent retailers were just starting to emerge.

Large retailers, already automated, continued to expand and upgrade their systems. Those initial software applications were geared towards single stores. The key

functions were to increase sales, track inventory and assist in purchasing and receiving merchandise.

As the technology advanced and the field became more competitive, the capability to read bar codes and manage multiple stores came into play. By the late 1995 less small retailers had the ability to extract valuable reports from computer systems. Such reports enabled them to zoom in on the most profitable and least profitable merchandise and many other valuable pieces of inventory information.

Retail systems without accounting functions developed partnerships with companies specializing in accounting software so the two could be linked or integrated. The typical system for today's independent retailer has all the basic functions, from the point of sale to the back office, working together.

Merchandise is purchased, received, sold, reported and accounted. Now that systems, such as Retail Pro, with advanced reporting capabilities have migrated to Windows the playing field between the independent businesses and the giant super stores has leveled out.

In computer system about retail business is divided following that business activities of almost retail business as revenue cycle business activities, expenditure cycle business activities, and general journal business activities.

But almost computer system of retailers cannot exchange information between any departments in their organization, and their customer in other places.

2.2.2 Architecture System

Independent retailers first started computerizing in the 1990's had application architecture can be allocated to a single machine (Single physical tier). When technology advanced retailers change application architecture to be client / server machine that application resides in the client and database reside in server machine.

Single tier architecture (See Figure 2.2.a) at present is to computerizing any information to run retailer business. The modern network computer potentially made the single tiered model more popular because these computers were more expensive and high to maintain them.

After that, Client / service architecture was developed and technology advanced than the past and lower cost for purchase any computers. Two-tiered architecture is popular to retailers' computer system. Because of the database reside in the server (resides inside their organization) and client must connect to server in order to using database so, information will share to any users inside their organization. Two-tier architecture split database resides another application. These technique architectures are called Distributed program (See Figure 2.2.b) and remote data architectures. (See Figure 2.2.c)

In distributed program, the application programs are split between the client and server machines and they communicate with each other through the remote-procedure-call middleware. Another technique is remote data typically stored in an SQL server and is accessed through ad hoc SQL statements sent over the network.

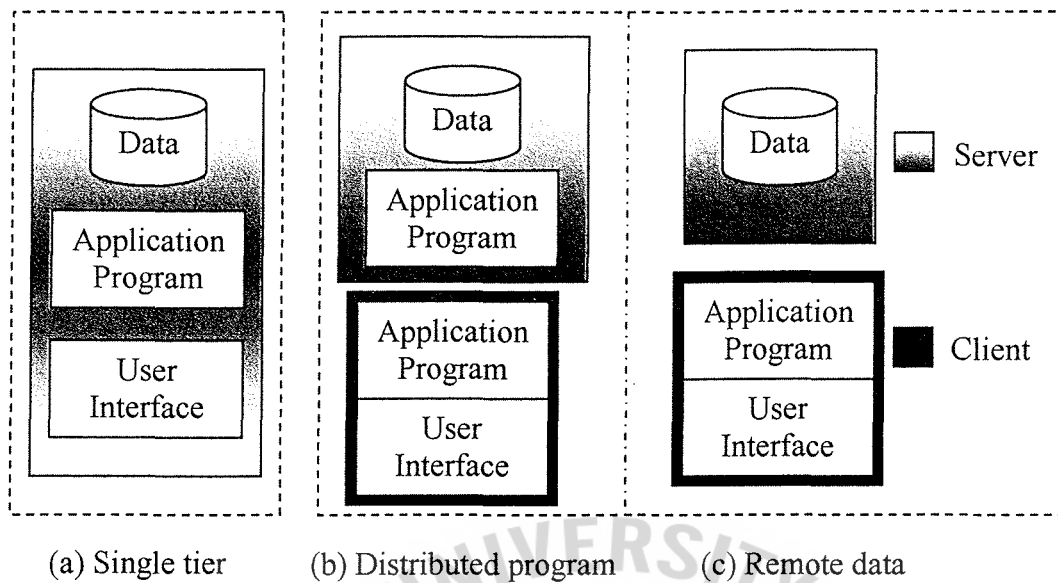


Figure 2.2. Single-tier and Two-tier Architectures.

2.2.3 Software System

When faced with the need to obtain software for its business information, decision support or data processing systems, an organization may either commission specially written software or purchase a standard applications package.

In the early days of retailer software around 1995 retailers used a PC for running the single-user software. The user operated the system, entering data and information, directing the processing and determining which type of output will be generated. Because the users direct the processing, they can watch, control and adjust the activities from the individuals using the system. The information generated by single-user software is usually stored within the system or an attached in the secondary storage device.

In the information age, the most important element of the infrastructure is its shared use for everyone benefits. So, the software system is developed in new idea. It must provide instant access to information technology and data communications

capabilities from a variety of sources. The new software of retailers must to share information in many departments in the organization. The multi-user system will happen in the information age. Multi-user system will increase the productivity and effectiveness of the people using the system, and organization.

The software can be written in COBOL and any fourth-generation languages such as Visual Basic. The specification of the business needs of an organization and the translation of these into program specifications is often preceded by a considerable period of analysis and design.

In finally, almost software of retailers may support the operating system windows from Microsoft because the same graphical interface is consistent from one application. And much popular software is installed in the client and running in the client and use centralize database in the server.

The existing software of retailers cannot transfer information to other place. But if they use EDI technology for doing it, they must spend more budgets to build EDI network. It's mean that every places need to exchange their information with retailers must to have the same hardware and software. So, customers' site must to spend their budgets for exchanging information with retailer.

2.3 Current Problem and Areas for Improvement

The business activities have more problems divided into each cycle as:

2.3.1 The Revenue Cycle

There are major threats and exposures in the revenue cycle and the additional control procedures, besides adequate documents and records that should be in place to mitigate them. Every retailer faces these threats of business. Therefore, it is important to understand how the computer system and all information can be designed to counter them.

Sales to Customers with Poor Credit

(1) Threat

The principal threat in sales order entry is the possibility of making sales that later turn out to be uncorrectable. Requiring proper authorization for each credit sales diminishes this threat.

Some retailers have many branches in the organization. Headquarters has received customer credit late, they cannot control salespersons in any branches for limited credit of each customer in each branches. This problem will take risk for organization. It's mean that the retail sent any goods to customer but they don't pay money back to company so, company take risk for losing profit from customers and the company cannot extend business because they have not more capital to do anything. If many customers don't pay money to retailer, retailer may be bankrupt because of lose capital.

(2) Areas for improvement

In order to counteract the poor credit of customers, retailers must establish a variety of internal controls. A foundation for establishing needed controls. It's desirable first to clarify the objectives that the controls are intended. There is several key control objectives are to ensure that all customers who are accepted for credit sales are credit worthy.

The retailers should use computer-based system to maintain accurate and current customer account balances and credit limits further diminished the risk of making uncorrectable sales. Using the information from an application program into which the credit approval rules have been built should authorize all credit sales transaction.

If the retailers have any branches or any departments which are located in other areas, their system must transfer customer information immediately and to accurate customer account balance calculation and to authorize the customer credit limited in the real time.

The solution that solves problems is that the retailers must receive correct customer information, sale order transaction, and product information in the real time. After that, they must to know accounting method about customer balances and check credit calculation.

All transferred information should be exchanged from a department to any departments that related with the correct information in real time. The computer system enable to transfer them and to protect the error from filled up the raw data about sales order transactions. The system should retrieve the accurate customer credit information to help any salespersons to authorize the credit of each customer and reduce the risk of credit sales to customers who represent poor credit risks.

Another solution is the computer system should automatic cut off the stock when inventory sent the products to customer. Product information is sent to the sales department. Salespersons can know any quantity of each product in the stock. They should tell customer immediate when the products are out of stock. When the correct sales order transaction are transferred to inventory department, all shipping are not error. Therefore shipping will send to customer in right delivery time and correct location and do not shipping error occur.

Failure customer relationship with retailers

(1) Threat

Some retailers have fewer budgets for advertising or promotion to new and existing customers. Or, there are lack employees for supporting and servicing their customer. Those problems are occur a bad customer relationship so, revenue will be drop and sale forecast is slow.

(2) Areas for improvement

Although, some retailers cannot spend more money to promote or span market share for there products, but they can closer customers by the Internet technology. E-retailer uses the Internet technology to support customer service, promotion, advertising, and built relationship with new and existing customer. The retailers' customers can search any interested in merchandises for comparing the pricing, asking question about these products, complaint any service of the organization, and do anything, and so on. This technique use mass market theory for finding new customers and serving existing customers via the Web site. Therefore, the web site (E-retailer) can make the best relationship between existing customers with their retailer and finding new customer to be their customers.

This technique (E-retailer) will support customer service, quotation pricing, shopping of customers. And another advantage of the system is to reduce the communication cost between customers and retailers.

Shipping Errors

(1) Threat

Shipping the wrong items of merchandise and shipping to the wrong location are serious errors, because they can significantly reduce customer satisfaction and thus future sales. Shipping mistakes can be caught by reconciling the copy of the sales order sent to the shipping department with the information on the picking ticket received from the warehouse. Shipping of inventory can virtually eliminate data entry errors.

(2) Areas for improvement

In order to counteract threat about shipped goods are errors. There are many main control objectives are to ensure that all ordered goods are shipped, and all service are performed by dates that are agreeable to both parties. All shipped goods are authorized and accurately billed within the proper accounting period.

The retailers must use computer- based system to control shipping and including stock in inventory. The system should exchange information between any departments for any operation in each department. For example, sales order information is transferred from sales department to inventory department in order to correct ship ordered product to customer. Any information is ordered product information, delivered address, and delivery date.

Failure to Bill Customer

(1) Threat

The important threat in the billing function is errors in preparing sale invoices (For example, showing greater quantities than were shipped or showing unit prices that are too low.) Unbilled accounts and the loss of assets and erroneous data of sales, inventory, and accounts receivable. Including sales, inventory departments are other areas so, data transfer is so different and difficult to check loss and erroneous accounts receivable data.

There are errors on invoice, and billing forms because the retailers manually to create these forms. So, it can cause operational failure occur such as writing wrong pricing, wrong quantity, wrong order and so on.

(2) Areas for improvement

The computer system should generate sales order form, invoice form and billing form to customers automatically. The system will generate them to customers so this strategy can reduce failure to create billing, invoice to customer. Another benefit is to reduce labor cost for writing any forms and reduce manual error for creating invoice, and billing forms. Information will be transferred from sale department to finance department for generate billing to customer. If clerk entry correct raw data to the system from sales department, information may be accurate, when send it to finance department. Therefore, the finance department will get right information and can reduce failure billing of customers.

Theft of Cash for Cash Collections

(1) Threat

Theft of cash receipts, especially currency, by persons involved in the processing often accompanied by omitted postings to affected customers' account. And another cases the lapping of payments from customers when amounts are posted to account receivable records. So, there is loss of cash receipts, incorrect account balances for these customers whose records are involved in the lapping.

(2) Areas for improvement

In order to protect the risk exposures in theft of cash, the retailers should have more policies for controlling internal organization. For instance, the risk of lapping can be reduced if the persons who receive and handle cash are organizationally separate from those who record the receipts in the customer accounts. There are many key control objectives are to ensure that all cash receipts are recorded completely and accurately. All cash receipt transactions are posted to proper customer's accounts in the account receivable ledger. And all accounting records and cash should be safeguarded.

Another way for protecting this problem is the computer system should support in accounting about customer account balances and can check cash or check flow in the business. The system should protect cash information in the system and database security that stores all information, and flow in the system. There is encryption about transferred information and any information stored in the database. So, all transaction and information are safeguarded from the system.

Another solution to solve the problem, Customers remittances should be deposited by sent check to retailers before the retailer delivers the sale order. This way can reduce the amount of payment in the retailer. So, it can reduce the risk of theft of whole cash in each order.

In additional function, the system should support deposit transactions. For easy to retailers that remember which customers pay deposit and cut off original accounts receivable in real time. The retailers can reduce fraud of cash collection when they use deposit method via retailer management online. Headquarter can manage cash collection of each branches when this program can transfer cash information to headquarters in real time. So the company will reduce risk of thief cash in each branches.

Posting Errors in Updating Accounts Receivable

(1) Threat

The other threat related to the cash collections step of the revenue cycle involves errors in maintaining customer accounts.

(2) Areas for improvement

Posting errors can be detected by reconciling the results of processing with both internal and external data. The sum of all individual customer account balances should equal the total balance of the accounts receivable control account in the general ledger. If the two are not equal, an error in posting has probably occurred and all transactions just entered should be reexamined.

The computer system should support to maintain customer accounts. After customer has received ordered products. Accounts receivable of customer will be increase immediately.

When the retailers use the computer-based system, salespersons can retrieve updated customer account balance information in the real time after customer has paid to cashier in the finance department.

Loss of Data and Poor Performance

(1) Threat

Another threat in the revenue cycle is loss of data about customer accounts. Accurate customer account and inventory records are important not only for external and internal reporting purposes, but also for responding to customer inquiries. Moreover, loss of all accounts receivable data could threaten a retailer's continued existence. Therefore those records must be protected from loss or damage. When the information is wrong or loss of data for running business, the organization will be poor performance for running business.

(2) Areas for improvement

If users will entry the accurate sales order information and shipping information, the whole transferred information should correct and not loss of data. Therefore all department ensure to receive the accurate information to do anything so, there are not operation error due to wrong information. Any departments can see the right information in the real time.

This system can reduce problems of poor performance because the program ensures accuracy and safeguarding whole information that transfer in the organization. The system should generate sales analysis reports, which break down sales by salesperson, zone and product. Those reports are the efficiency and effectiveness of the sales force.

2.3.2 The Expenditure Cycle

Stock Outs

(1) Threat

Sometimes the retailers don't receipt of uncoded goods. The exposure is losses due to stock out and another problem is that orders placed for unneeded goods or more goods than needed. So, there is an excessive inventory and storage cost.

(2) Areas for improvement

To guard against the threat of stock outs and overflow the stock, companies need to establish an accurate inventory control system and sales forecasting to accurate request goods. It has more problems about they order product overload but they don't know the products are out of stock. The retailers should use computer system for solving this problem. The system should manage stock of each product from sale order, shipping, cut off stock, and control limit of each product when purchasing products and can support sale forecasting to correct request goods.

Theft of Inventory

(1) Threat

Theft or misplacement of goods in the warehouse or on the shipping dock. There is to losses in revenue, overstatement of inventory on the inventory balance.

(2) Areas for improvement

First, Inventory should be stored in secure locations to which access is restricted. Second, all transfers of inventory within the retailer should be documented or should have the right information in the computer system.

Both the receiving worker and the warehouse worker should acknowledge the transfer of goods from the receiving dock into warehouse.

When information will be accurate and immediate for transferring, worker can compare between physical counts of inventory on hand and to the inventory records in the program.

Errors in Vendor Invoices

(1) Threat

Vendor invoices may contain various errors, such as discrepancies between quoted and actual prices charged or miscalculation of the total amount due.

(2) Areas for improvement

The mathematical accuracy of vendor invoices must be verified and the prices and quantities listed there on compared with those indicated on the purchase order and receiving information in the computer system.

Failure to Take Available Purchase Discounts

(1) Threat

Failure to take advantage of purchase discounts can cost the company.

(2) Areas for improvement

The retailer must use the computer system for tracking approved invoices from due date. The system should print a periodic list of all outstanding invoices. This option will help retailer plan to take advantage of any available purchase discounts.

Errors in Recording and Posting Purchase and Payments

(1) Threat

Errors in recording and posting payments to vendors will result in errors in financial and performance reports that in turn can contribute to poor decision making.

(2) Areas for improvement

Appropriate data entry and processing controls are necessary to prevent these types of problems. One such control involves comparing the difference in vendor account balances before and after processing checks with the total value of invoices processed. The total of all vendor account balance should also be reconciled periodically with the amount of the accounts payable control account in the general ledger. The solution is the system should generate the general ledger automatically when there are transactions. The general ledger will restrict from the system so, information are accurately.

2.3.3 The General Journal

Errors in Updating the General Ledger

(1) Threat

Error made in updating the general ledger can lead to poor decision making based on erroneous information in financial performance report.

(2) Areas for improvement

- (a) A validity check to ensure that general ledger accounts do exist for each account number referenced in journal entry
- (b) Field checks to ensure that the amount field in the journal entry contains only numeric data.

- (c) Zero-balance checks to verify those total debits equals total credits in a journal entry.
- (d) A sign check of the general ledger account balance once updating is completed, to verify that the balance is of the appropriate nature (debit or credit).

2.3.4 The System

Loss or Destruction of Data

(1) Threat

The general ledger is a key component of the organization's accounting information system. Therefore, it is important to provide adequate backup and disaster recovery procedures to protect this asset.

(2) Areas for improvement

- (a) There are database system should recovery to protect this accounting and any information in the organization.
- (b) Backup of the all information. At least two backup copies of the information should exist. One copy should be kept on-site where it can be immediately accessed. The other copy should be stored elsewhere to provide protection against a major disaster.

III. THE SYSTEM REQUIREMENT

3.1 Architecture System Requirement

3.1.1 Application Architecture

A major step in establishing application architectures is to identify application layers and specify the abstract messages between these layers. RMOS supports architecture in three logical layers of an application is also known as logical tier following that

Single-physical-tier Architecture (See Chapter 2).

Two-physical-tier Architecture.

There are 5 architectural configurations known as the Garter Group configuration to follow that remote presentation, distributed presentation, distributed program, remote data, and distributed data. But RMOS refers only one architectural configuration that is Remote data is shown in Figure 3.1.

Remote data represents in which the remote data is typically stored in a SQLserver and distributed data represents the case where the data exists at client as well as server machines.

Three-physical-tier Architecture.

The three tier client and server model, the client/server application object are split access three types of machines a front end machine, middle machine, back end machine. This architecture is illustrated in Figure 3.1 (c). It's important that the interactions in very tier user a Client/Server model. In addition, some business aware functionality must exist of each of the tiers for a three-tier Client/Server application. More important, middle machines can merge integrate results from different data sources and can serve a gateway between the desktop applications and the back end legacy.

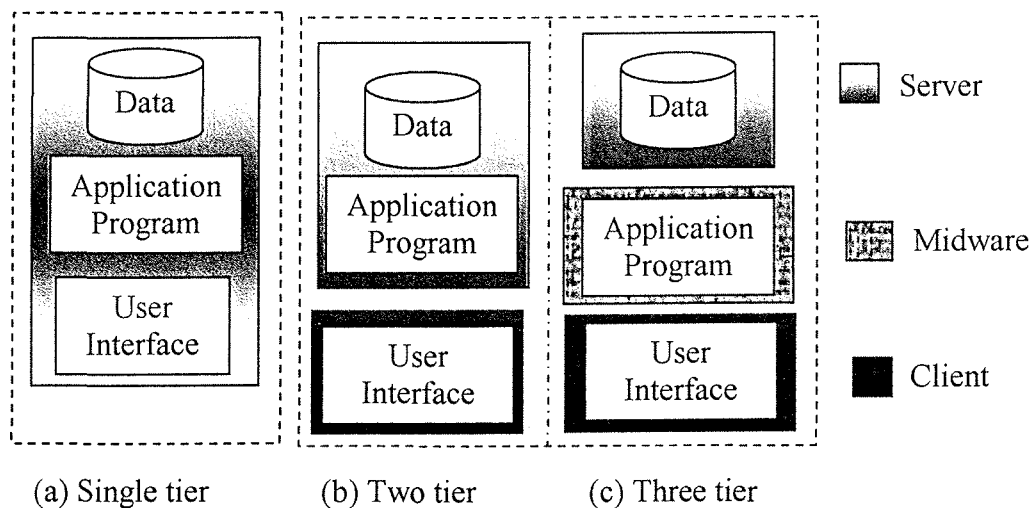


Figure 3.1. Single-tier, Two-tier and Three-tier Architectures.

In summary, The RMOS can support both single, two and three tiered architecture. However, If the retailers use single tiered architecture for executing RMOS, they cannot use E-retailer section. Because of their server, and database is offline which anybody can not connect to their server. It is called **RMOS offline version**. But if they must to use E-retailer and transferred information in any places though the Internet, they should choose two or three tiered architecture for their server. It is called **RMOS full version**. So, Tradeoffs between the different tiered configurations in terms of application types, flexibility, end-user independence, performance, availability, initial cost, upgrade cost, manageability, and security is shown in Table 3.1.

So, the retailers can choose one of two tiers for running RMOS over the Internet. It depends on their policy.

Table 3.1. Trade-off between Different Tiers.

Term	Two-tiered	Three-tiered
Typical Application type	Departmental	Enterprisewide
Flexibility and growth	Good	Very good
User Independence	Good	Very good
Performance	Congestion	Many choice
Availability	Good	Very good
Initial Cost	Medium	High
Upgrade Cost	Medium	Low
Manageability and Control	Good	Not good
Security	Good	Not good

Web-based Access and Execute Web Site in the Web Server (Using CGI)

Web gateway bridges the gap between Web browsers and Server, which keep the RMOS and its databases. Now CGI gateways are very popular at present. A CGI gateway is a program that resides on the Web server. So RMOS use ASP to develop. Therefore this system must be executed by the Web server. The Web server locates the gateway program and executes it. The output produced by the gateway program is sent back to the Web browser.

The fundamental difference between accessing a regular HTML file and accessing a CGI gateway is that the CGI gateway program is executed on the server to perform some specialized functions instead of just fetching and displaying an existing HTML page (See Figure 3.2).

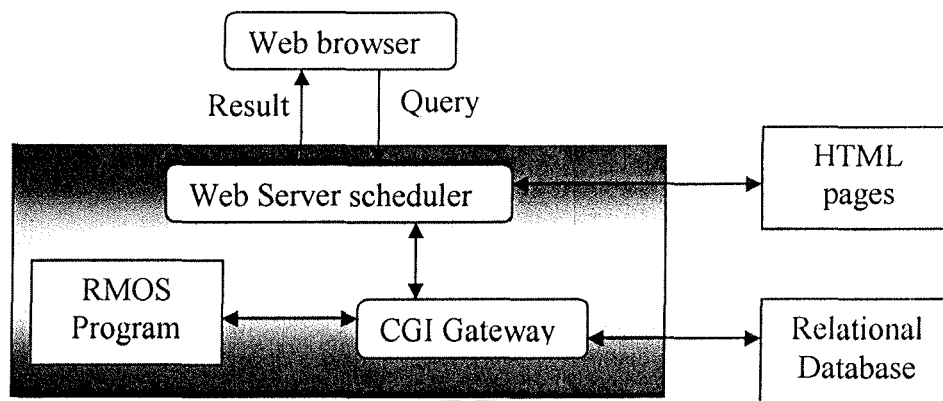


Figure 3.2. The CGI Gateway Processing Diagram.

Database Interface Architecture

The gateway that connects the web to the database interface software can also be called an interface. Some gateways require a database-specific module to talk to a database, and the module can be called an interface.

When someone use a Web browser to access a database, there are several components involved in passing the user query to the database and getting back the results show in the Figure 3.3.

Exactly how this process works depends on the capabilities of the target database and the type of gateway you use. There are 2 methods for a Web server to talk to a database engine that RMOS can support:

- (1) Using a database without networking capabilities (2 tired-architecture)

A database and HTTP server reside in the same server. A database may be able to handle multiple users at once. The HTTP server, CGI programs, and database server all exist on the same machine, giving CGI

programs direct access to whatever database interface program retailer want to use. So response time is as good as it can be.

If the database is of medium to large size and there are many users, it is definitely not a good idea to have the database server, HTTP server and multiple Web browsers all running on the same machine.

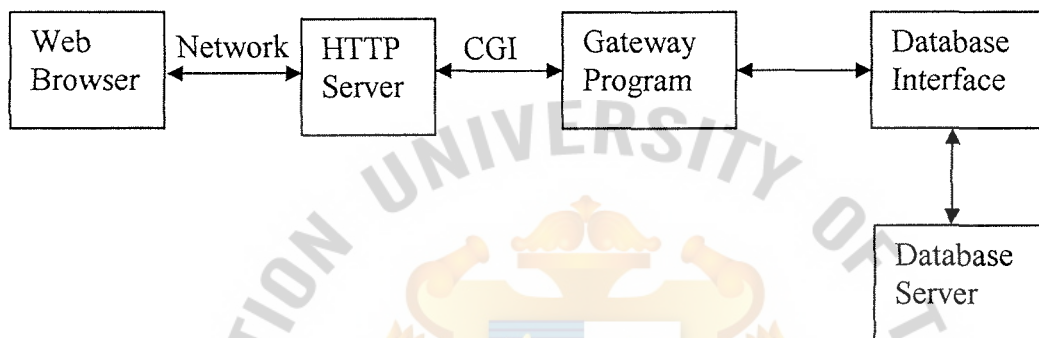


Figure 3.3. The Pieces Required Accessing a Database from Web.

(2) Using a database with networking capabilities (3-tier architecture)

If the target database comes with built-in network capabilities or retailers have purchased at least on license for remote access, this gives the option of running the HTTP server on a remote machine and accessing the database using the database network software.

Using a database with the existing network support presents several options (See Figure 3.3.). If the data can be broken into several distinct types, it is a good idea to use a separate HTTP server for each type of data, and even to run each HTTP server on a different machine, if retailers have the capacity. The load caused by the HTTP servers could also reduce

bottlenecks on a single node of the network, if the database server machine can serve multiple subnets.

This method also works well if you have more than one database server. A single HTTP server can access multiple database machines through CGI program.

Database Connection by ADO

ADO is an object-oriented API that sits over OLE DB. ADO is designed to provide an easy to use interface for all data access requirements. ADO supports specific data source features that are exposed through the different OLE DB data providers. ADO was designed to deliver better performance than other data access libraries and each version has been faster than the previous one. ADO provides the best performance against Database because not only is it optimized for speed but also the native database provider accesses data without going through the additional ODBC layer. ADO also componentizes functionality into multiple libraries so you only have to load the ones you need. ADO has a smaller memory footprint than its predecessors; this fact combined with its improved performance also makes it a good choice for Internet applications. ADO support hierarchical Recordset because you can access the child records as a Recordset, this functionality makes it easier to manipulate the data returned to the application.

ADO connection's takes advantage for connecting to database so much so, RMOS will use this connection to connect database for effectiveness between users who use the RMOS and database server.

3.2 Hardware and Software Requirement

3.2.1 Hardware Requirement

Hardware requirements depend on web server and database including the operation system. The retailers should choose hardware computability with their system for running RMOS. Hardware requirements are divided into 2 key groups as follows:

- (a) Stand Alone System (Use window9x or window ME operation system, PWS to be virtual web server, and MS access to be database.)

The minimum hardware requirements for this group to follow:

- (1) Processor: 486 MHz. above
 - (2) Memory: 16 MB RAM
 - (3) Video: Could be Super VGA and monitor
 - (4) Keyboard: any
 - (5) Mouse: compatible with operation system
 - (6) Harddisk: 500 MB.
 - (7) Floppy disk: 1.44 MB.
 - (8) CD-ROM: Bootable CD-ROM
- (b) Online system is divided into 2 subgroups.
 - (1) Server site: The minimum hardware requirement of hosting that support ASP programming.
 - (2) Client: the minimum hardware requirement same as the group 1. But there must be modem or LAN card for connection with Web server.

3.2.2 Software and Application Requirement

Web Server must to support ASP programming as:

(1) Microsoft's Personal Web Server

A Personal Web Server (PWS) is a Web server that retailers can install on their local computers, most likely their desktop. This allows small retailers to publish the RMOS onto their own computer and would not like to connect over the Internet. Retailers should choose PWS 4.0 for this workshop because it is available to all Windows users and it is ASP ready. Some retailers have operation system as WINDOW9X, and WINDOW ME. They can use the PWS for running RMOS offline version so, they cannot exchange their information in anywhere. If some retailers have one computer and don't transfer data to anywhere, in the program, retailers can use this web server for do anything in our program.

(2) Internet Information Server

Internet Information Server (IIS) is part of the NT Server 4.0 and Window 2000 server. It is the server service that will serve the interactive data-driven web applications to web browsers (clients). IIS is a scalable enterprise network tool for publishing FTP and Web content both internally for Intranets and externally for Internet sites.

When IIS is returning documents via HTTP, IIS can support client requests in one of these ways that is CGI Scripts - Common Gateway Interface (CGI) applications are script files that execute on the server-side of the IIS process. IIS is a very effective web server for sending HTML files to Web browsers, these supportive services that add power to IIS.

In conclusion, if the retailers must transfer data through each department in the organization via the Intranet, they should choose IIS to be

web server. Because of IIS can service any thing for running the RMOS fulfillment. In the special of IIS have authentication of window NT, so any secret information to be protected from anybody. Another security that IIS supports is a Certificate server, which allows you to act as own certificate authority when generating SSL keys, the digital files used to encrypt data. So, anybody can not intercept the information in LAN.

Web Browser

A web browser works by using a protocol (or a universal standard format for transmitting data) called HyperText Transport Protocol (HTTP). The web browser makes a request for a text document from a server. This text document is written in a special computer language called HyperText Markup Language (HTML). It is the job of the web browser to interpret the HTML in such a way that the user can view the content.

So, any client of retailers must have Web browser in the PC in order to running RMOS via browser and can exchange information between database server to client. IE browser is free and includes the all version of Microsoft OS. The retailers don't purchase the web browser program. Its can reduce cost of implement in client site. DHTML (RMOS use this technique for running the system)

"Dynamic HTML" is an umbrella term encompassing several ways in which Web developers can breathe life into pages which have traditionally been still portraits of information.

The basic notion behind Dynamic HTML is quite simple: allow any element of a page to be changeable at any time. The page could only be changed content on a page via CGI. With DHTML, the magic occurs entirely on the client-side. This means that page modifications should appear immediately following a trigger, such as a user selection.

DHTML, to stress the point, is not a language itself. In practice one program Dynamic HTML using a combination of HTML, Cascading Style Sheets, JavaScript, and ASP script. The Document Object Model, described earlier, provides a programming interface between HTML/CSS and JavaScript .

Here are some reasons for using DHTML in RMOS in order to use a technique that ties elements in a Web page to a data source. It allows the creation of a Web page that displays up-to-the-minute data extracted from a database. When the page is loaded, the current information from the data source can be read and inserted in a table. The data can be dynamically updated or sorted through a script without redrawing the page or having to go back to the server.

Another reason, Server and Bandwidth Friendly: In a client-server environment, DHTML lets the client/browser make changes after a web page has been downloaded, without the burden of relying on server-side programs or complicated sets of HTML pages to achieve special effects.

ASP (RMOS use ASP for generating DHTML)

In general, dynamic sites remained relatively few in number and were time consuming and expensive to create. Active Server Pages (ASP) could be embedded inside HTML code opened new doors for dynamic site development. ASP, which managed to arrive just in time for the explosive growth of the World Wide Web, was a next logical step for Web-based application development. Active Server Pages proved to be an exciting, new technology that extended standard HTML by adding built-in objects, server-side scripts, access to databases, and ActiveX components .

ASPs are server-generated pages which can call other programs to do things like access database serve different pages to different browsers - basically, anything we used to do with CGI. ASP is almost as efficient as writing code directly to the server's

application program interface, and it's a lot more efficient than CGI because it runs as a service and can take advantage of multithreaded architectures.

Active Server Pages enables server-side scripting for IIS with native support for both VBScript and Jscript. Almost of RMOS program uses Jscript in some events. This program can use a dynamic, database-driven and server-side application that interacts with the client is the norm.

Having persisted in using Microsoft Active Server technology as the technology of choice, there are more reasons to continue using it as the platform of choice to build the RMOS based on ASP program.

(1) Active Server is Windows NT based

ASP can be used both with Windows NT 4.0 Server using Microsoft Internet Information Server 3.0; in the case of Windows 95 you can use Microsoft's Personal Web Server with ASP to develop web applications for a ginger desktop. ASP can also be used on some UNIX based systems and NT system with Web servers other than IIS, using Chili!ASP the functional equivalent of Microsoft's Active Server engine.

(2) ADO compliant databases

ASP works with ADO compliant databases. Developers can use Microsoft Access 97 on the desktop to develop or prototype the web application using the upsize tool from Microsoft to move the data from Access to SQL Server. And so, if and when you choose to migrate to another database your investment in ASP is not lost.

(3) Integration with desktop applications

This is also possibly true for integration with other Microsoft NT Server based software. This point is a consideration for Web sites that

want to offer users something to play with post a database query at a Web site. Would it not be a great idea if the results of a dynamic database query could be sent back to enable the user to "play" with the data

(4) "Windows" like applications

With still some way to go, Web sites are using the best that JavaScript has to offer to provide a "Windows Application" feel to Web sites. Dynamic HTML, especially the data binding aspect of DHTML with IE4 will go a long way in making the browser the accepted client interface for client/server applications.

ASP is an Internet technology platform that is flexible and extendable; yet one that gives to control over application state and resource sharing. It is also an excellent choice for looking to web enabled applications.

Javascript

JavaScript is a scripting language A scripting language is a lightweight programming language A JavaScript is lines of executable computer code JavaScript is an open scripting language that anyone can use without purchasing a license JavaScript is supported by all major browsers like Netscape and Internet Explorer.

JavaScript statements are embedded within HTML code. When a request is made to see a page, the HTML code that defines the requested page along with the embedded JavaScript statements, are sent by the server to the client. Navigator interprets the HTML document and executes the JavaScript code. The resultant page is displayed for the client. It is important to understand that this interpretation occurs on the client-side rather than the server-side.

JavaScripts can be used to validate data in a form before it is submitted to a

rather than the server-side

JavaScripts can be used to validate data in a form before it is submitted to a server. This function is particularly well suited to save the server from extra processing. JavaScript is more benefit for chooses it to help RMOS process and reduce run time of server site because it can process in the client site.

CSS

CSS provides a means for web authors to separate the appearance of web pages from the content of web pages. CSS offers developers a powerful tool that helps simplify the complex task of maintaining web sites, and provides sophisticated layout and design features for web pages without the need for plugins, long download times and expensive tools.

RMOS use CSS technique for controlling their content of web pages in whole web site therefore; HTML files should not contain information about how that information is displayed. This approach has long been considered beneficial in areas of document management that have been around a lot than the World Wide Web.

With CSS, can decide how headings should appear, and enter that information once. Every heading in every page that is linked to this style sheet now has that appearance. Edit the style sheet, and every such heading now has the altered appearance. Another major advantage involves the management of large, sophisticated sites. With cascading style sheets, whole organizations can share a small number of style sheets, ensuring consistency across the site with no need for constant updating and editing to accommodate changes.

Application Tools

RMOS is built by using application tools to follow that:

(1) Editor tool

The editor that we will propose for coding any pages RMOS is called Editplus. EditPlus is a feature-rich text editor geared towards programmers and web developers. TextPad users will find EditPlus very easy to get into since most of its features seem to be derived from TextPad.

(2) FTP tool supports to transfer file to Web server

There are many FTP tools for transferring the data to server. In the past, everyone use Telnet to upload data to server. But now, in many companies can build the application tool for uploading the data, users don't have more knowledge about FTP code or syntax for uploading. The retailers must use FTP tool in order to upload RMOS to their own web server.

WS_FTP Pro is a freeware and a popular FTP tool, which it supports browser integration, file resuming and site-to-site transfers. It has a password protected site manager for secure access to your favorite FTP sites, a scheduler to automate daily file operations, and a transfer queue to store files from multiple sites for later transfer.

3.3 Security System Requirement

RMOS are a configurable and sophisticated set of security features that provide a complete security solution for the retail system. The system's security architecture has been designed with an emphasis on scalability, reliability and flexibility. This architecture must allow the user to setup the security policies that are required by retailers' organization. RMOS contains the following security levels:

3.3.1 Policy of Business

Among the needed access controls and security measures, especially in the presence of RMOS and in the network are the following:

- (1) Assigned passwords that authorized clerks must enter to access accounts receivable and other customer-related files, in order to perform their strictly defined tasks.
- (2) Terminals that are restricted in the functions they allow to be performed with respect to each function.
- (3) Logging of all transactions upon their entry into the system.
- (4) Access logs are maintained by the system to monitor all accesses and entries.
- (5) Physically protected warehouses (for storing merchandise in inventory) and safes (for holding stocks of blank checks).

3.3.2 Application Security

Users can have a login name and password to gain access to the system. The login name and password is stored in the database and the passwords are encrypted. Application passwords can optionally adhere to strict password aging and format policies to improve security and reduce the possibility of hackers breaking user passwords.

Users can play various roles in RMOS. A user can be a senior executive, or a manager, or team worker in each department. Based on his or her security profile a user gain access to or is restricted from accessing certain security modules. RMOS provides default access rights for every security profile and allows one to define new profiles or to customize existing profiles to according to the needs of a particular organization.

3.3.3 Data Security

In addition to application security, which controls system access RMOS supports Data security. Data security defines what data a specific user can view or update, or delete. Data security controls what pieces of data can be viewed, accessed and modified

by work in processes. For example, The record of Sale order cannot be deleted when, products of the sale order is delivery to customer and generate invoice and delivery to customer sign. Or, someone cannot delete some products that are using in the any process in the system.

3.3.4 Web Server Security

Web Server security ensures that only authorized users have access to the Web server and that their access rights are extremely limited; so even if their uername and password are compromised, intruders can not cause any damage to the Web server or gain access to the enterprise network.

3.3.5 Firewalls (Retailer must have a knowledge about firewall for decision to rent hosting)

A firewall is a system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet. All messages entering or leaving the Intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.

Packet filter, The firewall looks at each packet entering or leaving the network and accepts or rejects it based on user-defined rules. Packet filtering is fairly effective and transparent to users, but it is difficult to configure.

A firewall is considered a first line of defense in protecting private information. For greater security, data can be encrypted.

3.3.6 ASP (Active Server Pages) Security

RMOS is built on ASP (Active Server Pages) technology, which provides an excellent security model for controlling server side scripting. To ensure application

security, all database and business logic access information is kept out of the server side scripts in encrypted, secure files. This eliminates the possibility of intruders accessing any sensitive information such as database or application passwords even if they are able to break into the Web server.

3.3.7 Secure Sockets Layer (Retailer should rent hosting that support SSL)

Secure Sockets Layer (SSL) is an application-level protocol that enables secure transactions of data through privacy, authentication, and data integrity. It relies upon certificates, public keys, and private keys.

Certificates are similar to digital ID cards. They prove the identity of the server to clients. Certificate Authorities (CAs) such as VeriSign® or Thawte issue certificates. Each certificate includes the name of the authority that issued it, the name of the entity to which the certificate was issued the entity's public key, and time stamps that indicate the certificate's expiration date.

Public and private keys are the ciphers used to encrypt and decrypt information. While the public key is shared quite freely, the private key is never given out. Each public-private key pair works together: data encrypted with the public key can only be decrypted with the private key.

The server of the client's identity can configure SSL-enabled servers to require client authentication or cryptographic validation. When a server configured this way requests client, the client sends the server both a certificate and a separate piece of digitally signed data to authenticate it. The server uses the digitally signed data to validate the public key in the certificate and to authenticate the identity the certificate claims to represent.

3.3.8 Database Security

To begin with we have to look at what precisely we mean by database security. Firstly it is not about making a database multi-user; issues to do with record locking, concurrency and so on are to do with fundamental database and application design.

RMOS support any relational database management system (RDBMS) in order to store vital corporate information for day-to-day use by their personnel. For the same reason any retailers must secure the organization premises, they need to protect their information in the database.

MS Access

MS Access security is divided into 2 level-security as share-level and user-level security. The retailer can choose level security by their policy

The first level-security is share- level security If retailers are only interested in stopping unauthorized users from accessing a database, and they are happy to let authorized users have free reign once they are logged on, then they can apply what is called "share-level security". Simply put, this means password-protecting the database itself.

Another level-security is a separate option for having passwords set for individuals in the workgroup file. However, where this relatively simplistic form of security will not suffice. In such situations a properly secured database is required, which means using a combination of workgroup settings and permissions. This form of security is referred to as "user-level security".

MS-SQL Server

The security architecture in SQL Server addresses potential security problems including the following topics:

(1) Security philosophy

The SQL Server strong approach to security will contribute to a high level of accuracy and consistency and will help protect database from accidental or intrusive deletion. The high level of security by following these principles:

- (a) Keep the system physically secure to prevent accidental or intentional destruction.
- (b) Allow only the proper personnel to access the server.
- (c) Allow personnel to access only the database, object, or statements appropriate for their particular jobs.
- (d) Regularly monitor access by using Window NT audit and Event Log features.
- (e) Maintain a log of security incidents and look for trends.

(2) Encryption

Encryption is a method of protecting sensitive data by modifying it to an unreadable form. The following 3 rules apply to encryption in SQL server. In the first rule, Login & password stored in the system. In the second rule, Network packets sent between the client and configuring the client can encrypt the server. And the last rule, is stored procedures.

3.3.9 Network Security

Most issues concerning network security are independent of the enterprise software being used. However, certain organizations may decide to run Web site over secure HTTP and SSL (Security Socket Layer). In such cases, one must make sure that the Web server software has support for this level of network security. Retail management online fully supports and has been tested using these security protocols.

3.4 Backup and Recovery Database Requirement

Performing backups and preparing for recovery are the two most important jobs of a database. The key to performing these tasks is to establish a routine. There are 2 kinds of database that support the retail management online as:

3.4.1 MS Access

MS access backup to create a file (backup file) that duplicate data stored in one or more file on a client, server, or any computers.

Here's a good plan for performing a weekly backup by using backup file in evening of every day.

For recovery you can copy the backup file to the current folder that database stay it (The program can support to this function, user can recovery in system so easily). After that you can use the retail management system continually.

3.4.2 MS SQL Server

The most common type of database that SQL Server manages is probably the small to medium database that takes its share of both reading and writing. When backing up a small or medium database, first figure out how long it takes to perform the backup, and then determine whether that's an acceptable amount of time for the database to sufficiently, perform the daily backup once a day and rotate the tapes offsite the following morning.

Here is a good plan for performing a weekly backup by using a differential backup scheme:

- (1) Day 1(Sunday). Run a full backup to send offsite. Run another full backup to keep onsite.

- (2) Day 2 (Monday). Perform periodic transaction log backups during business hours and a differential backup in the evening to keep onsite. Send a copy of the full backup offsite. Send Friday's transaction log backups offsite.
- (3) Day 3 – 6 (Tuesday - Friday). Perform periodic transaction log backups during business hours. Send transaction log backups from previous day offsite. Perform a differential backup in the evening to keep onsite.
- (4) Day 7 (Saturday). In the evening, perform a differential backup, followed by whatever database diagnostics are prudent.

This brings up a few things to which you need to pay particular attention. First of all, at no point is the database recoverable from data onsite. For example, if the database crashed on Wednesday right after the tapes went offsite, it would be necessary to restore the full backup from Sunday, the differential backup from Tuesday night, and the transaction log backups up to the point of failure.

3.5 The Best Alternative System Requirement

The best alternative system requirement in RMOS depends on the transaction, data, amount of users in the existing computer and policy of business (Online or stand-alone system). RMOS can support 3 groups of business:

3.5.1 Stand-alone System (Using only one computer to process the system except E-retailer web site.)

In the stand-alone system is Single-physical-tier architecture (See in topic 1.1.a). When the retailers use only one computer for running their retail business operation, the operation system in their PC is not high quality so, the OS could be Window98 above for using PWS to be web server.

The database requirement is divided into 2 subgroups depended on size of data and transaction in the database that following:

(1) Medium and large size of transactions

Database requirement could be MS SQLserver 7.0 or 2000 because of MS server can the better provide the medium and large size of data and support backup and recovery database technology.

If the retailers use MS SQLserver to be the database server, the RAM of their database server must be 32 MB in minimum and any specification of computer should the higher quality than stand alone hardware requirement system (See topic 3.2.1.a). If the system use Window 9x, or Window ME, the MS server must to be Personal Edition version because this version can be database server in the Window9x and Window ME.

(2) Small size of transactions

Database requirement could be MS Access because there are small transactions in each day. MS Access support the stand-alone hardware requirement (See topic 3.2.1.a). So the retailer are few budgets for changing the computer system. The retailers should use the existing computer that using in order to reduce IT budgets cost or they have some budgets for purchasing the new computer that not high quality spec of computer. Minimum of the computer system is defined in topic 3.2

MS Access stay in the MS Office package that any computer could install it in the computer. So the retailer need not worry about MS Access and the retailers do not need more knowledge for installing the database. It is easy to install and maintain the database.

3.5.2 Online System

The retailer must find the ISP for rental hosting. The ISP provide any service about web server and database server. The retailer should found the ISP that support

high quality system and database security and service 24 hours and friendly. ISP should guarantee about the downtime of server and solving the network problem immediately.

This group uses small budget to support online-transferred transaction in any department in their organization and their customers in anywhere.

The database requirement can be divided into 2 subgroups depended on size of data and transaction in the database that following:

- (1) Medium and large size of transactions

Database server is MS SQL server.

- (2) Small size of transaction

If the retailers have more budgets or have more users to use it, database server should be MS SQL server because the hardware requirement of online system is high quality to support MS SQL server. Although, there are small size of the transaction, the retailer should not use the MS Access to be database because it does not support to multi-user to access the database in the same time. But the MS SQL server supports it. In addition advantage, MS SQL server has high quality of security backup and recovery for the data in the server.

But if they have fewer budgets and fewer users to use RMOS, database requirement could be MS Access.

The network of clients in the organization is divided into 2 groups of clients, which access the web site in the rental hosting as follows:

- (1) Using LAN in order to connect between clients in the organization

(See Figure 3.4)

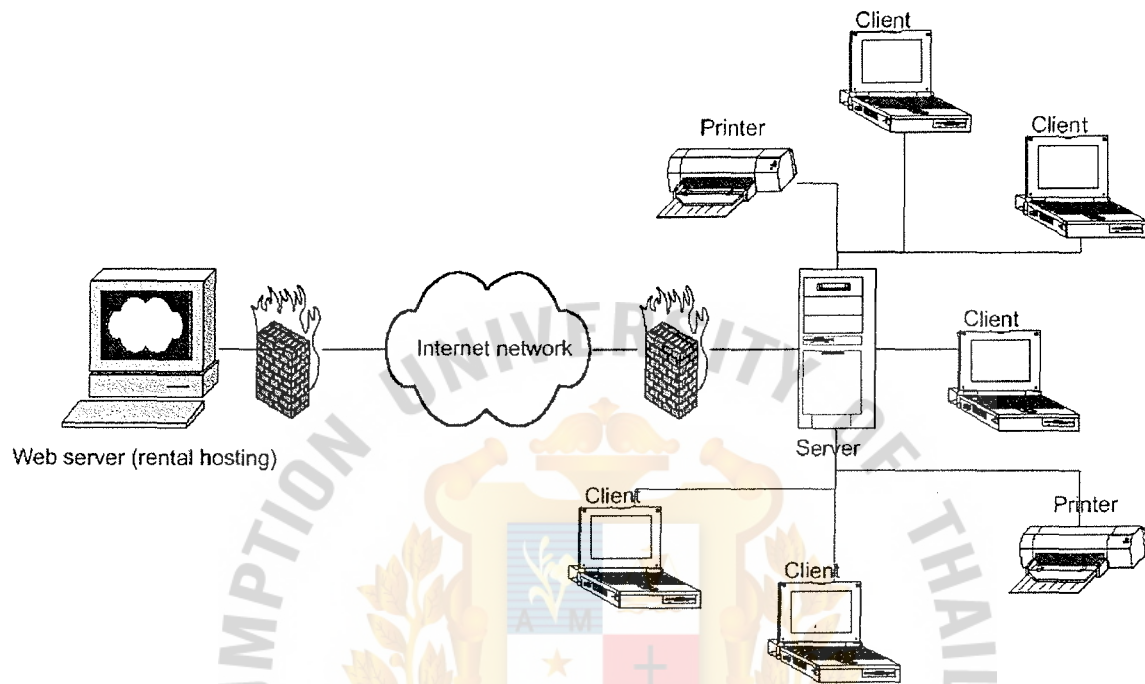


Figure 3.4. LAN Network Connect to the Internet.

- (2) Stand-alone client (See Figure 3.5)

Stand-alone computers should have modems for dial-up to access their Hosting over the Internet. So, The computer doesn't need high quality of spec of client that likes computer of the stand-alone system.

In conclusion of system requirement summarize in the Table 3.2

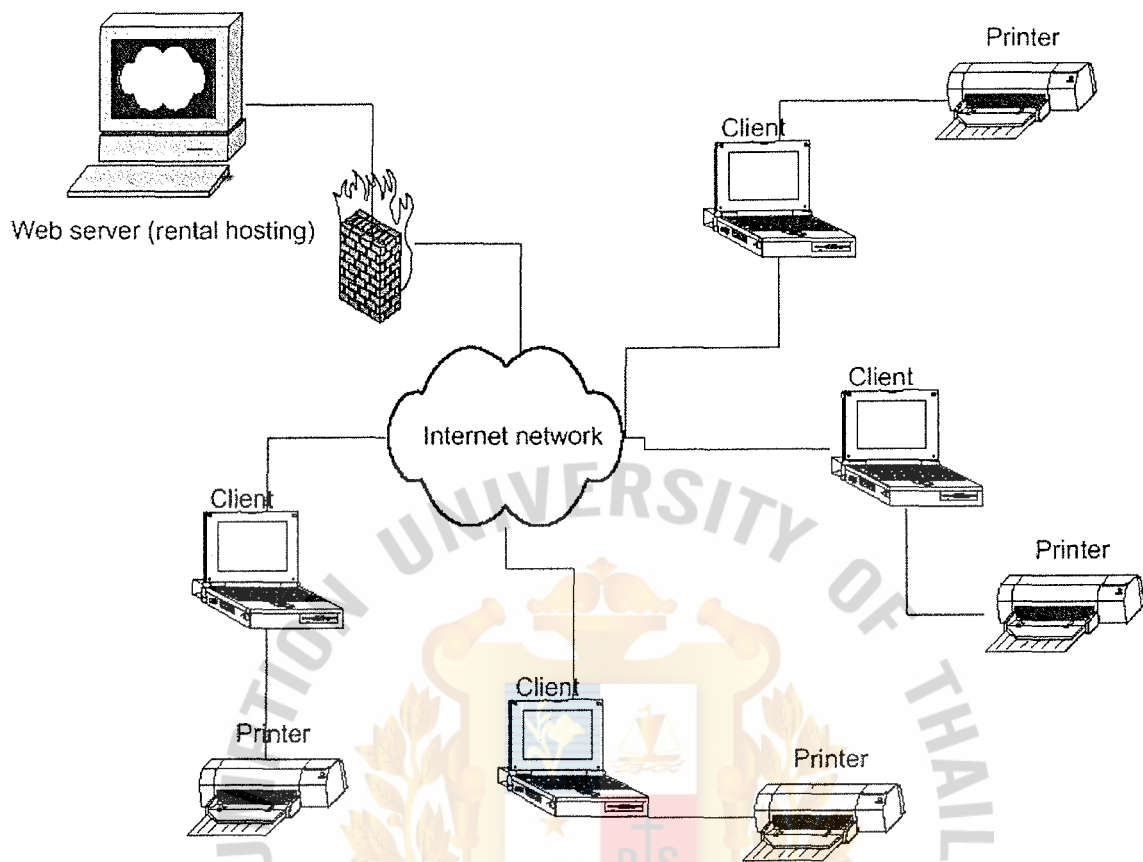


Figure 3.5. Each Stand-alone Computer Connect to the Internet.

Table 3.2. The System Requirement Matrix.

Requirement	Group 1	Group 2	Group 3
Method of data process	Stand-alone	Stand-alone	Client/Server
Access program	Stand-alone	Internet	Internet
Server and workstation	Technically architecture dictates 486Dx MHz above And Using MS Window9x,ME OS	- Sever dictates Pentium II and using Window NT or 2000 server - Client same as group 1	-Same as group 2 if using LAN network -Same as group 1 if There are stand-alone in the area.
Software tools needed	Internet Explorer for browsing	Same as group 1	Same as group 1
Application software	ASP packaging program	Same as group 1	Same as group 1
Web server	PWS	IIS4 above	Same as group 2
Application and database reside in	The computer	The server or database server in organization	The ISP hosting
Storage data Devices	MS access or SQL server	SQL server 7 above	Same as group 2
Input device	Keyboard & Mouse	Same as group 1	Same as group 1
Output device	Printer	Sharing printer	-Same as group 1 or Sharing printer in LAN network.

IV. PROJECT ANALYSIS AND DESIGN

4.1 Process Modeling

Process modeling is a technique for organizing and documenting the structure through a system's processes and/or the logic, policies and procedures to be implemented.

4.1.1 Workflow of Process Modeling

The retail processing is a complex system that is usually too difficult to fully understand when viewed as a whole (Single process). Therefore, we will separate a retail system into its component subsystem, which are decomposed into smaller subsystems until we have identified manageable subsets of the overall system.

The retail system is divided into 7 key functions:

Sales Function is divided into 4 sub functions to follow as (See Appendix A in figure A.1):

(1) Sales order

The sales order function initiates that customers can check pricing of products and preparing the sales order through the salesperson or E-retailer web site (It is a part of RMOS).

In the offline, salespersons must access to RMOS for checking pricing and stocking of products, and customer credit before received order or tell customer about any important information for them.

In the online, customer access to web site. Customers can check product price, product on hand and their sales credit in the real time and up to date. After that, customers can order any products via the Internet (this function expand in customer service topic).

(2) Shipment and Invoice

The sales order transactions are retrieved, via RMOS, by inventory department. After that, workers of the department pack ordered product in sale order transaction delivery to customer. Before shippers carry the whole packaging products, they must entry all ordered product transactions in order to print invoice vouchers automatically by the system. Finally, The shippers carry the ordered products and invoice vouchers to customers.

(3) Deposit

If customers can deposit to retailer, they must give the check or cash to Salesperson. After that salespersons get the deposit, they must entry deposit transaction in the system and print the billing of deposit generated by the system. Customer gets the billing of deposit in order to premise to pay and reduce customer account balance automatically.

(4) Sale return

If there are damaged products that are delivered by the retailer, customer can return the products to retailer. When retailer receive and check the damaged products, if the products are damage, the support of inventory department must entry returned product transactions in the system and call to the shipper in order to send new products back to customers (following by process shipment).

If the customer doesn't want the new products from retailer, customer and salesperson will negotiate about the amount of an allowance. If the allowance is approved, the accounting department will reduce the amount owed of customer and entry the sale discount in the system. After that, the reduction of customer's account document (Sale discount voucher) is

is generated by the system. The accounting prints the document and sent it to customer.

Purchase Function is divided into 4 sub functions to follow as (See Appendix A in Figure A.2):

(1) Purchase order

Requests of purchase originate outside the purchasing department. The purchasing requisition originates in the inventory department (It is expand in the inventory function).

After purchase requisitions are approved in the inventory department, purchasing department must select a vendor and check quotation of required products. After that, they must to prepare and distributes purchase order form for the requisition. The support of in purchasing department, entries purchase order form and print it to vendor. (The purchase order form is generated by the RMOS automatically.)

(2) Receiving

The receiver of inventory department must print the purchase order from the system in order to accept the shipment from supplier when it is delivery. The supervisors compare the quantities received products with those shown on the purchase order.

In additional function, the supplier sent the invoice voucher to the cashier. The cashier compares the amount of invoice voucher and data in the system and sent it to accounting department.

(3) Deposit

If the vendor must deposit from retailer, Cashier of finance department must to draw check and pay it to vendor and entry

deposit transaction in the system. And he/she must to send billing deposit form to accounting department for keeping to be evident.

(4) Purchase return

After the workers in the warehouse check the quality of product, there are damaged products. The supervisor must return the damaged products to vendor.

If vender does not return new products or the retailer would not like to receive new products, supervisor in the finance department must negotiate with the vendor to approve the amount of allowance. When the vendor approved and the document, and cash or check about the amount of allowance and/or is returned to finance department, the cashier get the money and entry the purchase discount transaction in the system and sent the document to accounting department. The cash or check must to deposit in the bank.

Inventory Function is divided into 2 sub functions to follow as (See Appendix A in Figure A.3):

(1) Transfer products between warehouses (if any)

If retailers have any warehouses, transferred products from a warehouse to another warehouse must happen. So, the inventory department must entry any transferred product transaction into the system for adjusting the stock of product in each warehouse to match the real product on hand in each warehouse.

(2) Check products that are out of stock

The system can calculate quantity of required products which will out of stock and alert to inventory department for checking the stock and approved purchase requisition to purchasing department.

Finance Function is divided into 4 sub functions to follow as (See Appendix A):

(1) Cash receipts

The customer takes a copy of the invoice to cash receipts on the due date or before. When the finance department receives cash receipts and accepts the customer's payment, they must entry cash receipts transaction in the system. The system will adjust the new customer's account balance. In finally, the billing form is generated immediately by RMOS. The customer must keep this form for premising to pay.

(2) Cash Disbursement

Periodically, the finance must check account payables, which are due date for payment.

In the system, account payable is performed payment processing, calculating the amount invoice, discount (if any) and other such items. The cashier prints it and drawing the check for payment to vendor. The cashier must entry the cash disbursement transaction in the system.

(3) Bank statement

The finance department must transfer cash and checks to banks. So, in this function, the cashier must enter all transactions in the system before transfer them.

But check that is paid to vendor, the user doesn't transfer in RMOS, the system will adjust cash flow balance about check automatically.

Accounting Function is divided into 2 sub functions to follow as (See Appendix A):

(1) Account receivable

Debit and credits are posted to the customer accounts from the posting media, and received from cash receipts. Periodically, accounting must check the customer account balances and print the customer statement to send each the customer.

(2) Account payable

The accounting improves the account payables to each vendor, and alerts to finance about some invoices are nearly due date.

In addition, the accounting should match process of documentation evidences and the data in the system.

Control system function is divided into 4 sub functions to follow as:

(1) Control the retailer information.

IT can adjust the retailer company information and change language mode in the system.

(2) Backup and recovery database

If the retailer uses MS Access, IT must backup and recover by using the system. The system will support the backup and recovery of MS Access database.

But if the retailer use the MS SQL server, IT must have some knowledge about MS SQL server for backup and recovery them. But they don't have the knowledge, the system support backup and recovery database to follow as RMOS support backup data to MS Access file. Retailer can keep the MS Access file in the same server or another computer. When data in the database are damage, retailer can upload MS Access backup file

to server. The system will copy all data in MS Access file to SQL server.

(3) Assign role and user

The retailer must assign role for group of user that can right to access in each function in RMOS before they assign role to user and fill up all user information in the system. The user can get her/his account to access the RMOS over the Internet.

Customer Service Online Function is divided into 4 sub functions as (See Appendix A in Figure A.5):

(1) Customers search information about themselves and products.

The customer must login through the retailer's web site. They can see their account balance and order the products to retailers.

The retailers can see sales order transactions immediately after the customers have submitted the order via the Internet. The RMOS will transfer sales order transaction to salesperson, which the system generate the sales order form automatically in order to salesperson print it out to customer for permission.

In the searching for the products in the Internet is divided into 2 ways as using search engine and categories of products. When customers view the quotation of products, they can choose the products in the cart and sent order to their salesperson and wait confirm from salesperson.

(2) Customer service support online (E-retailer)

In this function, customers can post the problem to web site and sent question to customer service directly through the Internet. And customers can see FAQ page

The FAQ page is generated by customer services center.

They will post the more frequency of problem and solution to solving problem in the FAQ page

(3) Receive the new customer information

The salesperson can receive the new customer information from the visitor register to be new customers when visitor fills up the information via the web site. The salesperson must check the information. If salespersons approve them, salesperson will contact to the customer via the email or the telephone. Customer will give the username and password to shopping in the web site and give any service via the Web site.

4.1.2 Structured English Procedural Structures

Structured English Procedural Structures based on the relative strengths of structured programming and natural English. The logical constructs of structured programming to overcome the lack of structure and precision in the English language. Think of it as the marriage of natural English language with the syntax of structured programming. Procedural structure of RMOS separates structure followed by the workflow in previous topic.

Sales Structure is divided into 5 substructures as:

(1) Sales order substructure

Structured English shows in topic 1 of Appendix B

(2) Invoice substructure

Structured English shows in topic 2 of Appendix B

(3) Deposit substructure

Structured English shows in topic 3 of Appendix B

(4) Return substructure

Structured English shows in topic 4 of Appendix B

(5) Sales history

Structured English shows in topic 5 of Appendix B

Purchase Structure is divided into 5 substructures as:

(1) Purchase order

Structured English follows the sales order substructure but the all information keeps in the purchase order records.

(2) Receiving

Structured English follows the invoice substructure but the all information keeps in the receiving records.

(3) Deposit

Structured English follows the deposit of sales substructure but the all information keeps in the deposit of purchase records.

(4) Purchase return

Structured English follows the sales return substructure but the all information keeps in the Purchase return records.

(5) Purchase history

Structured English to show in topic 6 of Appendix B

Inventory Structure is divided into 2 substructures as:

(1) Transferred products between warehouses structure

Structured English shows in topic 7 of Appendix B

(2) Product structure

Structured English shows in topic 8 of Appendix B

Finance Structure is divided into 3 substructures as:

(1) Cash receipts structure

Structured English shows in topic 9 of Appendix B

- (2) Sales discount

Structured English shows in topic 10 of Appendix B

- (3) Cash disbursement

Structured English shows in topic 11 of Appendix B

- (4) Purchase discount

Structured English shows in topic 12 of Appendix B

- (5) Bank statement

Structured English shows in topic 13 of Appendix B

Accounting Structure is divided into 3 substructures as:

- (1) Account receivable

Structured English shows in topic 14 of Appendix B

- (2) Account payable

Structured English shows in topic 15 of Appendix B

- (3) General journal transaction

Structured English shows in topic 16 of Appendix B

Control System Structure is divided into 5 substructures as:

- (1) Initial parameters

Structured English shows in topic 17 of Appendix B

- (2) Backup database

Structured English shows in topic 18 of Appendix B

- (3) Recovery database

Structured English shows in topic 19 of Appendix B

- (4) Assign role

Structured English shows in topic 30 of Appendix B

- (5) Assign users

Structured English shows in topic 20 of Appendix B

Customer Service Online Structure is divided into 2 substructures as:

- (1) Contact from customer

Structured English shows in topic 21 of Appendix B

- (2) FAQ

Structured English shows in topic 22 of Appendix B

- (3) Support

Structured English shows in topic 23 of Appendix B

E-retailer is divided into 5 substructures as:

- (1) Home page (E-retailer) design

Structured English shows in topic 24 of Appendix B

- (2) Shopping cart

Structured English shows in topic 25 of Appendix B

- (3) New account structure

Structured English shows in topic 26 of Appendix B

- (4) Contact to retailer

Structured English shows in topic 27 of Appendix B

- (5) Setting master file

Structured English shows in topic 28 of Appendix B

- (6) Security system

Structured English shows in topic 29 of Appendix B

4.2 Data Modeling

4.2.1 Entity Relationship Diagram

Something that an organization wishes to collect data about is an entity and the characteristics of the entity are attributes. The connections between entities and their

attributes are specified by relationships that link the entities. These relationships are shown graphically on an Entity Relationship Diagram (ERD). A typical ERD is shown in Appendix C.

ERDs add structure to the development process by creating a mechanism for defining the structure of data that:

- (1) Identifies the things that the system will collect data about
- (2) Identifies what specific characteristics are collected for each thing
- (3) Uses relational algebra to define relationships among the data
- (4) Displays this information in graphical form.

4.2.2 Data Dictionary

Each entry in the data dictionary contains the item name, an English description, related data elements, the range and length encoding and necessary editing information.

The data dictionary is useful in all phase of analysis, design, and ultimately documentation, since it's the authoritative source on how a data element is used and defined in the system.

The data dictionary cross-references all programs in the database using a particle data element (See Appendix D).

4.3 Database Design

The structure in the data flow diagramming method comes from.

- (1) Decomposing all systems into a small set of basic components (See section 4.1.1)
- (2) Defining explicit and restrictive rules for data flow between the components (See section 4.1.1)
- (3) Using a graphical representation. (See Appendix B Data flow diagram)

4.4 Input and Output Design

4.4.1 Input Design

Identify Good Screen and Web Forms Design.

The quality of system input determines the quality of system output. So, the input design must be designed with these critical relationship business functions.

RMOS makes forms easy to fill in, to reduce error, speed completion and facilitate the entry of data. The system is easy to fill in, so the retailers can reduce the cost of the time user entering data in to the system than filling them in manually.

RMOS use form flow to design a form with proper flow can minimize the time and effort expended by users in form completion. The form flow of system flows from top to bottom.

Select Appropriate GUI Controls.

The system forms are constructed with the following several guide lines in mind that following:

- (1) Use a variety of text boxes, push buttons, check box and radio buttons
- (2) Provide clear instructions.
- (3) Include radio buttons when users must choose one answer in a bipolar.
- (4) Employ check boxes to allow users to show whether a test condition is either true or untrue.
- (5) Prepare 2 basic buttons on every web fill in form "Submit" and "Clear"
- (6) Provide a scrolling text box at times when users are uncertain about how much space users will need to respond to a question.

Design, Validate Inputs.

The system ensures that the data is valid. The system prevents two types of errors as data entry errors and invalid data recorded by users. The following techniques are used to validate data in the system:

- (1) Existence check: All required fields on each form have actually been entered.
- (2) Data type checks: the system check data entry that required numeric data don't allow user save the data in the database.
- (3) Role of data checks: the system doesn't allow data entries that don't match with formatting requirements for that data.

4.4.2 Output Design

We classify outputs is according to their distribution inside and outside almost retailers and users who read and use them.

Internal Outputs

Internal outputs are intended for the internal system owners and system users within retailers. Internal outputs either support day to day operations, and management monitoring and decision making. Internal outputs are distributed such as:

- (1) Detailed reports (See Appendix F)
- (2) Summary reports (See Appendix F)

External outputs leave the retailers.

They are intended for customers, suppliers. They usually conclude or report on business transaction.

Turnaround Outputs

Turnaround outputs are those external outputs that eventually reenter the system as input. Outputs are distributed by:

(1) Printed Output

Although the most common medium for computer outputs is paper, some retailers must reduce cost of printed-paper. So we will consider using the paper as a document from customers and suppliers such as Purchase order, Invoice, Sales order, Billing etc.

Performance of printed-documents is to use any printer such as Dot matrix, and Laser printers depended on cost effective of each retailer.

(2) Printed design has the functional attributes includes:

- (a) The heading or title of the report
- (b) The page number
- (c) The date of presentation
- (d) The column heading
- (e) The grouping of related data items together
- (f) The use of control back.

(3) Screen Output (See Appendix F)

Online distribution is effective display of transferred information on PC monitors it anywhere that can launch the Internet (If retailer use Internet architecture.), or can access the Intranet of the organization.

While screen output provides the system user with convenient access to information, the screen output of the retailer management online system base on Web enable. This screen allow users who can access the system, to browse lists of records or search for specific records and retrieve

various levels of detailed information on demand. This way can reduce cost effective on printed reports because user can access via the Internet or Intranet to see the reports.

There are four facilitate the design of sources as to follow:

- (a) Keep the screen simple
- (b) Keep the screen presentation consistent
- (c) Facilitate user movement among screens
- (d) Attractive screens.

4.5 User Interface Design

4.5.1 Human Engineering

Human Engineering factors are designed in the retail management online system to tell the user what the system expects right now. This can take the form of a simple message for entry each field of users.

- (1) Tell the user that a task was completed or was not completed.
- (2) In the system is formatted so that the various types of information, instructions, and messages always appear in the same general display area.
- (3) The message, instruction or information is displayed long enough to allow the user to read them.
- (4) Default value is entered in some fields as the current date, information of customer and suppliers etc.

4.5.2 User Interface Technology

- (1) Operating systems and web browser.

In Internet and Intranet information system, the user interface is implemented to execute within the PC's Web browser. So, the Internet and Intranet application like the retail management online system, can run

in many OS making it possible to design a user interface that is independent on the computer.

- (2) Display monitor In the PC computer measure is graphical resolution.

The system can display the best solution that is 800 X 600. Because of this solution is the popular for display.

- (3) Keyboard and mouse

The function key of keyboard depends on the web browser. And Mouse, the user can move the mouse on the surface, and click and double-click for select objects or commands to process the system.

- (4) Menu-driven

The retail management online system use Pull-down and Cascading Menu for menu bar as in Figure 4.1.

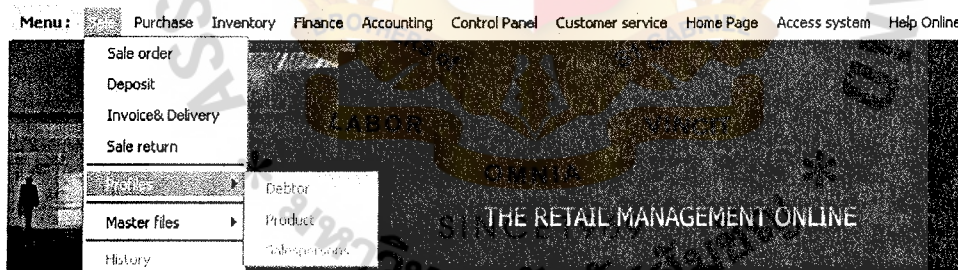


Figure 4.1. Pull-down and Cascading Menu for Menu Bar.

User can select a menu group either using the mouse. Each menu group has its own pull-down menu. When the user selects a group from the menu bar, a submenu is pulled down. The groups of menu are divided into 10 groups for main functions that are covered in the system.

The submenu choices may be subgrouped by horizontal lines. IN the other cases,

a named submenu action will have a small arrow indicating yet another submenu. This is called a cascading menu. (Figure 4.1.)

The users in the system are authorized by the role that the retailers assign by each person. So, the system doesn't allow user to choose some menus. Those menus are disable to access the menu. (Figure 4.1.)

4.5.3 Web Based User Interface

Site Design

(1) Provide meaningful content

The system provides accurate, current, substantive information. So, its content has more value determined by the user and is easy to know and easy for processing.

(2) Create a unified design

The site has unify of all pages in entire site, It use same page design, repeated image and color.

(3) Use a hierarchical structure

The site has a hierarchical structure. The obvious hierarchy of the system is easy for operating to understand

(4) Use a hierarchical menu

All pages of the system site have a menu bar. So, users can easy change and see the major information areas that they can access tem, and understanding that there are many links between the areas.

(5) User hierarchical text-based navigators

Operation of each menu, the system provide hierarchical text-based maps, its easy understand processing used by users.

- (6) Understand the bandwidths of target retailers

The system site has less large graphics because of the system support both Internet and Intranet with low bandwidth lines, So the site quickly for launching and executing.

Page Layout

- (1) Don't use horizontal scrolling

Display the important part of the web-based system without horizontal scrolling at 800 X 600 pixels.

- (2) Break a long page up into smaller units.

Long pages probably load more slowly than short pages. Therefore, the system has separate transactions (maximum 10 transactions) per page and has a navigator to go to other pages in the bottom of the table.

- (3) Use a grid

Use a grid to design each type of page on the entire pages so that similar types of pages have a similar look and feel. A grid can help ensure consistency throughout the site.

Make Each Title Unique and Meaningful

- (1) The titles are accurately reflected the age name and page content.
- (2) Use interlaced GIFs

User interlaced GIF allows image to start appearing in one-fourth of the normal time. The created page that feels like it is loading more quickly than if they had to wait for the entire image before seeing anything.

- (3) Use light-colored backgrounds of low intensity

The system site uses light green in order to users can be viewed large expanses for any length of the system and users will not feel extreme eye fatigue.



V. PROJECT IMPLEMENTATION AND MAINTENANCE

5.1 System Implement

System implementation is made up of many activities. There are three major activities as coding, testing, and installation.

5.1.1 The Process of Coding, and Testing in RMOS Web-based Application System

Coding is the process where by the physical design specifications created by the analysis term are turned into working computer code by using ASP script, Javascript, and SQL language to build the system. Coding is followed by process modeling in Chapter 4.1. When coding has begun, the testing can begin and proceed in parallel. As each program module, which is divided by process modeling, is produced, it can be tested individually, then as part of a larger program.

Planning of testing involves determining what needs to be tested and collecting test data and processing business test.

5.1.2 RMOS Implement to Be Web-based Application System

In RMOS application system is divided into 2 sub systems as Back office and front office.

In back office, Users of the retail organization use it for running their retail business. This subsystem has many functions to support their operation in almost departments in their organization. Examples for operation that use the RMOS so easily as print Sale order form, invoice voucher, billing of deposit or cash receipt from customers. And any decision-making information is generated by RMOS for any managers forecast their market share and control internal operation easily.

In front office, any new and existing customers can use the site via the Internet. This site can support customer service immediately. Such as order products in anywhere

and anytime to retailer, can see FAQ, and direct contact to support of retailer, which customer don't spend more money for contact with retailers.

Site map of Back office (See Figure 5.1)

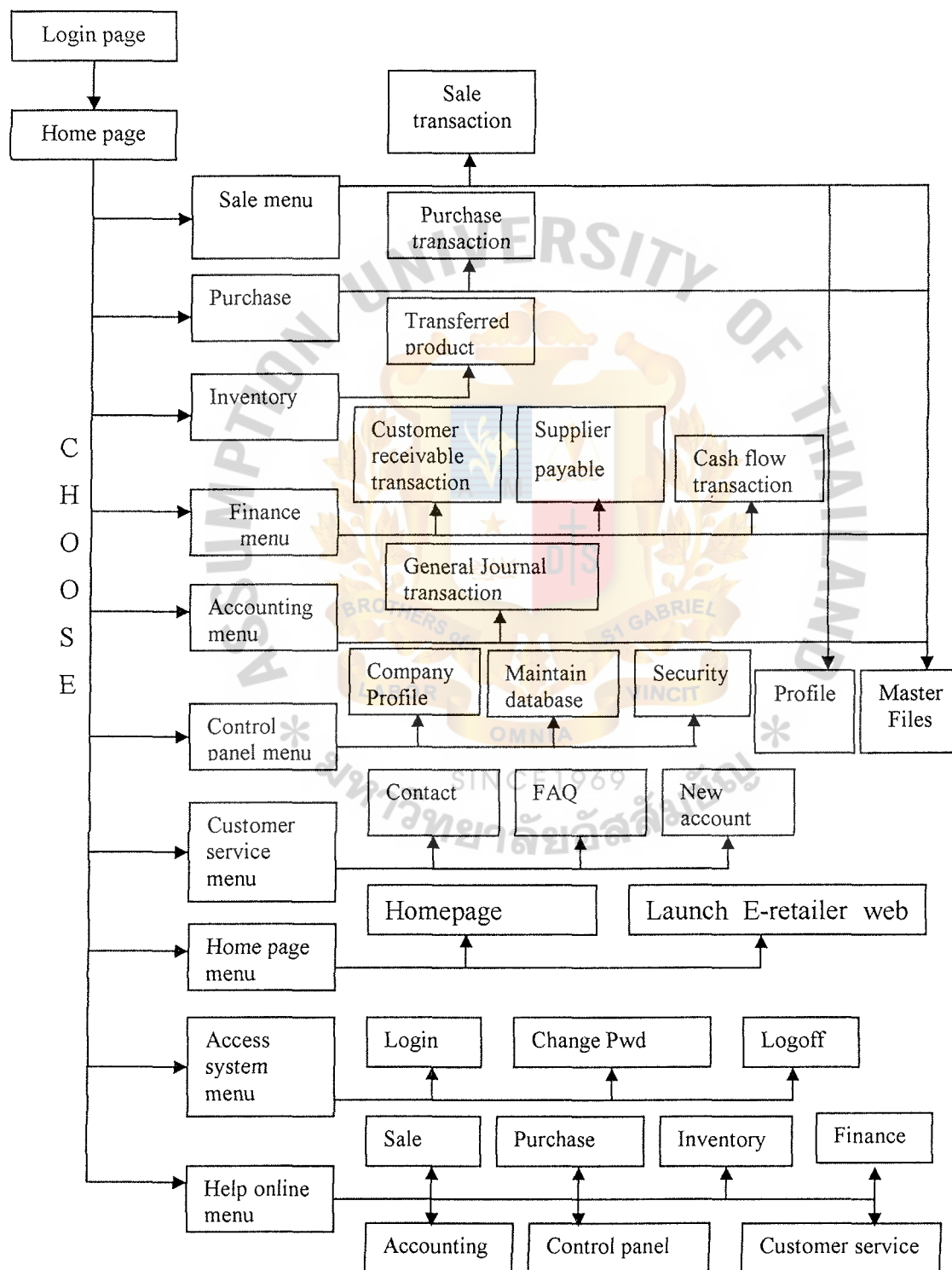


Figure 5.1. Site Map of Back Office Site.

Site map of Front office (See Figure 5.2)

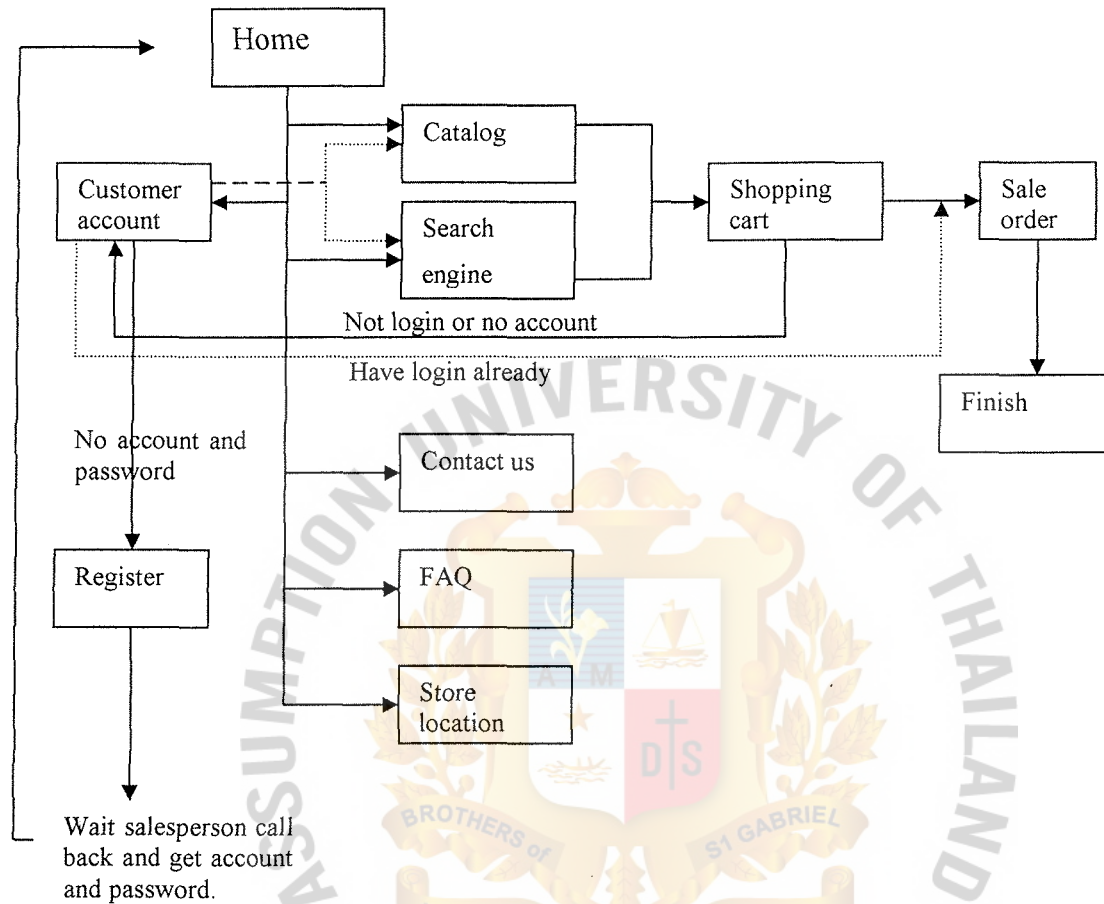


Figure 5.2. Site Map of Front Office Site.

The Back Office Site

Template of Back office site is divided into 5 parts as Company logo, Header, Menu bar (See Figure 5.4), Body, and Footer. All parts are shown in Figure 5.3.

Step for using the back office follows by site map in Figure 5.1 as:

(1) Login page

Login page is the first page of Back-office system of RMOS. User must to fill up username and password to access the system. This page will

check username and password of each user. If it is wrong the system doesn't allow the user access the system.

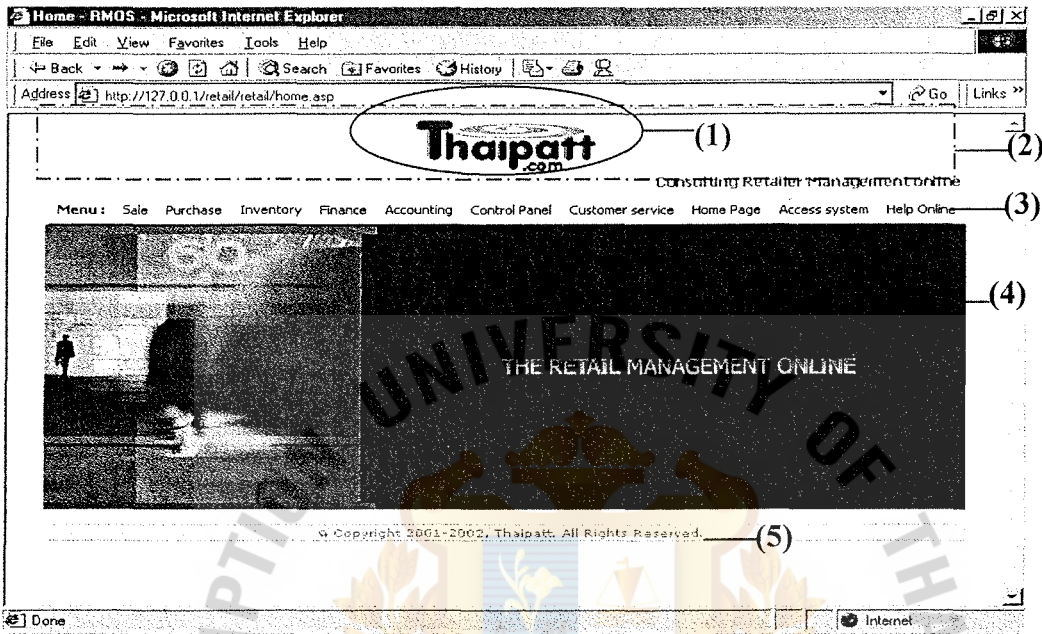


Figure 5.3. Template of Back Office.

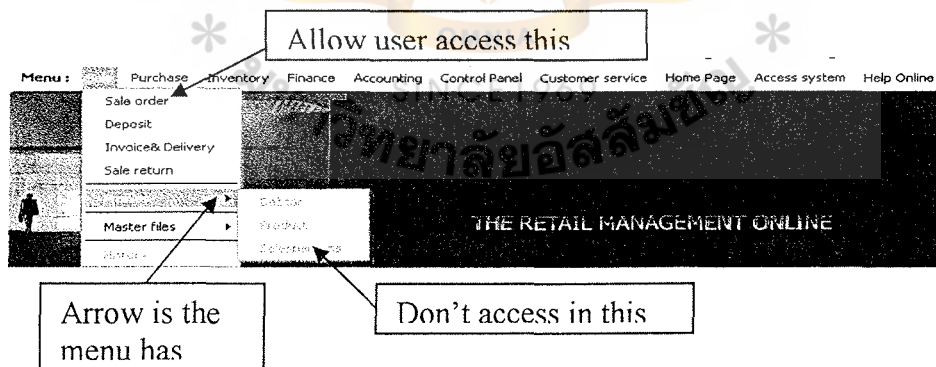


Figure 5.4. Menu Bar.

(2) Home page

Home page (Figure F.3) is the second page of Back-office system of RMOS. After user login and the username and password has in the database.

(3) Choose Menu in Main menu bar (See Figure 5.4)

Menu bar is generated by the role of each user. In some roles, users do not access all menus in the menu bar, font color of the menu is gray (See Figure 5.4). If some menu bar can be access the font color is black in Figure 5.4.

Menu bar is divided into 10 sections that are showed in Figure 5.4 as sales section, purchase section, inventory section, Finance section, Accounting section, Control panel section, customer service section, home page edition section, access system section, and help online section.

(4) Sales section

In sales section is divided into 4 submenus of sales transactions group in the Figure 5.1 (site map back office) as sales order transaction, sales deposit transaction, sales invoice transactions and sales return transactions.

In sales order, sales invoice, sales deposit, sales return, customer profile, and product profile have list and detail pages same sales order list, and sales order detail respectively (Example of Sales Order List - see Figure 5.5, Sales order detail is shown in Figure 5.6).

For product list page has a same function in sales order, sales invoice, sales deposit, and sales return is shown in Figure 5.7.

If user uses updated modules, users can add, update, and delete products in the list box (See Figure 5.7 left). When user would like to add new product, user can click add hyperlink in page of Figure 5.7 in order to add new products in the sales order product list table.

Delivery status of sales order transaction page is shown in Figure 5.8.

So user can see those general journals in each transaction via General Journal page of each transaction. A sample of general journal of sale invoice

Thaipatt.com
Consulting Retailer Management online

Menu: Sale Purchase Inventory Finance Accounting Control Panel Customer service Home Page Access system Help Online

Sale > Sale order (1)

Sale order lists / ใบรับจองสินค้า (2)

Search / ค้นหา: Search (3)

(4) Add (5) Delete

<input type="checkbox"/>	14/01/03	2003-01-0000003	Dr-00001	ร้านคุณแดง	Yes	
<input type="checkbox"/>	14/01/03	2003-01-0000002	Dr-00001	ร้านคุณแดง	Yes	
<input type="checkbox"/>	13/01/03	2003-01-0000001	Dr-00001	ร้านคุณแดง	Yes	
	17/12/02	2002-12-0000005	Dr-00001	ร้านคุณแดง	Yes	Yes
	13/12/02	2002-12-0000004	Dr-02-00001	เขียวสวย	Yes	Yes
	10/12/02	2002-12-0000003	Dr-02-00002	ร้านศิริรัตน์	Yes	Yes
	5/12/02	2002-12-0000002	Dr-02-00001	เขียวสวย	Yes	Yes
	3/12/02	2002-12-0000001	Dr-00001	ร้านคุณแดง	Yes	Yes

Page / หน้า: 11 (7)

Remark / หมายเหตุ: 1. Status of Check delivery as (สถานะการเช็คส่งของ)
 - Yes (Complete delivery / ส่งของครบ)
 - No (Incomplete delivery / ส่งของไม่ครบ)
 - NoP (No have any products in order form/ไม่มีสินค้าในใบจองสินค้า)

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Remark :

- (1) Navigator menu
- (2) Title of the table
- (3) Search engine: User can search any data in the table.
- (4) Add module: If the system allows user adds new transaction, the Add hyperlink can click it. But if the Add have not hyperlink and font text is gray, user can add new transaction.
- (5) Delete module: If the system allows user deleted transaction, which checkbox is showed in front of the transaction, the Del hyperlink can click it. But if the Del have not hyperlink and font text is gray, user cannot delete the transaction or There is not check box in front of the transaction.
- (6) Update, Read module: If the system allows user update the transaction, when user clicks the hyperlink user can update all data in the transaction. But if not use update module, user can read transaction only.
- (7) Navigator of page number

Figure 5.5. Sale Order List Page.

transaction is shown in Figure 5.8. The page will show Referred number as sales invoice number in this page, and show special journal, which is written. General Journal page has a same function in sales deposit, sales invoice, and sales return. The system must generate general journal automatically.

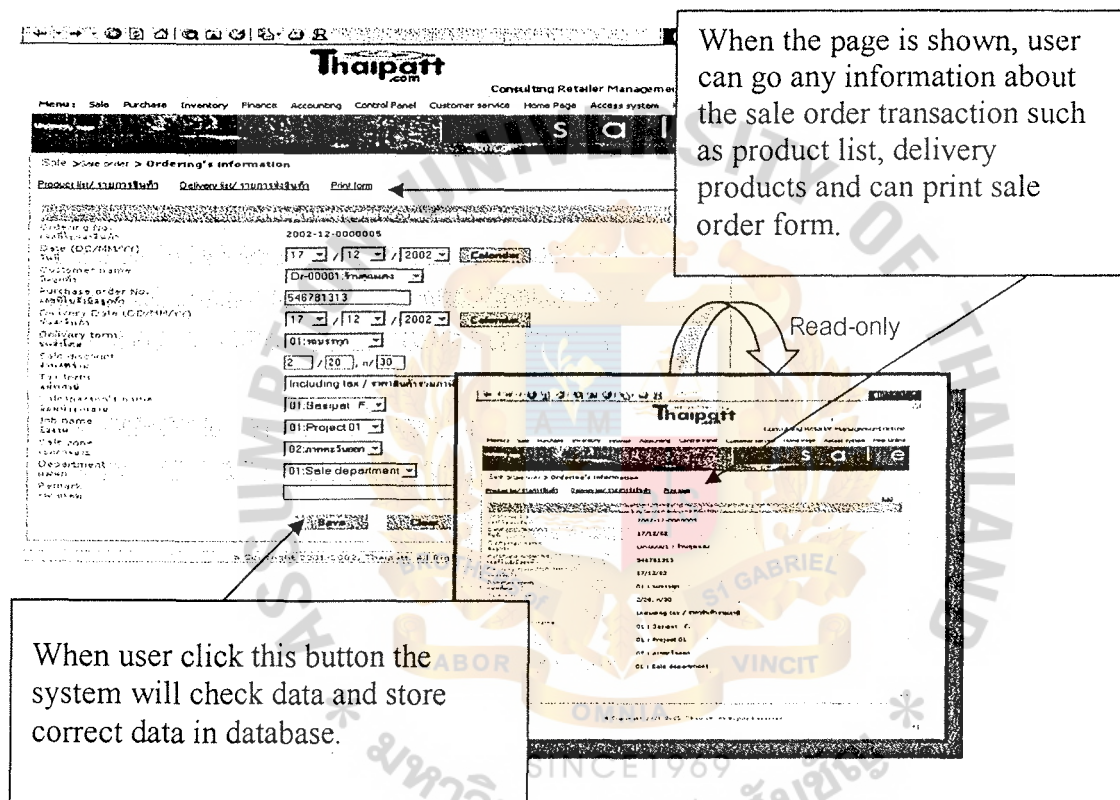


Figure 5.6. Updated Sales Order Detail (Left), Read-only Module (Right).

Sales history page is used by sales manager for decision making. Sales history is shown in the Figure 5.9.

The manager can search sales transactions groups by customer group, product group, or each customer or each product, or search by period of sales transaction date. After that, the system will match all transaction with his/her criteria.

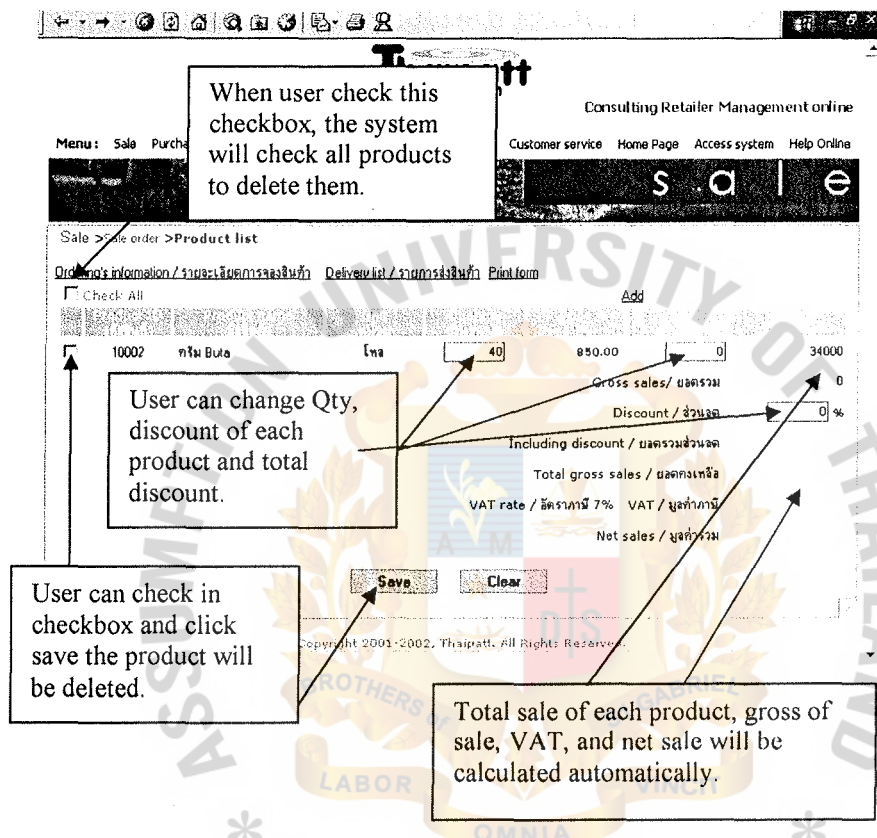


Figure 5.7. Sales Product List in Update Module (Left) and Read-only Module (Right).

(5) Purchase section

The purchase section is divided into 4 submenus of purchase transaction group in the Figure 5.1 (site map back office) as purchase order transaction, purchase deposit transaction, purchase receiving transaction and purchase return transaction.

In purchase order, purchase receiving, purchase deposit, purchase return, have list and detail pages same as sale order list (See Figure 5.5), and sales order detail (See Figure 5.6) respectively.

The screenshot shows the Thaipatt Consulting Retailer Management online interface. The menu bar includes: Sale, Purchase, Inventory, Finance, Accounting, Control Panel, Customer service, Home Page, Access system, and Help Online. The main content area is titled 'Sale > Invoice& Delivery > General Journal'. It includes links for 'Sale's information / รายละเอียดการรายสินค้า', 'Product's information / รายละเอียดสินค้า', and 'Print form'. Below these links, the 'Refer No. / เลขที่อ้างอิง' is 2002-12-0000005, and the 'Special Journal / จดหมายเหตุพิเศษ' is 01 : สมุดรายวันขาย. A table displays the following data:

No.	Product Code	Description	Unit	Quantity	Unit Price	Total Price
1.	120	ลูกท่อนี้	A		36,380.00	.00
2.	213	ภาษีมูลค่าเพิ่ม	A		.00	2,380.00
3.	500	รายได้จากการขาย	A		.00	34,000.00

Remark: A = The first(ครั้งแรก), U=Update(ปรับปรุง)

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Figure 5.8. General Journal of Invoice Voucher Page.

For product list page of purchase order, purchase receiving, purchase deposit, and purchase return has a same function in sales order product list is shown in Figure 5.7.

General Journal page of purchase receiving, purchase deposit, and purchase return has a same function in Figure 5.8.

And purchase history like a sales history page is shown in Figure 5.9

(6) Inventory section

Transferred product menu has transferred product list page same sale order list is shown in Figure 5.5), transferred product detail page similar sale order detail (See Figure 5.6)

Thaipatt.com Consulting Retailer Management online

Menu: Sale Purchase Inventory Finance Accounting Control Panel Customer service Home Page Access system Help Online

Sale

Sale > Sale history

Sale history / ประวัติการขาย

Customer / ลูกค้า From / จาก All / ทั้งหมด

To / ถึง Choose / เลือก

Product / สินค้า From / จาก All / ทั้งหมด

To / ถึง Choose / เลือก

Sale date / วันที่ขาย From / จาก DD / MM / YY

To / ถึง DD / MM / YY

Calendar

Search All criteria

Date	Customer	Product	Quantity	Price	Total
3/12/02	2/01/03	2002-12-00000001	Dr-00001-ร้านบุญ	10002-ครีม Bute	20 950
5/12/02	4/01/03	2002-12-00000002	Dr-02-00001-ร้าน	10001-สบู่	50 70
5/12/02	4/01/03	2002-12-00000002	Dr-02-00001-ร้าน	10004-สบู่โฟม X	20 20
10/12/02	9/01/03	2002-12-00000003	Dr-02-00002-ร้าน	10001-สบู่	300 90
13/12/02	12/01/03	2002-12-00000004	Dr-02-00001-ร้าน	10003-ยารักษาโรค	200 250
17/12/02	16/01/03	2002-12-00000005	Dr-00001-ร้านบุญ	10002-ครีม Bute	40 950

Page / หน้า : 11

Print

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Figure 5.9. Sale History Page.

(7) Finance section

It is divided into 3 groups of finance transactions as customer receivables, supplier payables and bank statements.

The **customer receivable** submenu consists of disbursement voucher, sale discount, and cash receipt.

The first, Disbursement voucher consists of sales invoice transactions in list table like Figure 5.5, disbursement detail page like Figure 5.6 and receivable payment is shown in Figure 5.10.

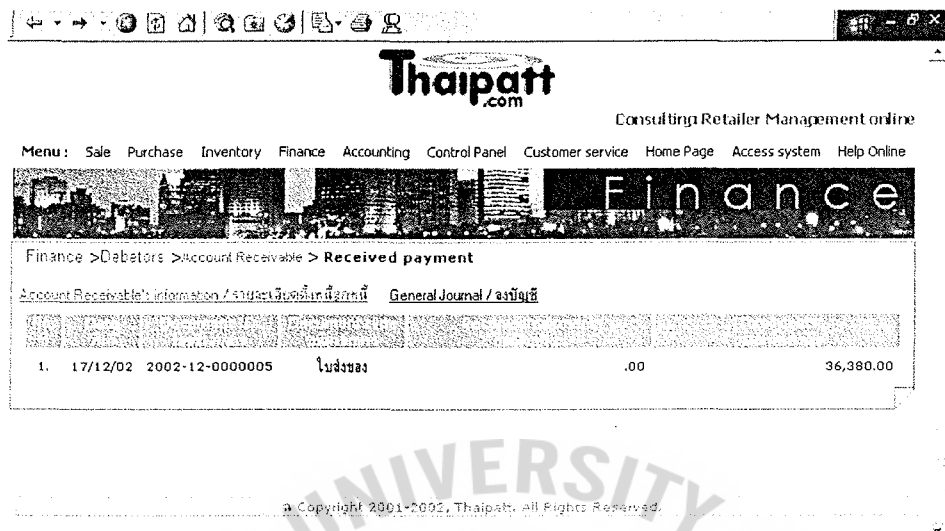


Figure 5.10. Receivable Payment Page.

Sales discount consist of sales discount transaction in list table like Figure 5.5, sales discount's detail page like Figure 5.11.

Cash receipt consists of cash receipt transactions in list table like Figure 5.5, cash receipt detail page like Figure 5.12. User must select checkbox in order to choose disbursement voucher (Sales invoice, or Purchase invoice) before user fill up payment from customer or to supplier in Figure 5.12. and, the user fills up all check information. This page is shown in Figure 5.12. After that, the system will calculate total of all checks, which are filled on popup.

Thaipatt.com
Consulting Retailer Management online

Menu: Sale Purchase Inventory Finance Accounting Control Panel Customer service Home Page Access system Help Online

Finance

Finance > Invoices > Payback > Pay back information

General Journal / ทั่วไป ☒ Purchase voucher / ใบพิกัด ☐ Add

Pay back No. 2002-12-0000002
 Date (DD/MM/YY) 16/12/02
 Customer's name Cr02-00001: ร้านค้าใหม่

Detail / รายละเอียด Print receipt information

No.	Date	Amount	Balance	Initial
1.	2002-12-0000001	31/12/02	132,145.00	121030
Total			121030	
Discount		0		
Discount		0		
Withholding tax		0		
Net		121030		
Amount		0		
Check		121030		

Save Clear

Figure 5.11. Cash Receipt Page.

New Document - Microsoft Internet Explorer

No.	Date	Amount	Balance
156423	16/12/2545		121030
		Bank/Branch	
		Bank/Branch	
		Bank/Branch	
		Bank/Branch	

Save Clear

Remark: if you would like to delete the cheque transaction, you can delete only cheque no.
(หากต้องการลบธุรกรรมเช็คได้เฉพาะเลขเช็คเท่านั้น)

New Document - Microsoft Internet Explorer

No.	Date	Amount	Balance
<input checked="" type="checkbox"/>	1/12/02	2002-12-00000001	132,145.00
<input type="checkbox"/>	16/12/02	2002-12-00000003	42,800.00

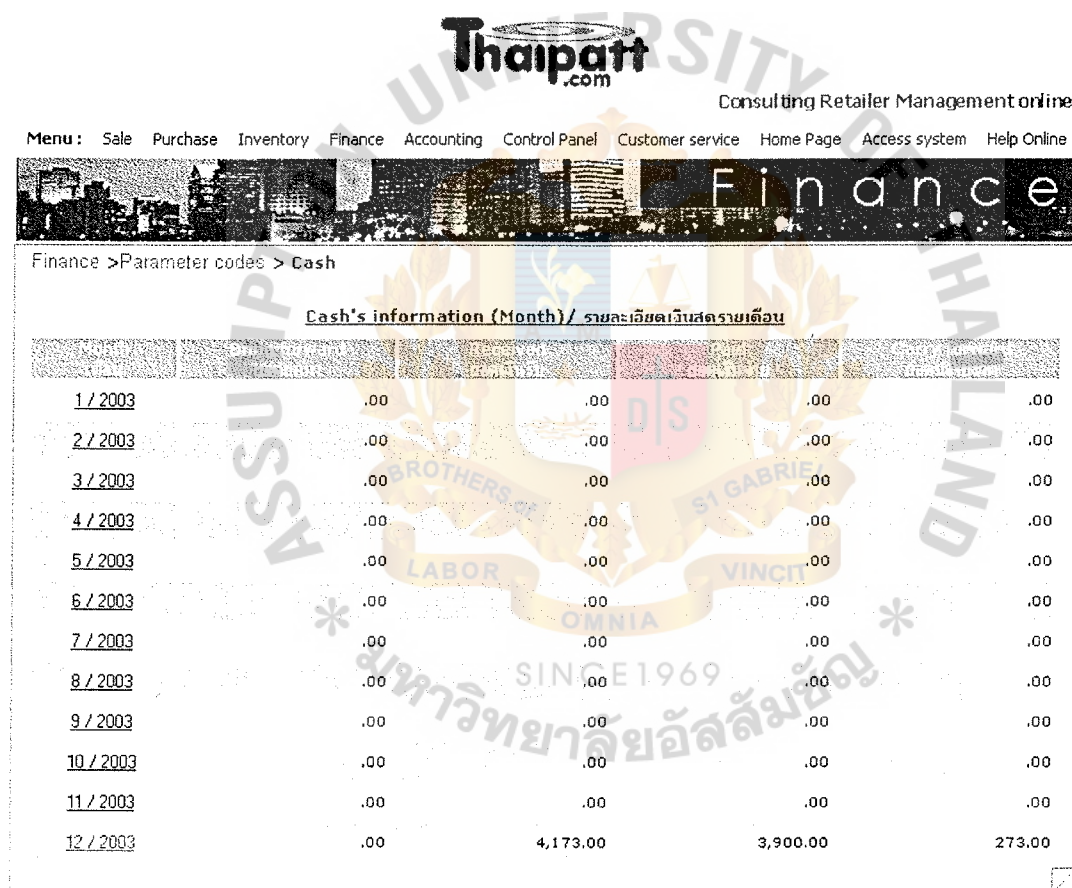
Choose Clear

Figure 5.12. Check Input Popup (left) and Disbursement Voucher Popup (right).

Supplier payable submenu consists of disbursement voucher, purchase discount and cash flow. They are like a customer receivable.

Bank statement of the retailers for sales and purchasing the product as Cash, Check

In cash section, this page shows cash flow in each month in current year. (See Figure 5.13)



Month	Column 1	Column 2	Column 3	Column 4
1 / 2003	.00	.00	.00	.00
2 / 2003	.00	.00	.00	.00
3 / 2003	.00	.00	.00	.00
4 / 2003	.00	.00	.00	.00
5 / 2003	.00	.00	.00	.00
6 / 2003	.00	.00	.00	.00
7 / 2003	.00	.00	.00	.00
8 / 2003	.00	.00	.00	.00
9 / 2003	.00	.00	.00	.00
10 / 2003	.00	.00	.00	.00
11 / 2003	.00	.00	.00	.00
12 / 2003	.00	4,173.00	3,900.00	273.00

Figure 5.13. Cash Flow Page.

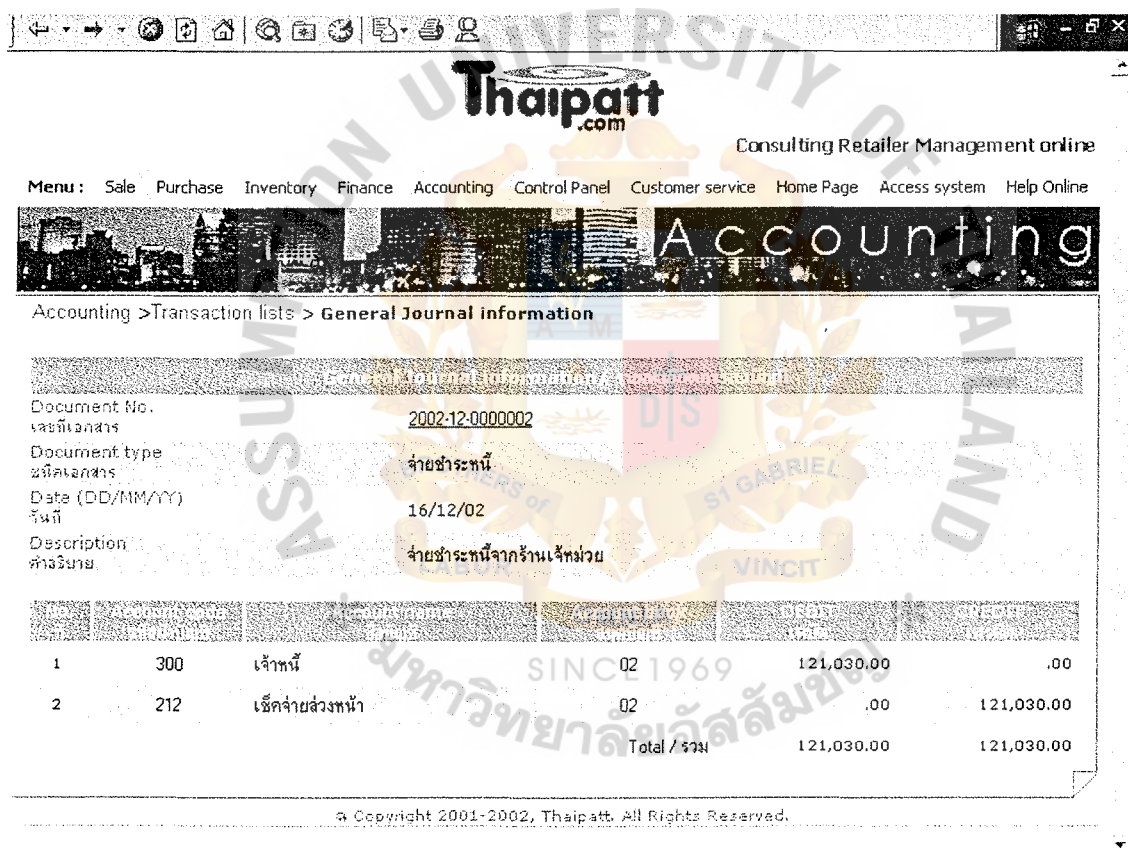
Another section is check section. This page shows check flow in each transaction both in and out of bank. Users can search group transactions by period of date and type (In/Out bank).

(8) Accounting section

General Journal transaction is divided into 2 groups as

(a) General Journal book (See Figure 5.14)

This page has a summary of all general journals of sales, purchase, and finance transactions. General journal transaction is generated by the system automatically in other sections.



The screenshot displays the Thaipatt.com website interface. At the top, there is a navigation menu with links: Sale, Purchase, Inventory, Finance, Accounting, Control Panel, Customer service, Home Page, Access system, and Help Online. Below the menu is a banner for 'Accounting'. The main content area shows 'Accounting > Transaction lists > General Journal information'. It contains a table with transaction details and a summary table at the bottom.

Document No.	Document type	Date (DD/MM/YY)	Description
2002-12-00000002	จ่ายชำระหนี้	16/12/02	จ่ายชำระหนี้จากร้านเจ้าหมวย

	Account Code	Account Name	Account Type	Debit	Credit
1	300	เจ้าหนี้	02	121,030.00	.00
2	212	เช็คจ่ายล่วงหน้า	02	.00	121,030.00
Total / รวม				121,030.00	121,030.00

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Figure 5.14. Summary General Journal Page.

(b) Chart of account

The page shows account information and summary of account code is separated from general journal in each month in the current year. This page has functions like Bank information page.

(9) Profile section

(a) Customer and Suppliers

In customer and supplier list and customer and supplier detail page similar to sales order lists (Figure 5.5) and sales order detail (Figure 5.6) respectively.

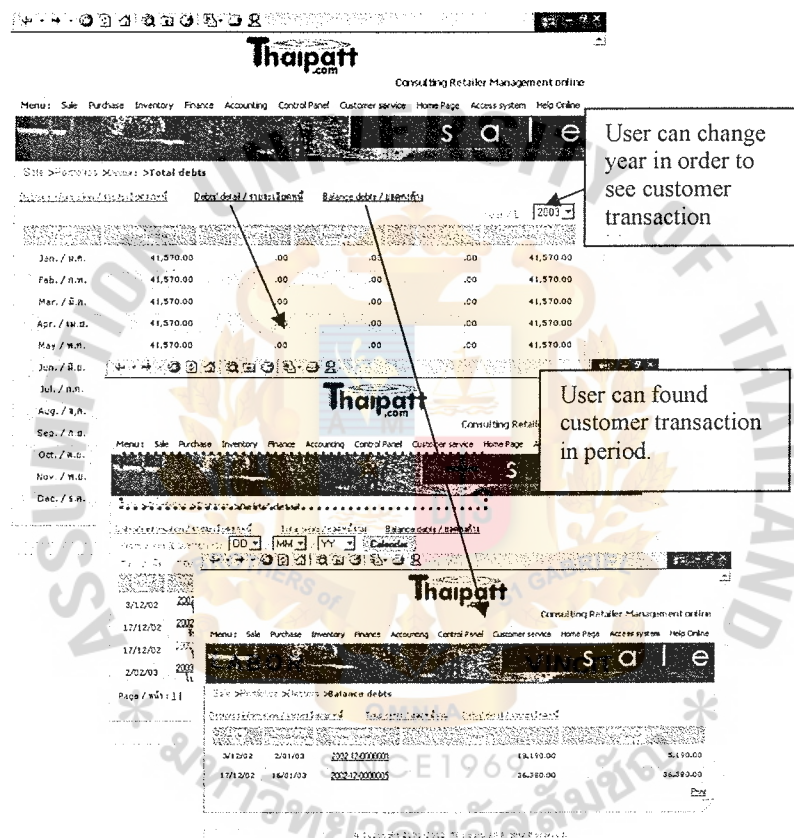


Figure 5.15. Customer or Supplier Transaction.

But customer and supplier analysis is shown in Figure 5.15.

(b) Product

In product list and product detail page similar sales order list (Figure 5.5) and sales order detail (Figure 5.6) respectively.

But product analysis is shown in Figure 5.16.

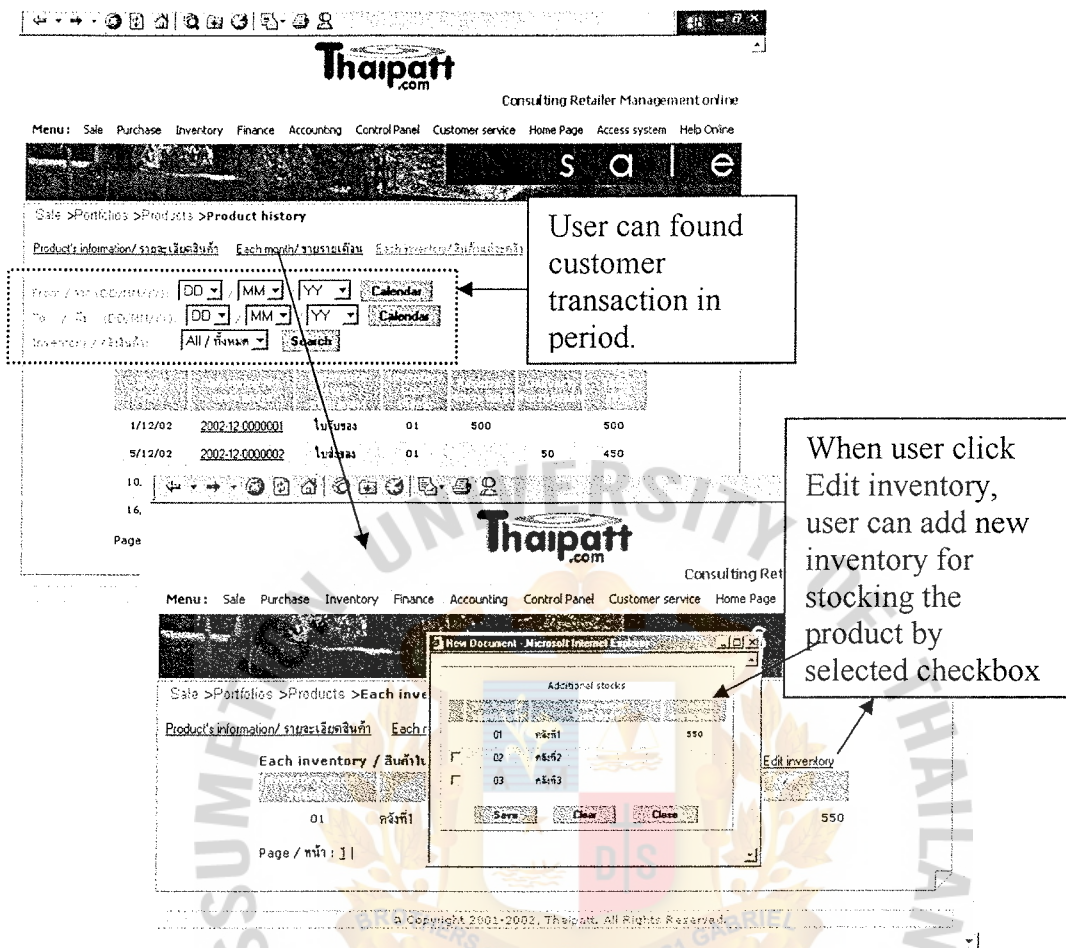


Figure 5.16 Each Product Transaction. Period of Transaction Date (Left). Choosing Warehouse for Stocking the Product (Right).

(10) Master file section

Master files reside in every main menu as Salespersons, Customer type, sale zone, Delivery term, Department, Project, Warehouse, Product type, Creditor type, Code cohere system, General Ledger Accounts, and Special Journal menu. A sample of master file page is shown in Figure 5.17. There are 8 parts in the page as: (1) Navigatormenu, (2) Title of master table, (3) Search engine, (4) Check All, (5) Show All, (6) Add module, (7)

Update module, and (8) Print function user can print the list of master table.

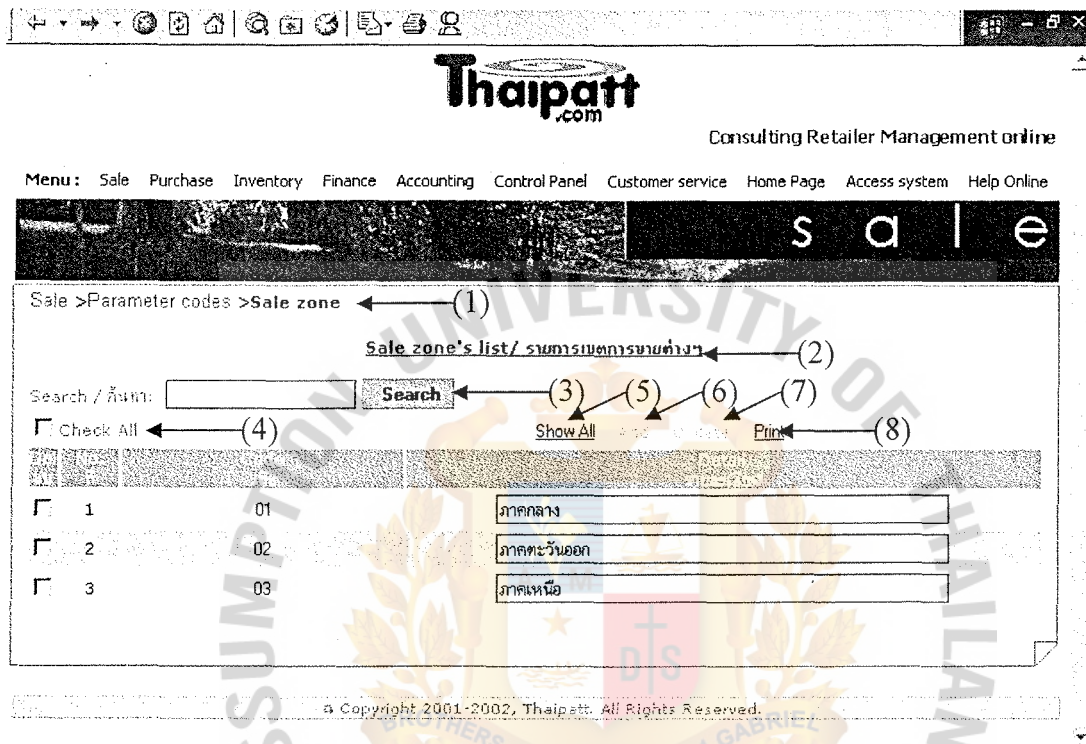


Figure 5.17. Master File Page.

(11) Control panel section

- (a) Company profile is similar sale order detail (See Figure 5.6)
- (b) Maintain database is Backup database page, and recovery page.
- (c) Security section as Define role: role master file list is similar sale order list (See Figure 5.5), role detail, and Assign user.

(12) Customer service section

- (a) Contact us section has functions similar to sales order lists (See Figure 5.6)
- (b) FAQ section is similar page with master file list (See Figure 5.17)

(c) New account has function is similar to sales order lists (See Figure 5.5)

(13) Home page section (See Figure 5.18)

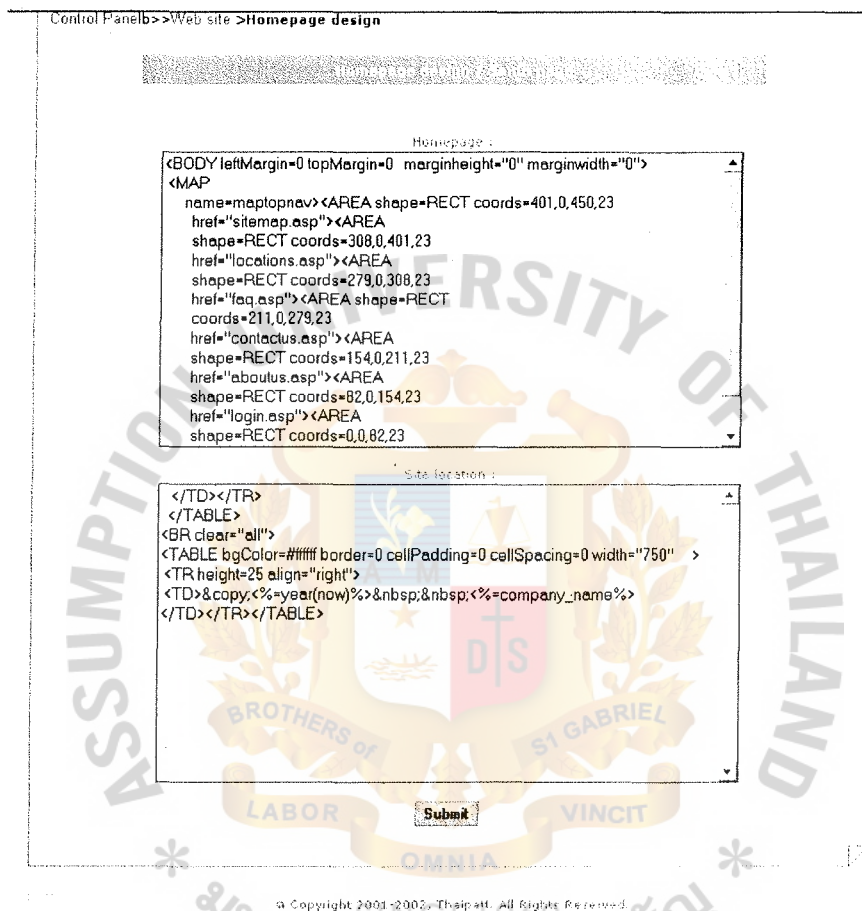


Figure 5.18. Editor Header, Footer and Header, Site Location.

The Front office site

Template of Back office page is divided into 5 parts as (See Figure 5.19):

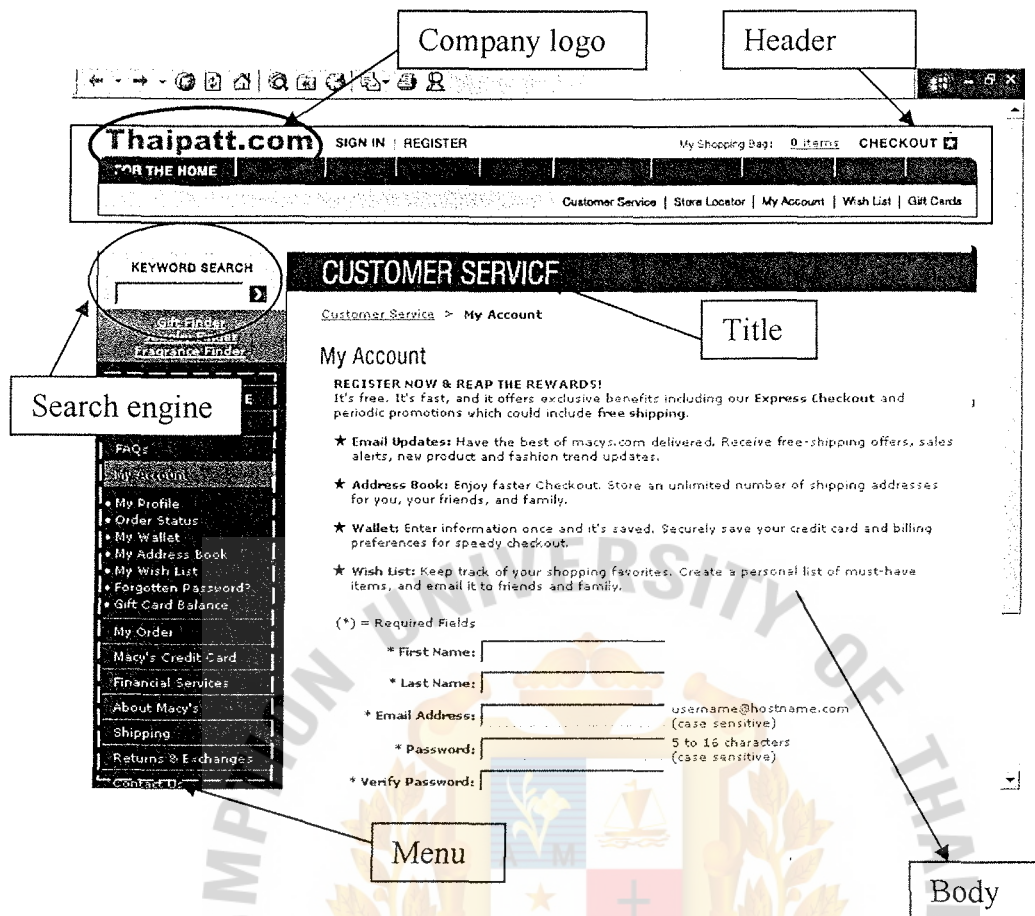


Figure 5.19. Template of Front Office (E-retailer Web Site).

Step for using the front office (E-retailer) follows by site map in Figure 5.2 as:

- (1) Home page of E-retailer web site is illustrated in Figure 5.20. In the body box, retailer can change HTML in order to show new promotion of their products.
- (2) Choose menu site bar



Figure 5.20. Home Page.

Customer Login & Register

Customer login page is separated into 2 parts as Customer has already registered and new customers are shown in Figure 5.21.

If customers are already registered with the retailer, Customers can sign in using their email address and their password (See Figure 5.21 left column). If not customers have their account or new customer, customers must register before using the sales order online service (They must click in register button in Figure 5.21 right column).

Thaipatt.com SIGN IN REGISTER My Shopping Bag: 0 items CHECKOUT

FOR THE HOME Customer Service | Store Locator | My Account | Wish List | Gift Cards

KEYWORD SEARCH

Gift Finder
Jewelry Finder
Fragrance Finder

CUSTOMER SERVICE

Getting Started
FAQs
My Account
My Order
Macy's Credit Card
Financial Services
About Macy's
Shipping
Returns & Exchanges
Contact Us

SIGN IN

Registered Customer Sign In

If you're already registered with macys.com, please Sign In using your email address and your password. (Both are case sensitive.)

Email Address:

Password:

SIGN IN

Not Registered Yet?

Register now with macys.com to use all our convenient site features and check out quickly. [Click here to learn all the benefits of registration now.](#)

REGISTER

Forgot your password?
[Click here to receive it via email.](#)
Or, call 1-800-BUY-MACY (1-800-289-6229).

Safe Shopping
* Privacy Policy
* Secure Shopping

My Info
* My Account
* Order Status

Helpful Links
* Contact Us
* Store Locator

Figure 5.21. Customer Login & Register.

After that, they must fill up their information (Figure 5.22) sent to salespersons of retailers and then, salesperson contact them via e-mail or telephone for checking the customer credit before getting username and password for using the E-retailer web site.

For existing customers, they can modify their information via the web site for updating their information in the real time in Figure 5.22.

Thaipatt.com SIGN IN | REGISTER My Shopping Bag: 0 items CHECKOUT

FOR THE HOME Customer Service | Store Locator | My Account | Wish List | Gift Cards

KEYWORD SEARCH

Gift Finder
Jewelry Finder
Fragrance Finder

CUSTOMER SERVICE

Getting Started
FAQs
My Account

- My Profile
- Order Status
- My Wallet
- My Address Book
- My Wish List
- Forgotten Password?
- Gift Card Balance

My Order
Macy's Credit Card
Financial Services
About Macy's
Shipping
Returns & Exchanges
Contact Us

CUSTOMER SERVICE

Customer Service > My Account

My Account

REGISTER NOW & REAP THE REWARDS!
It's free. It's fast, and it offers exclusive benefits including our Express Checkout and periodic promotions which could include **free shipping**.

- ★ **Email Updates:** Have the best of macys.com delivered. Receive free-shipping offers, sales alerts, new product and fashion trend updates.
- ★ **Address Book:** Enjoy faster Checkout. Store an unlimited number of shipping addresses for you, your friends, and family.
- ★ **Wallet:** Enter information once and it's saved. Securely save your credit card and billing preferences for speedy checkout.
- ★ **Wish List:** Keep track of your shopping favorites. Create a personal list of must-have items, and email it to friends and family.

(*) = Required Fields

* First Name:

* Last Name:

* Email Address: username@hostname.com (case sensitive)

* Password: 5 to 16 characters (case sensitive)

* Verify Password:

Figure 5.22. Register Page.

(2) Catalog & Search engine

Customers can easily find their needed products by choosing catalog or using search engine.

Catalog is shown in Figure 5.23 (1). Customers can click the interested product type. After that, the system will generate products that related in the product type and show any information including pricing of each product.

Or in a search engine, customers can fill up key word in the search text box and submit. Then, the system will find matched information in the database and retrieve all related products to show in Figure 5.23 (2).

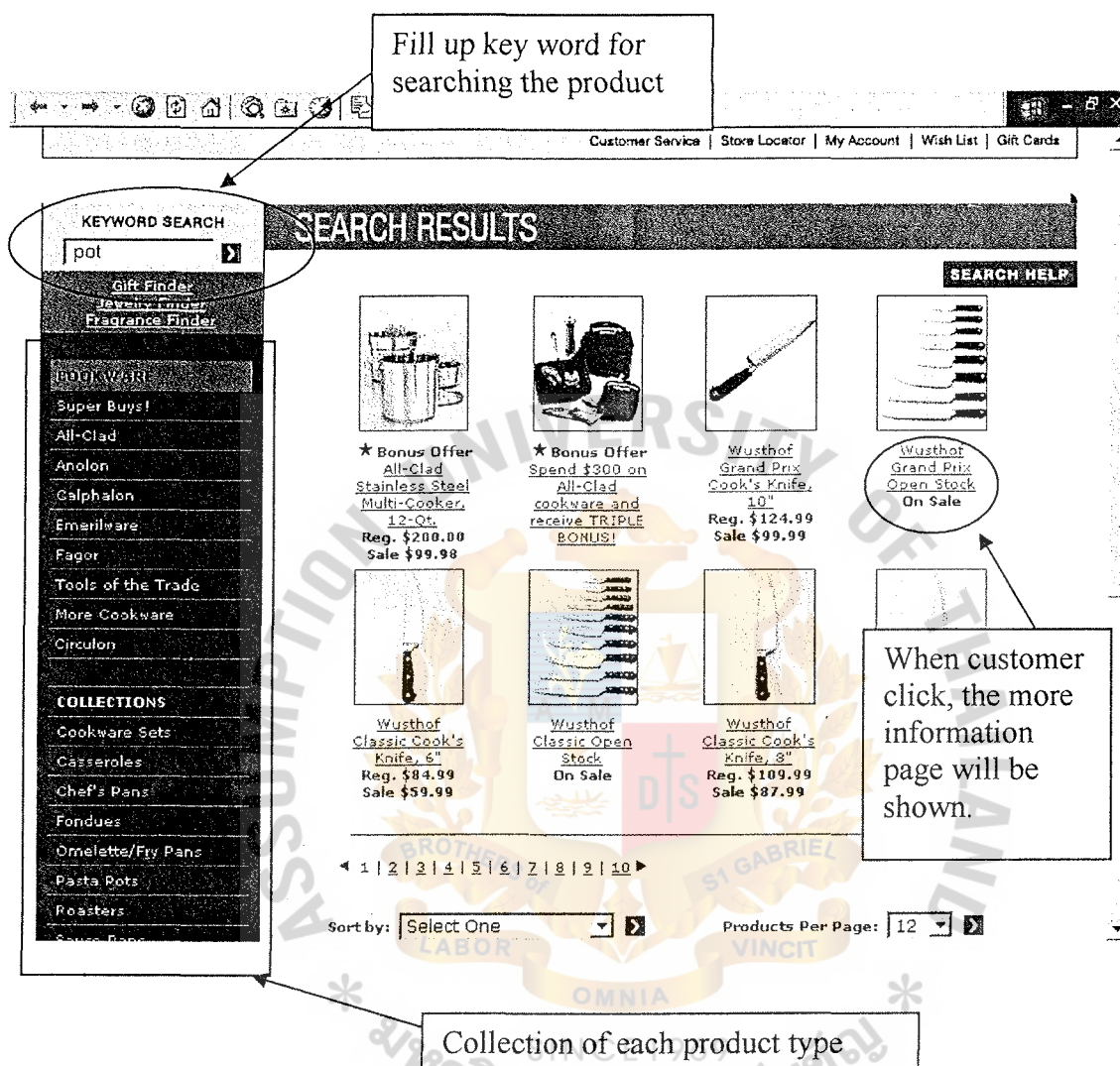


Figure 5.23. Catalog and Search Engine Page.

(3) Contact us

Customers can contact the retailer via the E-retailer web site in contact us page (See Figure 5.24) all information will send to back-office system.

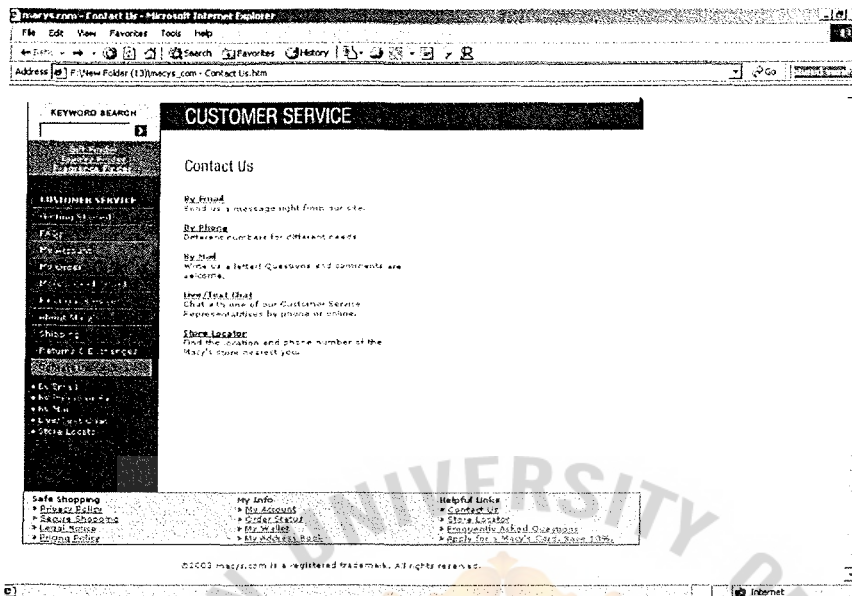


Figure 5.24. Contact Us Page.

(4) FAQ (Frequently Asked Questions)

The retailer will collect FAQ from the contact us information. The retailer can add the FAQ so easily in the back-office system. When the

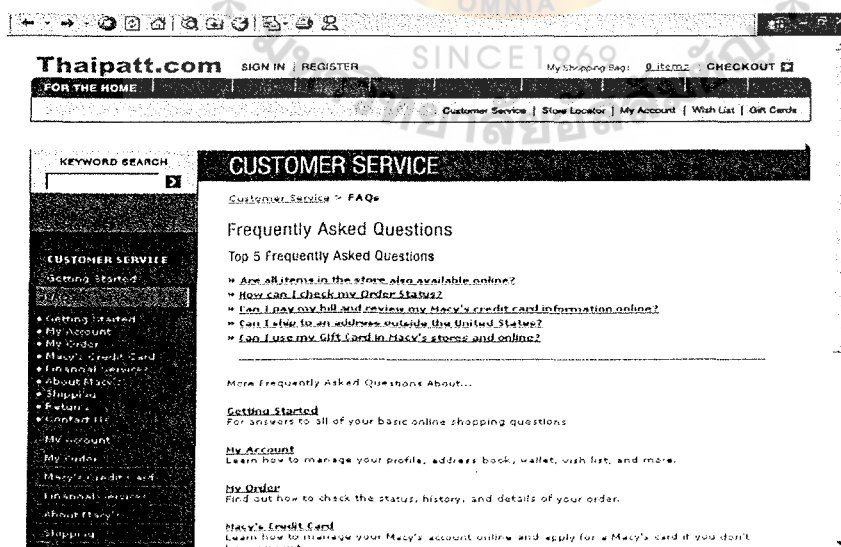


Figure 5.25. FAQ Page.

retailer fills up all information about FAQ in the FAQ section in back-office, they are shown in the FAQ page (See Figure 5.25)

(5) Store location (See Figure 5.26)

Store location shows the map of retailer location and retailer's address. The page can be changed by retailer in the back office site.

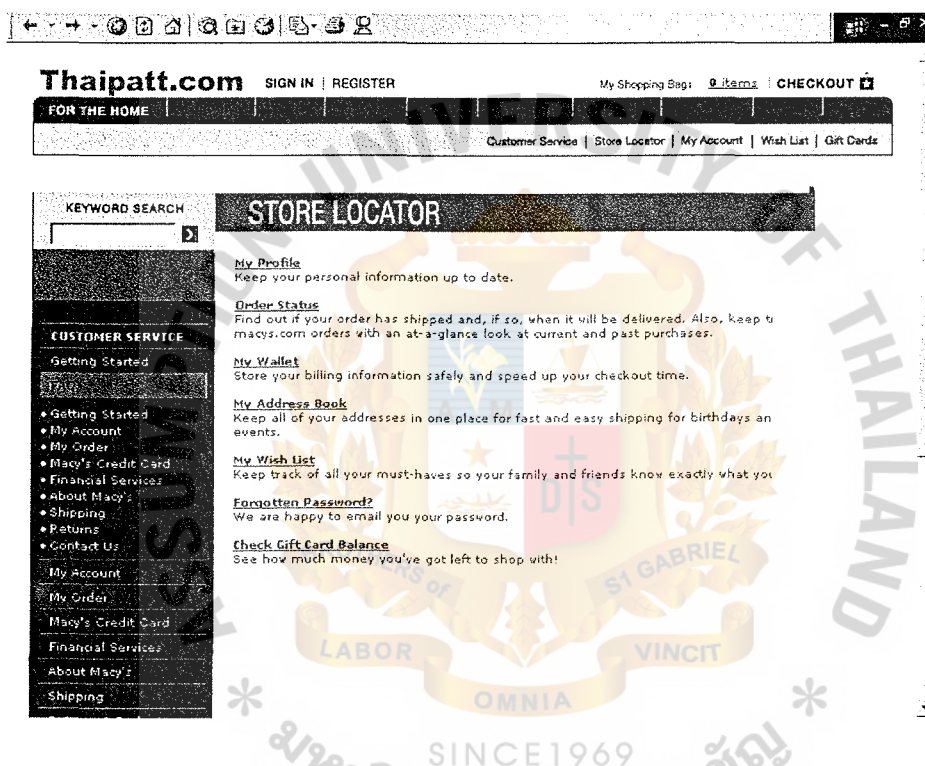


Figure 5.26. Store Locator.

5.1.3 The Process of Installation of RMOS

Installation is the process during which the current system is replaced by the RMOS. This includes conversion of existing data, software (if any), and documentation, and work procedures to those consistent with the RMOS.

The propose of RMOS installation is parallel in installation (Figure 5.27)

This way is riskless installation. The current system continues to run alongside the RMOS system until users and management is satisfied that RMOS is effectively

- (4) Comparison of manual data or data in offline application system to match in the RMOS data.
- (5) Redo c, d process until users and management are satisfied the RMOS program.
- (6) Only run RMOS program in their organization.

5.2 Training and Supporting Web-based Application

RMOS uses electronic performance support systems which is an on-line help system (It's a part of RMOS program) that go beyond simply providing help RMOS embed training directly into a web-based help section.

The main idea behind the development of help online is that the user never has to leave the application to get the benefits of training. Users learn the RMOS features at their own pace and on their own machines, without having to lose work time to remote group training sections. It's a just-in-time knowledge.

As both training and support on web-based form are increasingly able to be delivered on-line in modules, with some embedded in RMOS system. The training and support module access over the Internet has the potential to save retailers thousands of baht each year in training costs, especially when it come to this module

Instead of having to send personnel off-site for weeks and pay their travel expenses, retailer can gain access to the Internet training for lower cost and personnel can get the training at their desks.

performing its duties and the current system can be turned off. All of the work done by the current system is concurrently performed by the RMOS. Outputs are compared to help determine whether the RMOS is performing as well as the current system.

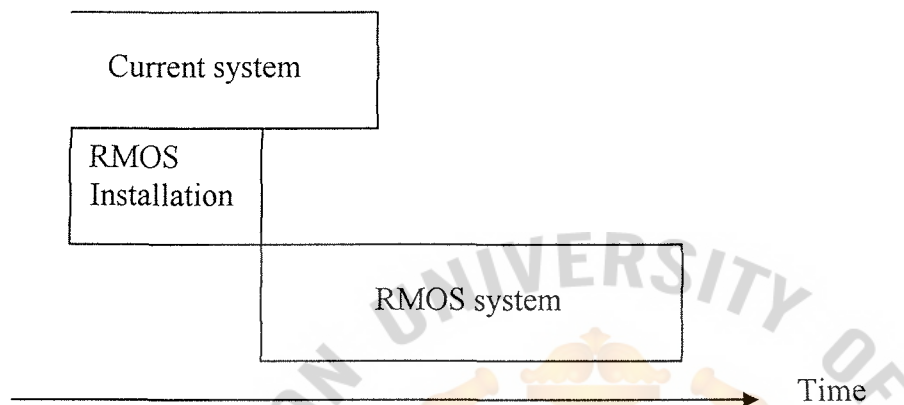


Figure 5.27. Parallel Installation.

Error discovered in the RMOS don't cost the organization much (But increase cost of manpower in each department that run 2 systems in parallel time for period of RMOS installation.)

How it work to install from manual system or offline application system to RMOS (online application system) that following

- (1) Hardware, and software preparation.
- (2) Installation about RMOS in the rent hosting.
- (3) When user has written any transaction in the document form, the user must entry them in the RMOS (In manual system). Or, in offline application system, when user entry any transactions in current system in all day, IT officer must transfer all entry data to RMOS database and run any transaction to follow the flow of RMOS.

5.3 Maintaining System

Most of system maintenance is data maintenance

5.3.1 Input Data Maintenance

User can enter about anything. It's RMOS maintenance job to make sure a little bad data from the user doesn't crash the system. The RMOS will alert any bad data to user in order to ensure the data is clean before it enters the rest of the system.

5.3.2 Application Maintenance

RMOS application system is stored in the server site and run on the server site. Therefore, some clients have problems. It is not affect to whole system, which anybody can go though the web sites. After the client is fixed, users can use RMOS via web browser (IE) that is installed automatically by Window OS. IT doesn't install, or fix problem in each client when the program is not usable.

IT maintains only program in the sever site. Therefore the retailer doesn't hire many IT for maintenance RMOS program.

5.3.3 Database Maintenance

Maintaining that database is an ongoing task that will consume a considerable amount of time over the lifetime of a database.

Database maintenance is critical. If database administration performs maintenance according to a regular, scheduled maintenance cycle and their monitor the results of the maintenance tasks, database server downtime can be reduced, and the users will be much happier. Database maintenance help find small problems before they become big user-impacting programs.

Therefore, when retailers choose SQL server 2000 to keep any data in their database, they must to choose rental hosting that support SQL server 2000 maintenance 24 Hours and have monitor of database failure occur. If some rental hosting companies

have some policy about database maintenance and support application monitor to alert database failure occur. When database is maintained by administration, database downtime could reduce and don't more risk of database failure.

And another database is MS access that has no complex maintenance. Periodically, the retailers can use the Compact Database method to compact your database to defragment the database file. The compacted database is usually smaller and often runs faster. The retailers can also change the collating order, the encryption, or the version of the data format while you copy and compact the database. Because Compact Database creates a copy of the database, they must have enough disk space for both the original and the duplicate databases. The Compact Database method copies all the data and the security permission settings from the database specified by old database to the database specified by new database.

VI. RMOS SYSTEM ANALYSIS

6.1 RMOS Improves the Manual System's Problem

RMOS can be able to improve the current problem for retailers, which operate their business manually. RMOS improves those problems in Chapter 2.3 to follow that:

6.1.1 Sale to Customer with Poor Credit

RMOS use web-based system to calculate, transfer and maintain accurate and current customer account balance and credit limits in order to reduce the risk of making uncorrectable sale.

Salespersons and customers can check updated customer account balances immediately by salesperson use back-office RMOS in customer menu to check it between each part of organization in another areas, and customer can check it in front-office RMOS (E-retailer) in customer information. Both of them must access RMOS over the Internet.

When Salespersons can be able to check accurate and current customers' credit immediately in any places, the retailers reduce the risk of making incorrect sales and reduce costs of transferring customers' information. RMOS will calculate customer credit-by-credit approval rules have been built to authorize all credit sale transaction.

6.1.2 Failure Customer Relationship with Retailers

RMOS use E-retailer technique to build the best relationship with new and existing customers over the Internet. Their customers can search any interested in product information about pricing and stocking of each product. And, they can check their account balance and sale credit.

The new customers can register though the Internet in order to order products anywhere and anytime. This part can found new customers that use the Internet for

selling something therefore; the retailers can reduce the salesperson for supporting their customers that always use the Internet for doing something.

Another benefit, the retailers can reduce costs and time for servicing any customers when they use RMOS in E-retailer part. Because of the RMOS can support any kinds of customers so they can reduce support service.

6.1.3 Shipping Error

RMOS ensure that ordered products, which are shipped are authorized and accurately delivered to the address, and product information. RMOS cut off the stock automatically when inventory sent the products to customers and print invoice voucher to customer.

All products' transaction flows internal organization therefore salespersons can know any quantity of each product in the stock and ensure to tell customer about due day for delivered products accurately.

6.1.4 Failure to Bill Customer

RMOS generate sales order form and invoice form including billing form to customers automatically. Salespersons must enter the correct sales order information in the RMOS system after that; the system will generate sale order, invoice form to customers. Then, customer pays money to the retailers. User must fill up all payment information to system; finally the system will generate the billing to customers. All sale and payment transaction enable to transfer both sale and finance department immediately, so cashier will get right information and get the correct billing to customer.

6.1.5 Theft of Cash for Cash Collections

RMOS can protect the risk exposures in theft of cash of cashier, so the retailers can control the problem though RMOS. It's mean that user must to fill up correct cash

that get customer, after that the system will generate the correct billing to customer. So, RMOS ensure that all cash receipts are recorded completely and accurately. And all cash receipt transactions are posted to proper customer accounts in the account receivable ledger immediately.

RMOS support in accounting about customer, supplier account balances and correctly checking cash flow in the retail business.

RMOS support deposit transactions in order to reduce theft of cash for cash collections when they use deposit method through RMOS. Headquarter can get the report cash collection of each branches over the Internet, although each branch stays in other places. Therefore, the retailers will reduce risk of theft of cash in each branch.

6.1.6 Loss of Data and Poor Performance

RMOS can reduce problem about poor performance. Because of the system have application program to filter bad data before those data is kept in the database, and ensure accuracy and safeguarding whole information that transfer in the organization over the Internet that have more transferred security.

And addition, RMOS uses the Areas for improvement method of Threat 1 in the system section (See Chapter 2) to solve the loss of data and poor performance problem.

6.1.7 Stock Outs in Each Warehouse

RMOS can be able to reduce out of stock in each warehouse because RMOS can manage stock of each product from sale order, shipping, cut off stock, and control limit of each product when purchasing products immediately over the Internet. So, the retailers don't worry about distance between each warehouse and headquarters for exchanging product information.

6.1.8 Theft of Inventory

RMOS cut off the stock immediately after they fill up invoice information in order to print the invoice voucher to customer. So, the manager of inventory department can see immediately when the product out of the stock after printing the invoice vouchers. This way can reduce theft of inventory and easy for checking the stock. RMOS can alert the less quantity products.

6.1.9 Errors in Supplier Invoices.

User must fill up all purchase order information in the RMOS before the system will generate purchase order form that must send the suppliers. So, the system must correct record of ordering product. When the supplier delivery goods to inventory, worker in inventory can print it and can check with supplier invoice. Although, warehouse and headquarters, that sent purchase order to supplier resides in other places, they can get the purchase order information in the real time.

6.1.10 Failure to Take Available Purchase Discounts

RMOS enable to track approved invoices from due date and the system will print a periodic list of all outstanding invoices. This option will help retailer plan to take advantage of any available purchase discounts.

6.1.11 Errors in Recording and Posting Purchase and Payments

RMOS can calculate each supplier's account balance and print it out to compare with vendor account balances before and after processing checks with the total value of invoices processed. The total of all vendor account balance enable be reconciled periodically with the amount of the accounts payable control account in the general ledger immediately after purchasing transaction have finished. So, the generating ledger, which is generated by RMOS, will restrict the system therefore information will be accurate.

6.1.12 Errors in Updating the General Ledger

RMOS use the Areas for improvement method of Threat 1 in the general journal section (See Chapter 2) to solve the errors in updating the general ledger problem.

6.2 RMOS Improves Both Manual and Offline System's Problem

Although the offline system can solve almost manual system's problem, but also the system still has the same problems that can not be solved in the retail operation productivity. Those problems are distinguished into 2 different problems

6.2.1 Transferring Information Problems

Both the existing systems cannot decrease transferring information between internal departments and their customers. So the existing systems still have expensed more commutation cost, and paper-based document cost for using fax machines.

Therefore, Infrastructure of RMOS uses Internet and E-commerce technology for solving those problems. The RMOS solution of transferring information problem is to use the Internet technology for decreasing transferring information cost.

The benefit of RMOS that use the Internet technology to solve transferring information problems is following that
Aggregating Information form Various Sources

Both internal and external information is shared in any departments of the organization and customers. The retailers using RMOS can increase revenues by introducing new products much faster via the Internet. They have decrease expense cost by cutting paper-based document cost, fax cost and communication cost for transferring and aggregating information because the information form various sources are kept in the same database and easy for exchanging information through the Internet to serve internal and external organization.

Speeding Up Time to Transfer Information

RMOS can increase speeding up time for distributing new products and exchanging operation information much faster than the existing system. When there are increased speeding up time to transferring information, the retailers take advantage of the following cost reduction opportunities

- (1) Reducing product handling with a shorter in the chain.
- (2) Decreasing delivery cost and time with ordering product.
- (3) Reducing facility and processing costs.
- (4) Decreasing inventory controlling cost through centralization.

6.2.2 Customer Retention: Strengthening the Customer Relationship

Online customer service (A part of E-retailer section in RMOS) is more than simply following through on order fulfillment. It has been communicated with a company and obtained desired information in a timely manner. Online customer service can help reduce consumer frustration, cut the number of abandoned shopping carts and increase sales.

The system use FAQ page, contact us system to encourage interaction with prospects and customers and provide customer service including the customer relationship with customers.

Another strategy is to use E-retailer for distributing promotion and product information and selling directly customers. RMOS allows retailers have more than one distributed channel for selling product that is E-commerce channel to enhance revenues by bypassing intermediaries and selling directly to customers.

The retailers use RMOS for solving customer retention problem and more benefits of the following high opportunities:

- (1) Offer direct sale to customers

- (2) Providing 24 hours access from any location.
- (3) Offer new and update product and service direct to customer.
- (4) Extended the market share.
- (5) RMOS can make better and faster customer support.
- (6) RMOS can be able to make customers oriented interaction.
- (7) RMOS can build up long term customer relationship.
- (8) Reduce advertising cost.
- (9) Reduction of cost about sale and marketing.

6.3 Summary of Benefit in RMOS

6.3.1 Benefit to Organization

- (1) RMOS can expand the market place to national and international market via the E-retailer section. The retailers can easily and quickly locate more customers. RMOS help retailer to improve publication like products and customer service or catalogs. So, RMOS help the retailers to provide high customer values by carefully monitoring the integration of function with in the retailers.
- (2) RMOS enable retailers to interact more closely with customers even if through intermediaries. RMOS can increase strong customer retention.
- (3) The retailers use RMOS to conduct their operation business efficiencies and effectively are following that:
 - (a) RMOS also enhances the timeliness and accuracy of information for distribution.
 - (b) In inventory management, RMOS take less time between order and shipment. Inventory information is transmitted immediately. So it can

reduce controlling inventory cost, inventory turns over faster and stocking of merchandises is better.

- (4) RMOS enable efficient e-procurement that can reduce administrative cost
(See Chapter 6)
- (5) RMOS decrease the cost of creating, processing, distributing, storing, and retrieving paper-based information.
- (6) RMOS support lower telecommunication costs. RMOS use the Internet technology in order to reduce communication, and transferring cost that is much cheaper than fax, and VAN.

6.3.2 Benefit to Consumers

- (1) RMOS support the retailers' consumer to shop or perform other customer service 24 hours a day, from any location.
- (2) RMOS provide customers with their criteria. They can customize for selecting from more needed products.
- (3) RMOS support to distribute updated product information in the real time. So, customers can locate relevant and detailed product information in seconds rather than days or weeks.

6.4 Retailers Case in RMOS

There are more than a million retail establishments in Thailand. Most of them are small operations including middle and large operations. Retailer establishments are distinguished in some depth the different types of outlets both store, non-store.

Retailers that feature broad product lines include department stores, supermarket, hypermarket, and specialty stores. But RMOS enable support retailers about supermarket, and specialty stores.

6.4.1 Supermarket

RMOS support supermarket that offers a variety of food and food-related items in specialized department. When supermarket firm use RMOS, the organization can be able to use online supermarket in order to add new distribution channel for promoting and receive the online sale orders from their customers in any location.

6.4.2 Specialty Store

RMOS support almost specialty store that carry one line of related products.

- (1) Drug stores and proprietary stores
- (2) Liquor stores
- (3) Sporting goods stores and bicycle shops
- (4) Book stores
- (5) Stationery stores
- (6) Jewelry stores
- (7) Toy and game shops
- (8) Camera and photographic supply stores
- (9) Gift, novelty, and souvenir shops
- (10) Luggage and leather goods stores

6.4.3 Non-Sore Retailers

RMOS support non-store retailers that establishments primarily engaged in the retail sale of products by using catalog via the Internet (It is called E-catalog). These establishments do not ordinarily maintain stock for sale on the premises.

6.5 Value of RMOS in Retail Stores

Although each retail stores have the same products, but also both supermarkets and specialty stores have a same key processing to conduct their business. Therefore, both supermarkets and specialty stores can able to use RMOS to conduct each kind of

retail stores. The value of RMOS for each retail stores can be able to exploit opportunities offered by the Internet to increase revenues and decrease cost.

6.5.1 Revenue Impacts of RMOS on the Retail Stores.

Some retail stores don't have physical stores when they use E-retailer site of RMOS selling their products to customers that using the Internet for shopping and finding special needed products. Although some retail stores have physical stores in any locations, they can manage cash flows and product flows from headquarters via the RMOS. And additional distribution channel for promoting and selling their products via the E-retailer site (Customers shop via the Internet). RMOS has exploited several opportunities on the Internet to attract retailers' customers and increase revenues. For example, In the E-retailer site has more functional program for serving their customer and shopping online. Search engine is provided in the site to easy find the special interested products in the large volume products in the stores.

6.5.2 Cost Impacts of RMOS on the Retail Stores

(1) Decrease operation cost

When retail stores use RMOS for processing their business, they can reduce operation cost such as reduce paper-based document cost, labor cost and human error cost for each department. Because any operations are conducted by computerization such as selling, creating sale order forms, checking product and generating purchase requisition and so on.

(2) Decrease inventory cost

Retail stores using RMOS can be able to decrease inventories by aggregating demand across other customer order from the same publisher and purchase order depended on demand of customer order.

VII. FINANCIAL ANALYSIS

7.1 Acquisition of Computer Hardware Equipment

The retailers are divided into 2 groups that use the RMOS to follow as:

7.1.1 Stand-alone System (Offline)

The retailers should buy own the computer because the computer will be used longer than four to five years, and RMOS support any specification of computer (Pentium Pro above). Another reason to buy option in acquisition of computer is the cost of purchase after five years is dramatically lower than that of renting (See Table 7.1 comparison of alternatives for computer acquisition to 3 years).

Table 7.1. Comparison of Alternatives for Computer Acquisition to 3 Years.

Purchase		Renting	
Purchase price	30,000 Bt.	Rental price per month	4,000 Bt.
Scrap value (5%)	- 4,500 Bt.	36 months	144,000 Bt.
Total cost	25,500 Bt.	Total cost	144,000 Bt.

7.1.2 Online System

In this section, it can be divided into 2 subgroups as:

(1) LAN network

The retailers must buy server system and network installation. But any clients that connect to server depended on amount and frequency to use them to follow in each policy of retailers. If there are fixed users to use clients, the retailers should decide to buy ant clients. But if there are those situations that are short-term move to handle non recurring or limited computer needs or user volatile time the retailer should decide to rent any

clients. The main advantage is that none of the retailers' capital is tied up.

Hence, no financing is required.

(2) Stand alone

The retailers should analyze amount and frequency of users to choose options for acquisition of computer. In addition, any stand-alone computer must have modem, telephone line, and Internet connection package to dial up though the Internet.

7.2 Acquisition of Computer Software Equipment

7.2.1 Web Server Software

PWS or IIS is free for buying because it's a service of MS operation system any kinds of version (Window 98 above).

And if the retailers choose RMOS to online system IIS is free for license because they purchase rental hosting that support MS Window 2000 or NT to operation system of hosting (See in next topic: Hosting).

7.2.2 MS Access

The retailers must buy license of MS Access 2000 for keeping the backup database in the backup computer, which is their server or stand-alone computer to access the Internet.

Pricing of MS Access 2000 end-user license is 15,000 Baht.

7.2.3 MS SQL Server 2000 (if option)

The retailers have fewer budgets to buy MS SQL server license that expensive price, because the retailers rent hosting that support MS SQL Server database So, the rental hosing company support about MS SQL server license payment.

7.2.4 Hosting

Any retailer must rent hosting for executing RMOS in the Internet. Minimum specification of hosting is:

- (1) To support MS operation system.
- (2) To support MS SQL server (if option)
- (3) Minimum of space in the rental hosting is 10 MB.
- (4) To service SSL security.
- (5) To service 24 hours.

Minimum pricing of rental hosting is 1,200 baht per month. Any retailer must register domain name, which they must spend money about 600 baht per years.

7.3 Development Cost Analysis

Development cost shows in Appendix G in Table G.1.

7.4 Benefit Expected

7.4.1 Tangible Benefits might be measured in terms of unit cost saving or profit.

The RMOS have many tangible benefits as:

Reduce Paper Document (See Appendix G in Table G.2)

Reduce Communication cost (See Appendix G in Table G.3)

Communication cost between each department which are located in other places, and between retailers and their customers.

Reduce operation cost as:

- (1) Messenger (See Appendix G in Table G.5)
- (2) Finance operation and finance worker (See Appendix G in Table G.6)
- (3) Accounting operation and accounting (See Appendix G in Table G.7)
- (4) Inventory control operation and worker (See Appendix G in Table G.8)

Reduce Operation Time About

- (1) Communication
- (2) Checking accounts receivable and payable
- (3) Accounting balance sheets

The retailers process manual operations in their business around 2 weeks per month (It is maximum period.) But if they use RMOS for running their business, they can process any operation and exchange information in the real time.

Although, some retailers use offline application system to run their business, it can reduce paper-based document more than they use manual system but also offline system still higher transferred information cost, communication cost, and customer service cost than RMOS.

RMOS reduce operation time of communication in real time to their customers, and reduce transferred information of any departments to real time including support customer service.

7.5 Break-even Analysis

Break-even analysis is to use any kind of system to compare cost. The point at which the total costs of the current system and of the RMOS intersect represents the break-even point where it becomes profitable for the business to get the RMOS.

Nowadays, current system has 2 groups of retailer operation as manual system, and computer offline system. So the RMOS must compare both two groups about diffidence cost of the retail business in Appendix G in Tables G.9-10 and break-even graph in Figures G.1-4.

The Figure G.1 shows the comparison between using RMOS and manual system for running retail business. In this graph, two straight line don't cut one another but cost of using RMOS less than using manual around 370,000 baht in first year. Although the

retailer must install the new system and train users for using RMOS but also the cost of RMOS system can still be reduced as it can reduce paper-based document costs and communication cost and customer service cost more than the manual system, which is around 370,000 baht. So, the retailer that runs the business manually should use RMOS for running business to reduce operation cost and easy transfer of data between internal organization and their customers.

Comparison between using RMOS and offline system for running retail business is shown in Figure G.2. Although, the operation system have little change the processing but also cost of communication and paper-based document is reduce more than offline system because RMOS use the Internet technology for running the system. So RMOS can reduce cost in the retail business in third year after RMOS installation. Although some hardware can use in the RMOS system such as their clients but the retailer must to spend budget for network installation cost and training new system to users and so on. But communication and paper-based document costs are the main cost that retailers must spend in every year. So in the long term, the RMOS can reduce two costs that transfer between internal organization and their customers more than offline system.

VIII. CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Developments in RMOS illustrate one way in which improvements in support activities can dramatically transform how retailers perform their primary activities such as sales, purchasing, inventory control, finance, and accounting. RMOS system adds value is by providing accurate and timely information to perform the various retailer activities. So, RMOS can also help retailers profit by improving the efficiency and effectiveness of its value system. Moreover, if such access reduces customers' costs and time of ordering, both sales and customer retention rates may increase. Of course, RMOS ensures reliability and accuracy of the data in the retailers. Other activities such as decision of managers that RMOS supports tools and data in retailers' database provide scalable solutions that can handle diverse requirements in RMOS system, support a large variety of branches and inventories in another place and enable secure collaborative analysis across all levels of the retailers.

RMOS is a web-based system that enables retailers of all types and sizes to provide applications that deliver content to the end user and customers, without the traditional, costly barriers of installation, training and maintenance. Because of RMOS can install in any platform of Microsoft operation system as Window 95 above. RMOS require computer hardware and software depended on retailers' budget and capacity of database. So, all small and medium retailers can use RMOS in their organization in low budget for installation, training any users and maintenance.

RMOS is a system that retailers should choose for running their operation. Because the system doesn't spend more budget than other programs as RMOS uses the low quality of server (Pentium II) and clients (Pentium Pro above) and does not require

any software for development of the system and only database software requirement that like any programs. In additional benefit as, RMOS use can build E-retailers to any retailers for promotion and service to customer over the Internet immediately.

Finally, RMOS is a well-designed retail management application program to provide the information that all small and medium retailers need to effectively using, managing, and controlling their businesses. RMOS can be able to process data of sales, and cash receipts, the purchase and payment, finance statements, and control their warehouse transactions and another benefit of RMOS web-based system is to be able to allow many users to access the system at the same time. All users can be able to process data in anyplace. This way can reduce costs and time of communication between each department and customers.

8.2 Recommendations

RMOS program provides in most retail management and transfers between retailer and customer. In RMOS doesn't provide payroll system, tax system, and human resource system.

However, In the future system should:

8.2.1 Additional Subsystem about Human Resource System:

The system should provide manpower and performance of each employee. The system should statistic about performance and manpower to sever any decision of HR manager about position, salary and so on.

8.2.2 Additional Subsystem about Payroll System:

The system should calculate salary for each employee in every mouth. The system should transfer information about salary to bank in the bank platform for using Media clearing of E-bank service.

8.2.3 Additional Subsystem about Tax, Expense in Accounting System:

The system should calculate balance sheet and build the tax information to set to the regional revenue officer.

8.2.4 Using Value Chain Concept and E-business Concept

The value chain concept can be extended by recognizing that retailers must interact with suppliers, and customers. If extended RMOS will pay attention to the interorganizational linkages in it's the value system, the retailers can add value by using advanced RMOS to help their supplier, and customers in their supply chain to improve their value chains.

The RMOS is developed in Web-based application program so advanced RMOS can enable use the Internet to conduct their outbound logistics activities electronically with their suppliers and customers. This change simultaneously reduces both the costs and time of delivering products to customers and from suppliers.

Another concept, the system should develop based on E-business theories. The system should:

- (1) Providing information access to the supply chain.
- (2) Negotiating prices and contracts with customers and suppliers.
- (3) Receiving payment from customers over the Internet.

In our opinion, if the system develops to follow e-business theories, the system has more successfully to move several supply chain activities to pull phase and postpone product differentiation until after a customer has placed his or her order. The system will be able to gain considerable reduction in facility and inventory cost as a result of centralization and to low their transaction costs for processing for exchanging information to better match supply and demand.

This way the RMOS adds value by providing accurate and timely information to perform the various value chain activities between suppliers and customers. This well-designed RMOS can further improve the efficiency and effectiveness of those activities by:

- (1) Improving the quality and reducing the costs of products.
- (2) Improving efficiency
- (3) Improved decision making
- (4) Sharing of knowledge and information.

Advanced RMOS can also help any retailers profit by improving the efficiency and effectiveness of its value system such as, allowing suppliers to directly access the retailers' inventory and purchase requisition in order to reduce the costs of overflow in the stocks and time of ordering.

The advanced RMOS will contribute to its success by both improving the retailers' value chain activities that is RMOS system can share information to suppliers and customer for supporting outbound logistics, distribution order processing, and services. Another benefit is to improve the operations of their value system for firm infrastructure, Human resources, Technology for supporting their information, purchasing and selling.



APPENDIX A

WORK FLOW DIAGRAM

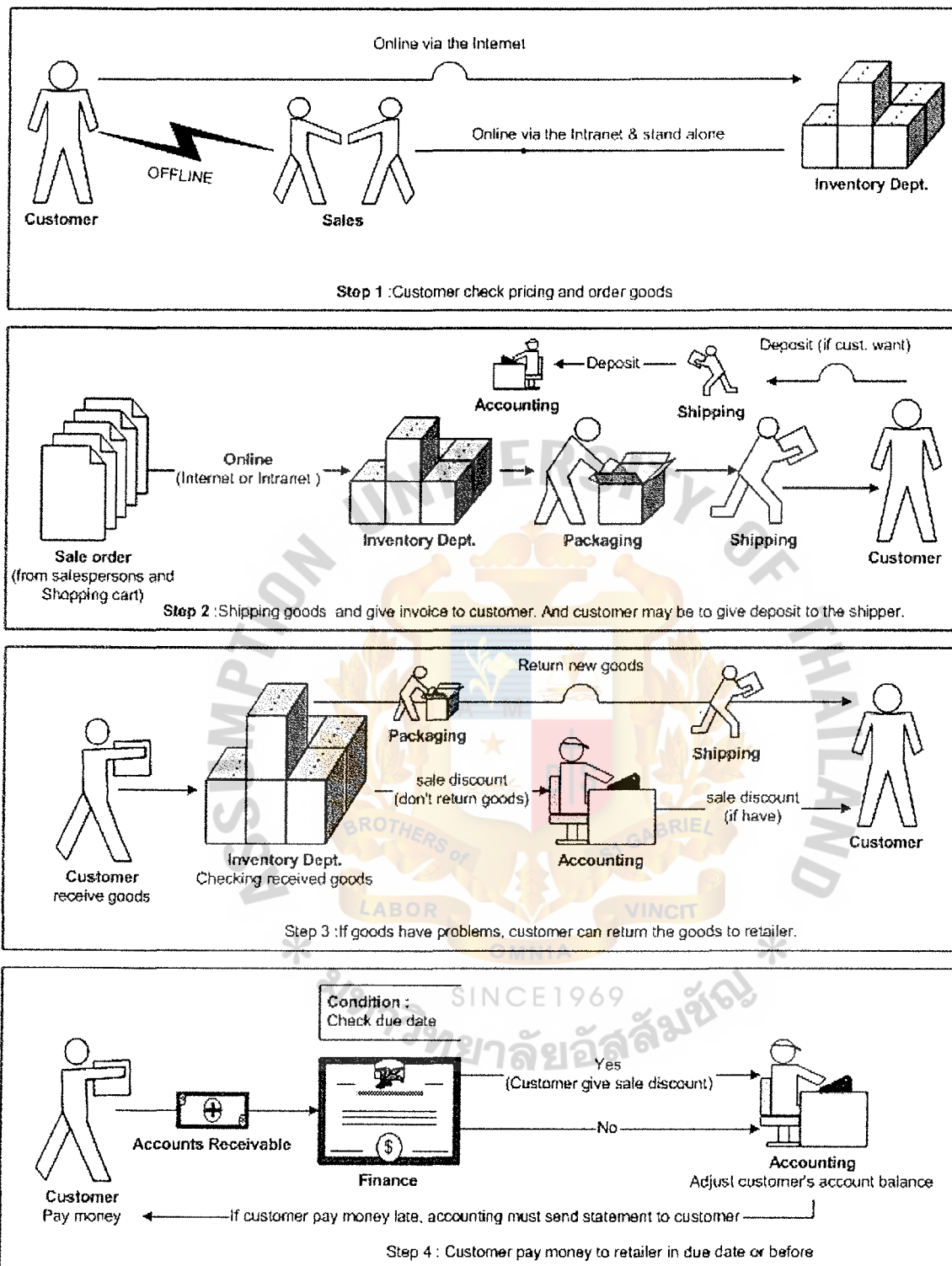


Figure A.1. Sales Life-Cycle in Retail Business.

Work flow (Purchase)

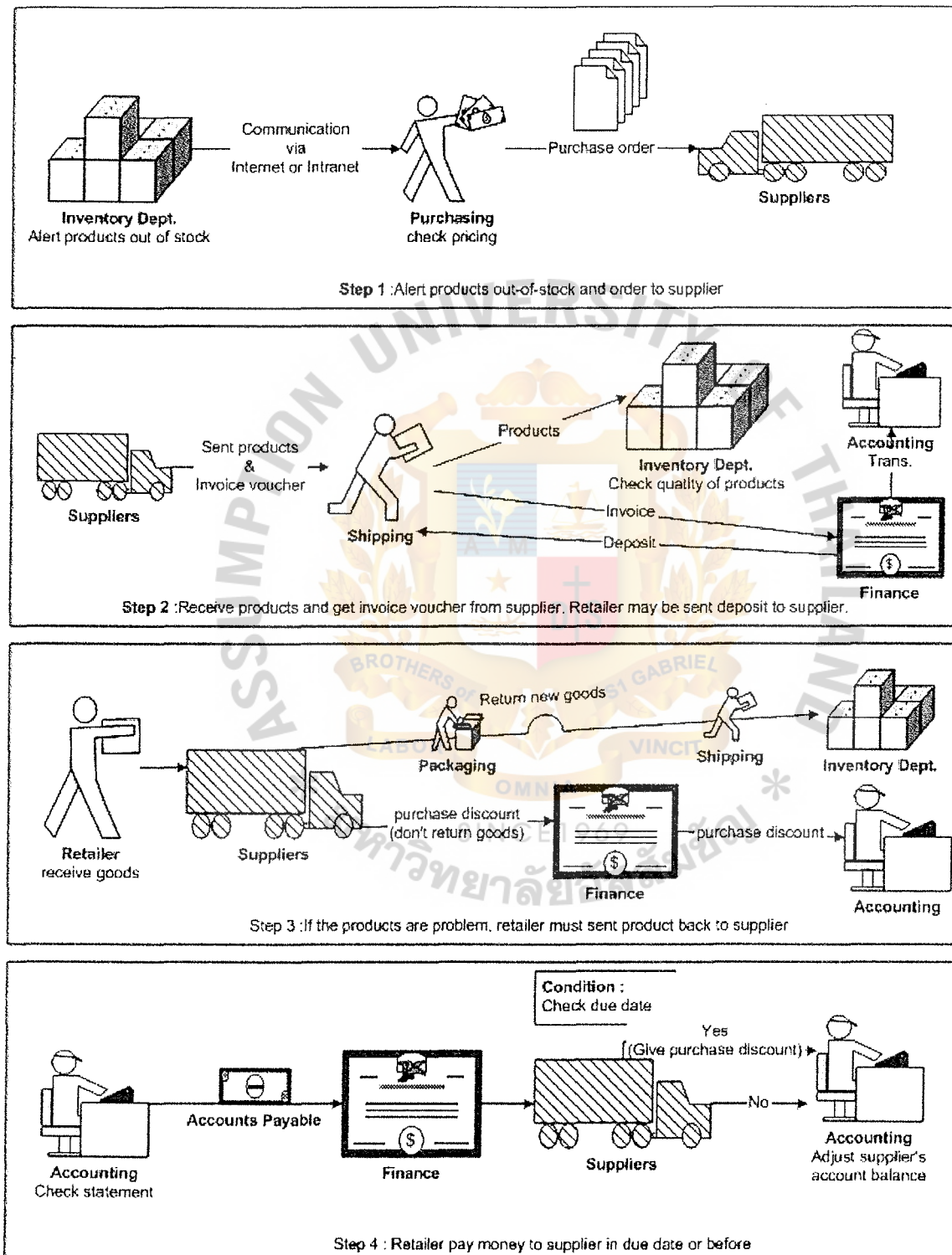


Figure A.2. Purchasing Life-Cycle in Retail Business.

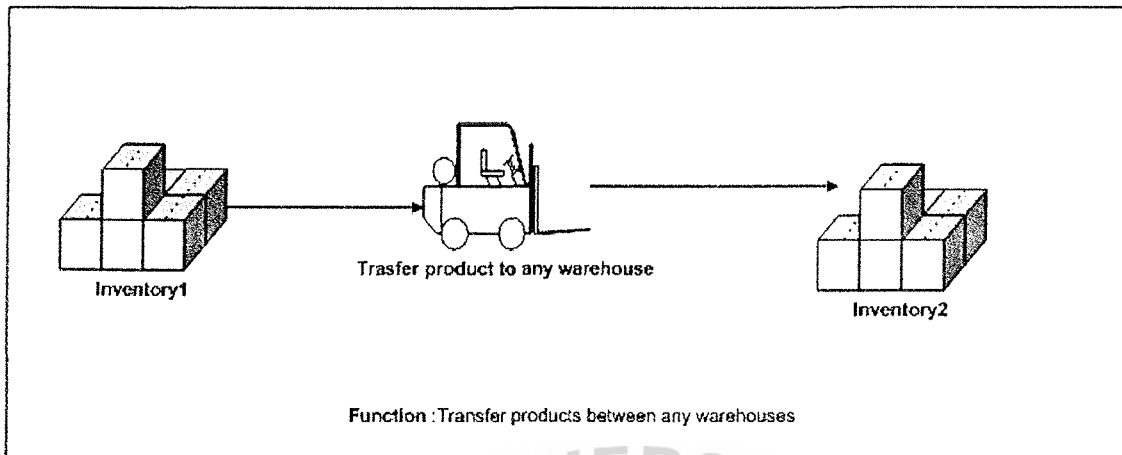


Figure A.3. Inventory Life-cycle in Retail Business.

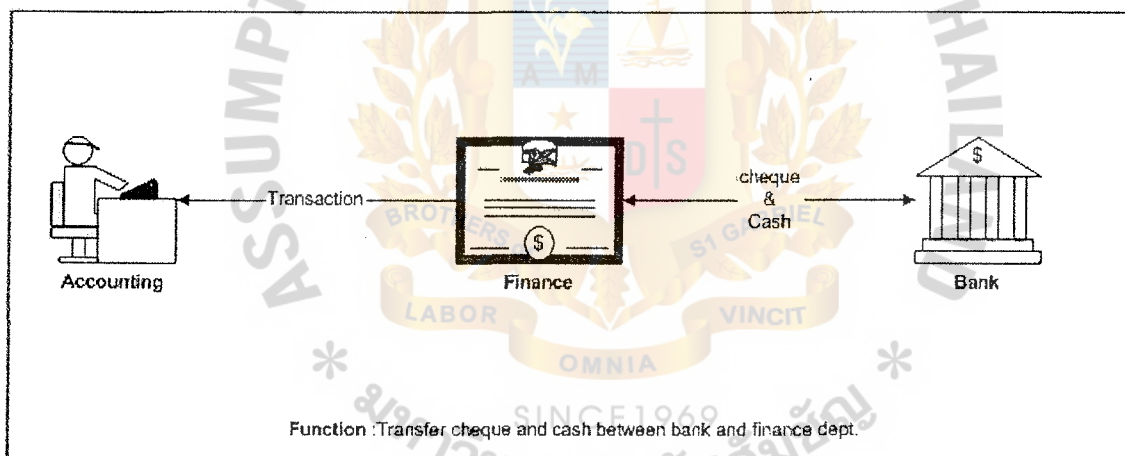


Figure A.4. Accounting Life-Cycle in Retail Business.

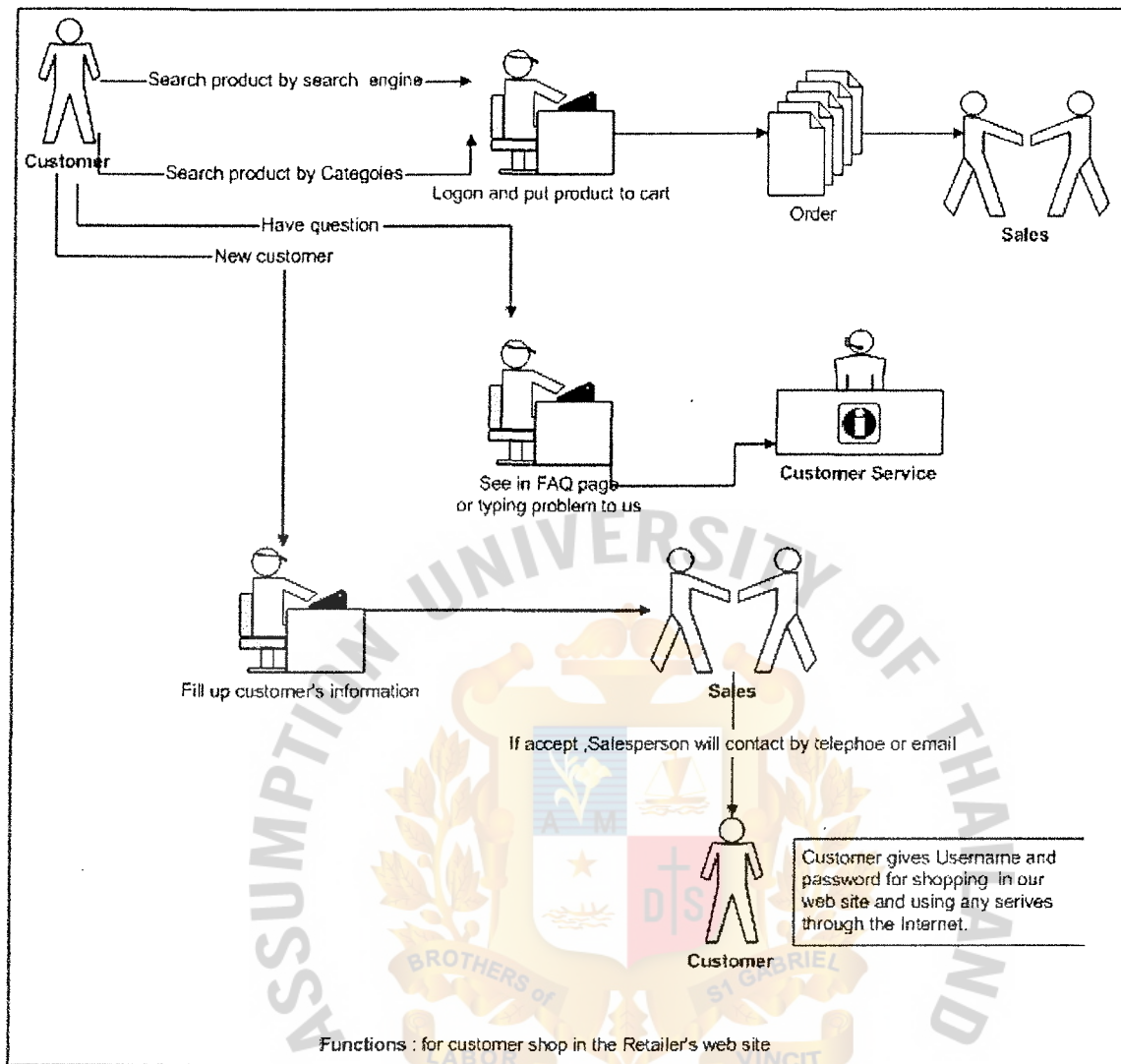


Figure A.5. Online Web Site.



Topic 1 Sales order

1. **If** user clicks insert button in sales order page **then**
 - a) **If** user chooses customer **then** the system will return all customer information that require field in the sales order form.
 - b) **Repeat the following unit** finished choose products in sales order form:
 - 1) The system lists all products in list box.
 - 2) **If** user chooses the product **then** the system will find the product information (Pricing, product code, product name, product unit, and product on hand each warehouse)
 - 3) User entry quantity of product that customer orders.
 - 4) The system calculates net sales of the product.
 - 5) **If** user entries discount of product more than maximum product discount **then** the system don't allow the discount field and change it to be maximum product.
Else the system recalculates net sales of the product.
 - c) Calculating total of net sales of the sales order including show VAT, Gross.
 - d) **If** user entry total discount more than maximum discount of the customer **then**
 - 1) The system adjusts to be maximum discount.
 - 2) The system recalculates the total net sales.
 - e) **If** user change quantity and discount field in product list **then** the system recalculates the total net sales.
 - f) **If** user enters submit button **then**

- 1) **If** the system retrieves last sales order number that has month or year don't match current month and current year **then** the system generates sales order number to be "current year- current month- 0000001"
- Else** the system generates sales order number to be "the last sales order year – the last sales order month- next number" (Ex. last sales order no. is 2003-01-0000011, the new sales order no. could be 2003-01-0000012)
- 2) Sales order date is the current day.
- g) The system shows the total customer account balance that include the amount of the sales order and customer credit.
- h) **If** the delivery flag is checked as "No" and some products in sales order are not delivered and user choose delete mode **then** the system allow user to delete the sales order
- Else if** the delivery flag is checked as "No" **then**
- 1) **If** user chooses modify mode **then**
- i) User can modify sales order information.
- ii) **Repeat the following unit** finished to modify products in sales order form:
- (1) **If** user adds the new products **then** step follow to structure 1.b loop
- (2) **If** modify quantity of product less than quantity of delivered products **then** the system doesn't allow for modify it.
- Else if** the delivery flag is checked as "No" and some product in sales order don't delivery **then**

Else the system doesn't allow user to modify or delete the sales order.

Topic 2 Invoice

1. If user clicks insert button in invoice page then

- a) The system lists the sales order that the delivery flag is "No".
- b) **If** user choose sales order **then** the system will return all sales order information that require field in the invoice form including product list in the sales order
- c) **Repeat the following unit** finished modify products in invoice form:
 - 1) If user adds the new products then step is similar followed in 1.b loop in sales order.
 - 2) If user modify quantity of product less than quantity of product in the sales order then the system allow for modify it and recalculate the net invoice
 - 3) Else the system doesn't allow for modify it.
 - 4) If user deletes the product then the system delete the product out of the product list in invoice.
- d) Recalculating total of net sales of the invoice including show VAT, Gross.
- e) **If** user entrys total discount more than maximum discount of the customer **then**
 - 1.) The system adjusts to be maximum discount.
 - 2.) The system recalculates the total net sales.
- f) **If** user enters submit button **then**
 - 1.) **If** the system retrieves last invoice number that has month or year don't match current month and current year **then** the system generates invoice number to be "current year- current month- 0000001"

Else the system generates invoice number to be “the last invoice year – the last invoice number month- next number” (Ex. last invoice no. is 2003-01-0000011, the new invoice no. could be 2003-01-0000012)

2.) Invoice date is the current day.

- g) The quantity of each product is record in the sales order in delivery field
- h) **If** all ordered products equal delivered products in the sales order **then** the system will change the delivery flag to be “Yes”
- i) The system records all accounting transaction (by accounting rule) depended on the invoice information.

2. **If** the current day is equal invoice date **then**

a) **If** user chooses modify mode **then**

- 1) User can modify invoice information.
- 2) **Repeat the following unit** finished to modify products in invoice form:
 - i) **If** user add the new products **then** step follow to structure 1.c loop
 - ii) The system recalculates the net of invoice and adjusts the delivery field in the related sales order followed by invoice
- 3) The system records all accounting transaction (by accounting rule depended on the invoice information.

b) **If** user chooses delete mode **then**

- 1.) The system records all accounting transaction (by accounting rule) depended on the invoice information.
- 2.) The system deletes the invoice transaction

Else if the current day is not equal invoice date **then** the system doesn't allow user to modify or delete the invoice.

Topic 3 Sales Deposit

1. **If** user clicks insert button in deposit page **then**
 - a) If user chooses the customer then the system will return the customer information that relates to the deposit information.
 - b) User entries all information of deposit.
 - c) The system calculates the net of deposit.
 - d) **Repeat the following unit** user entries total amount of cash and/or checks equal the net of deposit:
 - 1.) The system will alert error system.
 - 2.) User changes the amount of cash and/or checks equal the net of deposit.
 - e) **If** the user entries amount of checks **then** user must entry check information.
 - f) The system records all accounting transaction (by accounting rule) depended on the deposit information.
2. **If** deposit number doesn't relate in the invoice **then**
 - a) **If** user chooses modify mode **then**
 - 1.) User can modify deposit information.
 - 2.) **If** user change the deposit amount **then**
 - i) The steps are followed in 1.c-1.e
 - ii) The system recalculates the net of deposit including the VAT.
 - b) If user choose delete mode then the system delete the deposit transaction.
 - c) The system records all accounting transaction (by accounting rule) depended on the changing deposit information.

Else the system doesn't allow user to modify and delete the deposit.

Topic 4 Sales Return

1. **If** user clicks insert button in Sales return page **then**
 - a) **If** user chooses invoice **then** the system will return all sales return information that require field in the sales return form.
 - b) **Repeat the following unit** doesn't entry returned products:
 - 1.) User can choose only the products that stay in invoice.
 - 2.) **If** user entries quantity of product more than the quantity of delivered product **then** the system doesn't allow doing it.
 - 3.) The system adjusts the delivery field in the sales order that related into invoice that the user chooses it.
 - 4.) The system calculates the net of sales return.
 - c) **If** user enters submit button **then**
 - 1.) The system will keep all information in the database.
 - 2.) **If** the system retrieves last sales return number that has month or year don't match current month and current year **then** the system generates sales return number to be "current year- current month- 0000001"

Else the system generates sales return number to be "the last sales return year – the last sales return number month- next number" (Ex. last sales return no. is 2003-01-0000011, the new sales return no. could be 2003-01-0000012)
 - 3.) Sales return date is the current day.
 - d) The system will change the delivery flag in the sales order to be "No"
 - e) The system records all accounting transaction (by accounting rule) depended on the sales return information.

2. **If the current day is equal sales return date then**
- a) **If user chooses modify mode then**
 - 1.) User can modify sales return information.
 - 2.) **Repeat the following unit** finished to modify products in invoice form:
 - i) **If user adds the new products then** step follow to structure 1.b loop
 - b) If user chooses delete mode then the system delete sales return transaction.
 - c) The system recalculates the net of sales return and adjusts the delivery field in the related sales order followed by invoice.
 - d) The system records all accounting transaction (by accounting rule) depended on the sales return information.
 - Else if the current day is not equal invoice date then** the system doesn't allow user to modify or delete sales return.

Topic 5 Sales history

1. **If user sees the page in the first time then** the system retrieves all invoice transactions in this page.
- Else if user chooses group of customer then** the system will retrieves invoice transactions related with the group of customer in this page.
- Else if user chooses group of product then** the system will retrieves invoice transactions that have some/all products in the product list.
- Else if user chooses period of invoice date then** the system will retrieves invoice transactions resided in the period of invoice date
2. For each transaction, the system retrieves Invoice number, due date, customers, product, quantity and pricing of product, discount, and net sales of the product.

- a) Purchase structure is divided into 5 substructures as:
- 1) Purchase order has structured English to follow the sales order substructure but the all information keeps in the purchase order records.
 - 2) Receiving has structured English to follow the invoice substructure but the all information keeps in the receiving records.
 - 3) Deposit has structured English to follow the deposit of sales substructure but the all information keeps in the deposit of purchase records.
 - 4) Purchase return has structured English to follow the sales return substructure but the all information keeps in the Purchase return records.
 - 5) Purchase history have structured English to follow that:
 - i) If user sees the page in the first time **then** the system retrieves all receiving transactions in this page.

Else if user chooses group of customer **then** the system will retrieves receiving transactions related with the group of customer in this page.

Else if user chooses group of product **then** the system will retrieves receiving transactions that have some/all products in the product list.

Else if user choose period of invoice date **then** the system will retrieves receiving transactions resided in the period of invoice date

- ii) For each transaction, the system retrieves receiving number, delivery date, customers, product, quantity and pricing of product, discount, and net sales of the product.

Topic 6 Purchase history

1. **If** user sees the page in the first time **then** the system retrieves all receiving transactions in this page.

Else if user chooses group of customer **then** the system will retrieves receiving transactions related with the group of customer in this page.

Else if user chooses group of product **then** the system will retrieves receiving transactions that have some/all products in the product list.

Else if user chooses period of invoice date **then** the system will retrieves receiving transactions resided in the period of invoice date.
2. For each transaction, the system retrieves receiving number, delivery date, customers, product, quantity and pricing of product, discount, and net sales of the product.

Topic 7 Transferred products between warehouses

1. **If** user clicks insert button in transfer page **then**
 - a) User entry all information including 2 warehouses that products are transferred.
 - b) **Repeat the following unit** finish choose products from source warehouse:
 - 1.) User can choose the products that are transferred.
 - 2.) **If** quantity of transferred product more than quantity of product in the source warehouse **then** the system allows transferring in the maximum quantity of the product in the source warehouse.
 - c) **If** user enters submit button **then**

- 1.) The system will keep all information in the database.
- 2.) **If** the system retrieves last transferred product number that has month or year don't match current month and current year **then** the system generates transferred product number to be "current year- current month- 0000001"

Else the system generates transferred product number to be "the last transferred product year – the last transferred product number month-next number" (Ex. last transferred product no. is 2003-01-0000011, the new transferred product no. could be 2003-01-0000012)

- 3.) Transferred product date is the current day.
- 4.) The system adjusts quantity of products in source and destination warehouse.

2. **If** user clicks delete checkbox in transfer page **then**

a) **Repeat the following unit** finish transferred product transaction that checkbox:

- 1) The system adjusts the stock of product in source and destination warehouse.

3. **If** user must modify transferred product transaction **then** the system doesn't allow doing it.

Else

- a.) User must delete the transferred product transaction that wants to modify.
- b.) User inserts the new transferred product transaction that is modified information.

Topic 8 Product

1. **If** user clicks insert button in product page **then**

- a) User entries all information of product.
 - b) **If** user clicks submit button **then**
 - 1.) **Repeat the following unit** the product code is not exist in the database:
 - i) The system alerts error
 - ii) The system don't allow the product code keep in the database
 - 2.) The system keeps all information in the product table.
 - 3) The product price is kept in another table.
 - c) User can define which warehouses that the product is stocked.
2. **If** user must change the product **then**
- a) User can change all product information.
 - b) **If** user changes the pricing of product **then** the system will keep the new price to the pricing of product table for history.
 - c) All information is kept in the database.
3. **If** user must see the sales of the product per month **then**
- a) The system will retrieve all information to show in the table in each month or in each warehouse or whole warehouses.
4. **If** user must see the sales of the product in each transaction **then**
- a) The system will retrieve all information and the document that have related to the product.
 - b) The user can see the detail of each document that related to the product.
5. **If** user must see the stock of product **then**
- a) The system will retrieve quantity of product in each warehouse.
 - b) The system will check the limited out of stock in each product to alert to user.

Topic 9 Cash receipts

1. If user clicks insert button in Cash receipt page then

a) If user chooses the customer that payment cash then

1.) Repeat the following unit choose the documents that customer must pay:

i) User fills in the money that customer pay in each document

ii) Repeat the following unit pay field box equal or less than total amount

2.) The system sum total of customer paid.

3.) User chooses payment method.

4.) If user chooses checks method then the user must entry all checks detail

5.) Repeat the following unit amount of cash plus checks equal net amount:

6.) If user enters submit button then

i) The system will keep all information in the database.

ii) If the system retrieves last number that has month or year don't match current month and current year then the system generates number to be "current year- current month- 0000001"

iii) Else the system generates number to be "the last transferred product year – the last number month- next number"

iv) Cash receipt date is the current day.

7.) The system records all accounting transaction (by accounting rule) depended on the sales return information.

2. If the current day is equal cash receipt date then

- a) **If user chooses modify mode then**
 - 1.) User can modify cash receipt information.
 - 2.) Follow to 1.a.1 – 1.a.7 except 1.a.6.b
- b) **If user chooses delete mode then** the system delete the cash receipt transaction
- c) The system records all accounting transaction (by accounting rule) depended on the invoice information.

Else the system doesn't allow changing anything.

Topic 10 Sales discount

1. **If user clicks insert button in Sales discount page then**
 - a. **If user chooses the invoice number then**
 - 1) Fill in all information of sales discount.
 - 2) **Repeat the following unit** sales discount field box equal or less than Accrued debt.
 - 3) **If user enters submit button then**
 - i) The system will keep all information in the database.
 - ii) **If** the system retrieves last number that has month or year don't match current month and current year **then** the system generates number to be "current year- current month- 0000001"
 - iii) **Else** the system generates number to be "the last transferred product year – the last number month- next number"
 - iv) Sales discount date is the current day.
 - 4.) The system records all accounting transaction (by accounting rule) depended on the sales return information.
2. **If the current day is equal sales discount date then**

- a) **If user chooses modify mode then**
 - 1) User can modify sales discount information.
 - 2) Follow to 1.a.1 – 1.a.3 except 1.a.3.b
- b) **If user chooses delete mode then** the system delete the sales discount transaction
- c) The system records all accounting transaction (by accounting rule) depended on the invoice information.

Else the system doesn't allow changing anything.

Topic 11 Cash disbursement

1. **If user clicks insert button in Cash disbursement page then**
 - a. **If user chooses the supplier to pay cash then**
 - 1) **Repeat the following unit** chooses the documents to pay the supplier:
 - i) User fills in the money paid supplier in each document
 - ii) **Repeat the following unit** pay field box equal or less than total amount
 - 2) The system caculates net total to pay.
 - 3) User chooses payment method.
 - 4) **If user chooses checks method then** the user must entry all checks detail (Search the bank and branch from the bank list)
 - 5) **Repeat the following unit** amount of cash plus checks equal net amount:
 - 6) **If user enters submit button then**
 - i) The system will keep all information in the database.

- ii) **If** the system retrieves last number that has month or year don't match current month and current year **then** the system generates number to be "current year- current month- 0000001"
 - iii) **Else** the system generates number to be "the last transferred product year – the last number month- next number"
 - iv) Cash disbursement date is the current day.
- 7.) The system records all accounting transaction (by accounting rule) depended on the sales return information.
2. **If** the current day is equal cash disbursement date **then**
- a) **If** user chooses modify mode **then**
 - 1) User can modify cash disbursement information.
 - 2) Follow to 1.a.1 – 1.a.7 except 1.a.6.b
 - b) **If** user chooses delete mode **then** the system delete the cash disbursement transaction
 - c) The system records all accounting transaction (by accounting rule) depended on the invoice information.
- Else** the system doesn't allow changing anything.

Topic 12 Purchase discount

- 1. **If** user clicks insert button in Purchase discount page **then**
 - a) **If** user choose the purchase number **then**
 - 1) Fill in all information of purchase discount.
 - 2) **Repeat the following unit** purchase discount field box equal or less than Accrued debt:
 - 3) **If** user enters submit button **then**

- i) The system will keep all information in the database.
 - ii) **If** the system retrieves last number that has month or year don't match current month and current year **then** the system generates number to be "current year- current month- 0000001"

Else the system generates number to be "the last transferred product year – the last number month- next number"
 - iii) Purchase discount date is the current day.
 - 4) The system records all accounting transaction (by accounting rule) depended on the sales return information.
2. **If** the current day is equal purchase discount date **then**
- a) **If** user choose modify mode **then**
 - 1) User can modify purchase discount information.
 - 2) Follow to 1.a.1 – 1.a.3 except 1.a.3.b
 - b) **If** user choose delete mode **then** the system delete the purchase discount transaction
 - c) The system records all accounting transaction (by accounting rule) depended on the invoice information.
- Else** the system doesn't allow changing anything.

Topic 13 Bank statement

- 1. **If** user clicks insert bank account in the system **then**
 - a) User fills in all bank account information including balance bank.
 - b) **If** user clicks submit button **then**
 - 1) **Repeat the following unit** bank code is not existing in the database
 - 2) All information is kept in the database by the system.
- 2. **If** user would like to modify bank account information **then**

- a) User modifies bank account information.
 - b) **If** user clicks submit button **then** all information is kept in the database by the system.
3. **If** check in bank **then**
- a) The system will retrieve all check in each transaction to show in the page.
 - b) **If** check is due date **then**
 - 1) User must choose them that must transfer in the bank.
 - 2) If user clicks transfer button then all selected check change status to bank
 - 3) The system makes a new of the bank account balance after check in to bank.
4. **If** check out of bank **then**
- a) The system will change status of checks that due to out of bank
 - b) The system makes a new of the bank account balance after check out of bank.
5. **If** cash in bank **then**
- a) User fills in the cash that deposit in the bank.
 - b) **If** user clicks submit button **then** the system makes a new of the bank account balance after cash is deposited in the bank.
6. **If** cash out of bank **then**
- a) User fills in the cash that withdraw in the bank.
 - b) **If** user clicks submit button **then** the system makes a new of the bank account balance after cash is withdrawn from the bank.
7. **If** user would like to delete bank account and there is no money stored in this bank account **then** the system allow user to delete it.
- Else** the system doesn't allow user to delete the bank account.

Topic 14 Account receivable

1. **If** User clicks insert button in customer page **then**
 - a) User fills in all customers' information such as company name, contact name, and limit of sales credit and so on.
 - b) **Repeat the following unit** entry the customer code does not exist in the database: User reentry the customer code.
2. **If** user must check total of account receivable for each customer **then**
 - a) The system retrieves general journal records about the customer.
 - b) The system calculates bring forward, carry forward, and summarize of debt, and payment per month.
3. **If** user would like to see account receivable per transaction **then**
 - a) **If** user can search by period of account receivable transaction **then** the system will retrieve account receivable transaction.
Else the system will retrieve all account receivable transactions.
 - b) The system shows details about debt, and payable per transaction.
 - c) User can retrieve detail about related document of account receivable transactions.
4. **If** user would like to see each customer account balance **then** the system retrieve document number, document type and debit balance and due date of each transaction that don't receivable from customer

Topic 15 Account payable

1. **If** user clicks insert button in supplier page **then**
 - a) User fills in all suppliers' information such as company name, contact name, and limit of sales credit and so on.

- b) **Repeat the following unit** entry the supplier code does not exist in the database: User reentry the customer code.
- 2. **If** User must check total of account payable for each customer **then**
 - a) The system retrieves general journal records about the customer.
 - b) The system calculates bring forward, carry forward, and summarize of debt, and payment per month.
- 3. **If** user would like to see account payable per transaction **then**
 - a) **If** user can search by period of account payable transaction **then** the system will retrieve account payable transactions.
Else the system will retrieve all account payable transactions.
 - b) The system shows details about debt, and payable per transaction.
 - c) User can retrieve detail about related document of account payable transactions.
- 3. **If** user would like to see each customer account balance **then** the system retrieve document number, document type and debit balance and due date of each transaction that don't receivable from customer

Topic 16 General journal transaction

- 1. The system group general journal by transaction.
- 2. **If** user must see detail of general journal each transaction **then**
 - a) User clicks the transaction
 - b) The system will group general journal of the transaction to show in account balance sheet.

Topic 17 Initial parameters

- 1. **If** user must change anything of company information **then**
 - a) Change some or all field

- b) **If** user clicks submit button **then**
 - 1) The system keeps all information in database.
 - 2) Change some session field as language, VAT.

Topic 18 Backup database

- 1. **If** user uses SQL server as database **then** the system transfers data to MS Access file.
- 2. Users download MS Access backup file to their computer or backup computer.

Topic 19 Recovery database

- 1. User uploads MS Access backup file to the Recovery page.
- 2. **If** user uses SQL server as database **then** the system retrieve the backup data to SQL server.

Topic 20 Assign user

- 1. **If** user does not exist the system **then**
 - a) Fill up all information
 - b) Choose Role to define a scope to access in the system.
 - c) **If** user clicks submit button **then**
 - 1) **Repeat the following unit** Username is not same in the database:
 - 2) The system keeps the user's information in the database.
- Else if** user must modify user's information **then**
- 1) User changes user's information.
 - 2) **If** user clicks submit button **then** the system keeps the user's information in the database.

Topic 21 Contact from customer

- 1. If visitors post the any question and some problem in the page then

- a) Customer service goes to the page for seeing any question and problem for solving every problem to customers.
- b) After users read the contact from customer, they can delete the question.

Topic 22 FAQ

1. **If User click the insert button then**
 - a) Fill in the popular questions, or problems including answer or solving problem to occur with customers and anybody.
 - b) **If user clicks submit button then** the system stores all information.
2. **If User would like to modify FAQ then**
 - a) **Repeat the following unit** finished choose the FAQ
 - b) All transactions, what is chose, are modified by system.
3. **If User would like to delete FAQ then**
 - a) **Repeat the following unit** finished choose the FAQ
 - b) All transactions, what is chose, are deleted after users have clicked the delete button.

Topic 23 Support

1. **If visitors post their information in the Web site then**
 - a) Supporter goes to the new account page.
 - b) Supporter can see detail of each account for decision to receive new customers.
 - c) Supporter contacts the customer and checks checkbox for choosing any transactions.

Topic 24 Home page (E-retailer) design

1. Fill up all information

2. **If** user clicks submit button **then** the system keeps the user's information in the database.
3. The home page is change following by the code that user change in the page.

Topic 25 Shopping cart

1. **If** visitors would like to search products by Search engine **then**
 - a) The visitors fill in the product name.
 - b) **If** visitors click the Search button **then** the system retrieves all products that are related with search.
2. **If** visitors would like to search products by categories **then** the system retrieves all products in the category.
3. **Repeat the following unit** finished for choosing products in the cart:
4. **If** visitors click submit sales order **then**
 - a) **If** visitors logon in the system **then** the system know the customer code
Else visitors must logon the system for get the customer code to system
then the system generates the sales order related to the customer. And sent data to the sales order page.

Topic 26 New account

1. **If** visitors would like to be our customers **then**
 - a) Visitors fill in their information.
 - b) **If** visitors click submit button **then** all information are kept in to database.

Topic 27 Contact to retailer

1. **If** visitors would like to contact retailer **then**
 - a) Visitors fill in all information for contact.
 - b) **If** visitors click submit button **then** all information are kept in to database

Topic 28 Setting master file

1. **If user clicks insert button then**
 - a) **Repeat the following unit** finished to insert master data:
 - 1) Fill in all required information.
 - 2) **If user clicks submit button then**
 - i) **Repeat the following unit** primary key is not existing in the database: user reentry the primary key.
 - 3) The system keeps all information in database
2. **If user would like to update master file then**
 - a) **Repeat the following unit** finished to modify master data
 - 1) Modify any fields except primary key.
 - 2) **If user click submit button then** the system keeps all information in database
3. **If user would like to delete master file and the data don't relate to any transactions in the database then** User can delete them.
Else the system doesn't allow deleting them.

Topic 29 Security system

1. User must login to the system.
2. **Repeat the following unit** username and password match to the database
3. **If username and password match to the database then**
 - a) The system retrieves username and role of security of the person
 - b) **Repeat the following unit** doesn't use the system:
 - 1) The system doesn't lock pages that role of user allow to access the pages.
 - 2.) In current page, the security is retrieved by system in related role of user.

- 3.) **If** add method is allowed **then** user can add new transactions in the page
- 4.) **If** update method is allowed **then** user can update transactions in the page
- 5.) **If** delete method is allowed **then** user can delete transactions, which allow deleting them, in the page

Else the system allow user to read transactions only.

- c) User logoff
- d) The system abandons all session out of the system.

Else the system doesn't allow user through the system.

Topic 30 Assign role

2. **If** role does not exist the system **then**

- d) Fill up role information
- e) Choose Module to define a scope of role in order to access in the system.
- f) **If** user clicks submit button **then**

- 1) **Repeat the following unit** Role ID. is not same in the database:
- 2) The system keeps the role's information in the database.

Else if user must modify role's information **then**

- 3) User changes role's information.
- 4) **If** user clicks submit button **then** the system keeps the role's information in the database.



APPENDIX C

DATA FLOW DIAGRAM

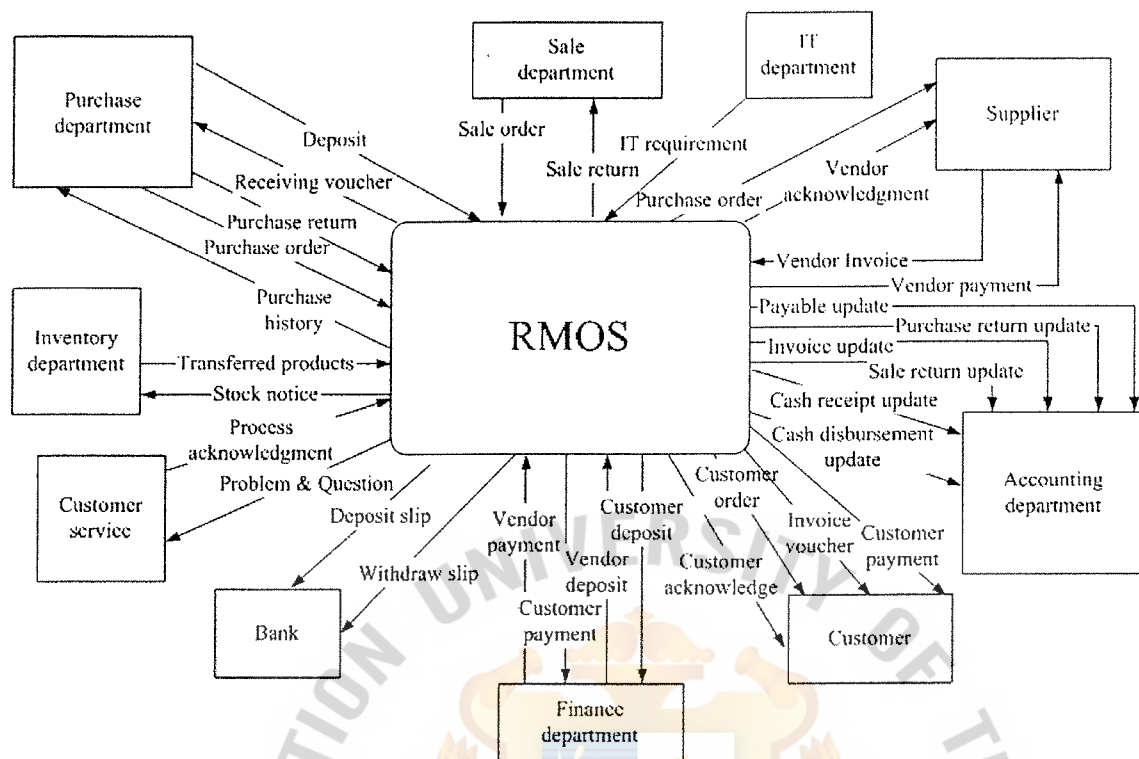


Figure C.1. The Context Diagram of RMOS.

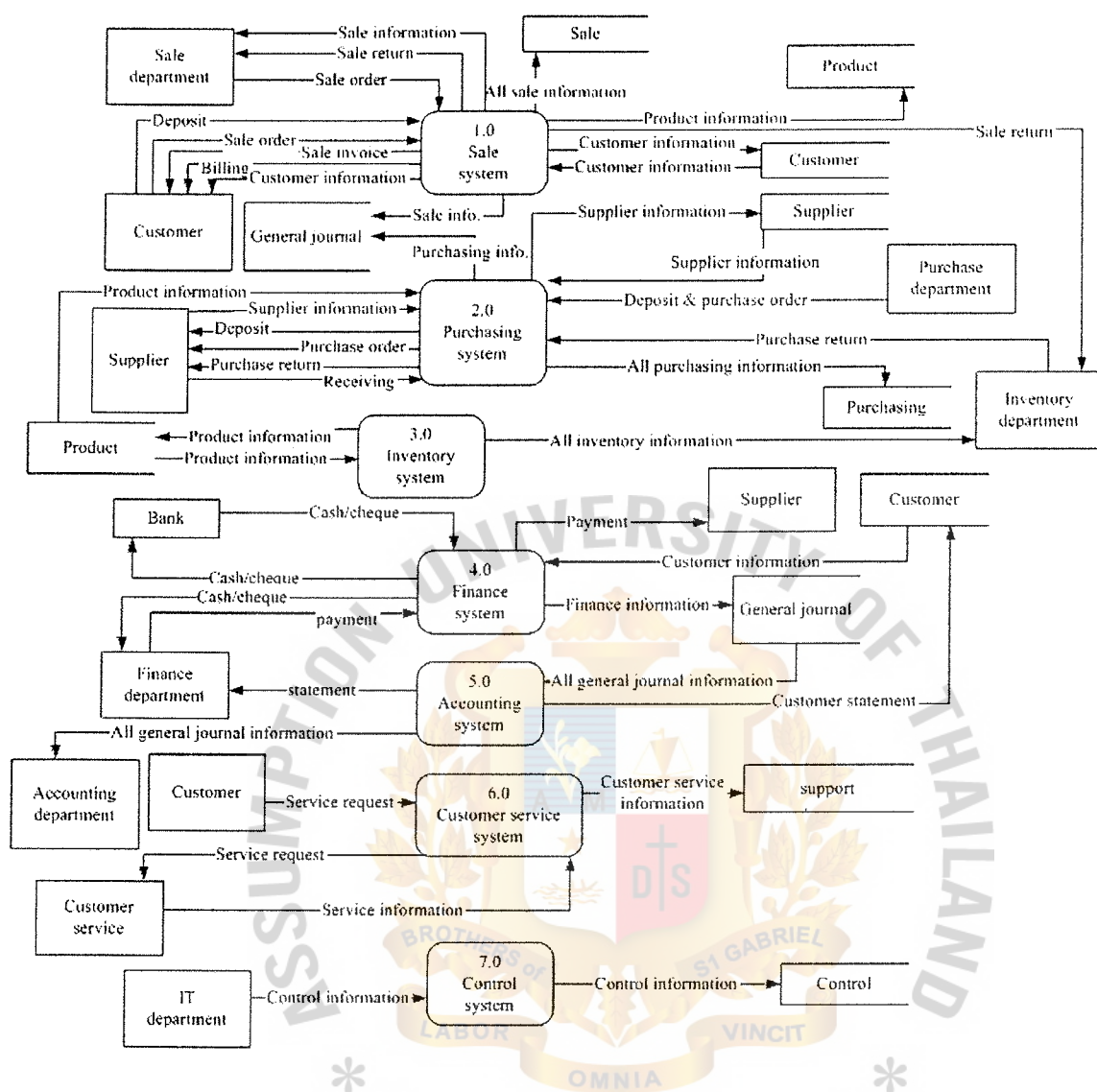


Figure C.2. Level 0 Data Flow Diagram of RMOS.

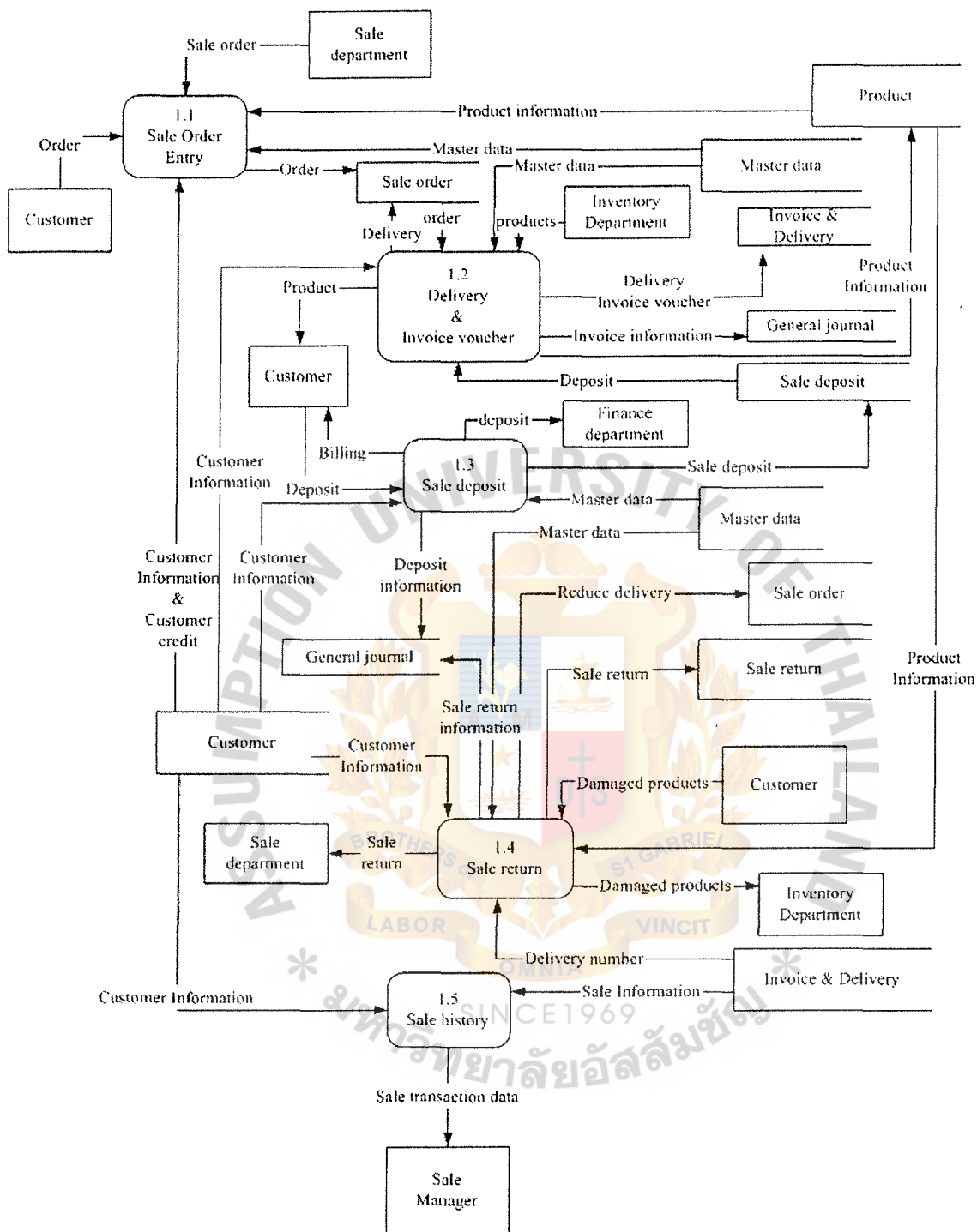


Figure C.3. Level 1 Data Flow Diagram of RMOS (Sale Section).

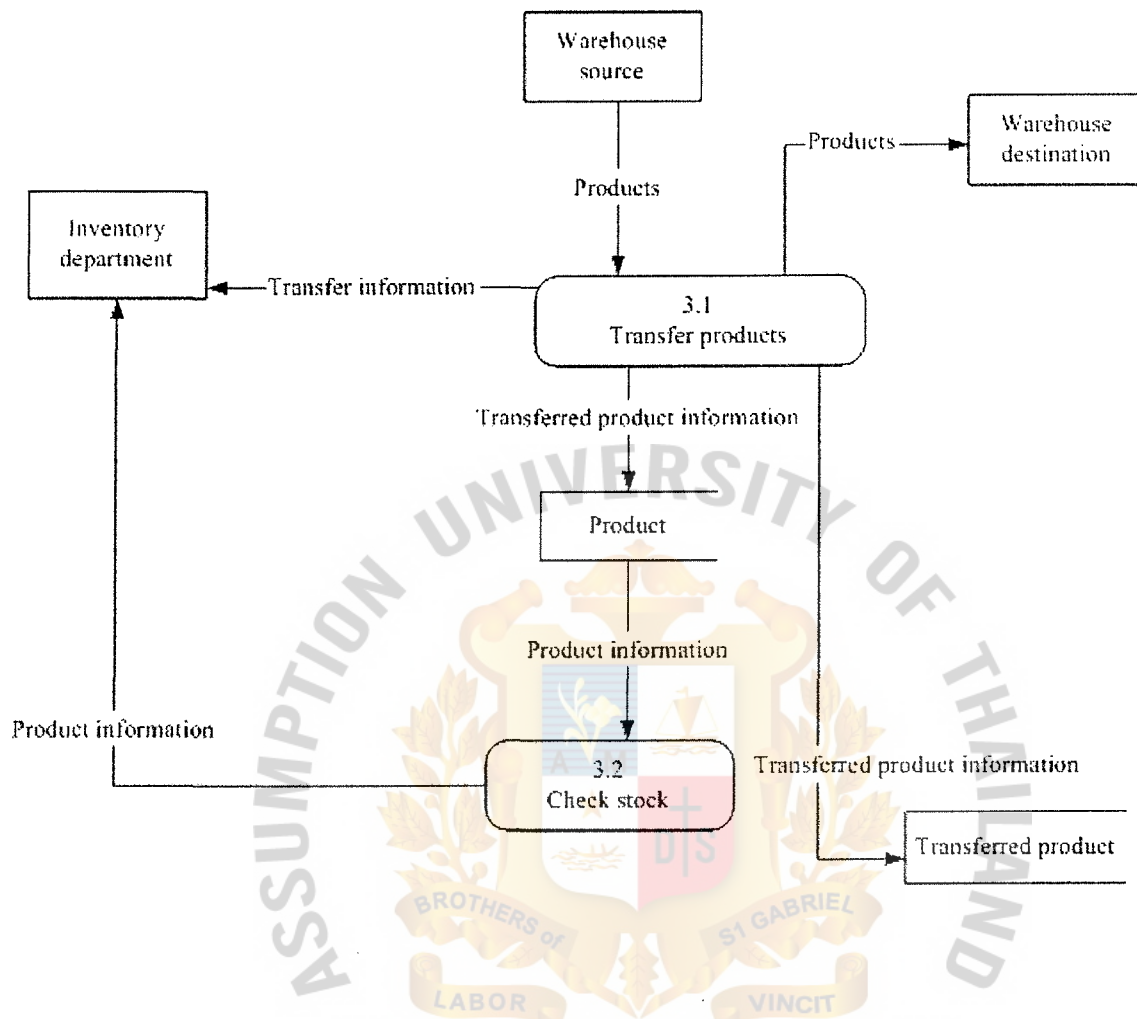


Figure C.5. Level 1 Data Flow Diagram of RMOS (Inventory Section).

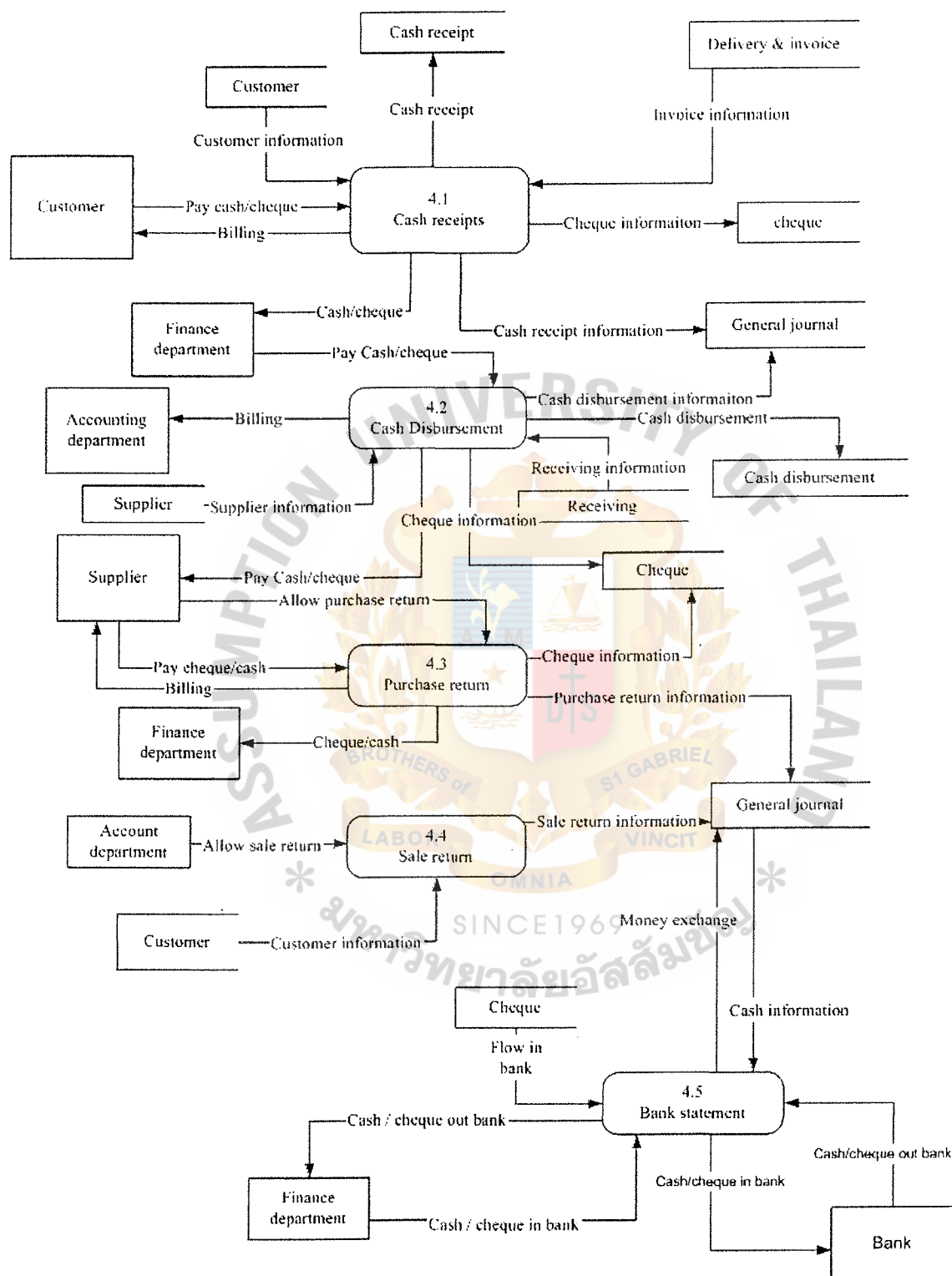


Figure C.6. Level 1 Data Flow Diagram of RMOS (Finance Section).

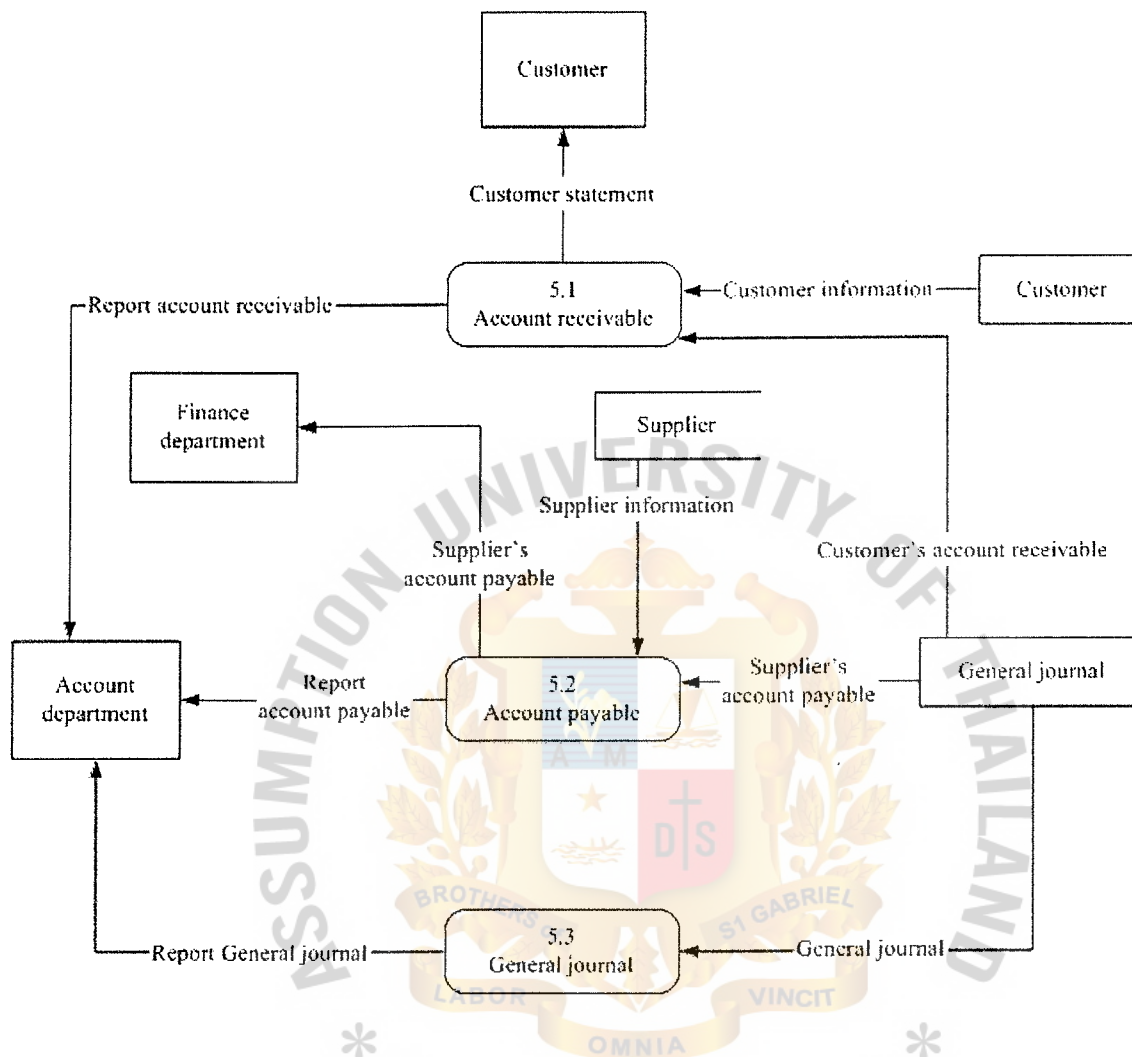


Figure C.7. Level 1 Data Flow Diagram of RMOS (Accounting Section).

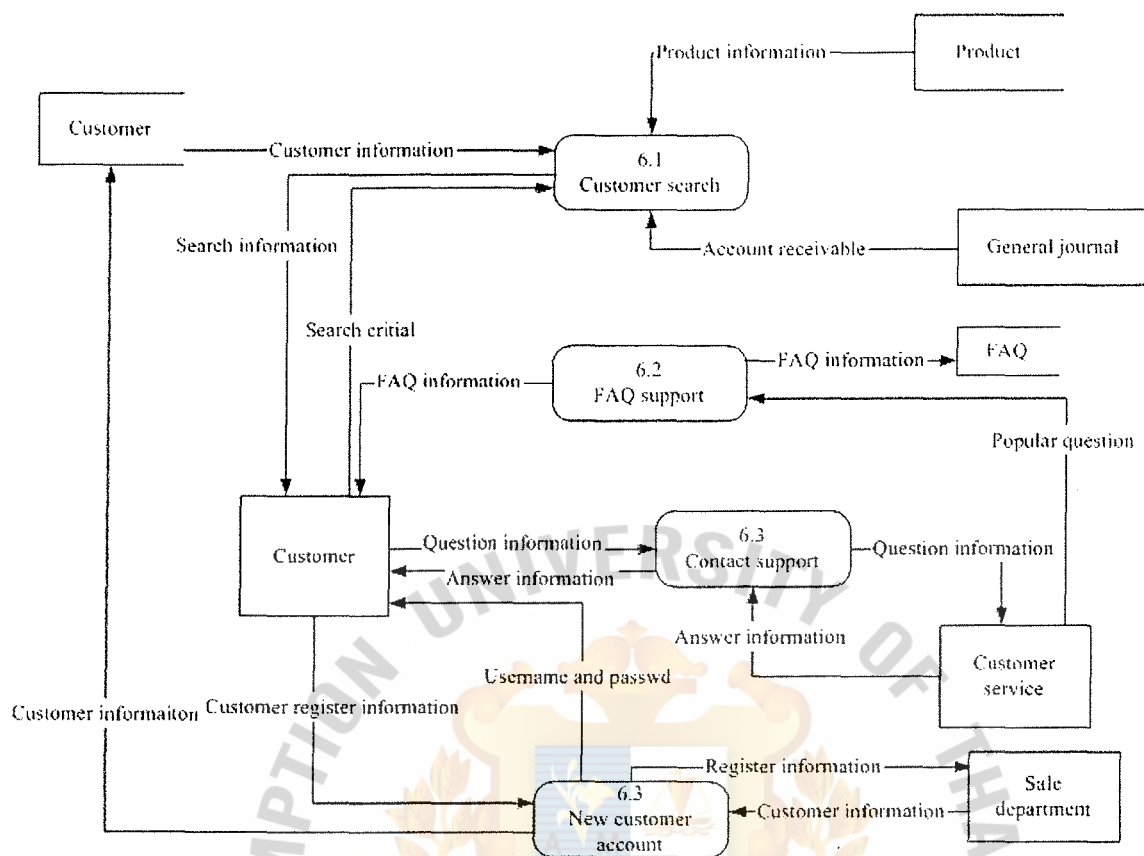


Figure C.8. Level 1 Data Flow Diagram of RMOS (Customer Service Section).

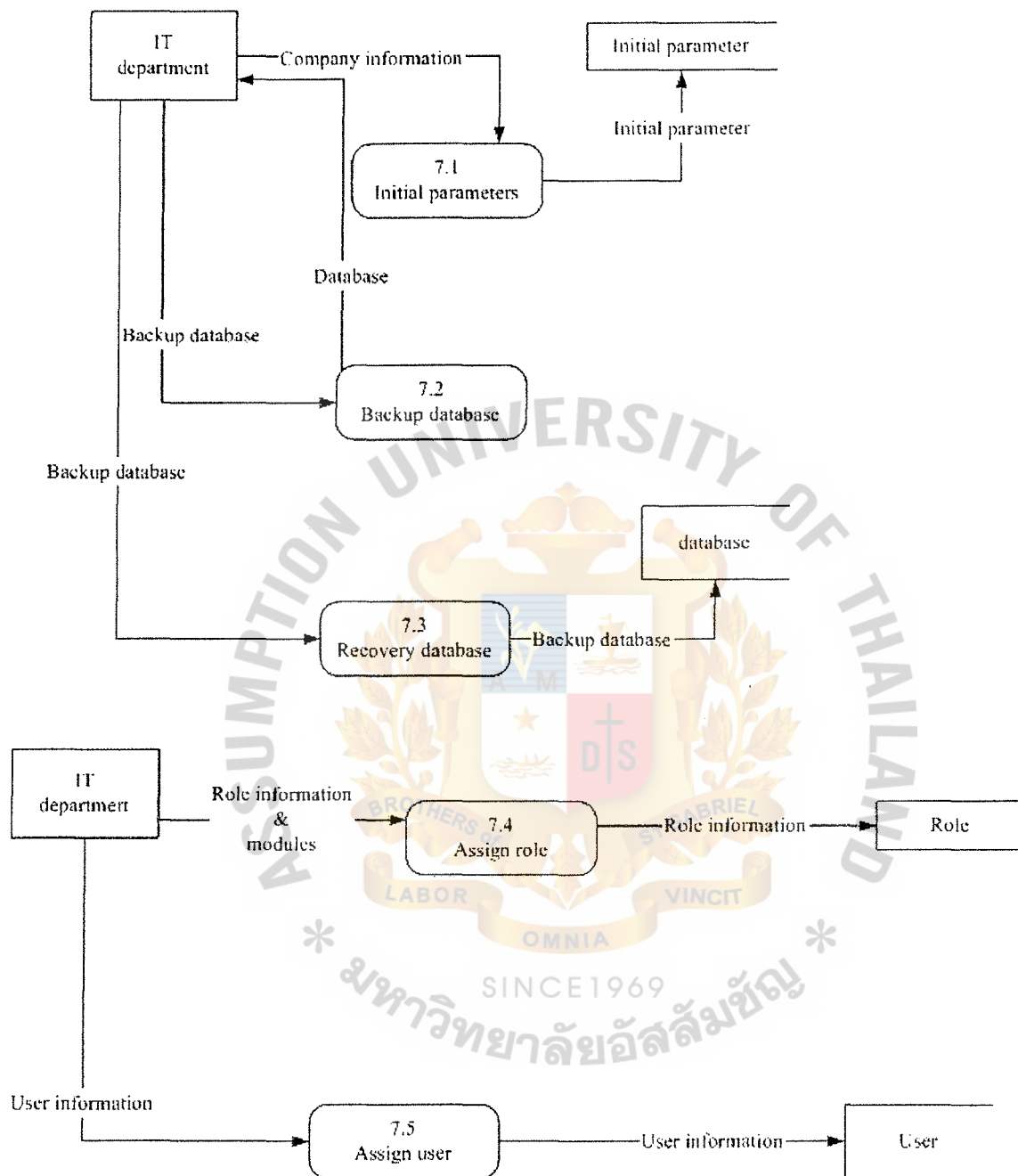


Figure C.9. Level 1 Data Flow Diagram of RMOS (Control System Section).



APPENDIX D

ENTITY RELATIONSHIP DIAGRAM

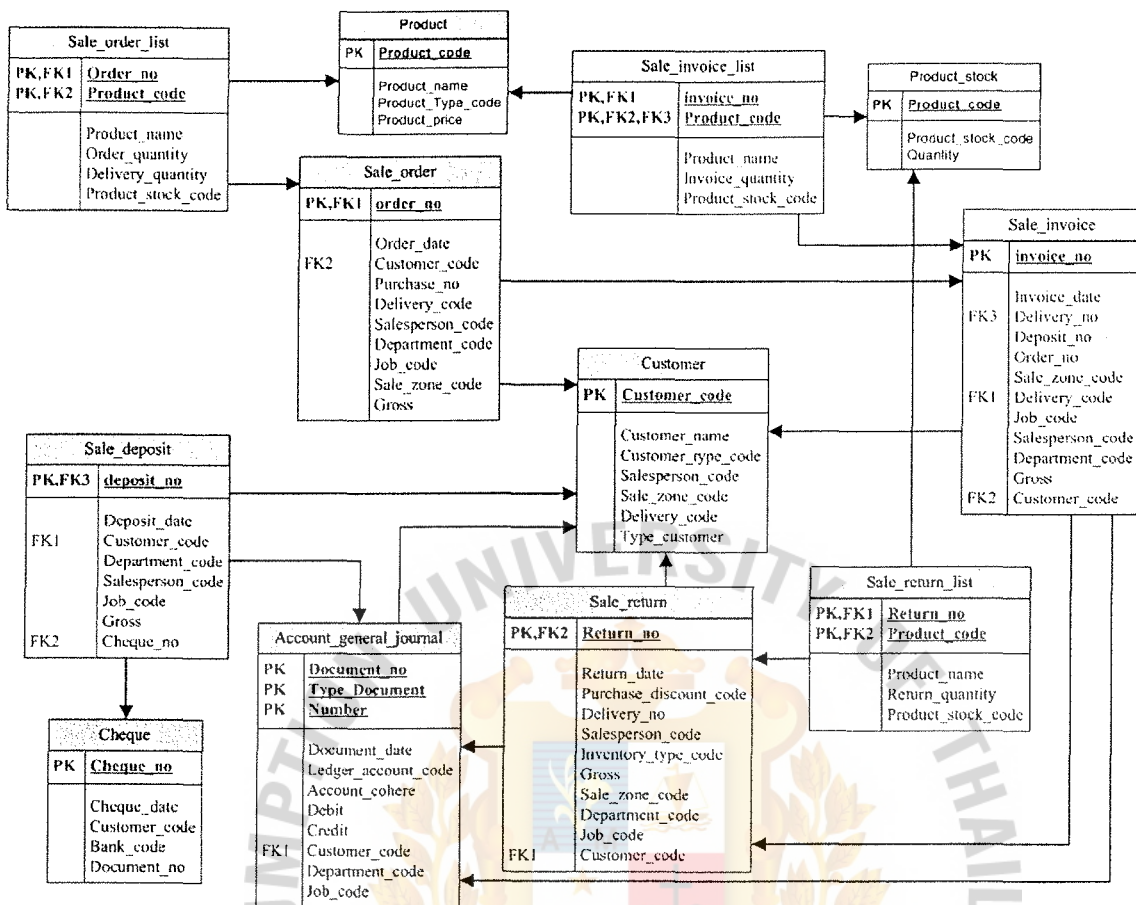


Figure D.1. Entity Relationship Diagram of Sales Section.

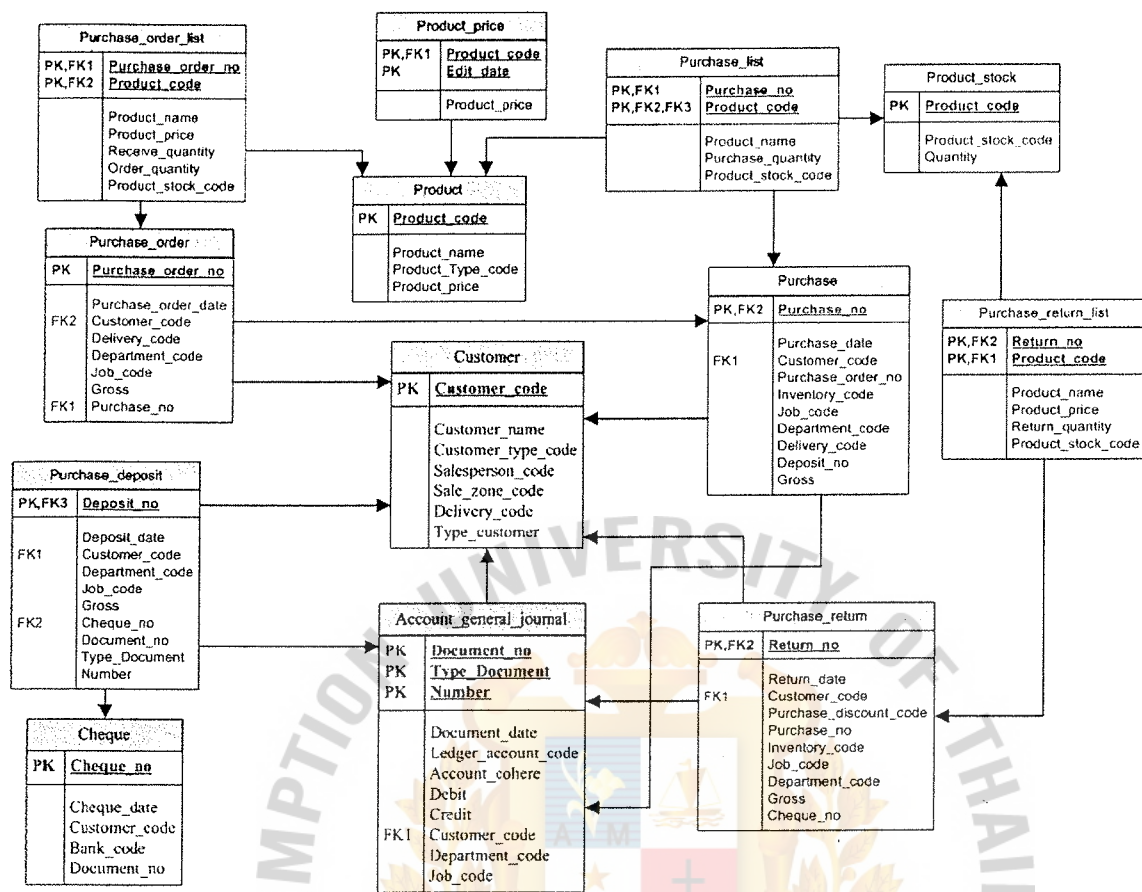


Figure D.2. Entity Relationship Diagram of Purchase Section.

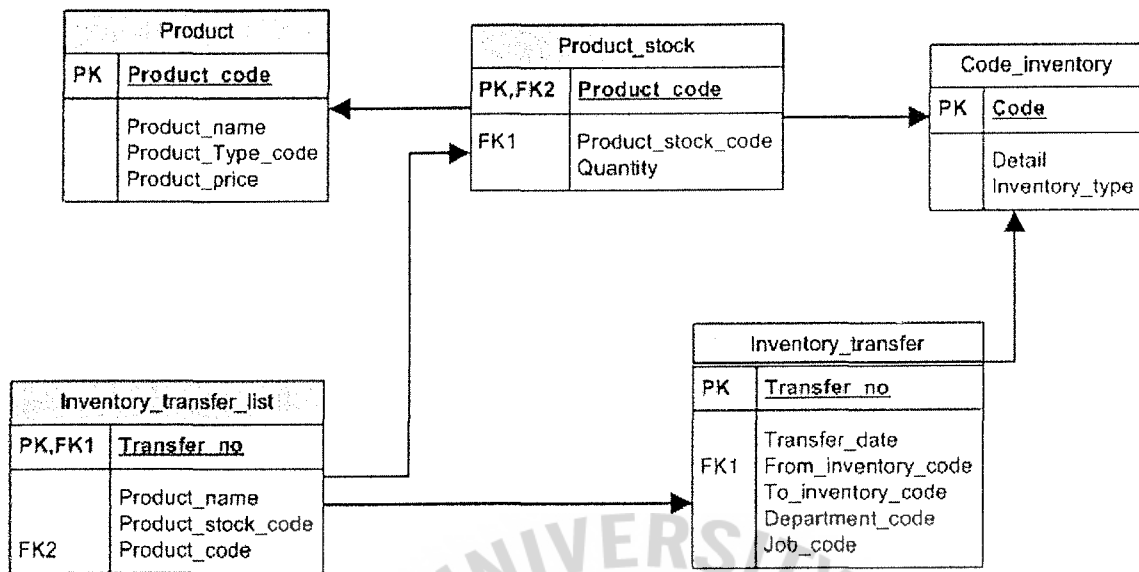


Figure D.3. Entity Relationship Diagram of Inventory Section.

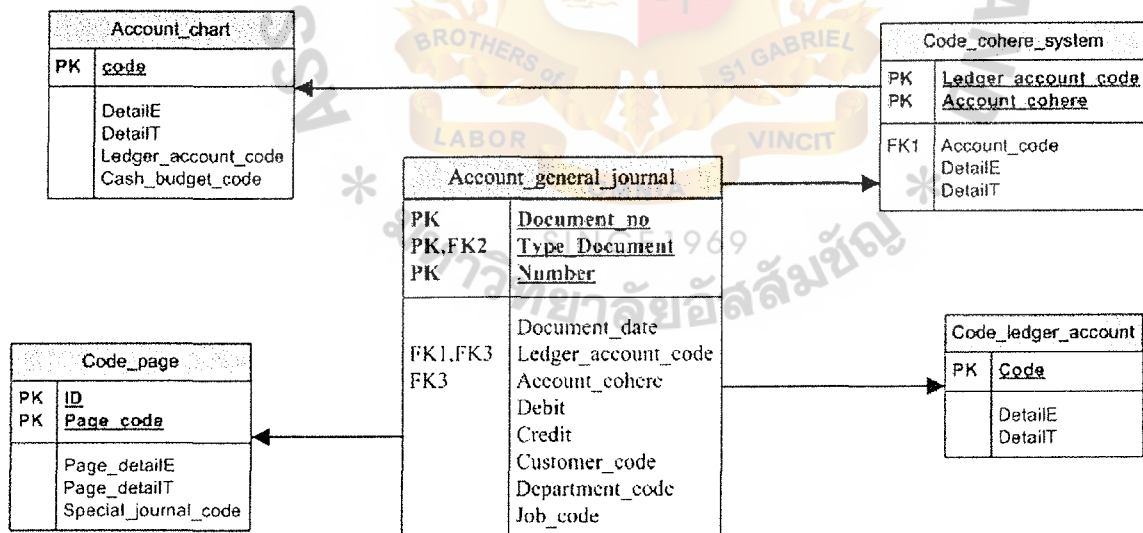


Figure D.4. Entity Relationship Diagram of Accounting Section.

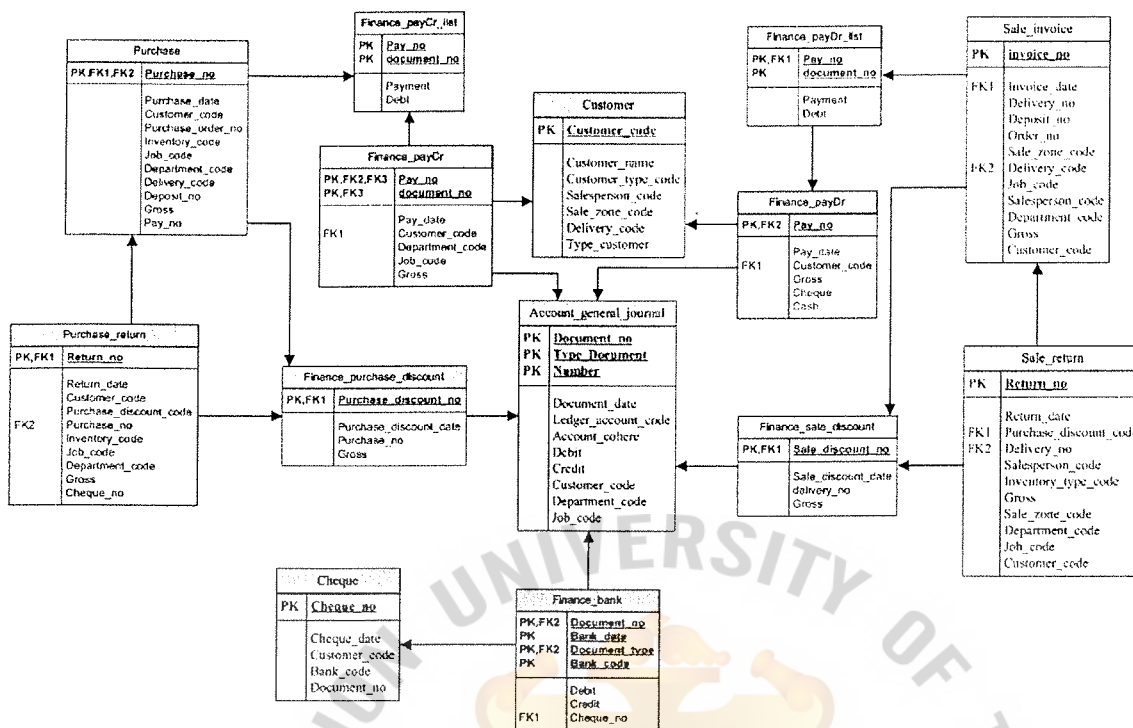


Figure D.5. Entity Relationship Diagram of Finance Section.

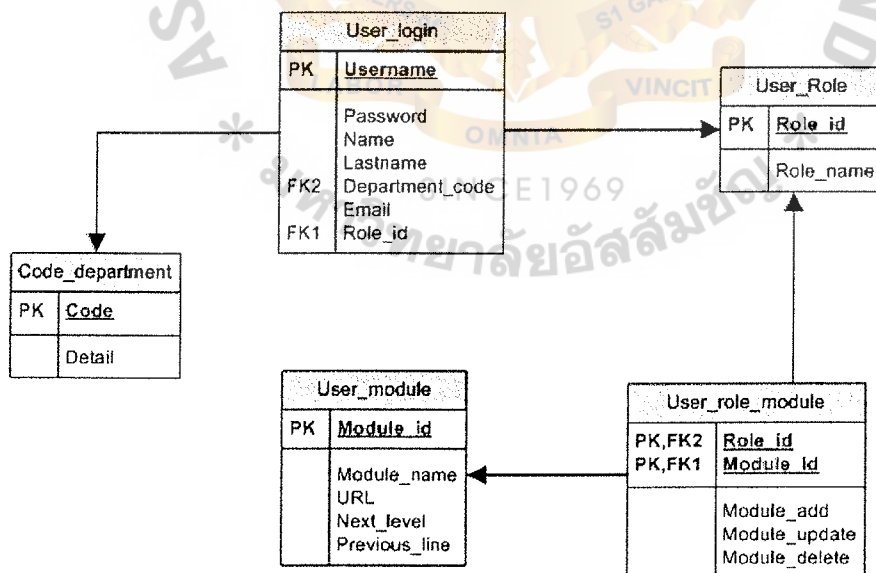


Figure D.6. Entity Relationship Diagram of Security Section.



Table E.1. Entity of General Journal.

Entity name Account chart			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	General journal code
	DetailE	Varchar(255)	General journal detail(English)
	DetailT	Varchar(255)	General journal detail(Thai)
FK.	Ledger account code	Varchar(20)	Ledger account's code
FK.	Cash_budget_code	Varchar(20)	Cash budget code (1=None 2= Operating activities 3=Investing activities 4=Financing activities)
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(20)	Status(A=add,U=update)

Table E.2. Entity of General Journal Transaction.

Entity name : Account general journal			
Key	Attribute name	Type	Definition
PK.	Document no	Varchar(20)	Document number
	Document date	Datetime	Document date
	Type_Document	Varchar(5)	Type of document (SO = Sale order form SID = Invoice form SR = Return form from customer PO = Purchase order form PD = Delivery form from supplier SR = Return form to supplier IT = Transfer product IF = Giving finished product)
PK.	Special journal code	Varchar(20)	Special journal code
PK.	Number	Int	Counting number
	Account date	Datetime	General journal date
FK.	Ledger account code	Varchar(20)	Ledger account's code
	Account cohere	Varchar(255)	Co-Account's code
	Debit	Money	Debit
	Credit	Money	Credit
FK.	Customer code	Varchar(20)	Customer code
FK.	Department code	Varchar(20)	Department code
FK.	Job code	Varchar(20)	Job code
	Description	Varchar(255)	General journal Description
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.3. Entity of Cheque Transaction.

Entity name : Cheque			
Key	Attribute name	Type	Definition
PK.	Cheque_no	Varchar(20)	Document number
	Cheque_date	Datetime	Cheque date
	Cheque_bank	Varchar(100)	Cheque bank
	Cheque_branch	Varchar(100)	Cheque branch
	Cheque_amount	Money	Amount of Cheque
FK.	Customer_code	Varchar(20)	Customer code
	Return_cheque	Varchar(5)	Returning cheque (Y = return N = not return)
	Bank_code	Varchar(20)	Bank code
	Bank_date	Datetime	Bank date
FK.	Document_no	Varchar(20)	Document number
	Document_date	Datetime	Document date
	Document_type	Varchar(20)	Type of document (SD = Deposit in sale section PD = Deposit in purchase section SR = returning product in sale section PR = returning product in purchase section PP = purchasing FB = cheque out bank AS = Sale discount in accounting section AE = Expense in account section)
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.4. Entity of Bank Master File.

Entity name : Code bank			
Key	Attribute name	Type	Definition
PK.	Bank_code	Varchar(20)	Bank code
	Bank_name	Varchar(100)	Bank name
	Bank_branch	Varchar(100)	Bank branch
	Account_code	Varchar(20)	Account code
	Bank_account	Money	Bank account balance
	Balance_amount	Money	Balance amount
	Balance_date	Datetime	Balance date
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.5. Entity of Ledger Account Master File.

Entity name : Code cohere system			
Key	Attribute name	Type	Definition
PK.	Ledger account code	Varchar(20)	Ledger account's code
PK.	Account_code	Varchar(20)	General journal code
	Account_cohere	Varchar(20)	Co-Account's code
	DetailE	Varchar(255)	Description (English)
	DetailT	Varchar(255)	Description (Thai)
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.6. Entity of Type of Supplier Master File.

Entity name : Code creditor			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Creditor type's code
	Detail	Varchar(255)	Creditor type's detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.7. Entity of Type of Customer Master File.

Entity name : Code_customer_type			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Customer type's code
	Detail	Varchar(255)	Customer type's detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.8. Entity of Type of Delivery Master File.

Entity name : Code_delivery			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Delivery term's code
	Detail	Varchar(255)	Delivery term's detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.9. Entity of Department Master File.

Entity name : Code_department			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Department code
	Detail	Varchar(255)	Department detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.10. Entity of General Ledger Account Master File.

Entity name : Code_general_ledger_account			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	General ledger account's code
	Detail	Varchar(20)	General ledger account's detail
FK.	Ledger account code	Varchar(20)	Ledger account's code
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.11. Entity of Warehouse Master File.

Entity name : Code inventory			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Customer type's code
	Detail	Varchar(255)	Customer type's detail
	Inventory_type	Varchar(20)	Type of inventory (1= Raw material stock 2 = Finished stock)
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.12. Entity of Job Master File.

Entity name : Code job			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Job code
	Detail	Varchar(255)	Job detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.13. Entity of Account Ledger Master File.

Entity name : Code ledger account			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	General account's code
	DetailE	Varchar(100)	General account's detail (Eng.)
	DetailT	Varchar(100)	General account's detail (Thai)
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(20)	Status(A=add,U=update)

Table E.14. Entity of Page of Module Master File.

Entity name : Code_page			
Key	Attribute name	Type	Definition
PK.	Page_code	Varchar(20)	Type of page (SO = Sale order form SID = Invoice form SR = Return form from customer PO = Purchase order form PD = Delivery form from supplier SR = Return form to supplier IT = Transfer product IF = Giving finished product)
	Page_DetailE	Varchar(100)	Page's detail (Eng.)
	Page_DetailT	Varchar(100)	Page's detail (Thai)
	Special_journal_code	Varchar(20)	Special journal code
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.15. Entity of Product Type Master File.

Entity name : Code product type			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Product type's code
	Detail	Varchar(255)	Product type's detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.16. Entity of Sales Zone Master File.

Entity name : Code sale zone			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Sale zone's code
	Detail	Varchar(255)	Sale zone's detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.17. Entity of Salesperson Master File.

Entity name : Code salesperson			
Key	Attribute name	Type	Definition
PK.	Salesperson_code	Varchar(20)	Salesperson code
	Salesperson_name	Varchar(100)	Salesperson name
	Salesperson_lastname	Varchar(100)	Salesperson lastname
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.18. Entity of Special Journal Master File.

Entity name : Code special_journal			
Key	Attribute name	Type	Definition
PK.	Code	Varchar(20)	Special journal code
	Detail	Varchar(255)	Special journal detail
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.19. Entity of Bank Master File.

Entity name : Finance bank			
Key	Attribute name	Type	Definition
PK.	Document_no	Varchar(20)	Document number
	Bank_date	Datetime	Bank date
	Document_date	Datetime	Document date
FK.	Document_type	Varchar(20)	Type of document (CAI = Cash in bank CAO= Cash out bank CHI = Cheque in bank CHO = Cheque out bank TFF = Transfer fund BIN = Bank income BEX = Bank expense)
	Bank_code	Varchar(20)	Bank code
	Remark	Varchar(255)	Remark
	Debit	Money	Debit
	Credit	Money	Credit
	Cheque_no	Varchar(20)	Cheque number
	User_no	Varchar(20)	User code
FK.	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.20. Entity of Customer.

Entity name : Customer			
Key	Attribute name	Type	Definition
PK.	Customer_code	Varchar(20)	Customer code
	Customer_name	Varchar(100)	Customer name
FK.	Customer_type_code	Varchar(20)	Type of customer code
FK.	Account_code	Varchar(20)	General journal code
	Contact_name	Varchar(100)	Contact name
	Contact_lastname	Varchar(100)	Contact lastname
	Email	Varchar(255)	Contact Email
	Address	Varchar(255)	Customer's address
	Delivery_address	Varchar(255)	Delivery address of customer
FK.	Salesperson_code	Varchar(20)	Salesperson code
	Telephone	Varchar(50)	Customer's telephone
	Fax	Varchar(50)	Customer's fax
FK.	Sale_zone_code	Varchar(20)	Sale zone's code
FK.	Delivery_code	Varchar(20)	Delivery term's code
	Remark	Varchar(255)	Remark
	Credit_extent	Money	Extent
	Due_date	Int	Collection period
	Discount_product	Float	Maximum discount for all products
	Due_percent	Int	Due date (%)
	Due_day	Int	Due date
	Discount_product	Money	Product's discount
FK.	Type_customer	Varchar(20)	Type of customer
	Tax_id	Varchar(50)	Tax invoice number
	status	Varchar(10)	Status of customer
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.21. Entity of Finances' Account Payable Submain Transaction.

Entity name : Finance_payCr_list			
Key	Attribute name	Type	Definition
PK.	Pay_no	Varchar(20)	Pay number
FK.	document_no	Datetime	Pay date
	Payment	Money	Total payment of creditor
	Debt	Money	Account balance
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.22. Entity of Account Payable Main Transaction.

Entity name : Finance_payCr			
Key	Attribute name	Type	Definition
PK.	Pay_no	Varchar(20)	Pay number
	Pay_date	Datetime	Pay date
FK.	Customer_code	Varchar(20)	Creditor's code
FK.	Department_code	Varchar(20)	Department's code
FK.	Job_code	Varchar(20)	Job's code
	Remark	Varchar(255)	Remark
	Tax_send_date	Datetime	Send tax date
	Gross	Money	Gross
	Discount	Money	Discount
	Cash	Money	Cash
	Cheque	Money	Cheque
	Withholding_tax	Money	Withholding tax
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.23. Entity of Account Receivable Main Transaction.

Entity name : Finance_payDr			
Key	Attribute name	Type	Definition
PK.	Pay_no	Varchar(20)	Pay number
	Pay_date	Datetime	Pay date
FK.	Customer_code	Varchar(20)	Debtor's code
FK.	Department_code	Varchar(20)	Department's code
FK.	Job_code	Varchar(20)	Job's code
	Remark	Varchar(255)	Remark
	Tax_send_date	Datetime	Send tax date
	Gross	Money	Gross
	Discount	Money	Discount
	Cash	Money	Cash
	Cheque	Money	Cheque
	Withholding_tax	Money	Withholding tax
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.24. Entity of Account Receivable Submain Transaction.

Entity name : Finance_payDr_list			
Key	Attribute name	Type	Definition
PK.	Pay_no	Varchar(20)	Pay number
FK.	document_no	Datetime	Pay date
	Payment	Money	Total payment of debtor
	Debt	Money	Account balance
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.25. Entity of Purchase Return/allowance Transaction.

Entity name : Finance_purchase_discount			
Key	Attribute name	Type	Definition
PK.	Purchase_discount_no	Varchar(20)	Purchase discount number
	Purchase_discount_date	Datetime	Purchase discount date
FK.	Purchase_no	Money	Purchase number
	Remark	Money	Remark
	Gross	Money	Gross
	VAT	Money	VAT
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.26. Entity of Sales Return/allowance Transaction.

Entity name : Finance_sale_discount			
Key	Attribute name	Type	Definition
PK.	Sale_discount_no	Varchar(20)	Sale discount number
	Sale_discount_date	Datetime	Sale discount date
FK.	delivery_no	Money	Sale delivery number
	Remark	Money	Remark
	Gross	Money	Gross
	VAT	Money	VAT
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.27. Entity of Inventory Transfer Products Main Transaction.

Entity name : Inventory_transfer			
Key	Attribute name	Type	Definition
PK.	Transfer_no	Varchar(20)	Transferred product number
	Transfer_date	Datetime	Transfer date
	From_inventory_code	Varchar(20)	Type of inventory's code (1 = Raw material stock 2 = Finished product stock)
	To_inventory_code	Varchar(20)	Type of inventory's code (1 = Raw material stock 2 = Finished product stock)
FK.	Department_code	Varchar(20)	Department code
FK.	Job_code	Varchar(20)	Job code
	Transfer_detail		Detail of transferred product
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.28. Entity of Inventory Transfer Products Submain Transaction.

Entity name : Inventory_transfer_list			
Key	Attribute name	Type	Definition
PK.	Transfer_no	Varchar(20)	Transferred product number
	Product_code	Datetime	Product code
	Product_name	Varchar(20)	Product name
	Product_unit	Varchar(20)	Product unit
FK.	Quantity	Varchar(20)	Quantity
FK.	Product_stock_code	Varchar(20)	Stock code
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.29. Entity of Product Price Transaction.

Entity name : Product_price			
Key	Attribute name	Type	Definition
PK.	Product_code	Varchar(20)	Product code
	Product_price	Datetime	Product price
	Edit_date	Varchar(20)	Change price date
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.30. Entity of Product Master File.

Entity name : Product			
Key	Attribute name	Type	Definition
PK.	Product_code	Varchar(20)	Product code
	Product_name	Varchar(100)	Product name
FK.	Product_Type_code	Varchar(20)	
	Product_detail	Varchar(255)	Product detail
	Product_detail_add	Varchar(255)	Additional detail of product
FK.	Account_code	Varchar(20)	General journal code
	Product_unit	Varchar(100)	Unit
	Ratio_unit	Varchar(100)	Ratio per unit
	Product_price	Money	Pricing of product
	Max_discount	Float	Maximum discount
	Min_quantity		
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.31. Entity of Product List of Receiving Transaction.

Entity name : Purchase list			
Key	Attribute name	Type	Definition
PK.	Purchase_no	Varchar(20)	Purchase number
PK.	Product_code	Varchar(20)	Product code
	Product_name	Varchar(100)	Product name
	Product_unit	Varchar(100)	Unit
	Product_price	Money	Pricing of product
	Product_discount	Float	Discount
	Product_quantity	Float	Quantity of receiving product
	Product_stock_code	Varchar(20)	Stock code
	Max_discount	Money	Maximum of discount
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.32. Entity of Product Stock.

Entity name : Product_stock			
Key	Attribute name	Type	Definition
PK.	Product_code	Varchar(20)	Product code
	Product_stock_code	Datetime	Stock code
	Quantity	Varchar(20)	Quantity
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.33. Entity of Purchase Deposit Transaction.

Entity name : Purchase_deposit			
Key	Attribute name	Type	Definition
PK.	Deposit_no	Varchar(20)	Deposit number to supplier
	Deposit_date	Datetime	Deposit date
FK.	Customer_code	Varchar(20)	Customer code
FK.	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
FK.	Account_code	Varchar(20)	General journal code
FK.	Department_code	Varchar(20)	Department code
	Tax_id	Varchar(20)	Tax invoice number
FK.	Job_code	Varchar(20)	Job code
	Deposit_detail	Varchar(255)	Detail of deposit
	Gross	Money	Total gross
	VAT	Float	VAT
	Cash_amount	Money	Amount of cash
	Cheque_amount	Money	Amount of cheque
	Withholding_tax	Float	Withholding tax
	Cheque_no	Varchar(20)	Cheque number
	Net_purchase	Money	Net purchase
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.34. Entity of Receiving Transaction.

Entity name : Purchase			
Key	Attribute name	Type	Definition
PK.	Purchase no	Varchar(20)	Purchase number
	Purchase date	Datetime	Purchase date
FK.	Customer_code	Varchar(20)	Customer code
	Due_date	Int	Collection period
	Due_percent	Int	Due date (%)
	Due_day	Int	Due date
FK.	Purchase_order no	Varchar(20)	Purchase order number
FK.	Delivery_no	Varchar(20)	Delivery number of supplier
	Delivery_date	Datetime	Delivery date
FK.	Purchase_term_code	Varchar(20)	Purchase term code (1 = Purchasing on credit 2 = Purchasing on cash)
	Inventory_code	Varchar(20)	Type of inventory's code (1 = Raw material stock 2 = Finished product stock)
FK.	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
FK.	Job_code	Varchar(20)	Job code
FK.	Department code	Varchar(20)	Department code
	Tax_id	Varchar(50)	Tax invoice number
FK.	Tax_basis_code	Varchar(20)	Tax basis's code (1=Accrual basis 2=Cash basis)
	Tax send date	Datetime	Date of sending tax
	VAT_status	Varchar(20)	Including VAT or not (Yes = Including VAT No = Not including VAT)
	Back_tax_status	Varchar(20)	Returning VAT (Yes, No)
FK.	Delivery code	Varchar(20)	Delivery term's code
FK.	Deposit_no	Varchar(20)	Deposit number
	Gross	Money	Total gross
	Discont	Float	Total discount
	VAT	Float	VAT
	Net	Money	Net
	Paid	Money	Paid
	Remark	Varchar(255)	Remark
	Cheque_no	Varchar(20)	Cheque number
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.35. Entity of Purchase Order Transaction.

Entity name : Purchase order			
Key	Attribute name	Type	Definition
PK.	Purchase_order_no	Varchar(20)	Purchase order number
	Purchase_order_date	Datetime	Purchase order date
FK.	Customer_code	Varchar(20)	Customer code
FK.	Payment_term_code	Varchar(20)	Payment term's code (1 = Cash 2 = Cheque 3 =Postdated Cheque)
	Receive_date	Datetime	Received product date
FK.	Delivery_code	Varchar(20)	Delivery term's code
	Due_date	Int	Collection period
	Due_percent	Int	Due date (%)
	Due_day	Int	Due date
FK.	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
FK.	Department_code	Varchar(20)	Department code
FK.	Job_code	Varchar(20)	Job code
	Remark	Varchar(255)	Remark
	Gross	Money	Total gross
	Discount	Float	Total discount
	VAT	Float	VAT
	Check_order	Varchar(20)	Order check
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.36. Entity of Product List of Purchase Order Transaction.

Entity name : Code_product_type			
Key	Attribute name	Type	Definition
PK.	Purchase_order_no	Varchar(20)	Purchase order number
PK.	Product_code	Varchar(20)	Product code
	Product_name	Varchar(100)	Product name
	Product_unit	Varchar(100)	Unit
	Product_price	Money	Pricing of product
	Product_discount	Float	Discount
	Receive_quantity	Float	Quantity of receive product
	Order_quantity	Float	Quantity of order product
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.37. Entity of Product List of Purchase Return Transaction.

Entity name : Purchase return list			
Key	Attribute name	Type	Definition
PK.	Return_no	Varchar(20)	Returning product number to supplier
PK.	Product_code	Varchar(20)	Product code
	Product_name	Varchar(100)	Product name
	Product_unit	Varchar(100)	Unit
	Product_price	Money	Pricing of product
	Product_discount	Float	Discount
	Return_quantity	Float	Quantity of return product to supplier
	Product_stock_code	Varchar(20)	Stock code
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.38. Entity of Purchase Return Transaction.

Entity name : Purchase_return			
Key	Attribute name	Type	Definition
PK.	Return_no	Varchar(20)	Returning product number to supplier
	Return_date	Datetime	Return date
FK.	Customer_code	Varchar(20)	Customer code
FK.	Purchase_discount_code	Varchar(20)	Purchase discount by (1 = Cut debts 2 = Pay cash 3 = Cut from received debts 4 = Pay cheque)
FK.	Purchase_no	Varchar(20)	Purchase number
	Inventory_code	Varchar(20)	Type of inventory's code (1 = Raw material stock 2 = Finished product stock)
FK.	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
FK.	Job_code	Varchar(20)	Job code
FK.	Department_code	Varchar(20)	Department code
	VAT_status	Varchar(20)	Including VAT or not (Yes = Including VAT No = Not including VAT)
	Back_tax_status	Varchar(20)	Returning VAT (Yes, No)
	Gross	Money	Total gross
	Discount	Float	Total discount
	VAT	Float	VAT
	Remark	Varchar(255)	Remark
	Cheque_no	Varchar(20)	Cheque number
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.39. Entity of Sales Deposit Transaction.

Entity name : Sale deposit			
Key	Attribute name	Type	Definition
PK.	Deposit_no	Varchar(20)	Deposit number of customer
	Deposit_date	Datetime	Deposit date
FK.	Customer_code	Varchar(20)	Customer code
FK.	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
FK.	Department_code	Varchar(20)	Department code
FK.	Salesperson_code	Varchar(20)	Salesperson code
FK.	Job_code	Varchar(20)	Job code
	Deposit_detail	Varchar(255)	Deposit's detail
	Gross	Money	Total gross
	VAT	Float	VAT
	Net sale	Money	Net sales
	Cash amount	Money	Amount of cash
	Cheque amount	Money	Amount of cheque
	Withholding tax	Float	Withholding tax
	Cheque no	Varchar(20)	Cheque number
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.40. Entity of Product List of Delivery and Invoice Voucher Transaction.

Entity name : Sale invoice list			
Key	Attribute name	Type	Definition
PK.	Invoice_no		
PK.	Product_code	Varchar(20)	Product code
	Product_name	Varchar(100)	Product name
	Product_unit	Varchar(100)	Unit
	Product_price	Money	Pricing of product
	Product_discount	Float	Discount
	Max_discount	Money	Maximum for discount
	Invoice_quantity	Float	Quantity of delivering product
FK.	Product_stock_code	Varchar(20)	Inventory's code
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.41. Entity of Delivery and Invoice Voucher Transaction.

Entity name : Sale invoice			
Key	Attribute name	Type	Definition
PK.	Invoice_no	Varchar(20)	Invoice number
	Invoice_date	Datetime	Invoice date
PK.	Delivery_no	Varchar(20)	Delivery number
FK.	Order_no	Varchar(20)	Order number
	Receive_date	Datetime	Receive date
FK.	Customer_code	Varchar(20)	Customer code
	Due_date	Int	Collection period
FK.	Sale_term_code	Int	Sale term's code (1 = Selling on credit 2 = Selling on cash)
	Delivery_date	Datetime	Delivery period
FK.	Payment_code	Int	Payment term's code (1 = Cash 2 = Cheque 3 =Postdated Cheque)
FK.	Delivery_code	Varchar(20)	Delivery term's code
FK.	Tax_term_code	Int	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
	VAT_status	Varchar(20)	Including VAT or not (Yes = Including VAT No = Not including VAT)
FK.	Job_code	Varchar(20)	Job code
FK.	Salesperson_code	Varchar(20)	Salesperson code
FK.	Department_code	Varchar(20)	Department code
FK.	Sale_zone_code	Varchar(20)	Sale zone's code
	Deposit_no	Varchar(20)	Deposit number of customer
	Gross	Money	Total gross
	Discount	Float	Total discount
	VAT	Float	VAT
	Net	Money	Purchase net
	Paid	Money	Payment
	Remark	Varchar(255)	Remark
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.42. Entity of Sales Order Transaction.

Entity name : Sale order			
Key	Attribute name	Type	Definition
PK.	Order_no	Varchar(20)	Order number
	Order_date	Datetime	Order date
	Customer_code	Varchar(20)	Customer code
	Purchase_no	Varchar(20)	Purchase number of customer
	Delivery_date	Datetime	Delivery date
FK.	Delivery_code	Varchar(20)	Delivery term's code
FK.	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
	Due_date	Int	Collection period
	Due_percent	Int	Due date (%)
	Due_day	Int	Due date
FK.	Salesperson_code	Varchar(20)	Salesperson code
FK.	Department_code	Varchar(20)	Department code
FK.	Job_code	Varchar(20)	Job code
FK.	Sale_zone_code	Varchar(20)	Sale zone's code
	Order_remark	Varchar(255)	Remark
	Gross	Money	Total gross
	Discount	Float	Total discount
	VAT	Float	VAT
	Check_order	Varchar(5)	Check delivery (Yes = Completely delivery No = Incompletely delivery)
	Check_credit	Varchar(5)	Check credit
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.43. Entity of Product List of Sales Order Transaction.

Entity name : Sale order list			
Key	Attribute name	Type	Definition
PK.	Order no	Varchar(20)	Order number
PK.	Product code	Varchar(20)	Product code
	Product name	Varchar(100)	Product name
	Product unit	Varchar(100)	Unit
	Product price	Money	Pricing of product
	Product discount	Float	Discount
	Max discount	Money	Maximum for discount
	Order quantity	Float	Quantity of ordering product
	Delivery quantity	Float	Quantity of delivering product
	Product stock code	Varchar(20)	Stock code
FK.	User no	Varchar(20)	User code
	User date	Datetime	Edit date
	User status	Varchar(10)	Status(A=add,U=update)

Table E.44. Entity of Product List of Sales Return Transaction.

Entity name : Sale return list			
Key	Attribute name	Type	Definition
PK.	Return no	Varchar(20)	Returning product number
PK.	Product code	Varchar(20)	Product code
	Product name	Varchar(100)	Product name
	Product unit	Varchar(100)	Unit
	Product price	Money	Pricing of product
	Product discount	Float	Discount
	Return_quantity	Float	Quantity of returning product from customer
	Product stock code	Varchar(20)	Stock code
FK.	User no	Varchar(20)	User code
	User date	Datetime	Edit date
	User status	Varchar(10)	Status(A=add,U=update)

Table E.45. Entity of Product List of Sales Return Transaction.

Entity name : Sale return			
Key	Attribute name	Type	Definition
PK.	Return_no	Varchar(20)	Returning product number
	Return_date	Datetime	Returning product date
FK.	Customer_code	Varchar(20)	Customer code
FK.	Purchase_discount_code	Varchar(20)	Purchase discount by (1 = Cut debts 2 = Pay cash 3 = Cut from received debts 4 = Pay cheque)
FK.	Delivery_no	Varchar(20)	Delivery number
FK.	Salesperson_code	Varchar(20)	Salesperson code
FK.	Tax_base_amount	Money	Tax based-value
	Inventory_type_code	Varchar(20)	Type of inventory's code
	Tax_term_code	Varchar(20)	Tax term's code (1 = Including tax 2 = separating tax 3 = No tax)
	Gross	Money	Total gross
	Discount	Float	Total discount
	VAT	Float	VAT
	Sale_zone_code	Varchar(20)	Sale zone's code
	Department_code	Varchar(20)	Department code
	Job_code	Varchar(20)	Job code
	Tax_basis_code	Varchar(20)	Tax basis's code (1=Accrual basis 2=Cash basis)
	Remark	Varchar(255)	Remark
	Tax_send_date	Datetime	Date of sending tax
	VAT_status	Varchar(20)	Including VAT or not (Yes = Including VAT No = Not including VAT)
	Cheque_no	Varchar(20)	Cheque number
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.46. Entity of Customer Sent Contact to Retailers Over the Internet.

Entity name : Temp_contact			
Key	Attribute name	Type	Definition
PK.	ID	Varchar(20)	ID
PK.	Company_name	Varchar(20)	Company name
	Name	Varchar(100)	Name
	Lastname	Varchar(100)	Lastname
	Email	Varchar(255)	Email
	Contact	Varchar(255)	Contact name

Table E.47. Entity of Customer Register Over the Internet.

Entity name : Temp_customer			
Key	Attribute name	Type	Definition
PK.	Customer code	Varchar(20)	Customer code
	Customer name	Varchar(100)	Customer name
FK.	Customer type code	Varchar(20)	Type of customer code
	Contact name	Varchar(100)	Contact name
	Contact lastname	Varchar(100)	Contact lastname
	Email	Varchar(255)	Contact Email
	Address	Varchar(255)	Customer's address
	Delivery address	Varchar(255)	Delivery address of customer
FK.	Salesperson code	Varchar(20)	Salesperson code
	Telephone	Varchar(50)	Customer's telephone
	Fax	Varchar(50)	Customer's fax
FK.	Type_customer	Varchar(20)	Type of customer

Table E.48. Entity of FAQ.

Entity name : Temp_faq			
Key	Attribute name	Type	Definition
PK.	ID	Varchar(20)	Customer code
	Question	Varchar(100)	Customer name
	Answer	Varchar(20)	Type of customer code
	Contact name	Varchar(100)	Contact name
	Contact_lastname	Varchar(100)	Contact lastname
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(10)	Status(A=add,U=update)

Table E.49. Entity of Initial Parameter for Control Some Parameter in the RMOS.

Entity name : User initial			
Key	Attribute name	Type	Definition
PK.	ID	Int	1
	English	Varchar(20)	Language in web site
	Company_name	Varchar(255)	Company name
	IMGcompany	Varchar(255)	URL of company's image
	Address	Varchar(255)	Company's address
	Tax_number	Varchar(20)	Tax number of company
	VAT	Money	VAT initial
	Fax	Varchar(20)	Fax
	Phone	Varchar(20)	Phone
	Over_extent	Varchar(5)	Alert customer about over extent (1= Dont' sell above extent 2= Alert and sell above extent 3 = Don't check extent)
	Back_up_date	Int	Period for back up
	start company	Datetime	Starting program
FK.	User_no	Varchar(20)	User code
	User_date	Datetime	Edit date
	User_status	Varchar(20)	Status(A=add,U=update)

Table E.50. Entity of User who Access in the RMOS.

Entity name : User login			
Key	Attribute name	Type	Definition
PK.	Username	Varchar(20)	Username
	Password	Varchar(20)	Password
	Name	Varchar(255)	Name
	Lastname	Varchar(255)	Lastname
FK.	Department_code	Varchar(20)	Department code
	Email	Varchar(255)	Email
	Role_id	Varchar(20)	Role code

Table E.51. Entity of Role Master File.

Entity name : User Role			
Key	Attribute name	Type	Definition
PK.	Role_id	Varchar(20)	Role code
	Role_name	Varchar(50)	Role name

Table E.52. Entity of Module Main Menu Master File.

Entity name : User_module			
Key	Attribute name	Type	Definition
PK.	Module_id	Varchar(20)	Module code
	Module_name	Varchar(50)	Module name (Menu)
	URL	Varchar(255)	Access file
	Next_level	Bit	(0= no submenu 1 = have submenu)
	Previous_line	Bit	(0= no top line 1 = have top line)

Table E.53. Entity of Assign Role to Access Each Module.

Entity name : User_role_module			
Key	Attribute name	Type	Definition
PK.	Role_id	Varchar(20)	Role code
PK.	Module_id	Varchar(20)	Module code
	Module_add	Varchar(255)	(0 = cannot add 1 = can add)
	Module_update	Varchar(255)	(0 = cannot update 1 = can update)
	Module_delete	Varchar(20)	(0 = cannot delete 1 = can delete)



APPENDIX F

REPORT DESIGN

SINCE 1969

We classify outputs is according to their distribution inside and outside almost retailers and users who read and use them.

F.1 Print Output

F.1.1 Detailed Reports

Detailed reports distribute to retailer's customers, or suppliers in any processing.

- (1) Sales order: User must print out Sales order document after User entries all information about sales order of each customer. This document is sent to customer to confirm about ordering of them. The sales order document is shown in Figure G.1.





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Igloo village. RCA road. pralem IX
Tel 02-275-7820 Fax 02-275-7927
เลขประจำตัวผู้เสียภาษี 25584562

หน้า:1

Sale order / ใบจองสินค้า

เลขที่	2003-01-0000003
วันที่	14 ม.ค. 2546

ลูกค้า	ร้านคุณแดง	วันส่งสินค้า	ก.พ.
ที่อยู่	58 หมู่ 1 ถนน สุขุมวิท ซอยบุรี	ขนส่งโดย	รถบรรทุก
โทรศัพท์	038-968-939	ส่วนลดจ่าย	2/20, n/30
เลขที่ใบส่งของลูกค้า	Internet2003-01-0000003	ชื่อพนักงานขาย	Sasipat F.
เขตการขาย	ภาคตะวันออก	แผนก	

รหัสสินค้า	ชื่อสินค้า	หน่วย	จำนวนจอง	ราคา	ส่วนลด	มูลค่า
10001	สบู่	โหล	15	90.00		1,350.00
10002	ครีม Buta	โหล	14	850.00		11,900.00
หมายเหตุ				ยอดรวม		13,250.00
				ส่วนลด	.00%	.00
				ยอดรวมส่วนลด		.00
				ยอดคงเหลือ		13,250.00
				มูลค่าภาษี(7%)		927.50
				มูลค่ารวม		14,177.50

ผู้จัดทำ
วันที่ / /


ผู้รับจองสินค้า
วันที่ / /

ผู้ตรวจสอบ
วันที่ / /

ผู้รับมอบอำนาจ
วันที่ / /

Figure F.1. Sales Order Form.

- (2) Sales deposit: When customer deposit to retailer, the cashier must to entry any information about sales deposit and print out billing of deposit to customer is shown in Figure F.2



Thaipatt
.com

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Tel 02-275-7820 Fax 02-275-7927
เลขประจำตัวผู้เสียภาษี 25584562

Deposit / โฉนดจำ

เลขที่	2003-02-0000002
วันที่	25 ก.พ. 2546

ลูกค้า	ร้านคุณแดง
ที่อยู่	58 หมู่ 1 ถนน สุขุมวิท ชลบุรี
โทรศัพท์	038-968-939

รายละเอียด	จำนวนเงิน
ร้านคุณแดง วางเงินมัดจำ	12,000.00
หมายเหตุ	<div style="display: flex; justify-content: space-between;"> ยอดเงินมัดจำ 12,000.00 </div> <div style="display: flex; justify-content: space-between;"> มูลค่าภาษี(7%) 840.00 </div> <div style="display: flex; justify-content: space-between;"> ยอดสุทธิ 12,840.00 </div>
วิธีการชำระ - เงินสด 12,840.00 บาท	

ผู้รับเงิน

วันที่ ____/____/____

ผู้อนุมัติ

วันที่ ____/____/____

Figure F.2. Billing of Sales Deposit.

- (3) Sales invoice: When the retailer will deliver products customer, the retailer must entry delivered product in the system and print out sales invoice to customer (See Figure F.3)
- (4) Sales return: When customer return damaged products to retailer, the warehouse worker must entry data in the system for printing sales return to customer (See Figure F.4)

(7) Paying voucher (Figure F.7) is printed when the Finance department of retailer has paid to supplier. This voucher is evidence of payment to supplier. So, this voucher is kept by accounting department.

Report - Microsoft Internet Explorer

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Eskimo co, th
Igloo village, RCA road, pralam IX
Tel 02-275-7820 Fax 02-275-7927
เลขประจำตัวผู้เสียภาษี 25584562

หน้า: 1

Paying voucher / ใบสั่งเบิก

เลขที่	2002-12-0000002
วันที่	16 ธ.ค. 2545

ลูกค้า: ร้านจ้หม่วย
ที่อยู่: 111 ซอยหม่วย เขต สัมพันธวงศ์ กรุงเทพฯ
โทรศัพท์: 02-378-2942-6

ที่	รหัสบัญชี	เลขที่ใบสั่งของ	เลขที่ใบสั่งจองของ	จำนวนเงิน	ยอดจ่าย
1	500	2002-12-0000001	2002-12-0000001	132,145.00	121,030.00
2					
3					
4					
5					
6					
7					
8					
9					
10					

หมายเหตุ	ยอดรวม	121,030.00
	ยอดรวมส่วนลด	.00
	ยอดคงเหลือ	121,030.00
	มูลค่าภาษี(%)	.00
	มูลค่ารวม	121,030.00

วิธีการชำระ
-เช็คเลขที่ 156423 ของ ช.กรุงเทพ สาขา ภาวนา ลงวันที่ 16/12/2545 จำนวน 121,030.00 บาท

ผู้จ่ายเงิน ผู้รับเงิน ผู้ตรวจสอบ ผู้อนุมัติ

.....

Figure F.7. Paying Voucher.

- (8) Billing voucher (Figure F.8) is printed when the customer has paid to retailer. Cashier must fill up all information about customer payment and print Bill voucher to customer.

Report - Microsoft Internet Explorer

Thaipatt.com

Eskimo co. th
Igloo village. RCA road. pralam IX
Tel 02-275-7820 Fax 02-275-7927
เลขประจำตัวผู้เสียภาษี 25584562

หน้า:1

Bill voucher / ใบเสร็จรับเงิน

เลขที่	2002-12-0000003
วันที่	17 ธ.ค. 2545

ลูกค้า	ร้านคณตง
ที่อยู่	58 หมู่ 1 ถนน สุขุมวิท ซอย 3
โทรศัพท์	038-968-939

ที่	เลขที่ใบส่งของ	ครบกำหนด	จำนวนเงิน	ยอดจ่าย
1	2002-12-0000001	2/1/2546	18,190.00	13,000.00
2				
3				
4				
5				
6				
7				
8				
9				
10				

หมายเหตุ	ยอดรวม	13,000.00
	ยอดรวมส่วนลด	.00
	ยอดคงเหลือ	13,000.00
	มูลค่าภาษี(%)	.00
	มูลค่ารวม	13,000.00

วิธีการชำระ
-เช็คเลขที่ 13000 ของ ธ.กสิกร สาขา ห้วยขวาง ลงวันที่ 22/12/2545 จำนวน 13,000.00 บาท

ผู้รับเงิน
วันที่ ____/____/____

ผู้ตรวจสอบ
วันที่ ____/____/____

ผู้จัดการ
วันที่ ____/____/____

Figure F.8. Bill Voucher.

F.1.2 Summary Reports

All weekly reports have similar with Monthly report. Weekly report is used operation manager but the monthly report is overview for each report per month, which it is used by senior manager.

(1) Weekly Total Product Report (Figure F.9)

et Explorer					
Thaipatt.com					
Weekly Total Product Report (1-7 Jan. 2003)					
No.	Product No.	Description	Total unit on hand	Prince/unit	Update pricing
หมายเหตุ					

Figure F.9. Weekly Total Product Report.

- (2) Weekly Total Product Report for each ware house (Figure F.10)

explorer				
Thaipatt.com				
Weekly Total Product Report (1-7 Jan. 2003)				
IN ABC Warehouse				
No.	Product No.	Description	Unit on hand	Remark

Figure F.10. Weekly Total Product Report for Each Warehouse.

- (3) Weekly Carrying-inventory Report (Figure F.11)

explorer				
Thaipatt.com				
Weekly Carrying-inventory Report (1-7 Jan. 2003)				
From ABC Warehouse to DEF Warehouse				
No.	Product No.	Description	Transferred unit	Remark

Figure F.11. Weekly Carrying-inventory Report.

(4) Weekly Carrying Inventory Report (Figure F.12)

Internet Explorer

หน้า:1

Thaipatt
.com

Weekly Carrying-inventory Report (1-7 Jan. 2003)

ABC Warehouse

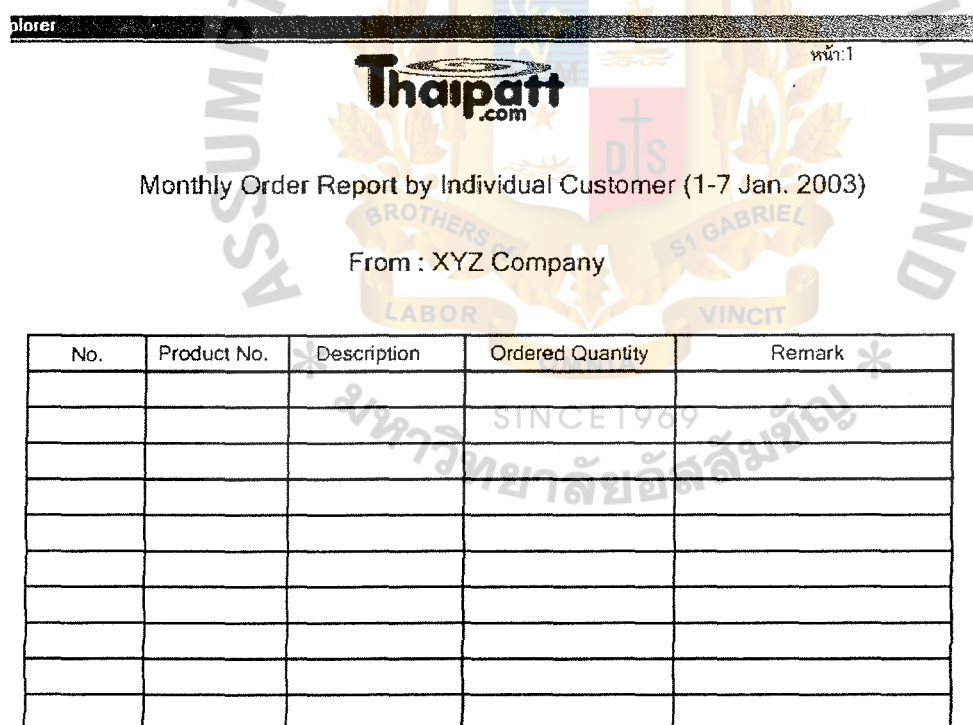
No.	Product No.	Description	Unit on hand	Used Unit	Difference	Percentage

Figure F.12. Weekly Carrying Inventory Report.

- (5) Monthly Order Report by individual Customer (Figure F.13) and those format reports are used in Weekly order report in every customer.

F.2 Screen Output

Sales order list, sales invoice list, sales deposit list, and any list page are screen output including Product pages, Customer pages, Supplier pages, and Accounting transaction pages. Those pages, user can drill-down and search any criteria for seeing the information (Example: Figure 5.12 Sales history)



No.	Product No.	Description	Ordered Quantity	Remark *

Figure F.13. Monthly Order Report by Individual Customer.



APPENDIX G

FINANCIAL ANALYSIS

Table G.1. Development Cost Analysis.

Cost item	Amount	Unit price	Total price
1. Personal cost	1	70,000	70,000
System analyst (1.5 month)	1	40,000	40,000
Web developer (2 month)	2	50,000	100,000
Training developer			210,000
Subtotal 1:			
2. New software	1	15,000	15,000
2.1 MS Access 2000	1	4,100	4,100
2.2 Hosting			19,100
Subtotal 2:			
3. New hardware			
3.1 Server site	1	500,000	500,000
Server	1	300,000	300,000
Network installation	10	30,000	30,000
3.2 Client	6	50,000	300,000
3.3 Printer			1,400,000
Subtotal 3:			
4. RMOS Installation	5	25,000	125,000
4.1 Install by developer	20	25,000	500,000
4.2 Testing by developer	10	15,000	150,000
4.3 Testing by users			775,000
Subtotal 4:			2,404,100
Total cost	1	70,000	70,000

Table G.2. Reduce Paper Document Cost.

Detail	amount	Year1	Year2	Year3	Year4	Year5
Manual system	100,000	3,500,000	3,850,000	4,235,000	4,658,500	5,124,350
Offline system (50%)	100,000	1,750,000	1,925,000	2,117,500	2,329,250	2,562,175
RMOS system (20%)	100,000	1,300,000	1,430,000	1,573,000	1,730,300	1,903,330

Remark: In every year, the retailers have grown up around 110% of transactions.

Table G.3. Reduce Communication Cost.

Detail	amount	Year1	Year2	Year3	Year4	Year5
Manual system	100,000	500,000	550,000	605,000	665,500	732,050
Offline system	100,000	500,000	550,000	605,000	665,500	732,050
RMOS system	100,000	210,000	225,000	241,500	259,650	279,615

Remark:

1. In manual and offline system, communication cost per transaction is 5 Baht approximately (telephone line, and fax).
2. RMOS system requires communication in Table G.4
3. In every year, the retailer has grown about 110% of transactions

Table G.4. Communication Requirement.

Requirement	Baht.
DSL Internet fee (5,000 baht per month)	60,000
Telephone line, fax (30% of 100,000 transactions)	150,000
Communication cost in one year	210,000

Table G.5. Reduce Messenger Operation Cost.

Detail	Amount	Year1	Year2	Year3	Year4	Year5
Manual system	2	96,000	105,600	116,160	127,776	140,554
Offline system	2	96,000	105,600	116,160	127,776	140,554
RMOS system	1	48,000	52,800	58,080	63,888	70,277

Table G.6. Reduce Finance Operation Cost.

Detail	Amount	Year1	Year2	Year3	Year4	Year5
Manual system	6	90,000	94,500	99,225	104,186	109,396
Offline system	3	540,000	567,000	595,350	625,118	656,373
RMOS system	3	540,000	567,000	595,350	625,118	656,373

Table G.7. Reduce Accounting Operation Cost.

Detail	Amount	Year1	Year2	Year3	Year4	Year5
Manual system	6	864,000	907,200	952,560	1,000,188	1,050,197
Offline system	2	360,000	378,000	396,900	416,745	437,582
RMOS system	2	360,000	378,000	396,900	416,745	437,582

Table G.8. Reduce Inventory Operation Cost.

Detail	Amount	Year1	Year2	Year3	Year4	Year5
Manual system	1	96,000	100,800	105,840	111,132	116,689
Offline system	0	-	-	-	-	-
RMOS system	0	-	-	-	-	-

Table G.9. Break-even Compare between Manual System and RMOS System.

Manual Detail	Amount	Year1	Year2	Year3	Year4	Year5
Salesperson	4	1,008,000	1,058,400	1,111,320	1,166,886	1,225,230
Inventory control worker	1	96,000	100,800	105,840	111,132	116,689
Accounting	6	864,000	907,200	952,560	1,000,188	1,050,197
Financial worker	6	90,000	94,500	99,225	104,186	109,396
Paper document	100,000	3,500,000	3,850,000	4,235,000	4,658,500	5,124,350
Communication	100,000	500,000	550,000	605,000	665,500	732,050
Messenger	2	96,000	105,600	116,160	127,776	140,554
Total cost		6,154,000	6,666,500	7,225,105	7,834,168	8,498,465
Cumulative cost		6,154,000	12,820,500	20,045,605	27,879,773	36,378,239
RMOS Detail						
Salesperson	4	720,000	756,000	793,800	833,490	875,165
Accounting	2	360,000	378,000	396,900	416,745	437,582
Financial worker	3	540,000	567,000	595,350	625,118	656,373
Messenger	1	48,000	52,800	58,080	63,888	70,277
Personal of computer		210,000	600,000	630,000	661,500	694,575
Paper document	100,000	1,300,000	1,430,000	1,573,000	1,730,300	1,903,330
Transferred data	100,000	210,000	225,000	241,500	259,650	279,615
Tranning	5	150,000				
Computer hardware		1,400,000				
Computer software		64,200	49,200	49,200	49,200	49,200
RMOS Installation		775,000				
Total cost		5,777,200	4,058,000	4,337,830	4,639,891	4,966,117
Cumulative cost		5,777,200	9,835,200	14,173,030	18,812,921	23,779,037

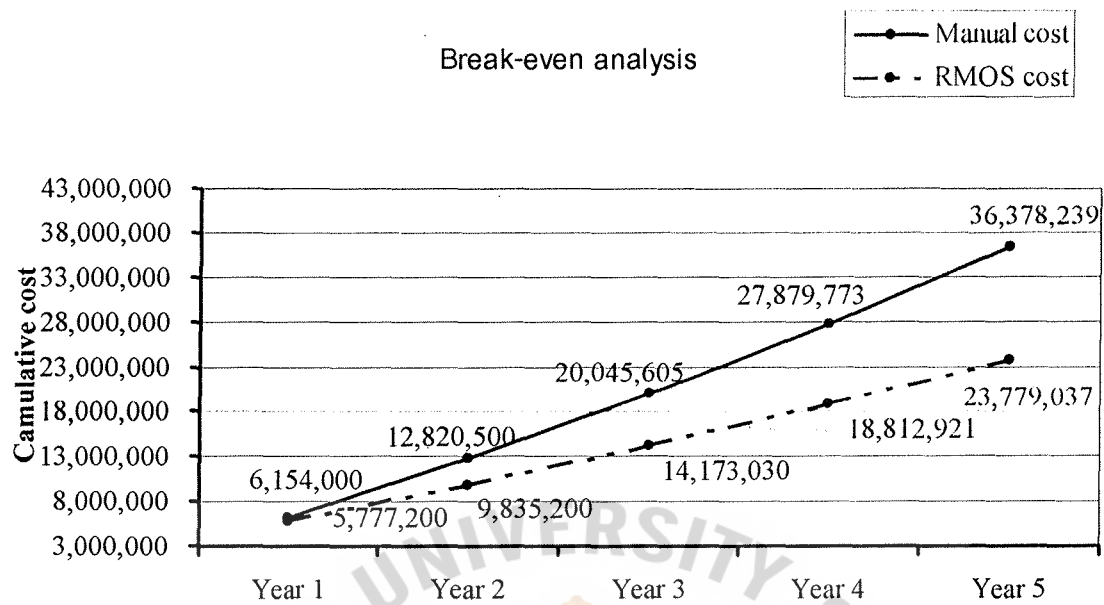


Figure G.1. Break-even Graph between Manual and RMOS System.

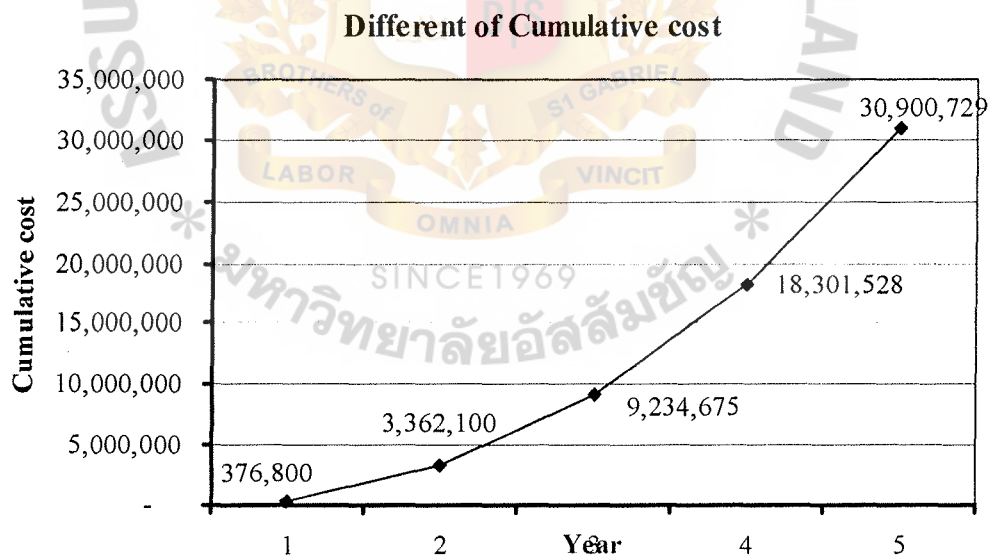


Figure G.2. Different of Cumulative Cost of Manual and RMOS System.

Table G.9. Break-even Compare between Offline System and RMOS System.

Offline Detail	Amount	Year1	Year2	Year3	Year4	Year5
Salesperson	4	720,000	756,000	793,800	833,490	875,165
Accounting	2	360,000	378,000	396,900	416,745	437,582
Financial worker	3	540,000	567,000	595,350	625,118	656,373
Messenger	2	96,000	105,600	116,160	127,776	140,554
Personal of computer		600,000	660,000	726,000	798,600	878,460
Paper document	100,000	1,750,000	1,925,000	2,117,500	2,329,250	2,562,175
Transferred data	100,000	500,000	550,000	605,000	665,500	732,050
Total cost		4,566,000	4,941,600	5,350,710	5,796,479	6,282,359
Cumulative cost		4,566,000	9,507,600	14,858,310	20,654,789	26,937,147
RMOS Detail						
Salesperson	4	720,000	756,000	793,800	833,490	875,165
Accounting	2	360,000	378,000	396,900	416,745	437,582
Financial worker	3	540,000	567,000	595,350	625,118	656,373
Messenger	1	48,000	52,800	58,080	63,888	70,277
Personal of computer		210,000	600,000	630,000	661,500	694,575
Paper document	100,000	1,300,000	1,430,000	1,573,000	1,730,300	1,903,330
Transferred data	100,000	210,000	225,000	241,500	259,650	279,615
Tranning	5	150,000				
Computer hardware		1,100,000				
Computer software		64,200	49,200	49,200	49,200	49,200
RMOS Installation		775,000				
Total cost		5,477,200	4,058,000	4,337,830	4,639,891	4,966,117
Cumulative cost		5,477,200	9,535,200	13,873,030	18,512,921	23,479,037

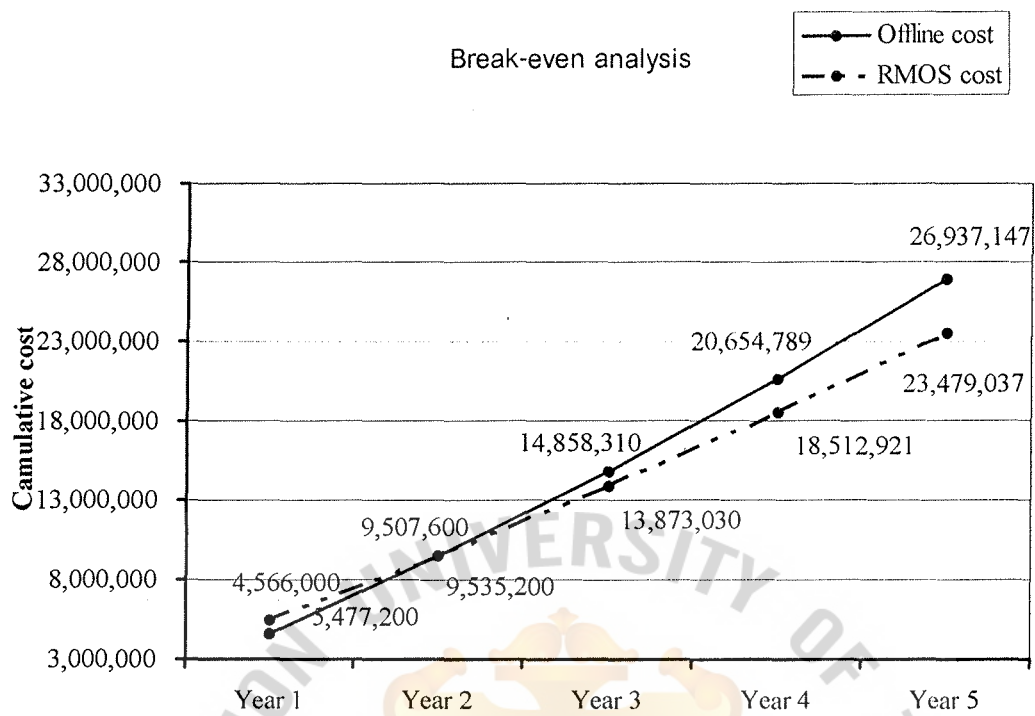


Figure G.3. Break-even Graph between Offline and RMOS System.

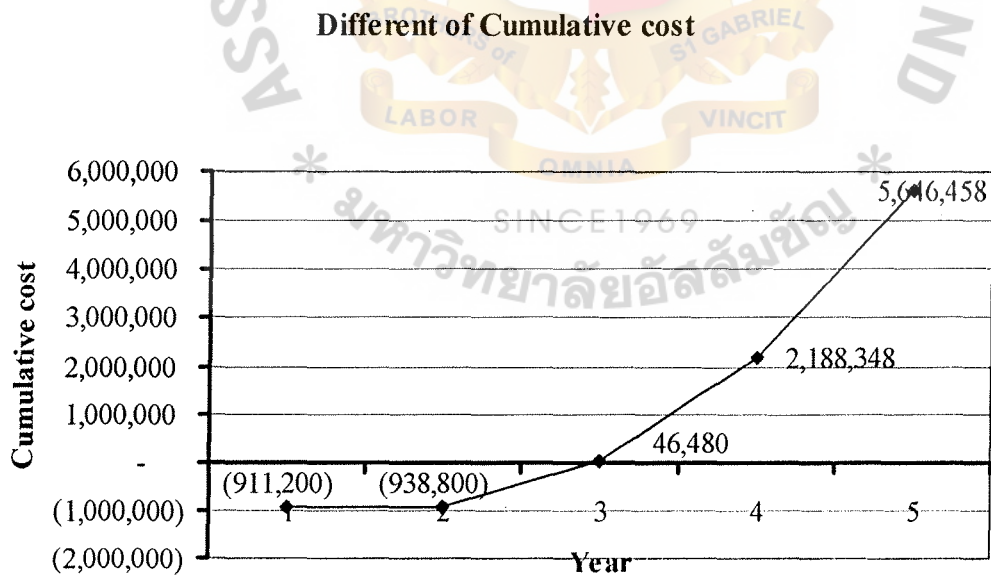


Figure G.4. Different of Cumulative Cost of Offline and RMOS System.

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