



Inventory Control System for Cloth Company

by

Ms. Chutharat Chalunchathuponsin

A Final Report of the Three-Credit Course
CS 6998 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
Assumption University

November, 2001

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Project Title Inventory Control System for Cloth Company

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The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

Approval Committee:



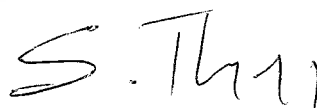
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ABSTRACT

Inventories can be defined as any idle goods or materials that are waiting to be used. For most companies the expenses associated with financing and maintaining inventories are a substantial part of the cost of doing business. In large companies, especially those with many or expensive products, the costs associated with raw material, in-process, and finished goods inventories can run into the million bahts. The study is made to gain an appreciation of how these costs arise and what managers can do to control them.

The project is concerned with the inventory control system of Cloth Company which is a manual system. The objective of the project is to create a new system that eliminates the existing problems and improves the daily operations in order to provide accurate information for management. Besides, the proposed system can provide better service to customers and help the inventory operation run smoothly and effectively. The cost and benefit analysis is carried out and the results obtained indicate that the proposed system is worth an investment.

The proposed system is developed in accordance with the system analysis, system design, and system implementation. System analysis involves with the study of the existing system. System design involves the proposed system, how it can be designed to solve the weak points of the manual-based system. System implementation involves the processes that make all the designs become realistic. In addition, other details supporting the proposed system, such as data dictionary, process specification, database design, screen form and report layout, all are available in the appendix.

ACKNOWLEDGEMENTS

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She would like to thank all professors of the Graduate School of Computer Information Systems at Assumption University, for teaching her with great performance.

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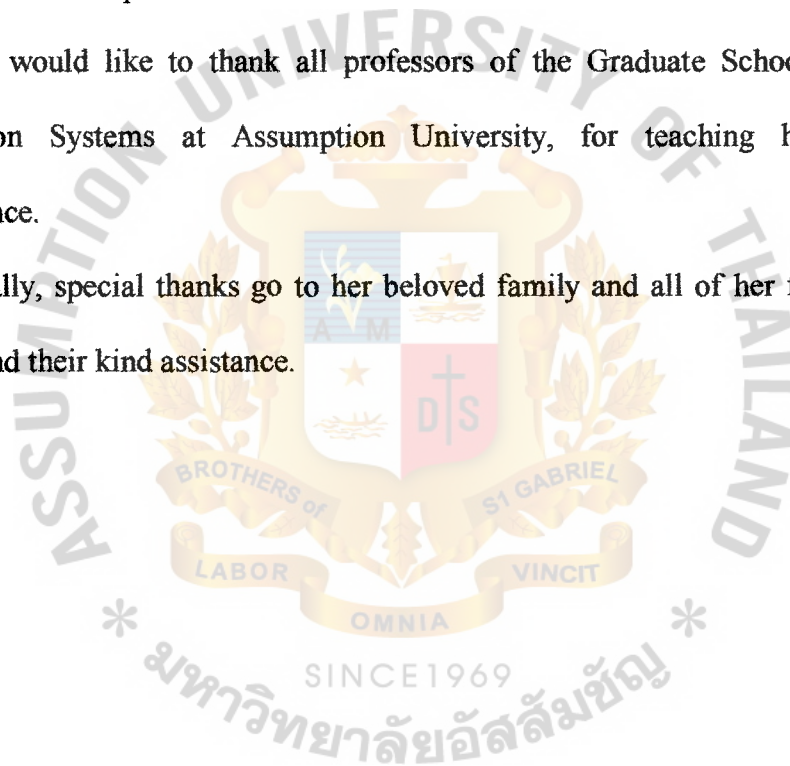


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I. INTRODUCTION

1.1 Background of the Project

Cloth Company represents a dealer of Sam Pran Drying Company, which sells various kinds of fabric products. The product of Cloth Company are categorized in various types such as fancy, plain satin, polyester, etc. The company has found that the current manual system causes many problems especially on inventory information system. The products in stock often do not meet the customers specification. Sometime over-stock which raise the carrying cost consequently. It also takes times to update stock. The staff who are in charge of checking stock usually take time for manually checking the number of product daily. The information of each product is always inaccurate. Therefore the management cannot forecast sale and reorder point.

Since inventory information is the major concern of wholesaler company, and there is also a rapidly growing number of customers, Cloth Company has decided to develop an inventory information system that can solve the current problems and make the inventory operation run smoothly and efficiently. Moreover, he proposed system can provide better service to customers.

1.2 Objectives of the Project

The objectives of this project are as follows:

- (1) To analyze the existing inventory control system of Cloth Company
- (2) To present the problem of out-of-stock and over-stock and to give the solution to solve the problems.
- (3) To organize the necessary data into proper designed database for reducing paper works.

- (4) To design a computer-based information system to improve the company's operation by making daily operation quick and smooth.
- (5) To provide management with reliable and up-to-date report for helping management determine market trend and plan purchase schedule.
- (6) To minimize carrying cost by keeping the right quantity of each product at the right time.

1.3 Scope of the Project

The project scope is to analyze the information needed in current situation of inventory control system, design and develop of the core system program. And also include testing the system to map the business's requirement training end-users to inspect the information's accuracy.

The function of this system will support the organization, which includes the following:

- (1) Control the movement of inventory.
- (2) Calculate correct stock balance.
- (3) Update inventory information.
- (4) Generate reports to support management decision making.

The proposed inventory information system will not include any finance and accounting operations.

1.4 Deliverables

The deliveries for the proposed inventory information system are as follows:

- (1) Software package that is developed by MS Visual Basic 6.0.
- (2) Input and output screen layout for user interface.

(3) Various reports are as below:

- (a) Product list report.
- (b) Inventory reserve report.
- (c) Inventory reorder report.
- (d) Inventory receipt report.
- (e) Reserve receipt report.
- (f) Inventory issue report.
- (g) Inventory return report.
- (h) Inventory quality balance report.
- (i) Inventory cost report.
- (j) Minimum planning report.
- (k) Maximum planning report.

1.5 Project Plan

This project plan of Cloth Company : Inventory Information System is given in Figure 1.1.

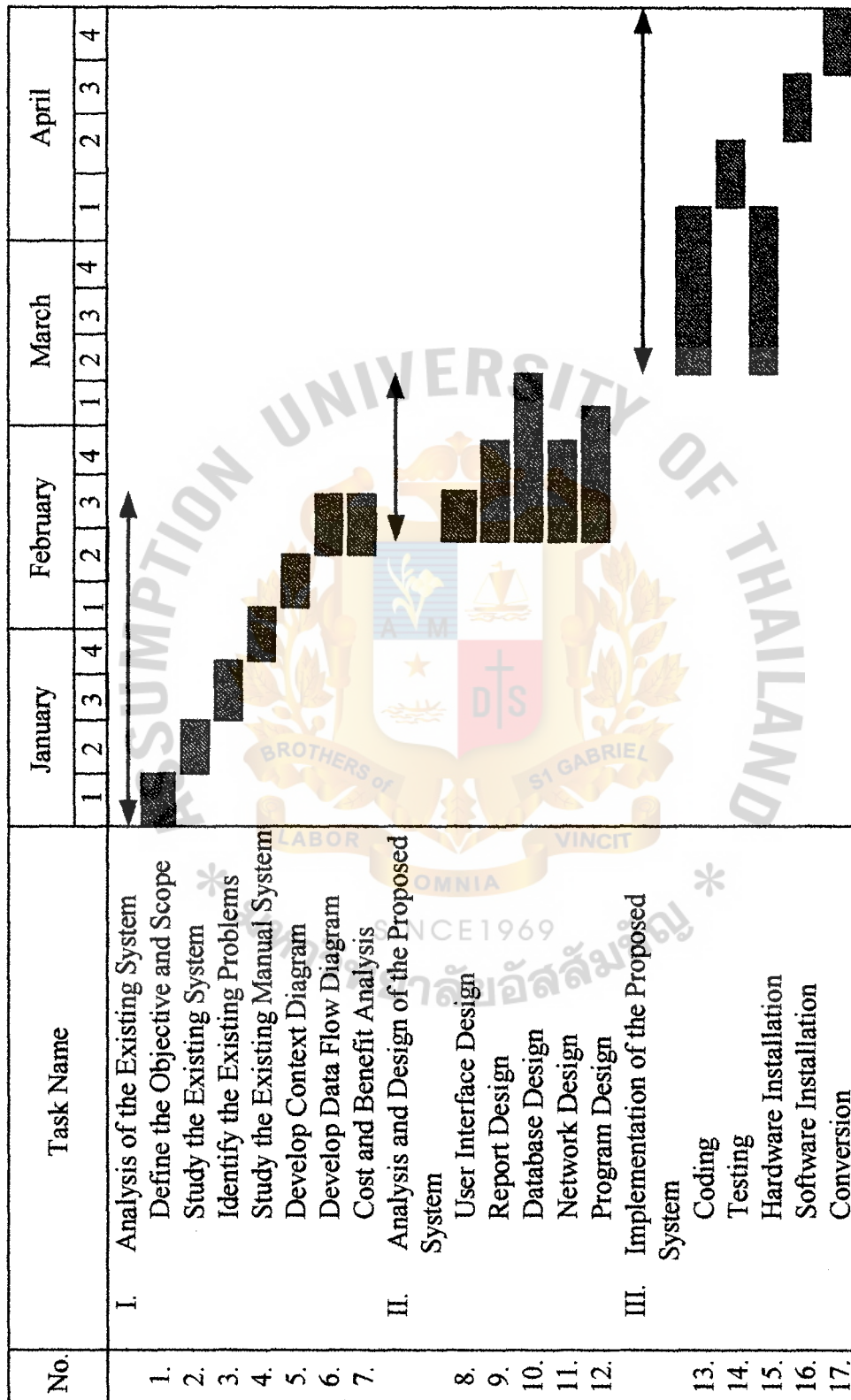


Figure 1.1. Project Plan of Inventory Information System.

II. EXISTING SYSTEM

2.1 Cloth Company

Cloth Company was established in the early 1990. Cloth Company is a wholesaler company which sells various kinds of fabric products.

Cloth Company represent a dealer of Sam Pran Drying Company, which has been in existence in Thailand's fabric market for over 30 years.

The product of Cloth Company are classified in 7 categories which are as follows:

- (1) Thai modern fancy fabric, size 44"
- (2) Thai traditional fancy fabric, size 44"
- (3) Plain satin fabric, size 60"
- (4) Plain satin fabric, size 44"
- (5) Plain polyester fabric, size 44"
- (6) Plain polyester fabric, size 48"
- (7) Plain polyester fabric, size 60"

2.1.1 Location

Cloth Company, the land stands on the area of 16 square meter and the building is located in 23 Vanit 1 Road, Sampeng, Pomprap District, Bangkok.

2.1.2 The Organization

There are four departments, that are sales & marketing department, purchasing department, finance & accounting department, inventory department.

The organization chart will be shown in Figure 2.1.

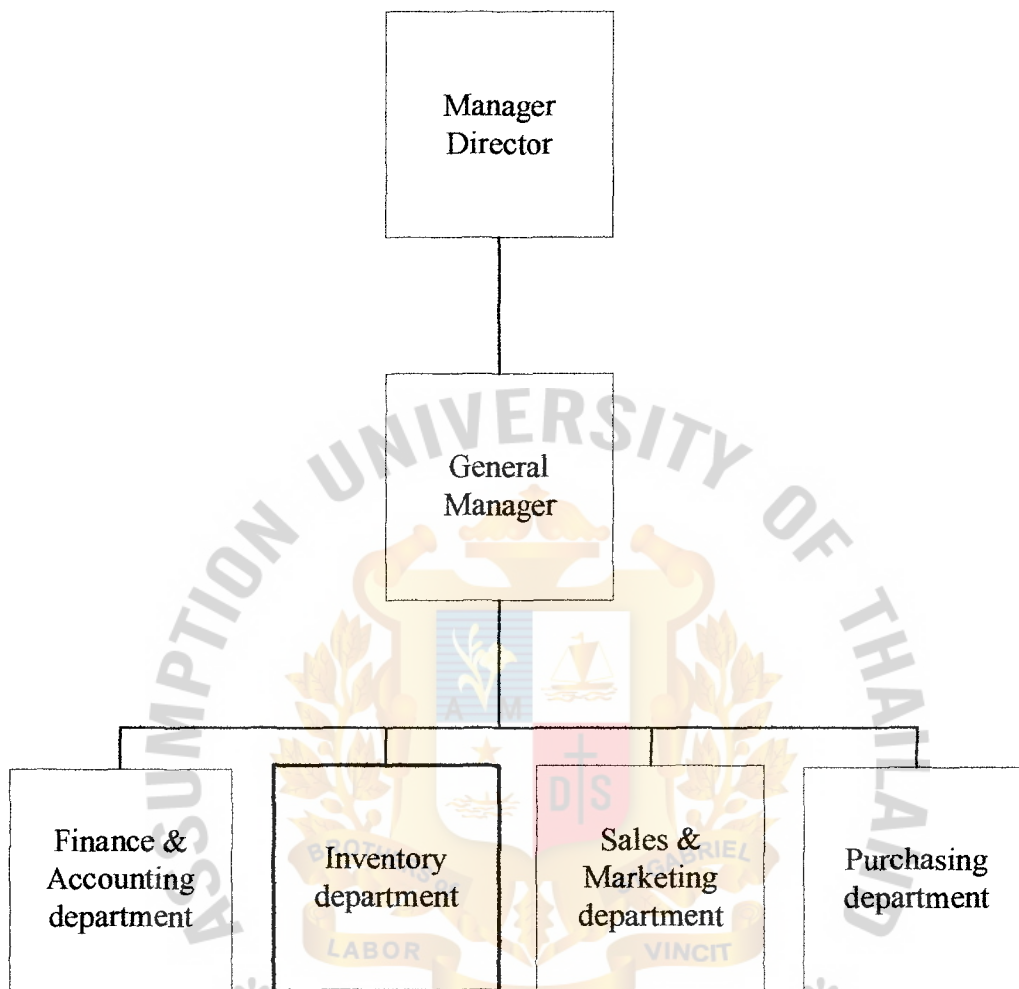


Figure 2.1. Organization Chart of the Cloth Company.

2.2 Current Problems and Areas for Improvement

2.2.1 Current Problems

The existing manual systems cause many problems that can be summarized as follows:

(1) Human Errors

Staff who are in charge of the inventory department take much time for checking availability of product after accepting orders from customers, preparing reordered product report for purchasing department and checking the remaining quantity of each products. Staff may forget to record received product from the supplier.

(2) Operation Errors

Some products may be over-stock due to the inability to estimate demand by management to order the suitable quantity of each item. The carrying cost of inventory is uncontrollable. Management cannot rely on the correctness of information.

2.2.2 Areas for Improvement

The improvement of the inventory information system will be done by using computer-based system. The organization can reduce not only human work but also human errors by using the new system. The new system also prepares all of the reports quickly and more reliably. Due to the correct information, management can forecast the budget and determine the market trend.

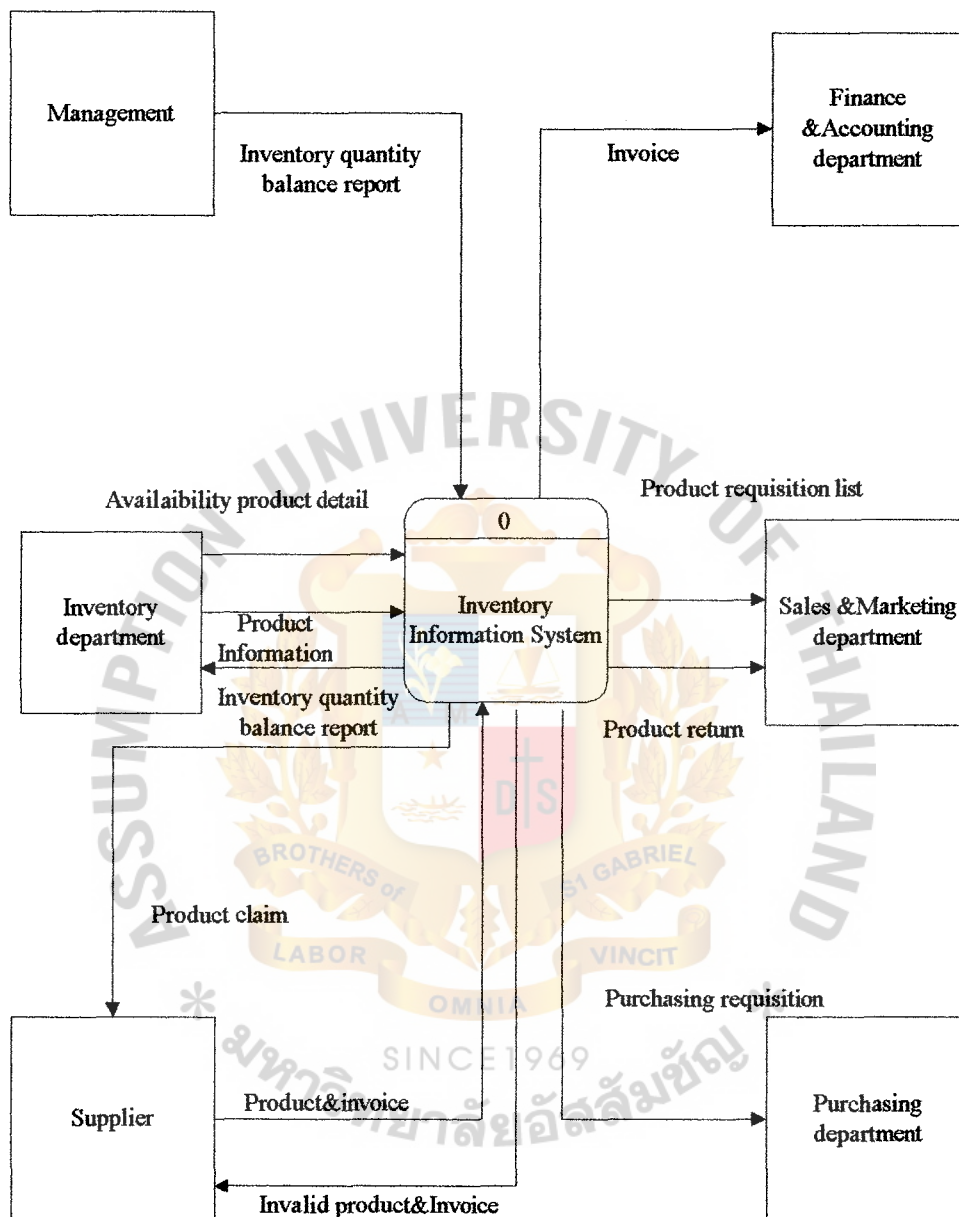


Figure 2.2. Context Diagram of the Existing System.

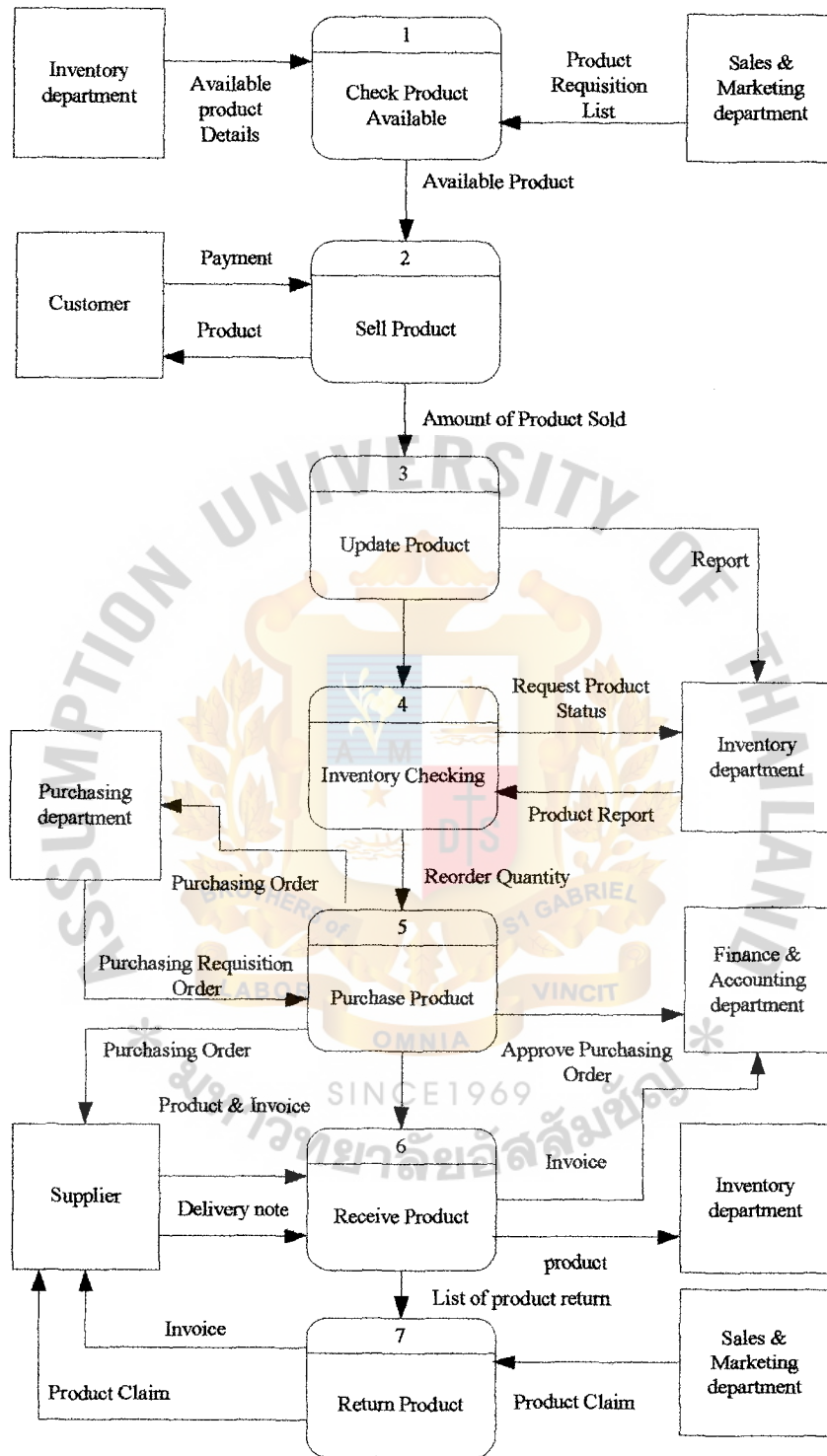


Figure 2.3. Data Flow Diagram Level 0 of the Existing System.

III. PROPOSED SYSTEM

3.1 System Specification

The user requirements for the proposed system can be summarized as follows:

- (1) Perform the right procedures properly.
- (2) Take less time for any routine tasks such as updating product quantity.
- (3) Provides an acceptance interface.
- (4) Presents information and instruction in an acceptable and effective fashion.
- (5) Easy to study and use by the users.
- (6) Produces reliable results.
- (7) Allows multiple users to access to the system at the same time.
- (8) To reduce staff's workload.

3.2 System Design

3.2.1 Proposed Functions

The functions of the proposed system can be summarized as follows:

Process 1: Check Availability

The check availability process will check first the request product details indicated in the product requisition list with the product master file to find out whether the products are available. If the product are not available or there are not enough quantity for requisition, the details of unavailable products will be recorded in a reserve transaction file and a product master file. So, the reorder process will be activated.

Process 2: Reorder

If the quantity of any products does not meet the requisition or there are some stocks out, this process will calculate the inventory turnover of those products and the quantity to order by reading the details from the product master file and reserve transaction file. The reorder quantity will be automatically saved in the product master file and reorder details will be saved in the reorder transaction file. The process will print a purchase requisition to the Purchasing department.

Process 3: Received Products

This process will receive product and invoice from the supplier as well as the reorder information from the reorder transaction file to compare the product quantity and details of the reorder with the invoice. If any of the products are invalid, they will reject and return to the supplier. If they are valid, the process will automatically check the product code in the stock. If the product is a new one, it will add as a new record in the product master file and receipt transaction file. If the product has the product code, the received product quantity is added in the product master file and the product details are recorded in the receipt. This process will check the reserved product to find out whether the received product is a reserved product. If so the inventory staff will send a reserved receipt report to the Sales & Marketing department to inform that the reserved product has been received in stock.

Process 4: Issue Products

If the products are available, this process will decrease the product quantity in the product master file and record the issue information in the issue transaction file.

Process 5: Returned Products

When there are products returned from the Sales & Marketing department, this process will receive the products returned together with the product return list and check the reason for product return. This process will keep the return transaction in the system and update the product and quantity in the product master file.

Process 6: Check Inventory

This process must be carried out for all products at least once a fiscal year. The actual count data are input and post any difference with the stock balance in the file.

Process 7: Reports

This process will read product information from the product master file and the issue transaction file to print reports for the Management, the Inventory department and the Finance & Accounting department for planning and forecasting.

The Context Diagram of the proposed system and Data Flow Diagrams for processes are represented in Appendix A. For Entity Relationship (ER Diagram) is represented in Appendix G.

3.2.2 Data Dictionary

Data Dictionary defines each data and procedure in Data Flow Diagram. Data Dictionary is represented in Appendix B.

3.2.3 Process Specification

Process Specification provides further description of element-level processes. Process Specification is represented in Appendix C.

3.2.4 User Interface Design

the User Interface Design are the design of the entire interface screens for the proposed system. User Interface Design is represented in Appendix D.

3.2.5 Output Report

The Output Report are the reports that are generated by the proposed system. Output Report is represented in Appendix E.

3.2.6 File Layout

The design of files includes decision about the nature and content of the files itself. It shows field name, type of field name, description, width of field name and default value for each field. File Layout is represented in Appendix F.

3.3 Hardware and Software Requirements

According to the proposed system, we designed the hardware and software specification based on the requirements and support the future trends. We have decided to use Microsoft Back Office suit as the major software for our proposed LAN system; therefore, the server must have specification, which can run both Microsoft Windows and the other software in the suit. The hardware & software specification for the proposed system are shown in the Tables 3.1 and 3.2 respectively.

Table 3.1. The Hardware Specification of the Server.

Hardware	Specification
CPU	Intell Pentium III 500 MHz
Cache	512 KB or higher
Memory	128 KB or higher
Hard Disk	8.3 GB or higher
CD-Rom Drive	40x or higher
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10 Base T
Display Adapter	SVGA card
Display	14" monitor
Printer	Ink Jet or Laser Printer
UPS	500VA

Table 3.2. The Software Specification for the Server.

Software	Specification
Network Operating System	Microsoft Windows NT Ver.4.0
Operating System	Microsoft Windows 2000
Database Server	Microsoft Access 2000

In the proposed system, the clients machine will have capacity only high enough to run database server. However, it should have specification higher than that to run any other application software such as microsoft Internet Explorer, Netscape Navigator, etc. The hardware & software specification for each client machine are shown in the Tables 3.3 and 3.4 respectively.

For power saver, we use UPS 500VA for 1 set at the server machine. The details of network peripheral are Ethernet Hub (12 ports), Ether Lan Card, UTP.

Table 3.3. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Intell Pentium III 500 MHz
Cache	512 KB or higher
Memory	128 KB or higher
Hard Disk	7 GB or higher
CD-Rom Drive	40x or higher
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10 Base T
Display Adapter	SVGA card
Display	14" monitor
Printer	Dot Matrix Printer(1 machine)

Table 3.4. The Software Specification for Each Client Machine.

Software	Specification
Network Operating System	Microsoft Windows NT Ver.4.0
Operating System	Microsoft Windows 2000
Database Server	Microsoft Access 2000

3.4 Security and Controls

3.4.1 User Access Control

The user's identifications and passwords are assigned only to authorized persons. When the users access into the system, the user will be asked for the user ID and password. Therefore, only the authorized users can access the system. The passwords of all users must be changed every four months.

The user ID and Password can determine the user's status. Some users, such as managers, will have an extra-authorization to perform the critical functions.

3.4.2 Data Access Control

The user's status according to their user IDs and passwords will limit their use of system. A few users who are assigned to be extra-authorized persons can access to the critical part of the system such as to change product codes, and modify prices of the products. Although the authorized users who are allowed to access into the system can update and modify data in the system, the structure of the file should not be allowed to be modified.

3.4.3 Physical Security

The computer will be kept in an air-conditioned room. Uninterruptible Power Supply (UPS) is used to supply power in case of failure of the main electricity supply.

3.4.4 Other Security

Staff have to back up the important information everyday. The back up should be kept separately in safe places.

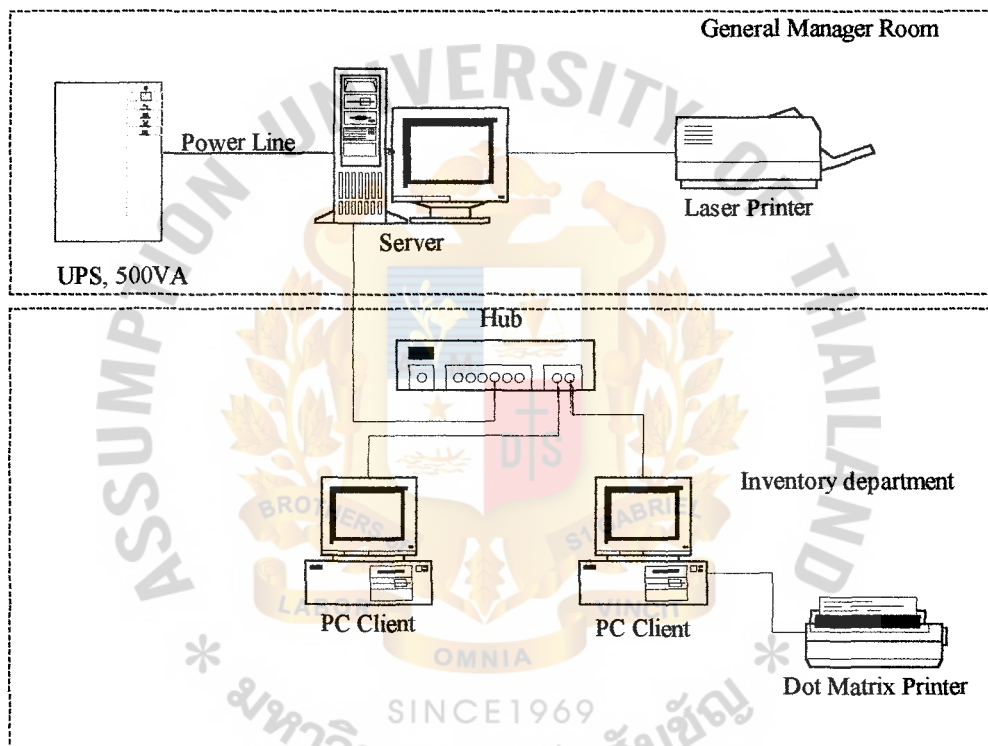


Figure 3.1. Network Configuration of the Proposed System.

3.5 System Cost Analysis

(1) Costs of Current System

Table 3.5. Current System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
<u>Operating Cost</u>					
<u>Staff:</u>					
Stock officer 2 persons@12,000	288,000	316,800	348,480	383,328	421,661
Receiving clerk 2 persons@7,500	180,000	198,000	217,800	239,580	263,538
Overtime Payment 100 Baht per hour * 50 hours per month * 12 months	60,000	66,000	72,600	79,860	87,846
<u>Office Supplies & Miscellaneous</u> <u>Cost:</u> (paper , etc.) 10% increasing per year	40,000	44,000	48,400	53,240	58,564
<u>Utility:</u> 10% increasing per year	15,000	16,500	18,150	19,965	21,961
Total Current System Cost	583,000	641,300	705,430	775,973	853,570

Table 3.6. Five Years Accumulated Current System Cost, Baht.

Year*	Total Current Cost	* Accumulated Cost
1	583,000	583,000
2	641,300	1,224,300
3	705,430	1,929,730
4	775,973	2,705,703
5	853,570	3,559,273
Total	3,559,273	-

(2) Costs of Proposed System

Table 3.7. Proposed System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
Fixed Cost					
<u>Hardware Cost:</u>					
Computer Server Cost	10,000	10,000	10,000	10,000	10,000
Workstation Cost	12,000	12,000	12,000	12,000	12,000
Laser Printer Cost	3,400	3,400	3,400	3,400	3,400
Dot Matrix Printer Cost	2,800	2,800	2,800	2,800	2,800
UPS, 500 VA	1,400	1,400	1,400	1,400	1,400
Network Peripheral Cost	2,000	2,000	2,000	2,000	2,000
Total Hardware Cost	31,600	31,600	31,600	31,600	31,600
<u>Software Cost:</u>					
Network Cost	4,000	4,000	4,000	4,000	4,000
Operation System Cost	4,000	4,000	4,000	4,000	4,000
Software Cost	3,000	3,000	3,000	3,000	3,000
Total Software Cost	11,000	11,000	11,000	11,000	11,000
<u>Implementation Cost</u>					
Software Development Cost	4,000	4,000	4,000	4,000	4,000
Training Cost	4,000	4,000	4,000	4,000	4,000
Total Implementation Cost	8,000	8,000	8,000	8,000	8,000
Total Fixed Cost	50,600	50,600	50,600	50,600	50,600
Operating Cost					
<u>Staff:</u>					
Stock officer 2 persons@12,000	288,000	316,800	348,480	383,328	421,661
Receiving clerk 1 person@7,500	90,000	99,000	108,900	119,790	131,769
10% increasing per year					
<u>Office Supplies & Miscellaneous Cost:</u>	30,000	33,000	36,300	39,930	43,923
(paper, etc.)					
10% increasing per year					
<u>Maintenance Cost:</u>	12,000	13,200	14,520	15,972	17,569
10% increasing per year					
<u>Utility:</u>	30,000	33,000	36,300	39,930	43,923
10% increasing per year					
Purchase Equipment	150,000				
Total Operation Cost	600,000	495,000	544,500	598,950	658,845
Total Proposed System Cost	650,600	545,600	595,100	649,550	709,445

Table 3.8. Five Years Accumulated Proposed Cost, Baht.

Year	Total Proposed Cost	Accumulated Cost
1	650,600	650,600
2	545,600	1,196,200
3	595,100	1,791,300
4	649,550	2,440,850
5	709,445	3,150,295
Total	3,150,295	-

- (3) The Comparison of the System Costs between Proposed System and Current System.

Table 3.9. The Comparison of the System Costs, Baht.

Year	Accumulated Current Cost	Accumulated Proposed Cost
1	583,000	500,600
2	1,224,300	1,196,200
3	1,929,730	1,791,300
4	2,705,703	2,440,850
5	3,559,273	3,150,295

(4) Benefits

Annual Tangible benefits (Baht) are estimated as follows:

1.	Reduce on inventory holding cost	300,000
2.	Profit on increased sales	160,000
3.	Reduction of over time expense	180,000
4.	Reduction of receiving clerk	90,000
5.	Reduction of stationary and equipment	25,000
6.	Reduction of fringe benefit	45,000
	Total	800,000

Intangible benefit are as follows:

1. Provide timely, accurate, up to date information, and fast access to information needed to support management decision making.
2. Provide better service to customer.
3. Smooth the operation flow of sales without interruption by the product shortage.
4. Improve customer satisfaction.
5. Provide user friendly system.

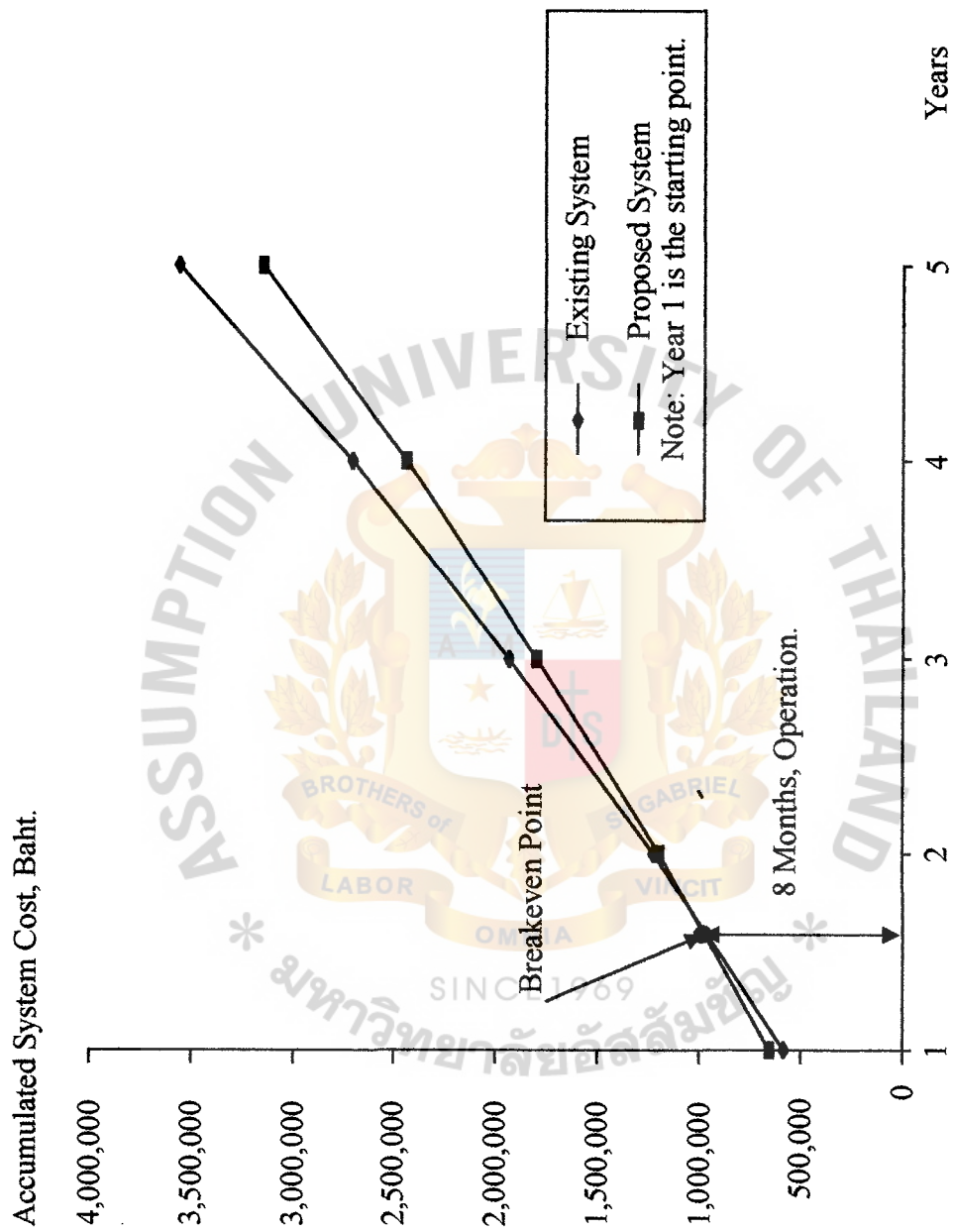


Figure 3.2. Cost Comparison between Existing & Proposed System.

Table 3.10. Payback analysis for Proposed System.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost:	253,000					
Operation & Maintenance cost		600,000	495,000	595,100	598,950	658,845
Discount factor for 12%	1	0.89	0.80	0.71	0.64	0.57
Time adjusted cost (adjusted to present value)	253,000	534,000	396,000	422,521	383,328	375,542
Cumulative time adjusted costs over lifetime:	253,000	787,000	1,183,000	1,605,521	1,988,849	2,364,391
Benefit derived from operation of new system	0.00	800,000	900,000	1,000,000	1,100,000	1,200,000
Discount factor for 12%	1	0.89	0.80	0.71	0.64	0.57
Time adjusted cost (adjusted to present value)	0.00	712,000	720,000	710,000	704,000	684,000
Cumulative time adjusted costs over lifetime:	0.00	712,000	1,432,000	2,142,000	2,846,000	3,530,000
Cumulative lifetime time- adjusted cost- benefits:	-253,000	75,000	795,000	1,505,000	2,209,000	2,893,000

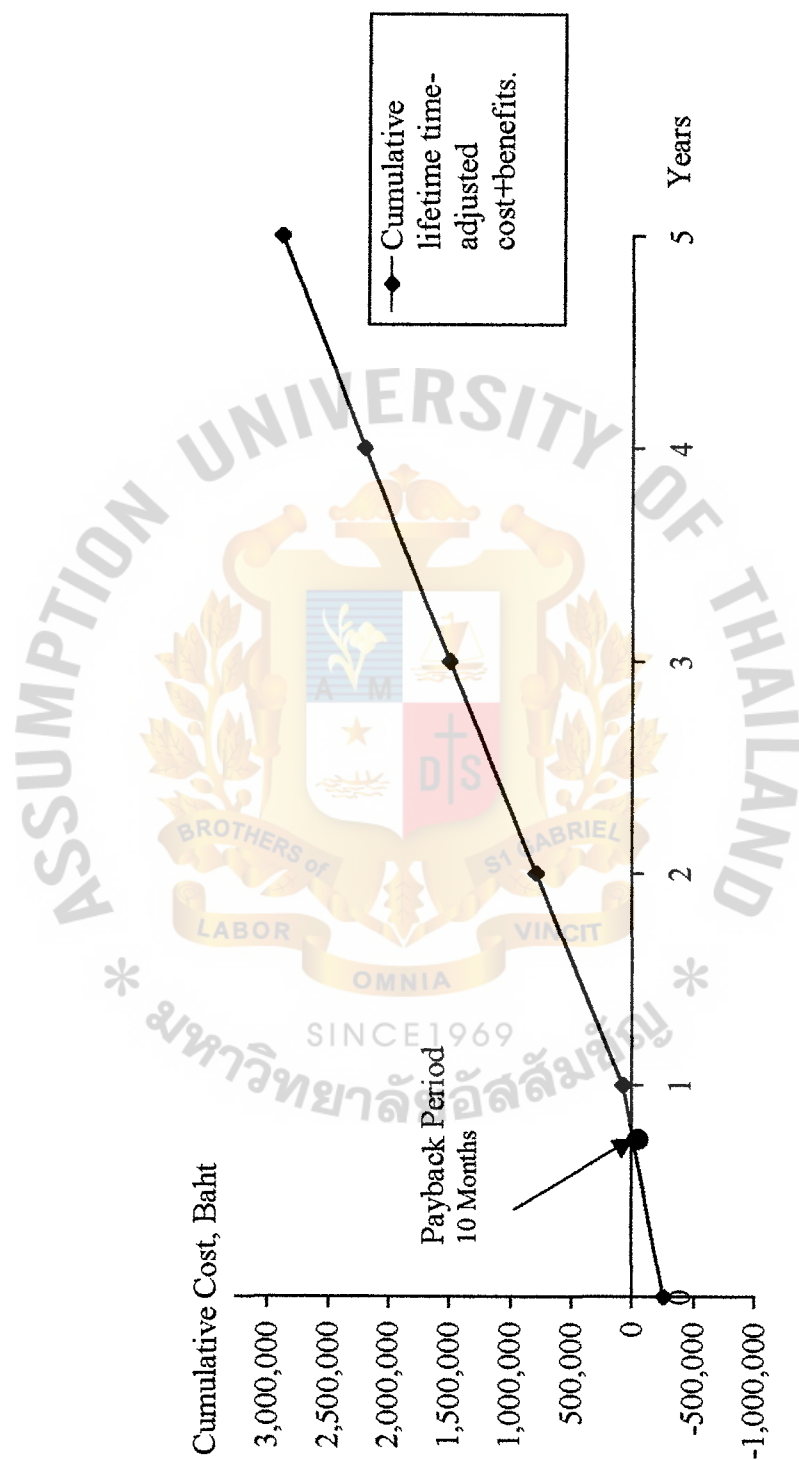


Figure 3.3. Payback analysis for Proposed System.

3.6 Economic Order Quantity (EOQ) Model

The best know and most fundamental inventory decision model is the economic order quantity (EOQ) model. This model is applicable when the entire quantity ordered arrive in the inventory at one point in time and when the demand for the item has a constant, or nearly constant, rate. The constant demand rate condition simply means that the same number of units are taken from inventory each period of time, such as 5 units every day, 25 units every week, and so on.

Let us see how EOQ model can be applied by company. Warehouse manager has conducted a preliminary analysis of overall inventory costs and decided to do a detailed study of one product for the purpose of establishing the how-much-to-order and when-to-order decision rules that will result in the lowest possible inventory cost for the product. The manager has selected product for this study.

In meeting with manager found that the purchaser tended to order large quantity ahead of time and always maintain a sizable inventory so that the company would never experience a shortage. Actually no attention was being given to the costs associated with placing purchase orders or holding the inventory. Records showed that over the past year the purchaser has placed 13 orders of 8000 cases each (ordering about every 4 weeks) with a purchase price of Bht 55 per case.

The historical demand data for company in 10 weeks are total cases are 2840 and average cases per week are 284 cases.

The how-much-to-order decision involved selecting an order quantity that draws a compromise between (1) keeping small inventories and ordering frequently and (2) keeping large inventories and order infrequently. The first alternative would probably result in undesirably high ordering costs, while the second alternative would probably

result in undesirably high inventory holding costs. In order to find an optimal compromise between these conflicting alternatives, let us develop a mathematical model that will show the total cost as the sum of the inventory holding cost and the ordering cost.

Inventory holding or inventory carrying costs are costs that are dependent upon the size of the inventory; that is, large inventories require large inventory holding costs. Since company estimated its annual inventory holding cost to be 25% of the value of its inventory and since the cost of one cases is Bht 55, the cost of holding or carrying one case i inventory for 1 year is $.25(55) = \text{Bht } 13.75$. Note that defining the inventory holding cost as a percentage of value of the product is convenient because it is easily transferable to other products.

The next step in our inventory analysis is to determine the cost of placing an order, or the ordering cost. For the largest portion of this cost involves the salaries of the purchasers. An analysis of purchasing process showed that a purchaser spends approximately 45 minutes preparing and processing an order. This amount of time is required regardless of the number of cases ordered. With a wage rate and fringe benefit cost for purchasers of Bht 16 per hour, the labor portion of the ordering cost is Bht 12. Making allowance for paper, storage, telephone, transportation, and receiving cost at Bht8 per order, the manager estimated that the cost of ordering was Bht 20 per order. That is, company is paying Bht 20 per order regardless of the quantity requested in the order.

The inventory holding cost, the order cost, and the demand information are the three data items that must prepared prior to the user of any EOQ model. Since these data have now been developed for the company example, let us see how they are used

to develop a total cost model. We shall begin by defining the symbol Q to be the size of the order quantity. Thus the how-much-to-order decision involved trying to find that value of Q that will minimize the sum of inventory holding and ordering costs.

The inventory level for company will have a maximum value of Q units when the order of size Q is received from the manufacturer. Company will then supply its customers from inventory until the inventory is deficit, at which time another shipments of Q units will be received. With the assumption of a constant demand rate 284 units per week or, assuming company is open five days each week, 57 units per day, the sketch of the inventory level for company is shown in Figure H.1.

Note that the sketch indicates that the average inventory level for the period in question is $1/2 Q$. This should appear reasonable to you since the maximum inventory level is Q , the minimum is 0, and the inventory level declines at a constant rate over the period.

Figure 3.4 shows the inventory pattern during one order cycle of length T . As time goes on, this pattern will repeat. The complete inventory pattern is shown in Figure 3.5. If the average inventory during each cycle is $1/2 Q$, the average inventory level over any number of order cycles is also $1/2 Q$. Thus, as long as time period involved contains an integral number of order cycles, the average inventory for the period will be $1/2 Q$.

The inventory holding cost can be calculated using the average inventory level. That is, we can calculate the inventory holding cost by multiplying the average inventory by the cost of carrying one unit in inventory for the stated period. The period of time selected for the model is up to you; it could be 1 week, 1 month, 1 year, or more. However, since the inventory carrying costs for many industries and businesses

are often expressed as an annual percentage or rate, you will probably find most inventory models developed on an annual cost basis.

Let

I = annual inventory carrying charge (25% for company)

C = unit cost of the inventory item (Bht 5 for one unit)

The cost of storing or holding one unit in inventory for the year, denoted by Ch is given by $Ch = IC$, which for company is $.25(5) = \text{Bht } 13.75$. Thus the general equation for annual inventory holding cost is as follows:

$$\begin{aligned}\text{Annual inventory holding cost} &= (\text{annual inventory})(\text{annual holding cost per unit}) \\ &= \frac{1}{2} QCh\end{aligned}$$

To complete our total cost model; we must now include the ordering cost. Our goal is to express this cost in term of the order quantity Q . Since the inventory holding cost was expressed as an annual cost; we need to express ordering costs on an annual basis. The first question is how many orders will be placed during the year? Let D denote the annual demand for the product [for company, $D = (52 \text{ weeks}) (284 \text{ per weeks}) = 25,000$]. We know that by ordering Q units each time we order we will have to place D/Q orders. For example, if $Q = 13,000$, we would need to order only twice a year to satisfy demand for company. If Co is the cost of placing one order (Bht 20), the general equation for the annual ordering cost is as follows:

$$\begin{aligned}\text{Annual ordering cost} &= (\text{Number of orders per year}) (\text{cost per order}) \\ &= (D/Q)Co\end{aligned}$$

Thus the total annual cost - inventory holding cost plus ordering cost - can be expressed as follows:

$$TC = \frac{1}{2} QCh + D/QCo$$

Using the data, the total cost model becomes

$$\begin{aligned} TC &= 1/2 Q (\text{Bht } 13.75) + 25,000/Q (\text{Bht } 20) \\ &= 6.875Q + 5,000,000/Q \end{aligned}$$

The development of the above total cost model has gone a long way toward helping solve the inventory problem. We now are able to express the total annual cost as a function of one of the decision, how much should be ordered. The development of a realistic total cost model is perhaps the most important part of applying quantitative techniques to inventory decision making. Equation is the general total cost equation for inventory situations in which the assumption of the economic order quantity model is valid.

The How-much-to-order-decision

The next step is to find the order quantity Q that does in fact minimize the total cost as stated in equation. Using a trail and error approach we can compute the total cost for several possible order quantities.

As a starting point, let us use the current purchase policy for company, which is $Q = 8000$. The total annual cost is:

$$TC = 6.875(600) + 5,000,000/600 = \text{Bht } 4958$$

A trial with an order quantity of 5000 gives:

$$TC = 6.875(500) + 5,000,000/500 = \text{Bht } 4438$$

The result of several other trial order quantities are shown in Table H.2. As can be seen, the lowest cost solution is around 270 units. Graphic of the inventory holding ordering and total cost are shown in Figure 3.6.

The advantage of the trial-and-error approach is that it is rather easy to do and provides the total cost for number of possible order quantity decisions. Also, we can

see that approximately 270 units appear to be the minimum cost order quantity. The disadvantage of this approach, however, is that it does not provide the exact minimum cost order quantity.

Refer to Figure H.3. You can see that the minimum total cost order quantity is an order size of Q^* . By using differential calculus it can be shown that the value of Q^* which minimizes the total cost is given by the formula.

$$Q^* = \sqrt{\frac{2DC_o}{Ch}}$$

This formula is well known by management scientists and is referred to as the economic order quantity (EOQ) formula.

For company the minimum total cost order quantity is:

$$Q^* = \sqrt{\frac{2(25,000)20}{13.75}} = 270$$

Use of an order quantity of 270 in equation shows that the minimum cost inventory policy for company result in a total cost of Bht 3708. Note that this inventory decision-that is, $Q^* = 270$ -result in a Bht 4959-3708 =, or 25% cost reduction from the current purchase policy of $Q = 600$.

Also, you might note that this value of Q^* has balanced the inventory holding and ordering costs. Check for you to see that these costs are equal.

The when-to-buy decision

Now that we know how much to order, we want to answer the second question of when to order. The when-to-order decision is most often expressed in terms of a reorder point-the inventory level at which a new order should be placed.

The manufacturer of company guarantees a 2-day delivery on any order placed by company. Hence, assuming a demand rate of $25,000/250 = 100$ cases per working day. Thus, we expected $(2 \text{ days}) (100 \text{ cases/day}) = 200$ cases to be sold during the 2 days it take a new order. In inventory terminology, the 2-day delivery period is referred to as the lead time for a new order, and 200 cases of demand anticipated during this period is referred to as the lead time demand. Thus company should order a new shipment of product from manufacturer when the inventory on hand reaches a level of 200 cases. For inventory system using the constant demand rate assumption and fixed lead-time, the reorder point is the same as the lead-time demand. The general expression for the reorder point is given as follows:

$$r = dm$$

where

r = reorder point

d = demand per day

m = lead time for a new order in days

The question of how frequently the order will be placed can now be answered. This period between orders is referred to as the cycle time. Previously [see equation]. We defined D/Q as the number of orders that will be placed in a year. Thus $D/Q^* = 25,000/270 = 93$ is the number of orders will place each year. If we place 93 orders over 250 working days, we will order every $250/93 = 2.68$ working days. Thus the cycle time is computed to be approximately 3 working days. The general expression for the cycle time of T days with 250 working days per year is given by

$$T = \frac{250}{D/Q^*} = \frac{250Q^*}{D}$$

As we have shown throughout the text, microcomputer packages of quantitative models can be employed to perform the computation and analysis for the user. The software package Microcomputer Model for Management Decision Making by T. L. Dennis and L. B. Dennis was used to obtain the result.

For our company we will show that we calculate Optimum Quantity for 3 examples. We show the equation and find the answer for it. Table will have much abbreviation. It is:

1. Stand for Thai modern fancy fabric, size 44"
2. Stand for Thai traditional fancy fabric, size 44"
3. Stand for Plain satin fabric, size 60"

Q* Stand for Optimum Quantity

TC Stand for Total cost which come from holding cost and ordering cost

D Stand for Demand per year

Ch Stand for Holding cost

Co Stand for Ordering cost

For product 1, $TC = 6.875Q + 5,000,000/Q$

For product 2, $TC = 6.25Q + 2,000,000/Q$

For product 3, $TC = 8.75Q + 3,000,000/Q$

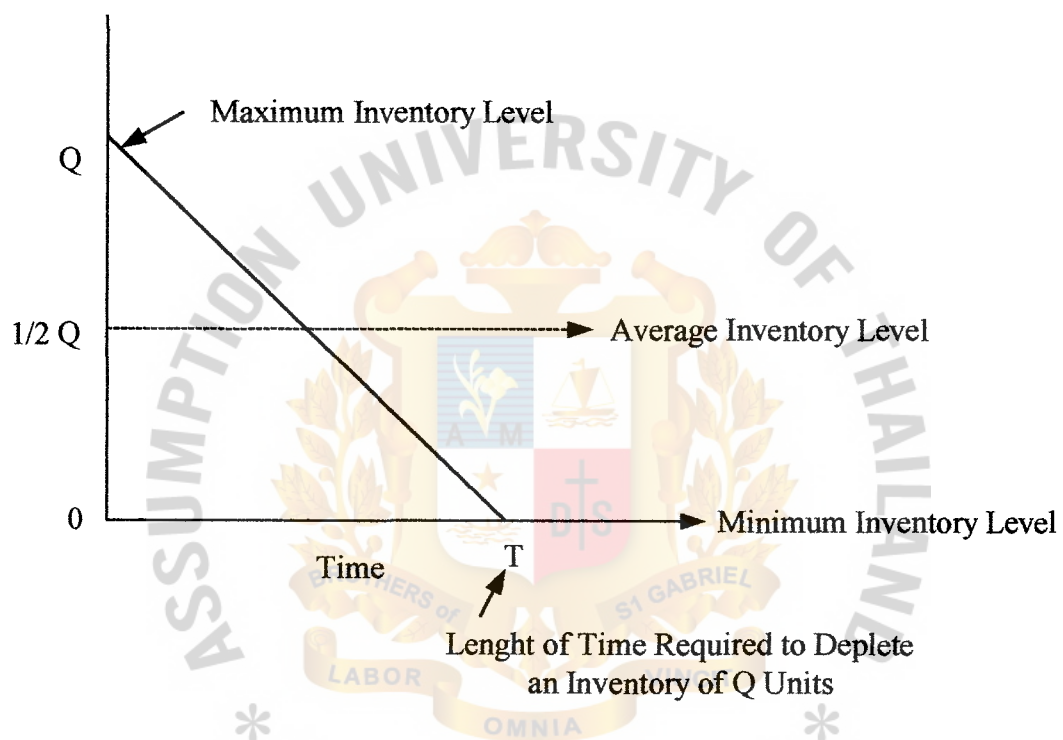


Figure 3.4. Sketch of the Inventory Level.

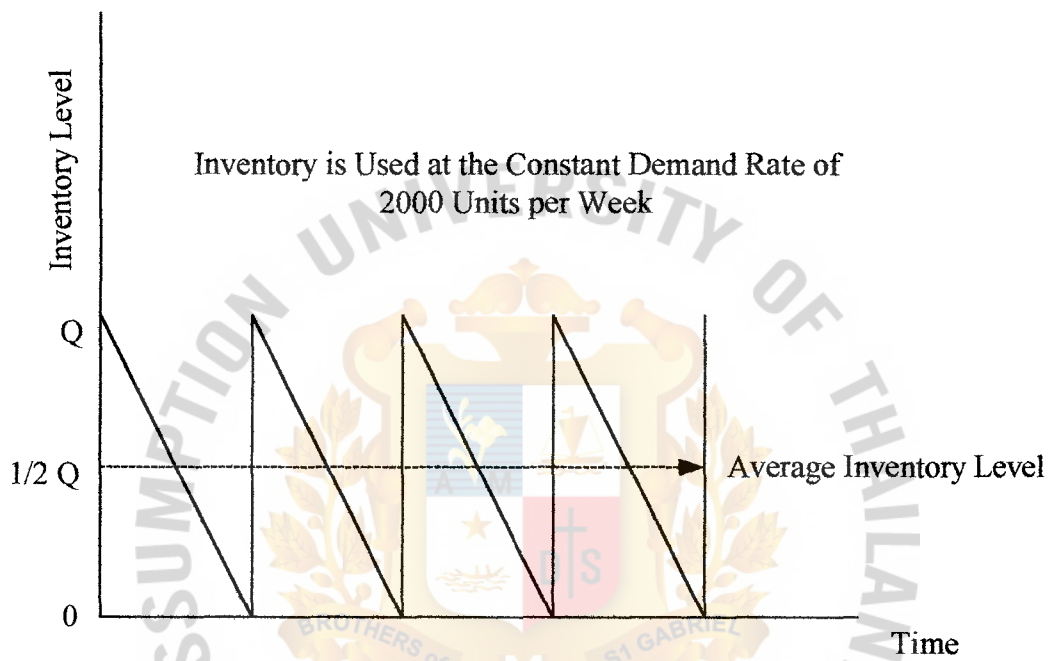


Figure 3.5. Inventory Pattern for the EOQ Inventory Decision Model.

Table 3.11. Important Value for EOQ Equation.

Product	Q*	TC	D	Ch	Co
1.	270	3,708	25,000	13.75	20
2.	566	7,072	100,000	12.50	20
3.	586	10,247	150,000	17.50	20

Table 3.12. Inventory Holding and Ordering Cost for Various Orders Quantities of Product 1.

Order Quantity Unit	Annual Inventory Holding Cost	Annual Inventory Ordering Cost	Total Cost
100	688	5,000	5,688
200	1,375	2,500	3,875
270	1,856	1,852	3,708
300	2,063	1,667	3,730
400	2,750	1,250	4,000
500	3,438	1,000	4,438
600	4,125	833	4,958

Table 3.13. Inventory Holding and Ordering Cost for Various Orders Quantities of Product 2.

Order Quantity Unit	Annual Inventory Holding Cost	Annual Inventory Ordering Cost	Total Cost
300	1,875	6,667	8,542
400	2,500	5,000	7,500
500	3,125	4,000	7,125
566	3,538	3,533	7,071
600	3,750	3,334	7,084
700	4,375	2,875	7,232
800	5,000	2,500	7,500

Table 3.14. Inventory Holding and Ordering Cost for Various Orders Quantities of Product 3.

Order Quantity Unit	Annual Inventory Holding Cost	Annual Inventory Ordering Cost	Total Cost
300	2,625	10,000	12,625
400	3,500	7,500	11,000
500	4,375	6,000	10,375
586	5,127	5,120	10,247
600	5,250	5,000	10,250
700	6,125	4,286	10,411
800	7,000	3,750	10,750

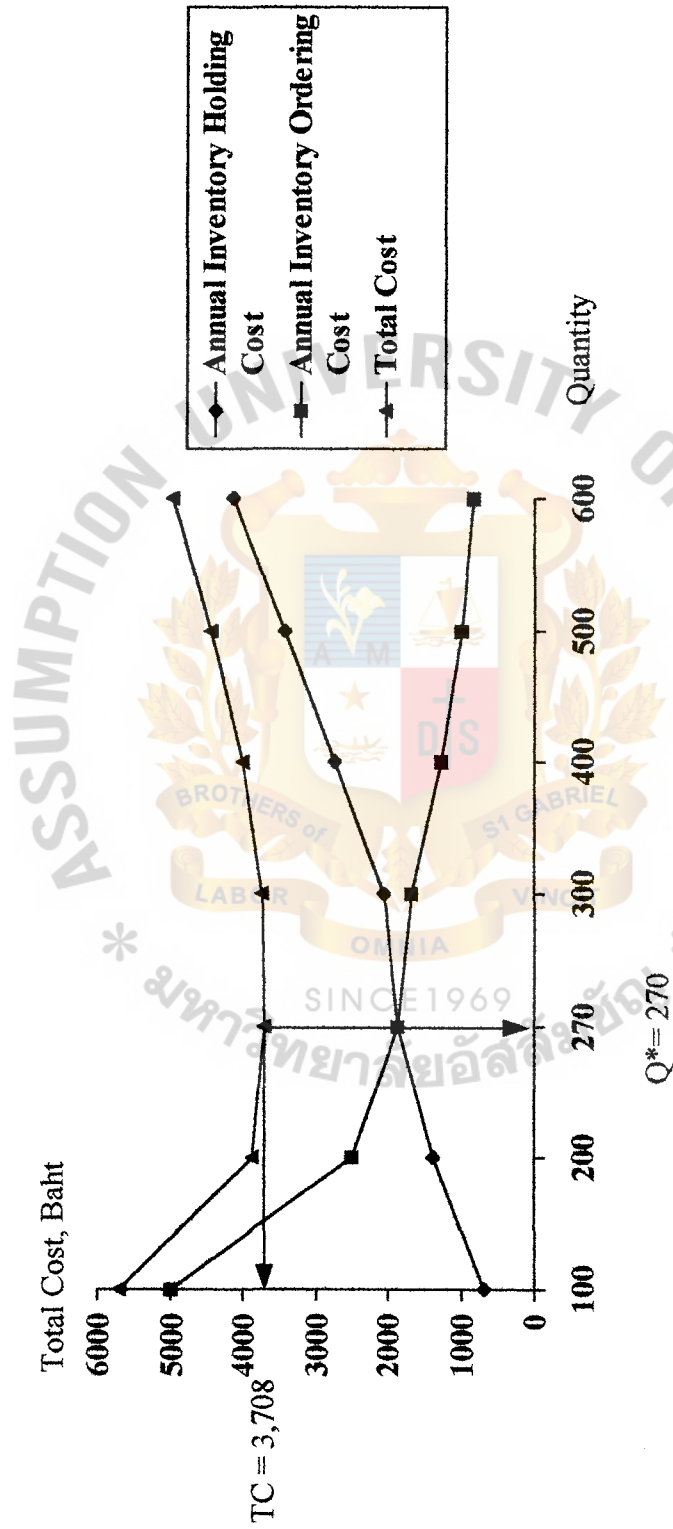


Figure 3.6. Economic Order Quantity of Product 1.

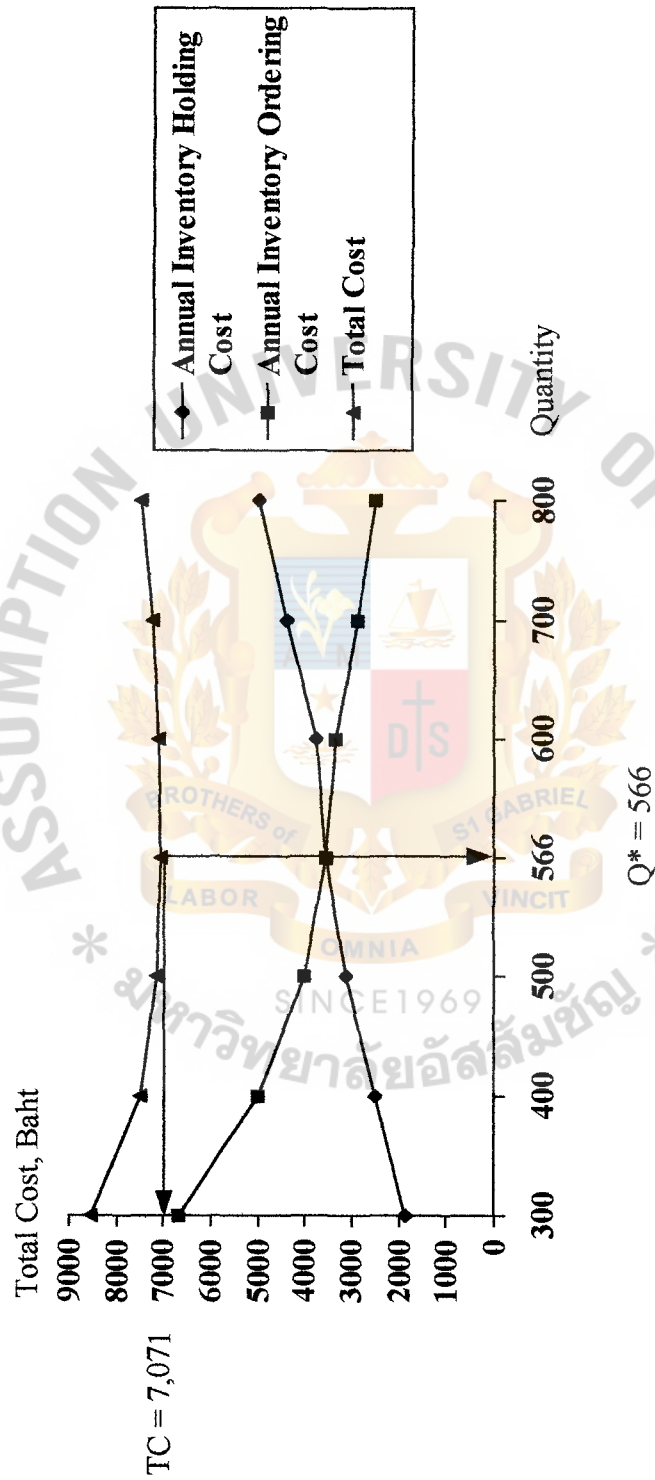


Figure 3.7. Economic Order Quantity of Product 2.

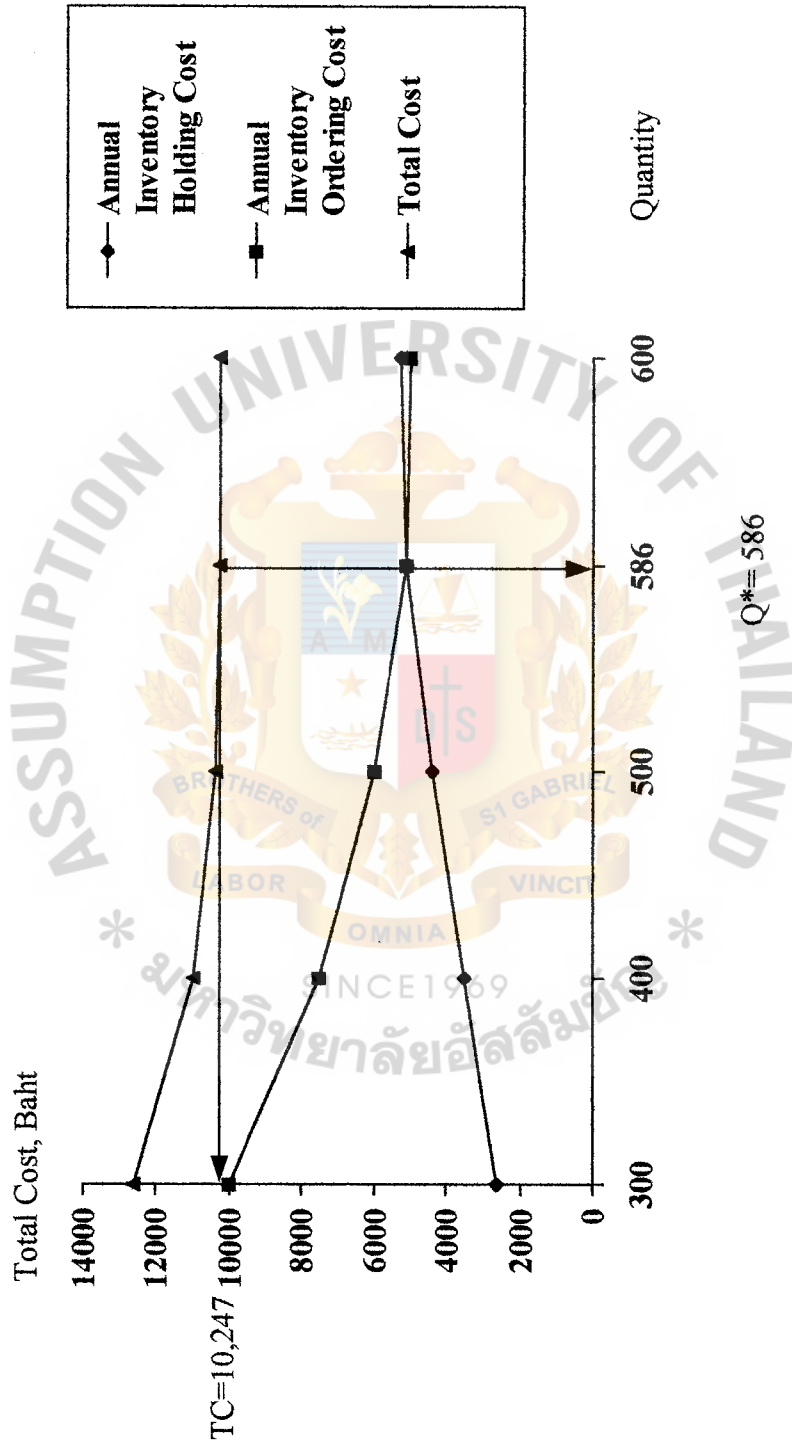


Figure 3.8. Economic Order Quantity of Product 3.

IV. PROJECT IMPLEMENTATION

System Implementation

Based on System Development Life Cycle, we begin to analyze the requirement in analyze phase. In design phase, we developed distributed data and process model and design specification to implement in system.

The action begins in construction and implementation phase. The construction phase consists of 4 tasks: build and test network, build and test database, install and test new software packages, write and test new programme. System Implementation is to implement all the design realistically. The purpose of implement phase is to smoothly convert from the old system to the new system. The program that supports the work flow are created. All screens, such as input/output screens, database and various kinds of reports are generated to support the designed work flow. After that, the program will be tested and then trained to the user of the system when the test is accepted. The activities of implement phase are:

- (1) Conducting a system test
- (2) Preparing a system conversion plan
- (3) Installing database
- (4) Training system users
- (5) Converting from the old system to the new system

4.1 Testing

Testing is done for checking the correctness of the new system and meet the requirement of user before the system is actually used.

(a) Program Testing

The Programmer must create both valid and invalid test data and test all possible cases. Created data test should test both the minimum and the maximum values possible.

(b) Creating Data Test

The programmer probably created some test data for testing the program, but now the test data must be created for all the possible real-life situations.

(c) Linking Test

After finishing the individual testing programs, they must go through the linking test. The linking test will check to make sure that interdependent programs can work together as planned.

(d) User Acceptance Test

Users have to make their own data to test whether the system meets their requirements.

(e) Operation Acceptance Test

To ensure that the proposed system has functions in the production environment without adversely affecting the existing systems.

(f) System Test

The entire system is run. The objective of this testing is to verify that programme go along with the original programing specifications and make sure that the entire system functions as a whole, when all the programs are interconnected.

(g) **Backup and Restart Testing**

The basic goals are to make sure that the programs are backed up in case they are destroyed and that the systems can be restarted in case of disaster.

4.2 Prepare a System Conversion Plan

Plan type of conversion strategic and when to start the conversion. It is shown in project plan.

4.3 Installing Database

In this project, we set the parallel conversion which gives us to use the new system together with the current system. We install the real database to the new system. After a period of time, we develop and correct the new system until satisfied.

4.4 Training System Users

To teach how to use the new system, we conduct 2 classes. First, the training for the manager, one to one. Next, the classes for the staff. The class is conducted for all staffs. The training consists of how to work with computer and the solution on screen problem. We give the user books and telephone number for after sales service.

4.5 Conversion

Parallel Conversion is recommended for this system. The parallel changeover method allows both the existing systems and the new systems to operate simultaneously until the new system has proven its reliability. This method is appropriate when replacing the manual system with the computerized system because parallel conversion is used to ensure that all the major problems in the new system have been solved before the old system is discarded.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Cloth Company is a wholesaler company which sells various kinds of fabric materials. Cloth Company still uses a manual system to manage and control the inventory system and found out that the current manual system causes many problems. The current problems of the existing manual system arise because the large amount of product types, product quantities and transactions are done manually. The reports are not accurate due to improper collection of information.

In order to solve the existing problems, the new computerized system has been introduced. First, the proposed system saves 528,609 Baht in 5 years. And, the payback period is only 10 months. Second, the cost of proposed system is compared to the current system to determine the breakeven point. It is only 8 months, means when the old system's cost equal to the new system's cost.

On the other sides, the proposed system can solve the problem of management, information technology, organization, information, and business solution.

For information technology, we use LAN and Microsoft Access 2000 for managing the documents and informations in the system.

For organization, the proposed system saves the cost of over time, human labor, stationary and equipment, fringe benefit. The total amount is 800,000 Baht. Proposed system will give the up-to-date information or report for the manager to support their decision making, forecasting budgeting, and improve management control.

For information, it helps to reduce the errors in documentations, and the duplicated work processes

For business solution, proposed system provides quick and efficient service to customer, or we can say achieving customer satisfaction.

For management, proposed system reduces work processing time and improves the efficiency of the operation. It is shown in Table 5.1. The time performance on each process of the proposed system is compared with the existing system. It is shown that each process of the proposed system performed in less time than each process of the existing system which has to operate many work steps in the manual system. So, we can conclude that the proposed system is more efficient and effective than the existing system.

Table 5.1. The Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
Check Product Available	20 mins.	10 mins.
Sell Product	30 mins.	20 mins.
Update Product	45 mins.	30 mins.
Inventory Checking	3 days	1 day
Purchase Product	30 mins.	20 mins.
Receive Product	1-7 days	1-7 days
Return Product	2 days	1 day
Total	6-12 days 2 hrs. 5 mins.	3-9 days 1 hr. 20 mins.

Proposed system uses less time than Existing system in most steps, we use computerized system to store the up-to-date information. The user can view it faster and more have accurate information such as Check Product Available in the Existing system which uses 20 mins. but Proposed system uses only 10 mins. The user views the amount from the monitor not from the account. We can say that it saves 50% of total time

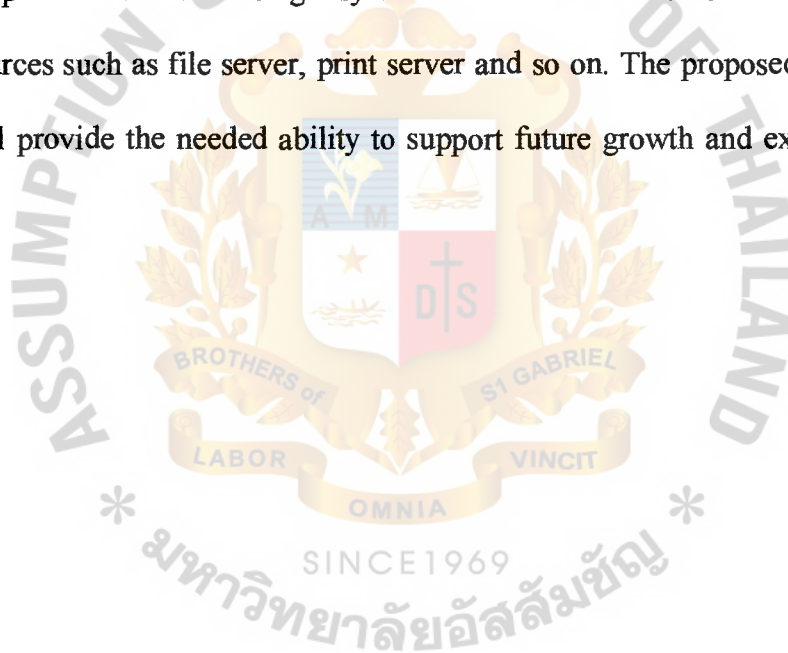
Saving time is begins from the first step, Checking Product Available apply the computer instead of manual system. It saves 10 minutes for this step. Second step is Sell Product. This step use computer to show the picture of good's details instead of bring the category to show the customer. It keep the customer interest and help the salesman to close sales easily. This step keep 10 minutes faster than the old system. Third, Update Product get the faster speed 15 minutes because officer update the information by computer system. It help the officer comfortable and accurate information. Next, Inventory Checking is speed up from 3 days to 1 day only. The officers only compare the amount list which print from computer, not from the book which are difficute to read or not update. Time preparing for this step is faster.

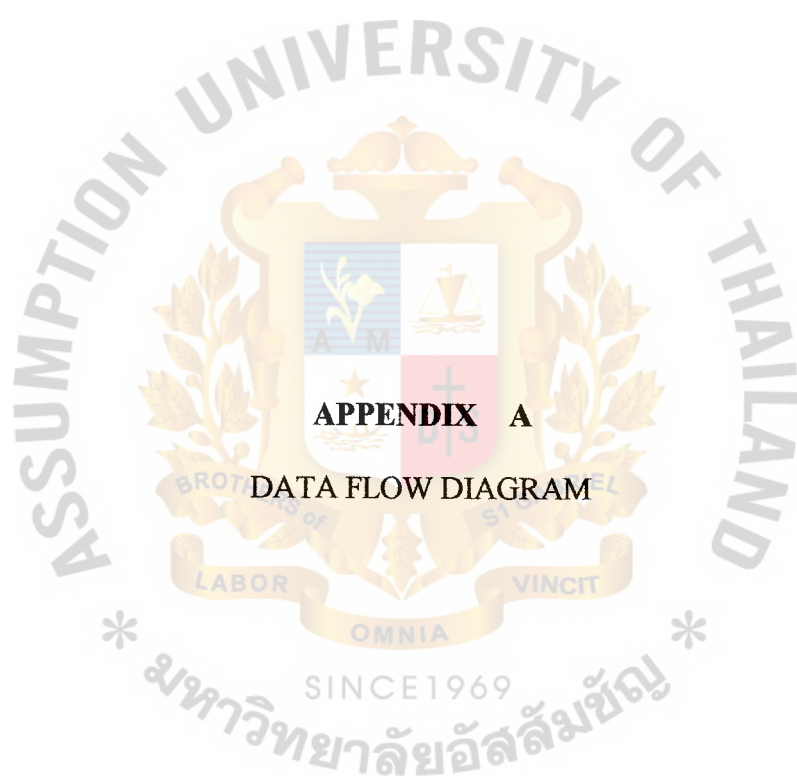
Purchasing Product decrease time of working from 30 minutes to 20 minutes because the computer information is available no need to check from other table. The officer can less time for check what to buy. Receiving Product still use same lenght of time. Return Product use less time from 2 days to 1 day because the computer will show what good to return. The officer can return it to supplier quickly.

From all steps, it could save 3 days 1 hr. 15 mins. from the proposed system. It can say that 50% faster than the current system.

5.2 Recommendations

After having operated according to the system stated in this project, the use of the computerized system in inventory information is recommended. The company should introduce the use of the computerized system in keeping and processing data to other departments. Each department can be developed individually and intergrated as soon as possible by connection through LAN (Local Area Network). When the other departments in the company install computers and implement the computerized system, the company will be able to control all the data flow within the company itself as a single unit performed under a single system. Information can be shared as well as any other resources such as file server, print server and so on. The proposed computerized system will provide the needed ability to support future growth and expansion of the company.





APPENDIX A

DATA FLOW DIAGRAM

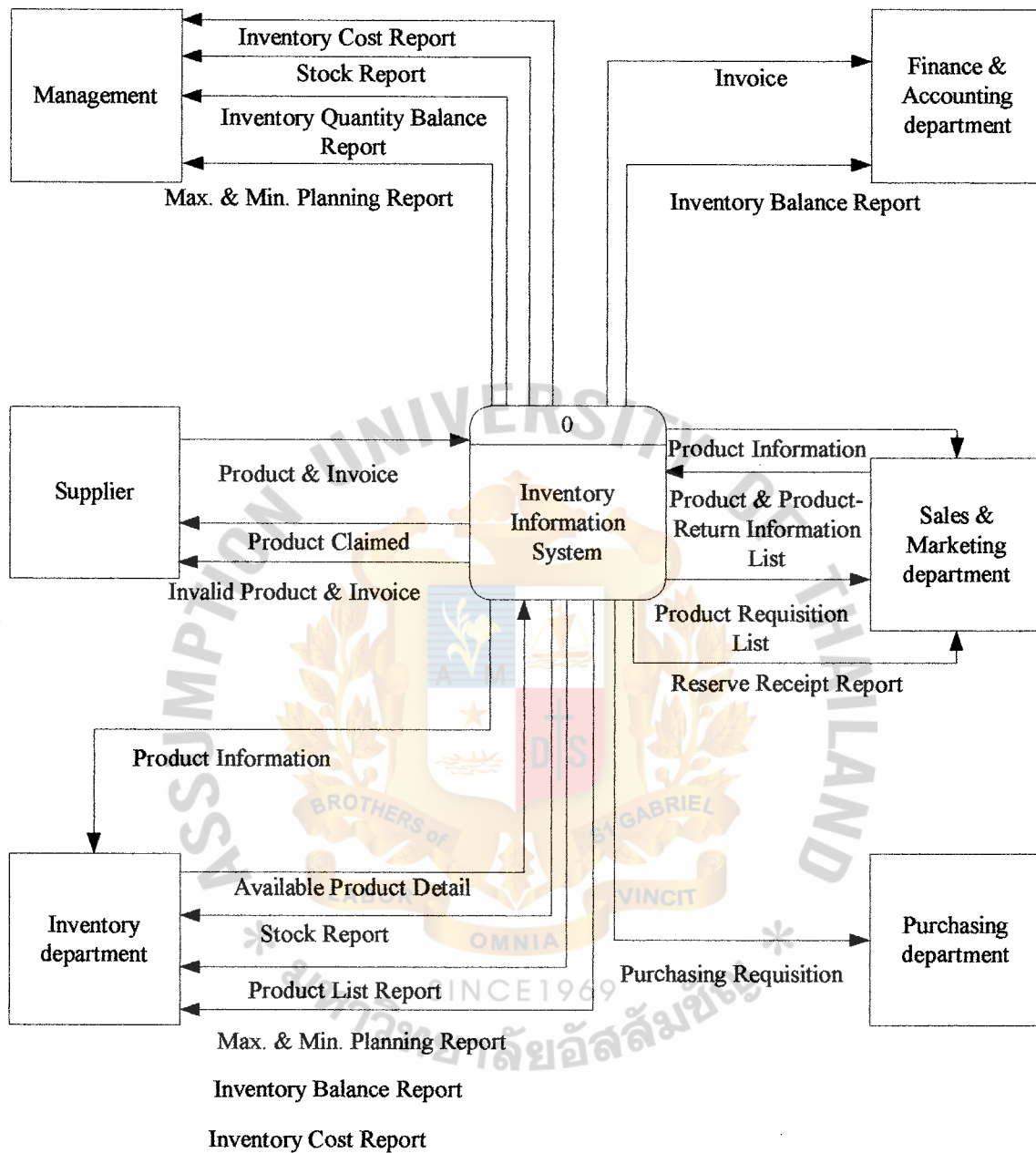


Figure A.1. Context Diagram of the Proposed System.

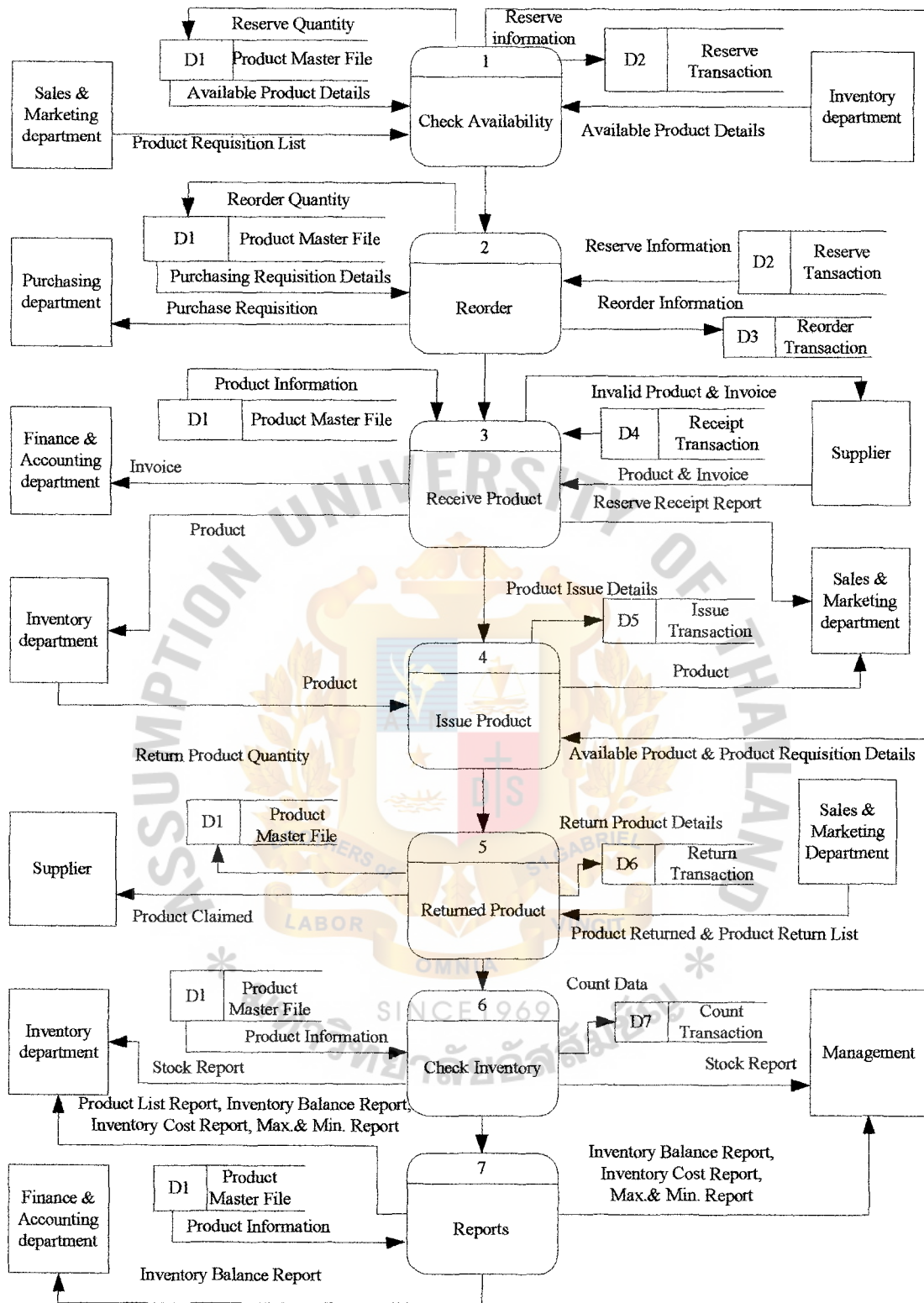


Figure A.2. Data Flow Level 1 of the Proposed System.

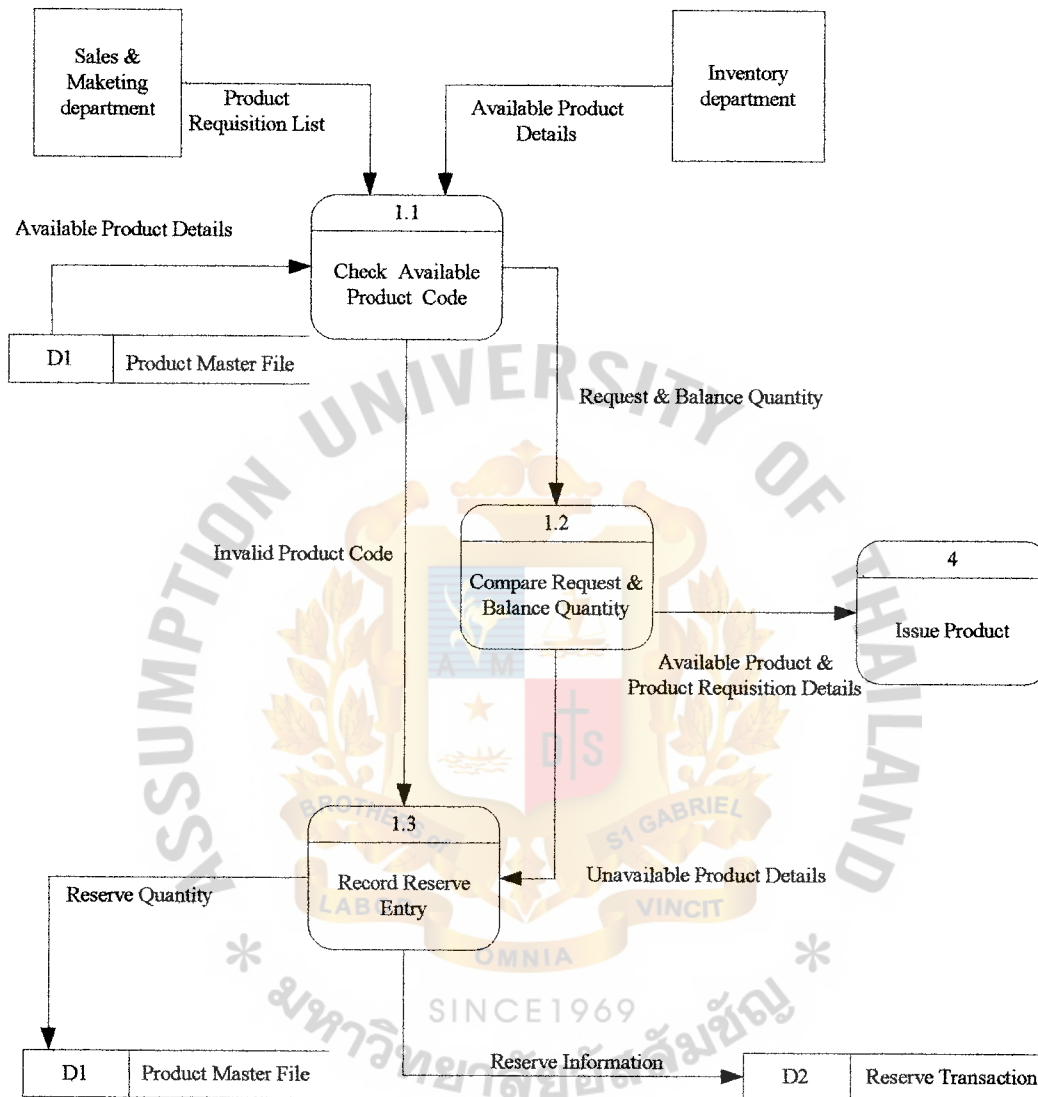


Figure A.3. DFD Level 1 of the Proposed System:Check Availability.

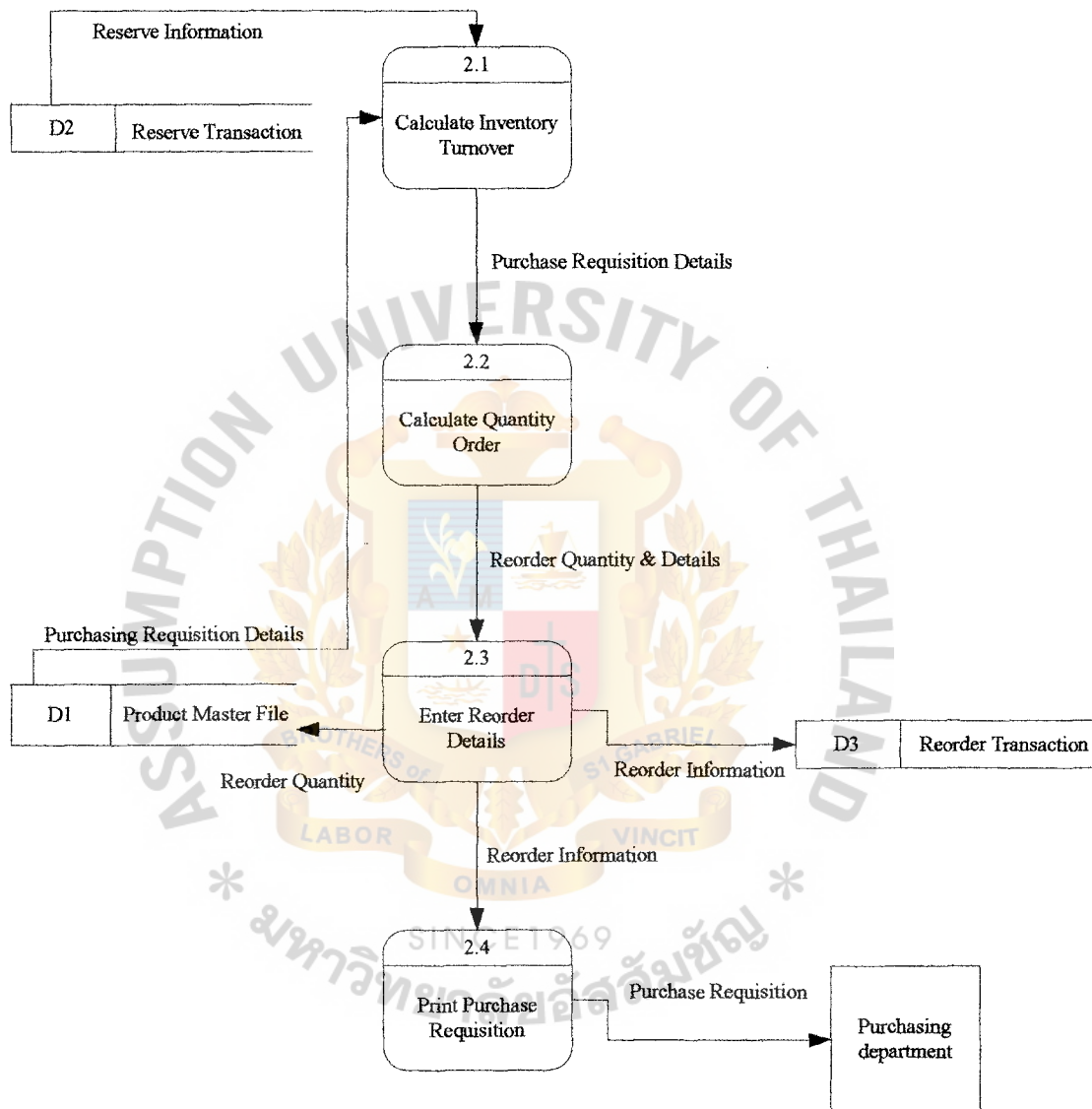


Figure A.4. DFD Level 1 of the Proposed System: Reorder.

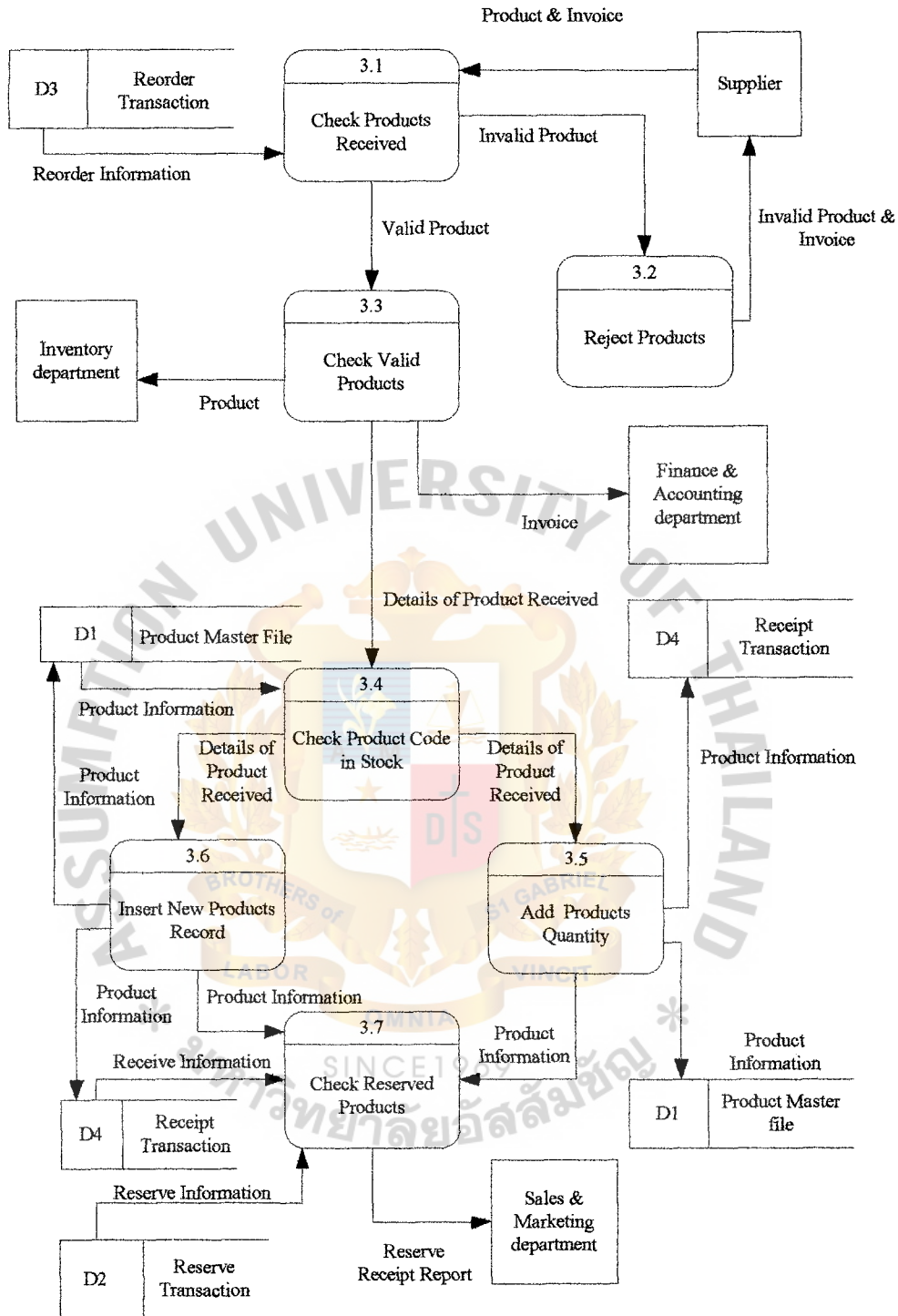


Figure A.5. DFD Level 1 of the Proposed System: Receive Products.

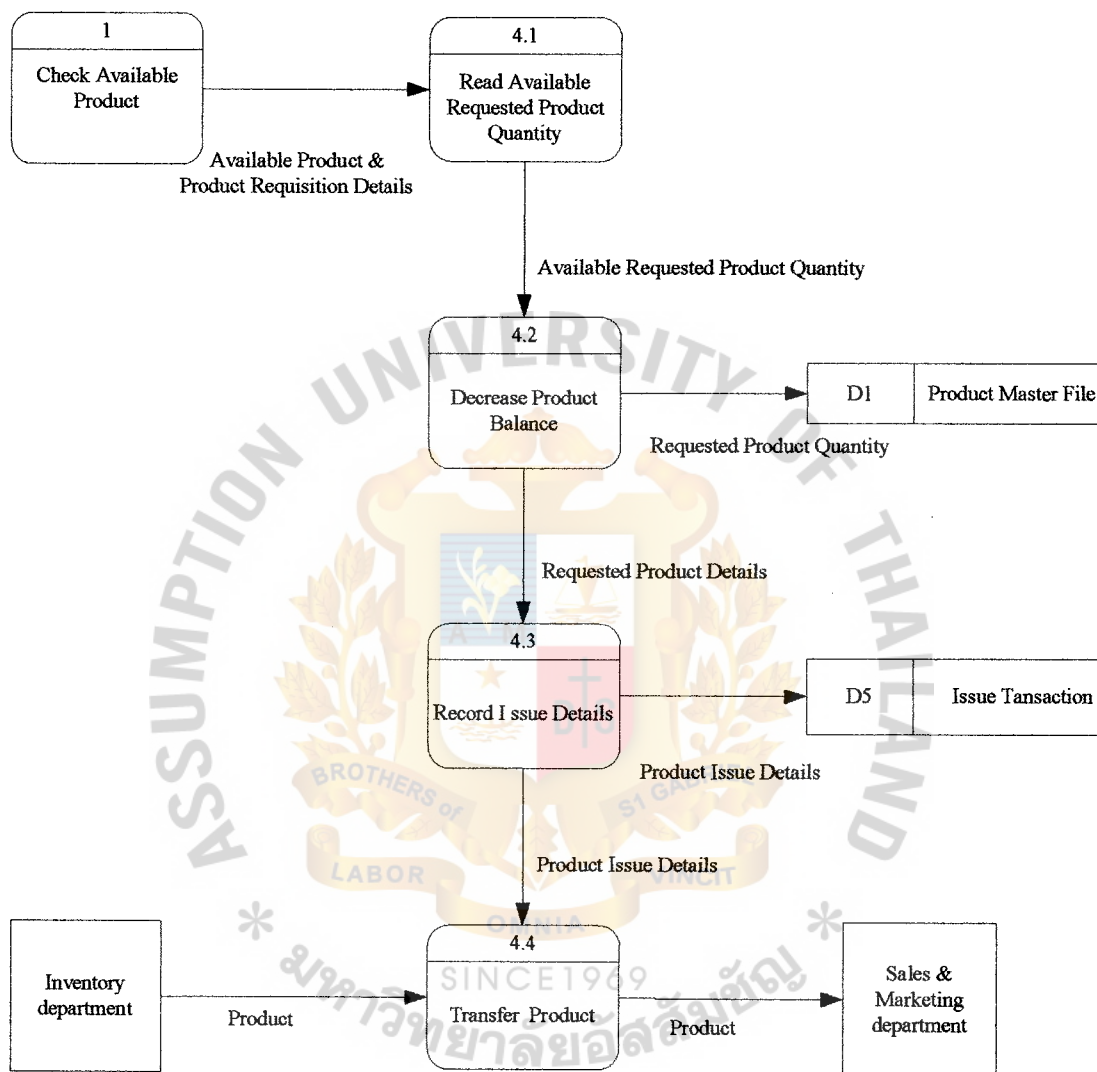


Figure A.6. DFD Level 1 of the Proposed System: Issue Products.

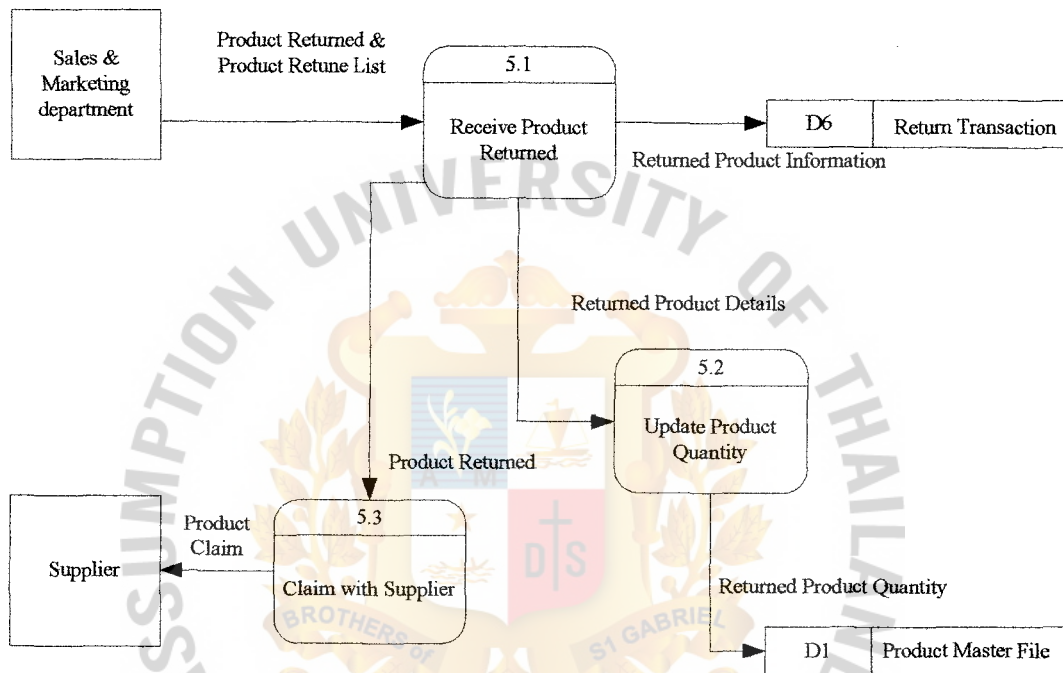


Figure A.7. DFD Level 1 of the Proposed System: Returned Products.

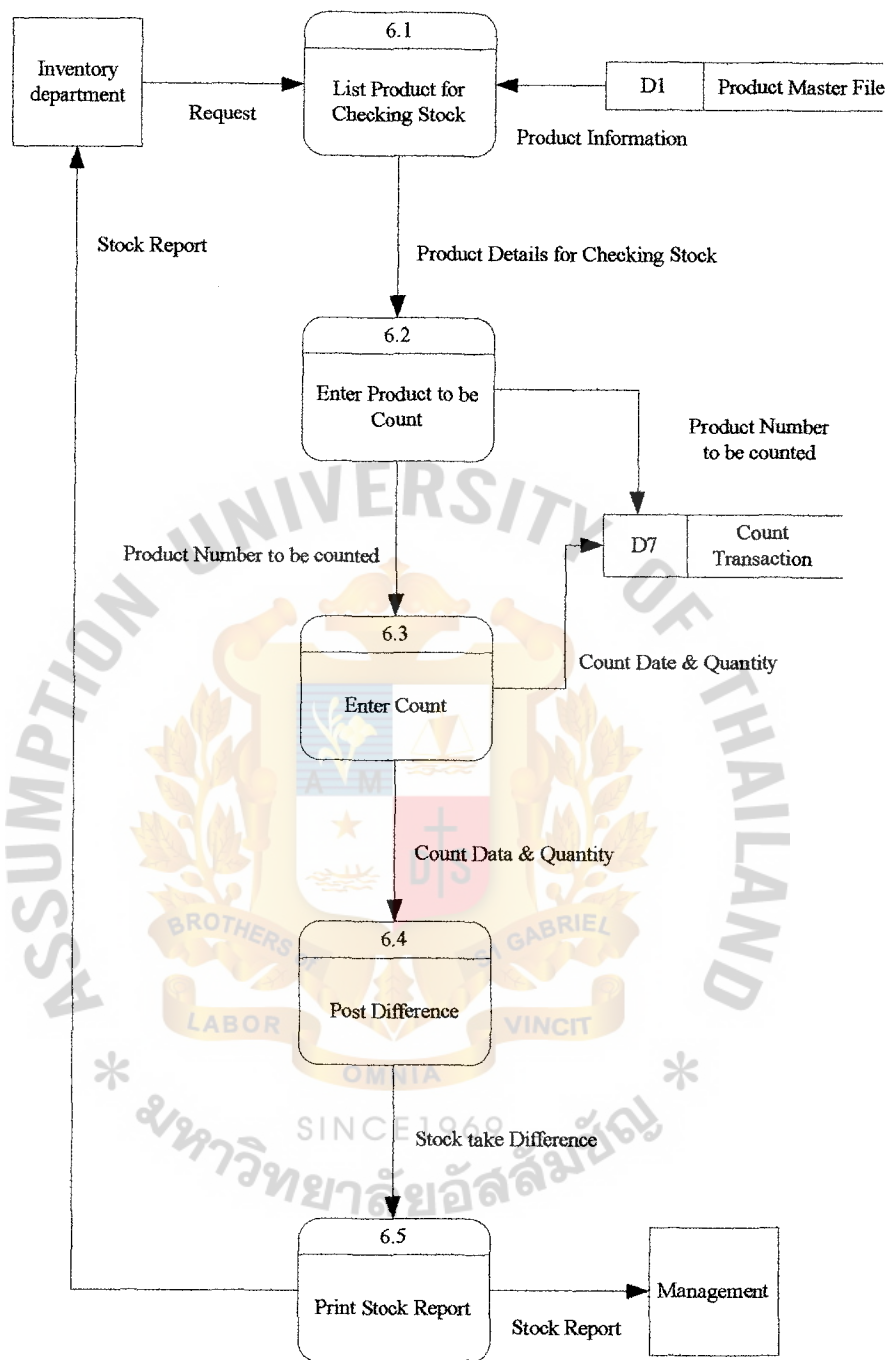


Figure A.8. DFD Level 1 of the Proposed System: Check Inventory.



APPENDIX B

REPORT DESIGN

Table B.1. Product List Report.

Product Code	Product Name	Color	UOM	Cost/Unit	Stock Balance
440101	Thai modern fancy fabric, size 44"	red-black	yard	55	400
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	50	200
440103	Plain satin fabric, size 60"	black	yard	70	450
440104	Plain satin fabric, size 44"	black	yard	45	500
440205	Plain polyester fabric, size 44"	cream	yard	40	900
440306	Plain polyester fabric, size 48"	orange	yard	43	500
440107	Plain polyester fabric, size 60"	black	yard	50	700

Table B.2. Inventory Cost Report.

Product Code	Product Name	Color	UOM	Cost/Unit
440101	Thai modern fancy fabric, size 44"	red-black	yard	55
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	50
440103	Plain satin fabric, size 60"	black	yard	70
440104	Plain satin fabric, size 44"	black	yard	45
440205	Plain polyester fabric, size 44"	cream	yard	40
440306	Plain polyester fabric, size 48"	orange	yard	43
440107	Plain polyester fabric, size 60"	black	yard	50

Table B.3 . Inventory Reserve Report.

Product Code	Product Name	Color	UOM	Cost/Unit	Reserve Qty
440101	Thai modern fancy fabric, size 44"	red-black	yard	55	100
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	50	400
440103	Plain satin fabric, size 60"	black	yard	70	600
440104	Plain satin fabric, size 44"	black	yard	45	1000
440105	Plain polyester fabric, size 44"	black	yard	40	2000
440306	Plain polyester fabric, size 48"	orange	yard	43	200
440107	Plain polyester fabric, size 60"	black	yard	50	100

Table B.4 . Inventory Reorder Report.

Product Code	Product Name	Color	UOM	Cost/Unit	Reorder Qty
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	50	400
440103	Plain satin fabric, size 60"	black	yard	70	350
440104	Plain satin fabric, size 44"	black	yard	45	700
440105	Plain polyester fabric, size 44"	black	yard	40	2200

Table B.5 Inventory Receipt Report.

Product Code	Product Name	Color	UOM	Receipt Date	Quantity
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	8/1/44	400
440103	Plain satin fabric, size 60"	black	yard	17/1/44	350
440104	Plain satin fabric, size 44"	black	yard	10/1/44	700
440105	Plain polyester fabric, size 44"	black	yard	13/1/44	2200

Table B.6 Inventory Issue Report.

Product Code	Product Name	Color	UOM	Issue Date	Quantity
440101	Thai modern fancy fabric, size 44"	red-black	yard	2/1/44	100
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	3/1/44	200
440103	Plain satin fabric, size 60"	black	yard	3/1/44	450
440104	Plain satin fabric, size 44"	black	yard	4/1/44	500
440306	Plain polyester fabric, size 48"	orange	yard	4/1/44	200
440107	Plain polyester fabric, size 60"	black	yard	5/1/44	100
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	8/1/44	200
440104	Plain satin fabric, size 44"	black	yard	10/1/44	500
440105	Plain polyester fabric, size 44"	black	yard	13/1/44	2000
440103	Plain satin fabric, size 60"	black	yard	17/1/44	150

Table B.7. Inventory Return Report.

Product Code	Product Name	UOM	Quantity	Product Return List No.	Date Return
440202	Thai traditional fancy fabric, size 44"	yard	50	13144	3/1/44
440306	Plain polyester fabric, size 48"	yard	40	24144	4/1/44

Table B.8. Stock Report.

Product Code	Product Name	Color	UOM	Stock Balance	Count Qty
440101	Thai modern fancy fabric, size 44"	red-black	yard	300	300
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	250	250
440103	Plain satin fabric, size 60"	black	yard	200	200
440104	Plain satin fabric, size 44"	black	yard	200	200
440105	Plain polyester fabric, size 44"	black	yard	200	200
440205	Plain polyester fabric, size 44"	cream	yard	900	900
440306	Plain polyester fabric, size 48"	orange	yard	340	340
440107	Plain polyester fabric, size 60"	black	yard	600	600

Table B.9. Reserve Report.

Reserve No. 01						
Date	Product Code	Product Name	UOM	Qty Unavailable	Qty On Request	Date Require
4/1/44	440105	Plain polyester fabric, size 44"	Yard	2000	2200	13/1/44

Table B.10. Reserve Receipt Report.

Product Code: 440105				
Product Name: Plain polyeter fabric, size 44"				
Reorder Date	Quantity On Request	Receiving Date	Quantity Received	
4/1/44	2200	13/1/44	2200	

Table B.11. Reorder Report.

Purchase Requisition Number: 04					
P/R Date	Product Code	Product Name	UOM	Quantity	Date Required
4/1/44	440105	Plain polyester fabric, size 44"	yard	2200	13/1/44

Table B.12. Issue Report.

Issue Number: 09				
Issue Date	Product Code	Product Name	UOM	Quantity
13/1/44	440105	Plain polyester fabric, size 44"	yard	2000

Table B.13. Receipt Report.

Receiving Number: 09					
Receiving Date	P/R No.	Product Code	Product Name	UOM	Quantity
13/1/44	09	440105	Plain polyester fabric, size 44"	yard	2200

Table B.14. Maximum Planning Report.

Product Code	Product Name	Color	UOM	Max_Qty	Stock Balance
440101	Thai modern fancy fabric, size 44"	red-black	yard	400	300
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	400	250
440103	Plain satin fabric, size 60"	black	yard	400	200
440104	Plain satin fabric, size 44"	black	yard	400	200
440105	Plain polyester fabric, size 44"	black	yard	400	200
440205	Plain polyester fabric, size 44"	cream	yard	400	900
440306	Plain polyester fabric, size 48"	orange	yard	400	340
440107	Plain polyester fabric, size 60"	black	yard	400	600

Table B.15. Minimum Planning Report.

Product Code	Product Name	Color	UOM	Min_Qty	Stock Balance
440101	Thai modern fancy fabric, size 44"	red-black	yard	200	300
440202	Thai traditional fancy fabric, size 44"	blue-black	yard	200	250
440103	Plain satin fabric, size 60"	black	yard	200	200
440104	Plain satin fabric, size 44"	black	yard	200	200
440105	Plain polyester fabric, size 44"	black	yard	200	200
440205	Plain polyester fabric, size 44"	cream	yard	200	900
440306	Plain polyester fabric, size 48"	orange	yard	200	340
440107	Plain polyester fabric, size 60"	black	yard	200	600

Table B.16. Inventory Balance Report.

Product Code	Product Name	UOM	Stock Balance	Reorder Qty	Reserve Qty	Return Qty	Available Balance
440101	Thai modern fancy fabric, size 44"	yard	400	0	100	0	300
440202	Thai traditional fancy fabric, size 44"	yard	200	400	400	50	250
440103	Plain satin fabric, size 60"	yard	450	350	600	0	200
440104	Plain satin fabric, size 44"	yard	500	700	1000	0	200
440105	Plain polyester fabric, size 44"	yard	0	2200	2000	0	200
440205	Plain polyester fabric, size 44"	yard	900	0	0	0	900
440306	Plain polyester fabric, size 48"	yard	500	0	200	40	340
440107	Plain polyester fabric, size 60"	yard	700	0	100	0	600



APPENDIX C

DATABASE DESIGN

Coporate Database

Database D 1

Table C.1. Structure of Product Master File.

No.	Field Name	Type	Description	Width	Default
1	Product Code	Text	Product Code	15	Null
2	Product Name	Text	Product Name	40	Null
3	Category	Text	Product Category	20	Null
4	UOM	Text	Unit of Measure	10	Null
5	Cost/unit	Currency	Cost per Unit	15	Null
6	Min_Qty	Number	Minimum Quantity	Long Integer	Null
7	Max_Qty	Number	Maximum Quantity	Long Integer	Null
8	Reorder Qty	Number	Reorder Quantity	Long Integer	Null
9	Reserve Qty	Number	Reserve Quantity	Long Integer	Null
10	Stock Balance	Number	Stock Balance	Long Integer	Null
11	Available Balance	Number	Available Balance	Long Integer	Null

Database D2

Table C.2. Structure of Reserve File.

No.	Field Name	Type	Description	Width	Default
1	Reserve No.	Text	Reserve Number	10	Null
2	PRL No.	Text	Product Requisition List Number	10	Null
3	Date	Date	Reserve Date	10	Null
4	Product Code	Text	Product Code	15	Null
5	Product Name	Text	Product Name	40	Null
6	QtyOnRequest	Number	Quantity on Request	Long Integer	Null
7	QtyUnavailable	Number	Quantity Unavailable	Long Integer	Null
8	UOM	Text	Unit of Measure	10	Null
9	Date Required	Date	Date Required	15	Null

Database D3

Table C.3. Structure of Reorder File.

No.	Field Name	Type	Description	Width	Default
1	P/R No.	Text	Purchase Requisition Number	10	Null
2	P/R Date	Text	Purchase Requisition Date	15	Null
3	Date Required	Date	Date Required	15	Null
4	Product Code	Date	Product Code	15	Null
5	Product Name	Text	Product Name	40	Null
6	Quantity	Text	Quantity	Long integer	Null
7	UOM	Number	Unit of Measure	10	Null
8	Price/Unit	Text	Price per Unit	15	Null
9	Total Amount	Currency	Total Amount	15	Null
10	Remark	Memo	Remark	50	Null

Database D4

Table C.4. Structure of Receipt File.

No.	Field Name	Type	Description	Width	Default
1	Receiving No.	Text	Receiving Number	10	Null
2	Receiving Date	Date	Receiving Date	15	Null
3	P/R No.	Text	Purchase Requisition Number	10	Null
4	Product Code	Text	Product Code	15	Null
5	Product Name	Text	Product Name	40	Null
6	Quantity	Number	Quantity	Long Integer	Null
7	UOM	Text	Unit of Measure	10	Null
8	Cost/Unit	Currency	Cost per Unit	15	Null
9	Total Amount	Currency	Total Amount	15	Null
10	Remark	Memo	Remark	50	Null

Database D5

Table C.5. Structure of Issue File.

No.	Field Name	Type	Description	Width	Default
1	Issue No.	Text	Issue Number	10	Null
2	Issue Date	Date	Issue Date	15	Null
3	Product Code	Text	Product Code	15	Null
4	Product Name	Text	Product Name	40	Null
5	Quantity	Number	Quantity	Long Integer	Null
6	UOM	Text	Unit of Measure	10	Null
7	PRL. No.	Text	Purchase Requisition List Number	10	Null
8	Remark	Memo	Remark	50	Null

Database D6

Table C.6. Structure of Return File.

No.	Field Name	Type	Description	Width	Default
1	Product Code	Text	Product Code	10	Null
2	Returned Date	Date	Returned Date	15	Null
3	Product Code	Text	Product Code	15	Null
4	Product Name	Text	Product Name	40	Null
5	Quantity	Number	Quantity	Long Integer	Null
6	UOM	Text	Unit of Measure	10	Null
7	Reason	Memo	Reason	50	Null

Database D7

Table C.7. Structure of Count File.

No.	Field Name	Type	Description	Width	Default
1	Transaction No.	Text	Document Number	10	Null
2	Date	Date	Date	15	Null
3	Remark	Memo	Remark	50	Null
4	Product Code	Text	Product Code	10	Null
5	Product Name	Text	Product Name	40	Null
6	Count Qty	Number	Count Quantity	Long Integer	Null
7	UOM	Text	Unit of Measure	10	Null



Table D.1. Process Specification of Process1.1.

Items	Descriptions
Process Name:	Check Available Product Code
Data In:	Product Requisition List Available Product Details
Data Out:	Request & Balance Quantity Unavailable Product Details
Process:	<ol style="list-style-type: none"> 1. Find product code in product master file. 2. If it has, show that balance quantity. 3. If it is not have, show that unavailable product.
Attachment:	<ul style="list-style-type: none"> • Product Master File

Table D.2. Process Specification of Process 1.2.

Items	Descriptions
Process Name:	Compare Request and Balance Quantity
Data In:	Request Quantity Balance Quantity
Data Out:	Available Product Product Requisition Details Unavailable Product Details
Process:	<ol style="list-style-type: none"> 1. Find product code in product master file and product requisition list. 2. If it has in both file, compare that request quantity is more than balance quantity. Show the excess amount as an unavailable amount, and quantity in stock. 3. If it has not in product code, show the unavailable product amount and issue product requisition to order from supplier.
Attachment:	<ul style="list-style-type: none"> • Product Master File • Product Requisition List

Table D.3. Process Specification of Process 1.3.

Items	Descriptions
Process Name:	Record Reserve Entry
Data In:	Unavailable Product Details
Data Out:	Reserve quantity and information
Process:	<ol style="list-style-type: none"> 1. Get unavailable product amount in unavailable product details and date require. 2. Add reserve amount in product master file. 3. Update reserve amount.
Attachment:	<ul style="list-style-type: none"> • Product Master File

Table D.4. Process Specification of Process 2.1.

Items	Descriptions
Process Name:	Calculation Inventory Turnover
Data In:	Purchase Requisition Details Reserve Information
Data Out:	Purchase Requisition details
Process:	<ol style="list-style-type: none"> 1. Get information from product master file and reserve file. 2. Find inventory turnover by product code $= (\text{quantity issue} * \text{cost per unit}) / (\text{beginning product master file} + \text{ending product master file} / 2)$. 3. Print inventory turnover by using product code.
Attachment:	<ul style="list-style-type: none"> • Product Master File

Table D.5. Process Specification of Process 2.2.

Items	Descriptions
Process Name:	Calculate Quantity Order
Data In:	Purchase Requisition details Inventory Turnover Details
Data Out:	Reorder Quantity and details
Process:	<ol style="list-style-type: none"> 1. Get information about purchase requisition details and inventory turnover rate. 2. Compare purchase requisition details with inventory turnover rate, correct or not. 3. Compute quantity reorder .
Attachment:	<ul style="list-style-type: none"> • Product Master File • Reorder File

Table D.6. Process Specification of Process 2.3.

Items	Descriptions
Process name:	Enter Reorder Details
Data In:	Reorder Quantity and details
Data Out:	Reorder Quantity and information
Process:	<ol style="list-style-type: none"> 1. Get reorder quantity and information. 2. Add reorder quantity in product master file. 3. Update reorder transaction file.
Attachment:	<ul style="list-style-type: none"> • Product Master File

Table D.7. Process Specification of Process 2.4.

Items	Descriptions
Process Name:	Print Purchase Requisition
Data In:	Reorder Information
Data Out:	Purchase Requisition
Process:	<ol style="list-style-type: none"> 1. Display purchase requisition information which show P/R No., P/R _Date, Product Code, Product Name, Quantity, UOM, Price/Unit, Total Amount, Remark. 2. Check the correctness of information. 3. Print valid purchase requisition.
Attachment:	<ul style="list-style-type: none"> • Purchase Requisition

Table D.8. Process Specification of Process 3.1-3.2.

Items	Descriptions
Process Name:	<ol style="list-style-type: none"> 3.1 Check product received 3.2 Reject product
Data In:	Product received Reorder information
Data Out:	Valid product Invalid product
Process:	<ol style="list-style-type: none"> 1. Get reorder information and details of product received. 2. Check product received and reorder information, correct or not. 3. If it is correct, show it as valid product. 4. If it is not correct, contact the supplier about invalid product.
Attachment:	<ul style="list-style-type: none"> • Supplier • Staff

Table D.9. Process Specification of Process 3.3.

Items	Descriptions
Process Name:	Check Valid Product
Data In:	Valid Product Received
Data Out:	Details of Product Received
Process:	Get details of valid product received . Match quantity of product received with reorder information
Attachment:	Staff

Table D.10. Process Specification of Process 3.4.

Items	Descriptions
Process Name:	Check Product Code in Stock
Data In:	Details of Product Received Product Information
Data Out:	Details of Product Received
Process:	<ol style="list-style-type: none"> 1. Get product code. 2. Retrieve product code from product master file. 3. If it is old product code, add in product quantity. 4. If it is new product code(not found in product master file), insert new product record.
Attachment:	Staff

Table D.11. Process Specification of Process 3.5.

Items	Descriptions
Process Name:	Add Product Quantity
Data In:	Details of Product Received
Data Out:	Details of Product Received
Process:	<ol style="list-style-type: none"> 1. Get product code and product quantity. 2. Open product master file and add stock balance = Stock balance + Product quantity received in the supplier invoice.
Attachment:	<ul style="list-style-type: none"> • Staff • Supplier invoice

Table D.12. Process Specification of Process 3.6.

Items	Descriptions
Process Name:	Insert New Product Record
Data In:	Details of Product Received
Data Out:	Product Information
Process:	<ol style="list-style-type: none"> 1. Get product code, product name, quantity. 2. Insert new record in product master file.
Attachment:	<ul style="list-style-type: none"> • Product Master File • Staff

Table D.13. Process Specification of Process 3.7.

Items	Descriptions
Process Name:	Check Reserve Products
Data In:	Product Information Receipt and Reserve Information
Data Out:	Reserve Receipt Report
Process:	<ol style="list-style-type: none"> 1. Get information and check that product received is the product reserve in reserve file. 2. Print details of product receipt by use reserve receipt.
Attachment:	<ul style="list-style-type: none"> • Product Master File • Staff

Table D.14. Process Specification of Process 4.1-4.2.

Items	Descriptions
Process Name:	<ol style="list-style-type: none"> 4.1 Read Available Requested product Quantity 4.2 Decrease Product Balance
Data In:	Available Product Product Requisition Details
Data Out:	Available Requested Product Quantity
Process:	<ol style="list-style-type: none"> 1. Get product code and requested quantity. 2. Edit product information in product master file by stock balance = stock balance + requested quantity.
Attachment:	<ul style="list-style-type: none"> • Product Master file

Table D.15. Process Specification of Process 4.3.

Items	Descriptions
Process Name:	Reorder Issue Details
Data In:	Requested Product Details
Data Out:	Product Issue Details
Process:	1. Record Requested product details in issue transaction file.
Attachment:	<ul style="list-style-type: none"> Issue file

Table D.16. Process Specification of Process 4.4.

Items	Descriptions
Process Name:	Transfer Product
Data In:	Product Issue Details
Data Out:	Product Transferred
Process:	1. Transfer Product to Sales & Marketing department.
Attachment:	<ul style="list-style-type: none"> Staff Goods

Table D.17. Process Specification of Process 5.1.

Items	Descriptions
Process Name:	Received Product Returned
Data In:	Product Returned Product Return List
Data Out:	Returned Product Information Product Returned
Process:	1. Get details of product in product return list from Sales & Marketing department and product returned. 2. Update return file.
Attachment:	<ul style="list-style-type: none"> Sales & Marketing department Staff

Table D.18. Process Specification of Process 5.2.

Items	Descriptions
Process Name:	Update Product Quantity
Data In:	Returned Product Details
Data Out:	Returned product Quantity
Process:	1. Add the quantity of product returned with quantity-on-hand in product master file.
Attachment:	<ul style="list-style-type: none"> Product Master File

Table D.19. Process Specification of Process 5.3.

Items	Descriptions
Process Name:	Claim with Supplier
Data In:	Product Returned
Data Out:	Product Claimed
Process:	1. Contact supplier about the damaged product claim from the supplier.
Attachment:	<ul style="list-style-type: none"> Staff Supplier

Table D.20. Process Specification of Process 6.1.

Items	Descriptions
Process Name:	List Product for Checking Stock
Data In:	Request and Product Information
Data Out:	Product Details for Checking Stock
Process :	1. Check goods in stock and physical inventory occurs. 2. Perform product list after checking.
Attachment:	<ul style="list-style-type: none"> Staff

Table D.21. Process Specification of Process 6.2.

Items	Descriptions
Process Name:	Enter product to be counted
Data In:	Product details for Checking stock
Data Out:	Product No. to be counted
Process:	1. Count the product inventory.
Attachment:	<ul style="list-style-type: none"> Staff

Table D.22. Process Specification of Process 6.3.

Items	Descriptions
Process Name:	Enter Count
Data In:	Product to be counted
Data Out:	Count data and quantity
Process:	1. Go in inventory to count goods.
Attachment:	<ul style="list-style-type: none"> Staff

Table D.23. Process Specification of Process 6.4.

Items	Descriptions
Process Name:	Post Difference
Data In:	Count data and quantity
Data Out:	Stock take difference
Process:	1. Look the difference in physical inventory and the product list. 2. Adjust the difference to the stock.
Attachment:	<ul style="list-style-type: none"> Staff

Table D.24. Process Specification of Process 6.5.

Items	Descriptions
Process Name:	Print Stock Report
Data In:	Stock take difference
Data Out:	Stock report
Process:	1. Get stock take difference and print it.
Attachment:	<ul style="list-style-type: none"> Staff

Table D.25. Process Specification of Process 7.

Items	Descriptions
Process Name:	Report
Data In:	Product Information
Data Out:	Report
Process:	1. Select any reported topics to print.
Attachment:	<ul style="list-style-type: none"> staff



APPENDIX E

DATA DICTIONARY

Table E.1. Data Dictionary of Inventory Information System (Continued).

Field Name	Meaning
Product Infor	Product Information
Product List Report	The report of product which shown the status details of the product
Product Master File	@Product Code + Product Name + Category + UOM + Cost/Unit + Min_Qty+ Max_Qty + Reorder Qty+ Reserve Qty + Stock Balance+ Available Balance
Product Requisition List	List of product which are requested from the sales & marketing department for delivering to the customer
Product Return List	List of product which are returned to the inventory department due to some reason by sales & marketing department
Purchase Requisition	The request of product purchase from the supplier
Receipt Info	Receipt Information
Receipt File	@Receiving No.+Receiving Date+P/R No.+ Product Code + Product Name + Quantity + UOM + Cost/Unit + Total Amount + Remark
Reorder	The company product order to the supplier
Reorder Info	Reorder Information
Reorder Qty	Reorder Quantity
Reorder File	@P/R No. + P/R Date + Date Required + Product Code + Product Name + Quantity + UOM + Price/Unit + Total Amount + Remark
Reserve	The requested product which are unavailable in the stock
Reserve Info	Reserve Information
Reserve Qty	Reserve Quantity
Reserve Receipt Report	The report of reserved product;which are received from supplier
Reserve File	@Reserve No. + PRL No. + Date + Product Code + Product Name + QtyOnRequest + QtyUnavailable + UOM + Date Required
Return File	@Product Return List No. + Date Returned + Product Code + Product Name + Quantity + UOM + Reason
Stock Balance	The balance of quantity in stock
Stock Report	The report of comparison between the quantity of stock balance and the quantity of stock count balance
UOM	Unit of Measurement

Table E.1. Data Dictionary of Inventory Information System.

Field Name	Meaning
Available Balance	The balance of available quantity which is calculated from stock balance, added by reorder quantity, and subtracted by reserve quantity
Available Product	Product available in stock
Available Product Detail	The details of product available in stock
Cost	The cost of product
Count File	@Transaction No.+ Date+Reference No. + Remark + Product Code + Product Name+Count Qty+UOM
Count Qty	The count quantity
Inven	Inventory
Inventory Cost Report	The report of product cost information
Inventory Issue Report	The report of issued product information from the Inventory department
Inven Balance Report	The report of product quantity information
Inventory Receipt Report	The report of received product information of reorder process of the product
Inventory Reorder Report	The report of ordered product information from reorder process of the company
Inventory Reserve Report	The report of requested product which are unavailable in stock and reserved by the customer
Inventory Return Report	The report of product returned to the inventory department
Issue File	@Issue No.+Issue Date+Product Code +Product Name + Quantity + UOM +PRL+No.+Remark
Maximum PlanningReport	The report which is a method of determining when and how much to order based on user defined maximum inventory level
Max_Qty	The maximum quantity
Minimum Planning Report	The report which is a method of determining when and how much to order based on user-defined minimum inventory level
Min_Qty	The minimum quantity
P/R	Purchase Requisition
PRL	Product Requisition List





Figure F.1. Login Screen.

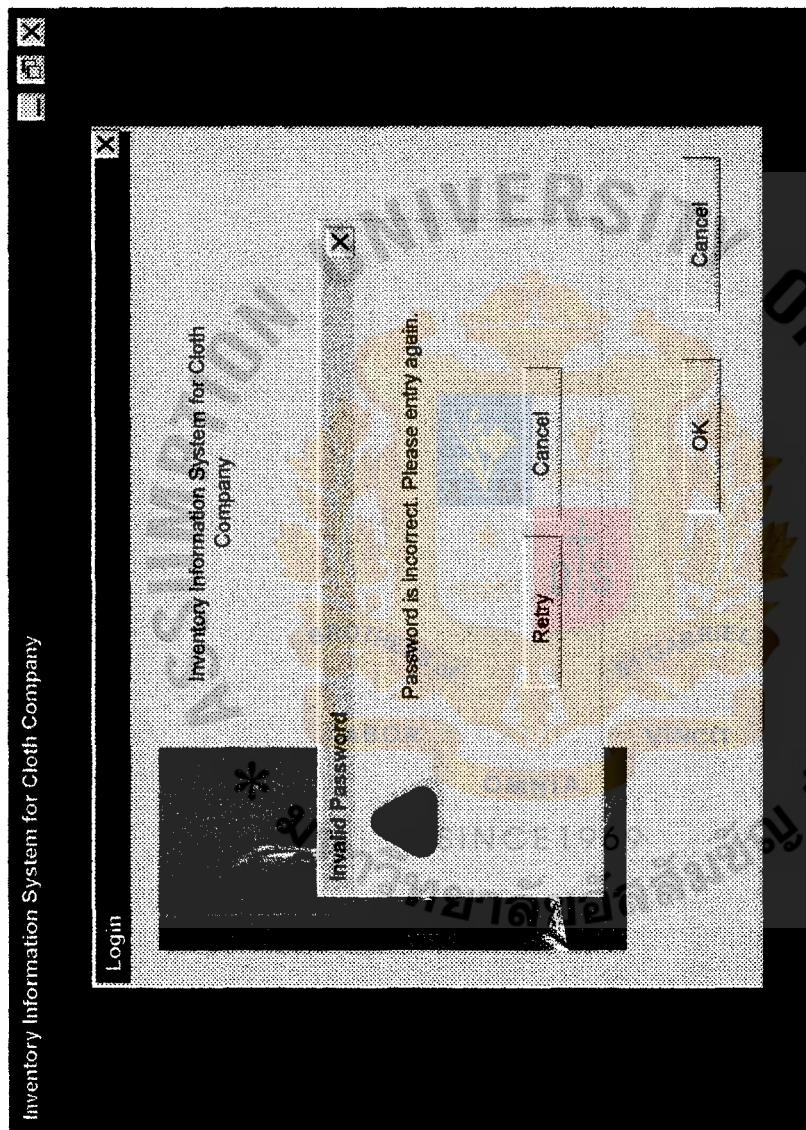


Figure F.2. Invalid Password Screen.

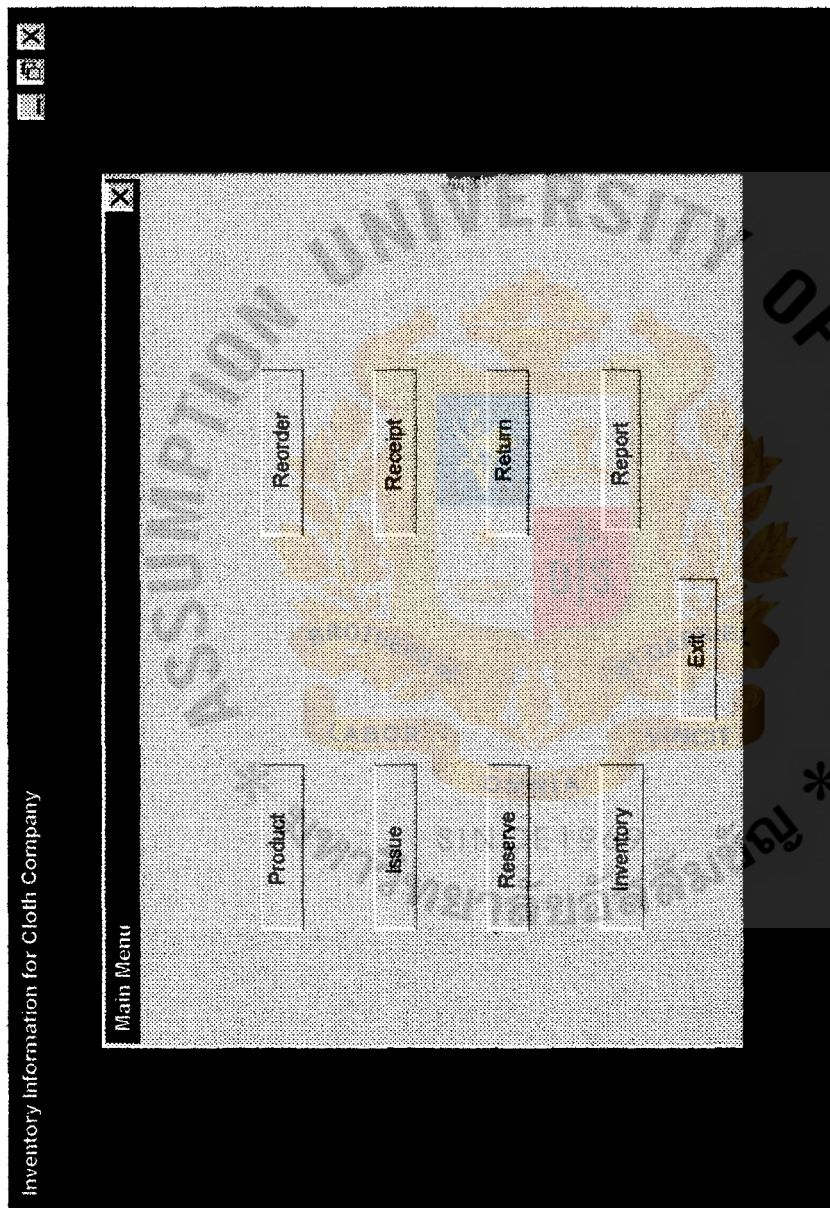


Figure F.3. Main Menu Screen.

Inventory Information System for Cloth Company

Product

Product Code	Minimum Qty
Product Name	Maximum Qty
Color	Reserve Qty
UOM	Available Balance
Cost/unit	Stock Balance
	Reorder Qty

Add Refresh Update Close

Figure F.4. Product Screen.

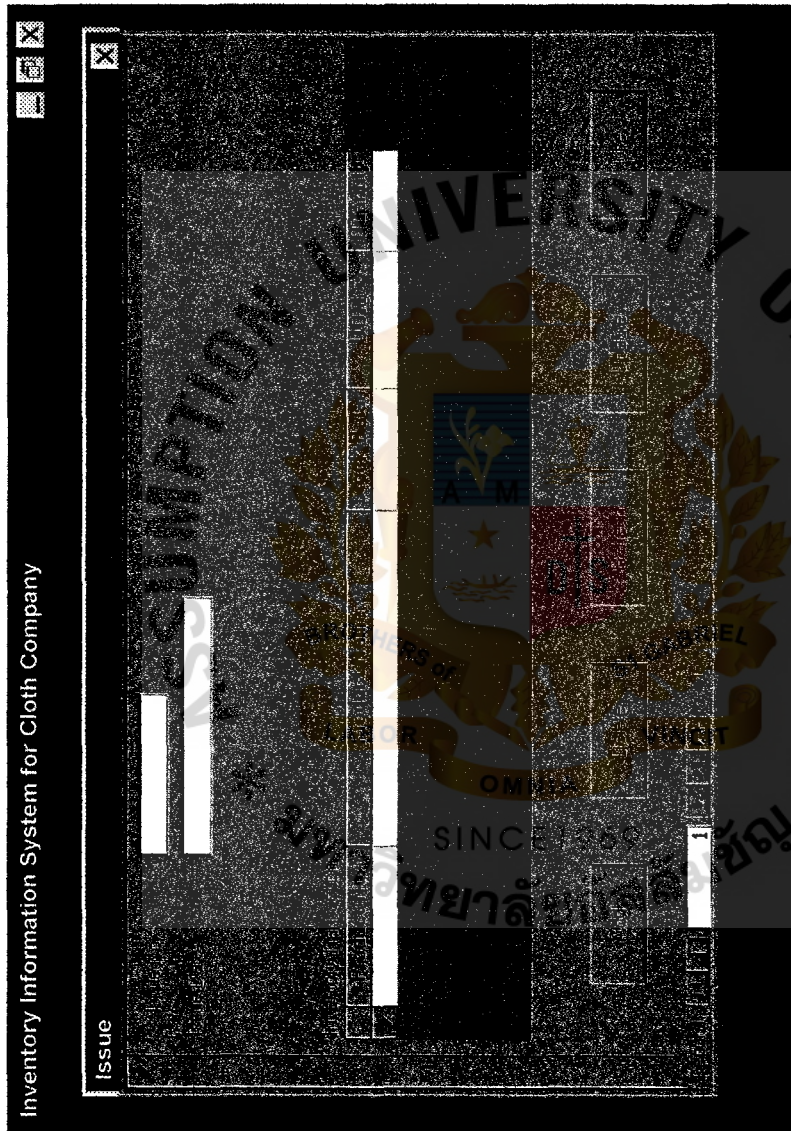


Figure F.5. Product Issued Screen.

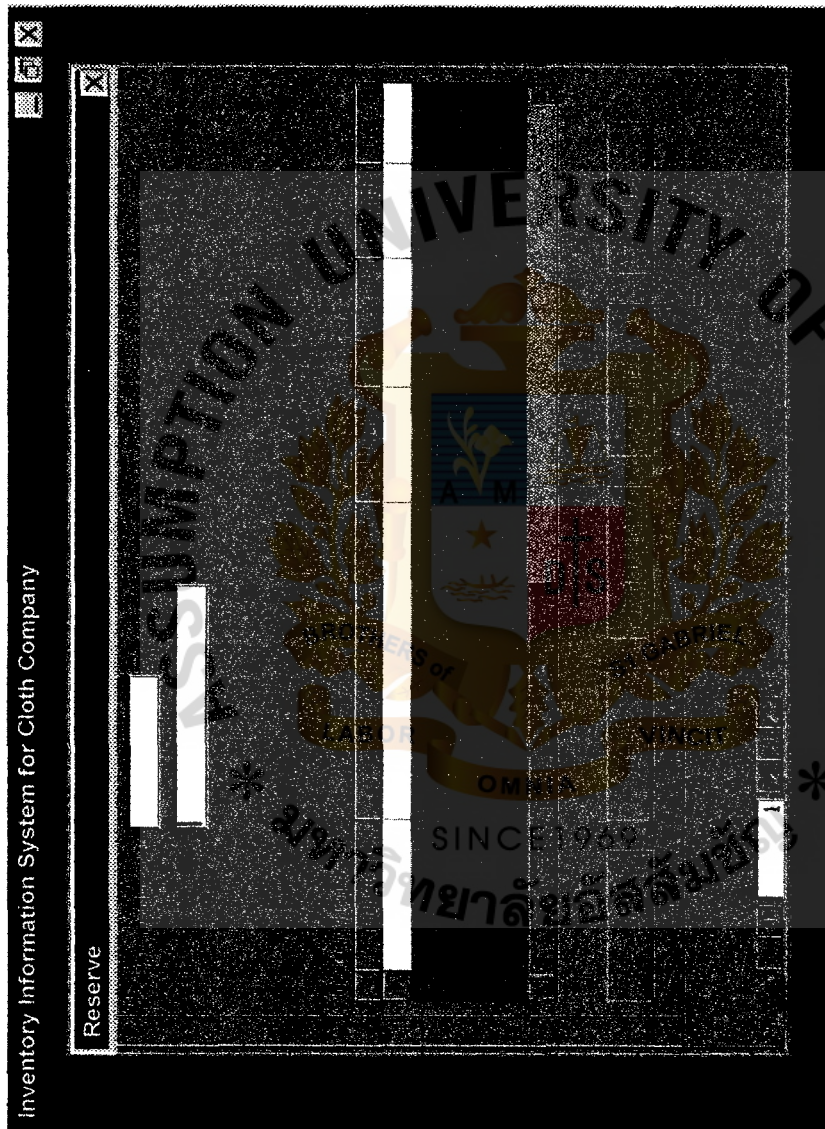


Figure F.6. Reserve Screen.

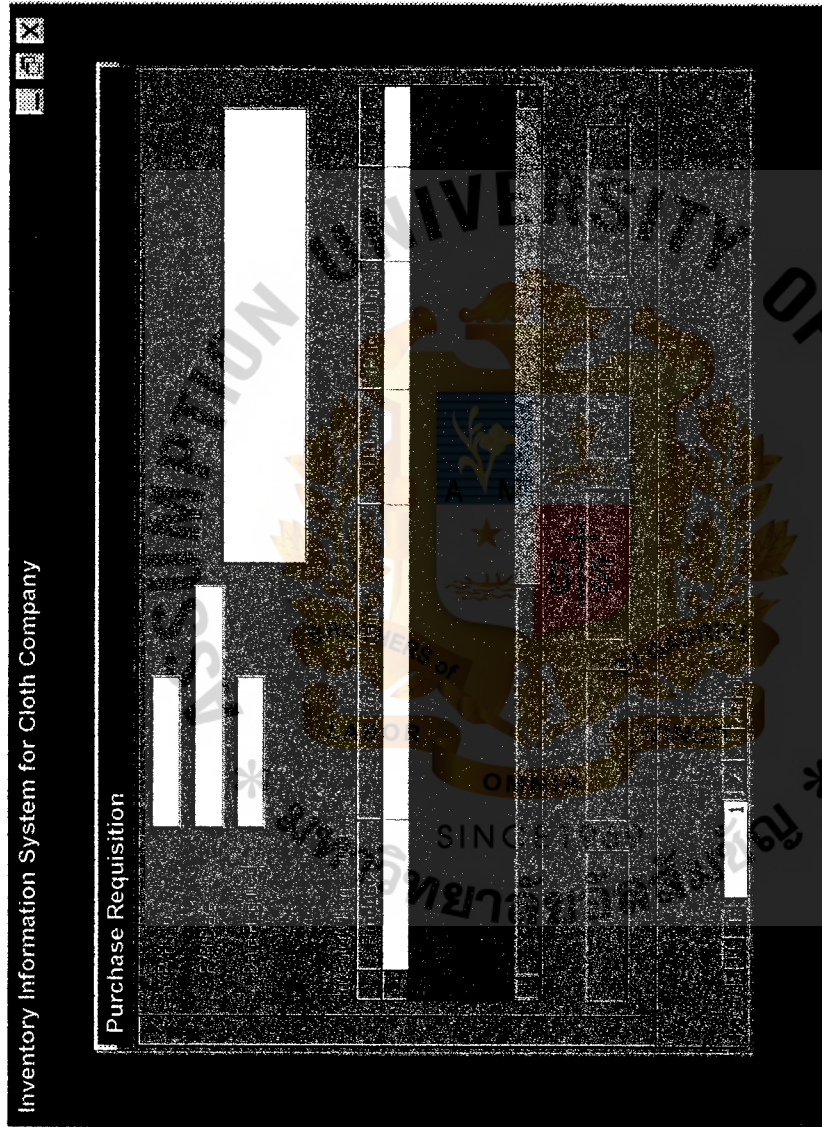


Figure F.7. Reorder Screen.



Figure F.8. Receipt Screen.

Inventory Information System for Cloth Company

Return

Product Return List No.

Date Returned

Product Code

Product Name

UOM

Quantity

Remark

Add Refresh Update Close

Figure F.9. Return Screen.

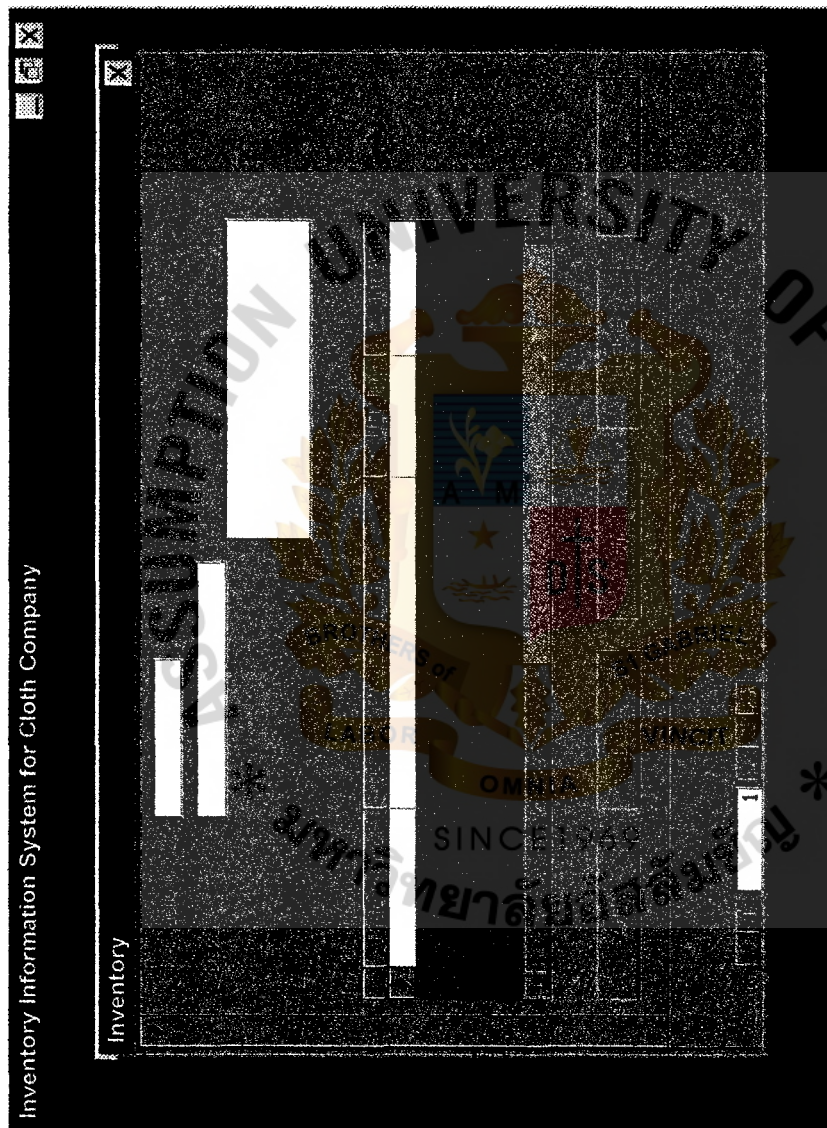


Figure F.10. Inventory Balance Screen.



Figure F.11. Report Screen.



APPENDIX G
ER DIAGRAM

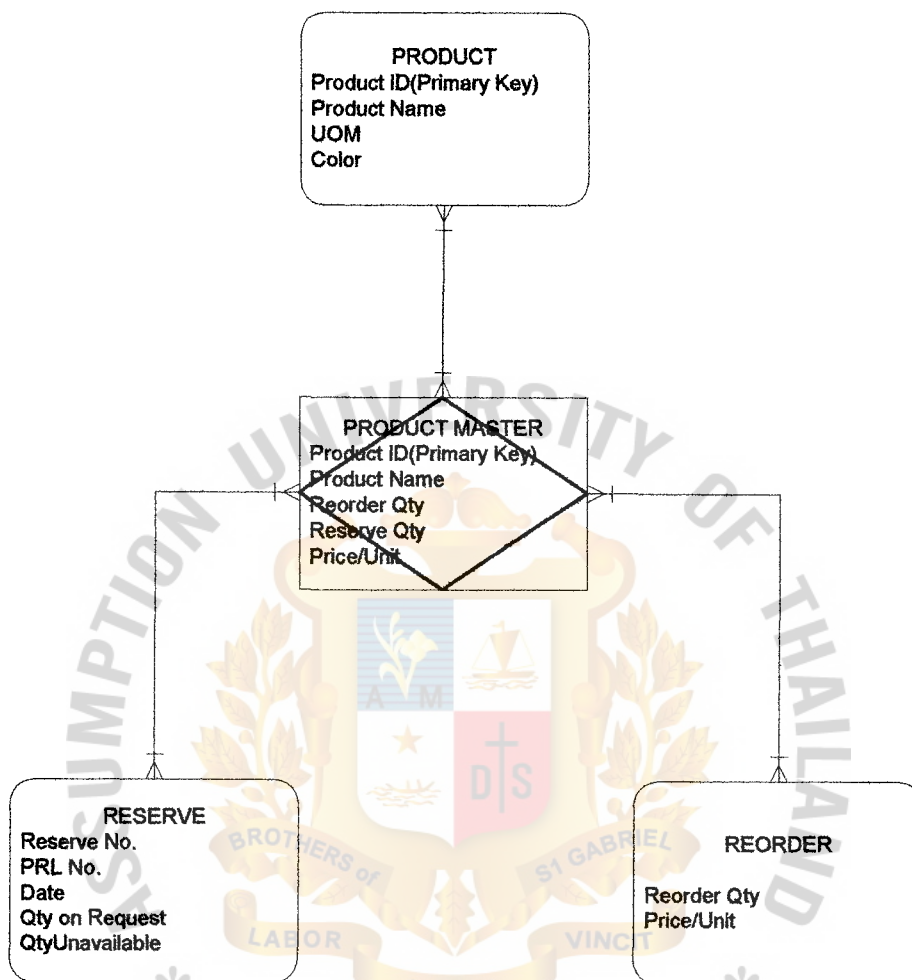


Figure G.1. Entity Relationship of Inventory Information System, Data Store D1.

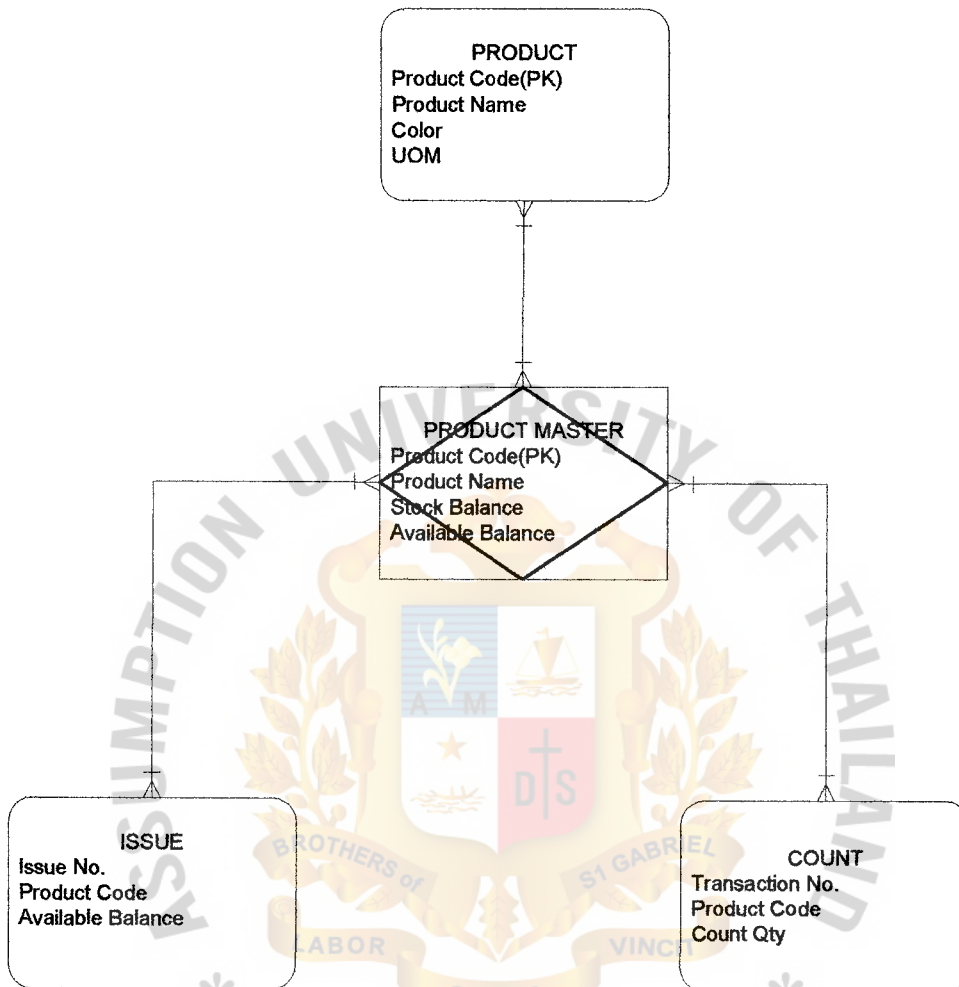


Figure G.2. Entity Relationship of Inventory Information System, Data Store D1 (Continued).

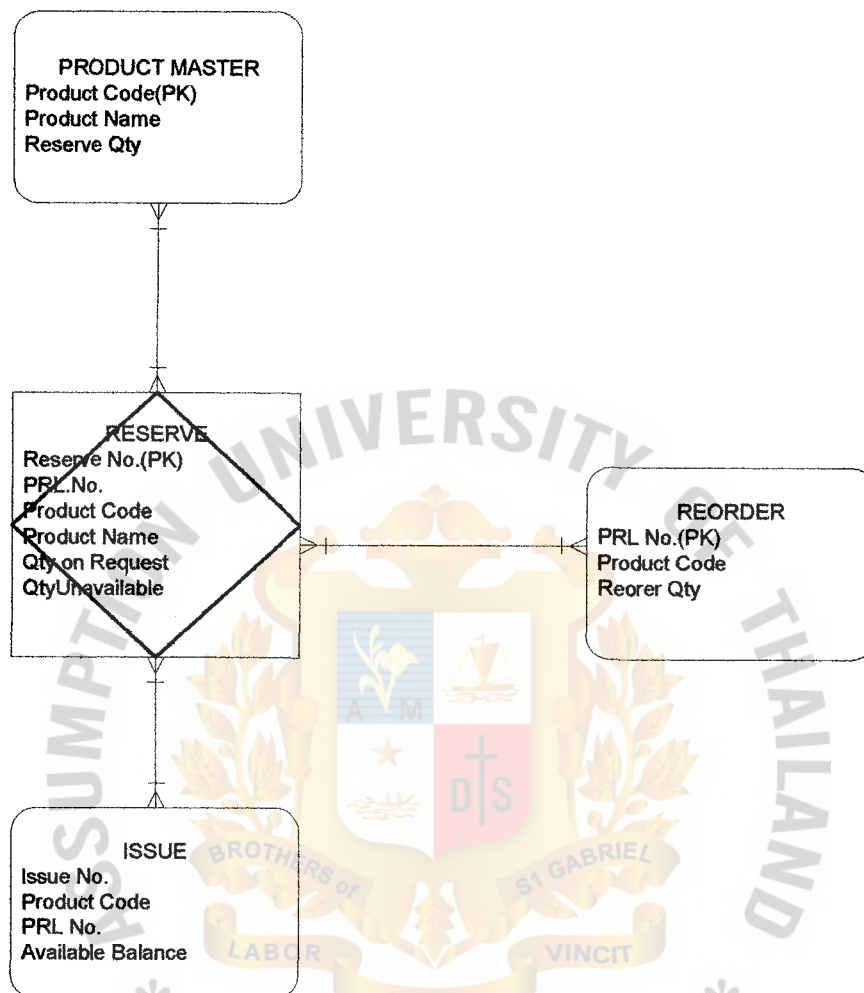


Figure G.3. Entity Relationship of inventory Information System, Data Stores D2.

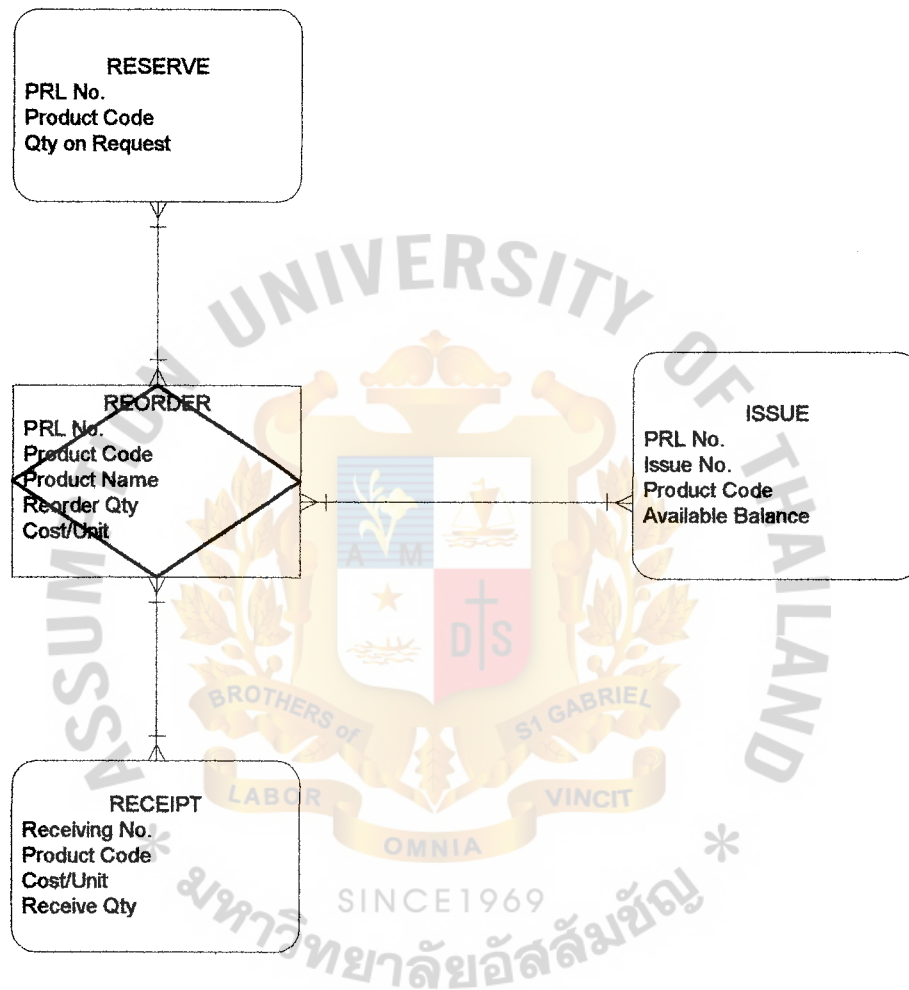


Figure G.4. Entity Relationship of Inventory Information System, Data Store D3.

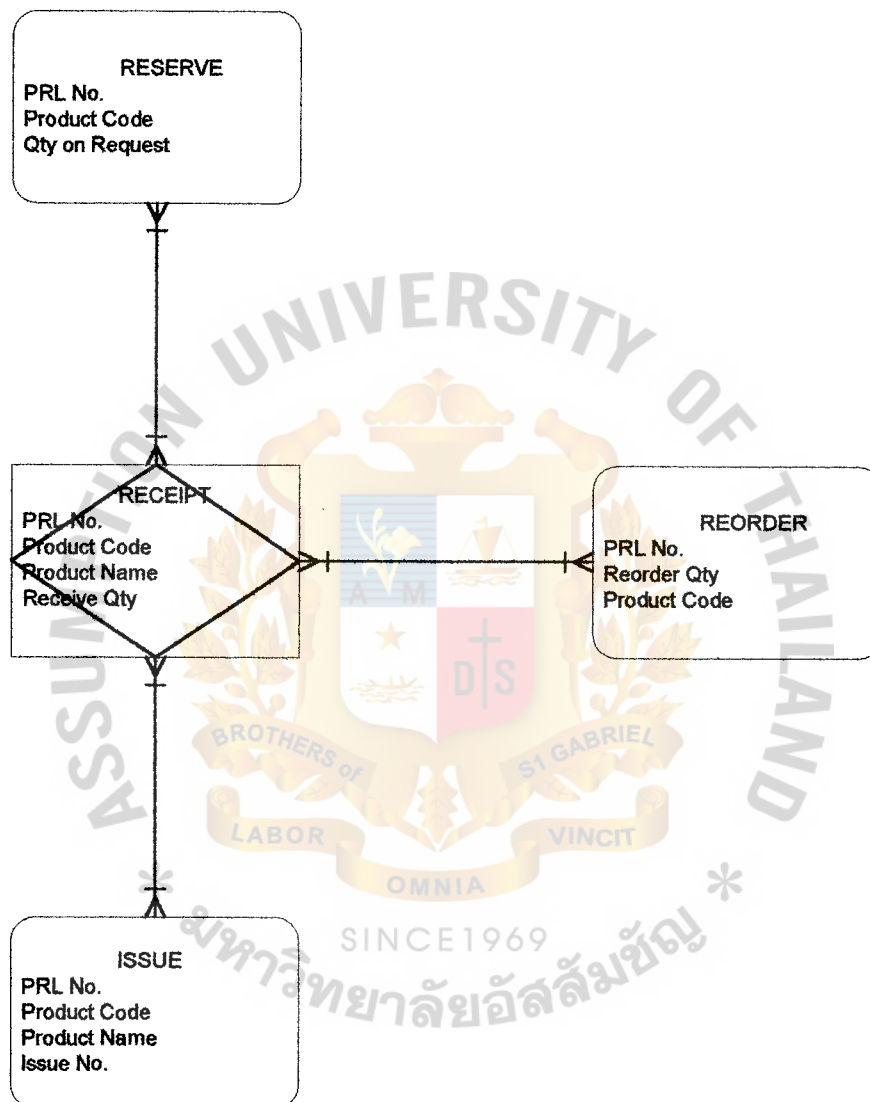


Figure G.5. Entity Relationship of Inventory Information System, Data Store D4.

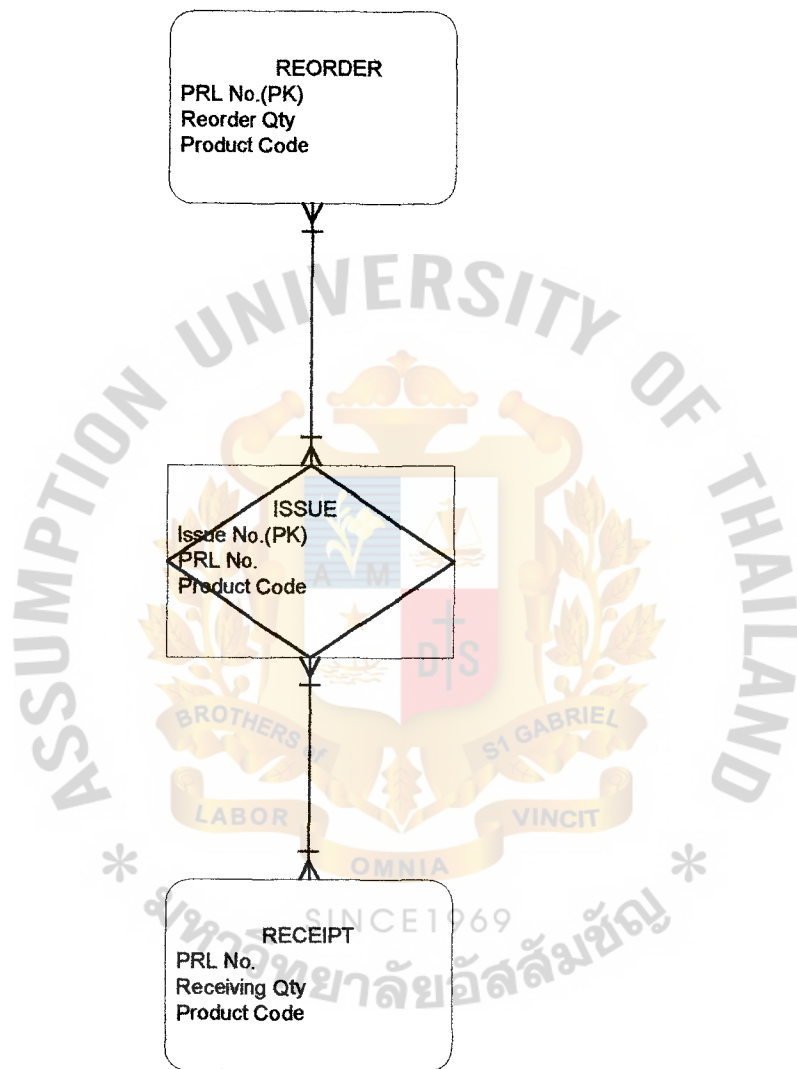


Figure G.6. Entity Relationship of Inventory Information System, Data Store D5.

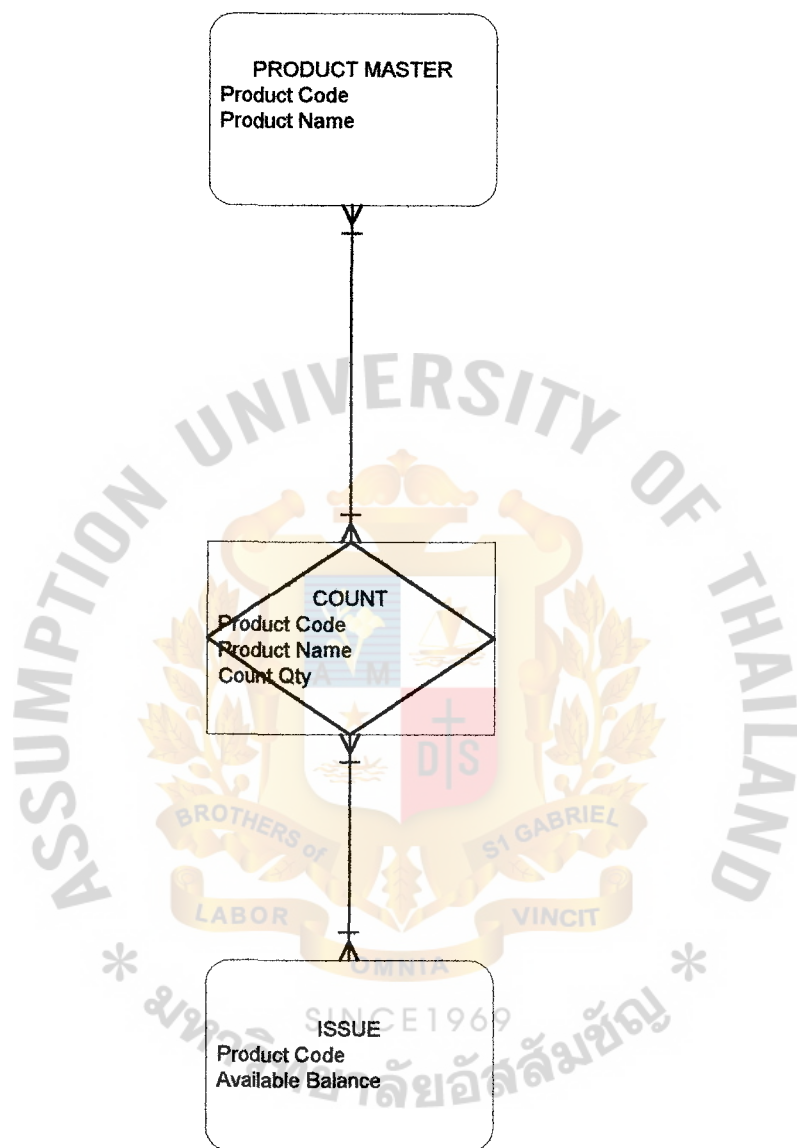


Figure G.7. Entity Relationship of Inventory Information System, Data Store D7.



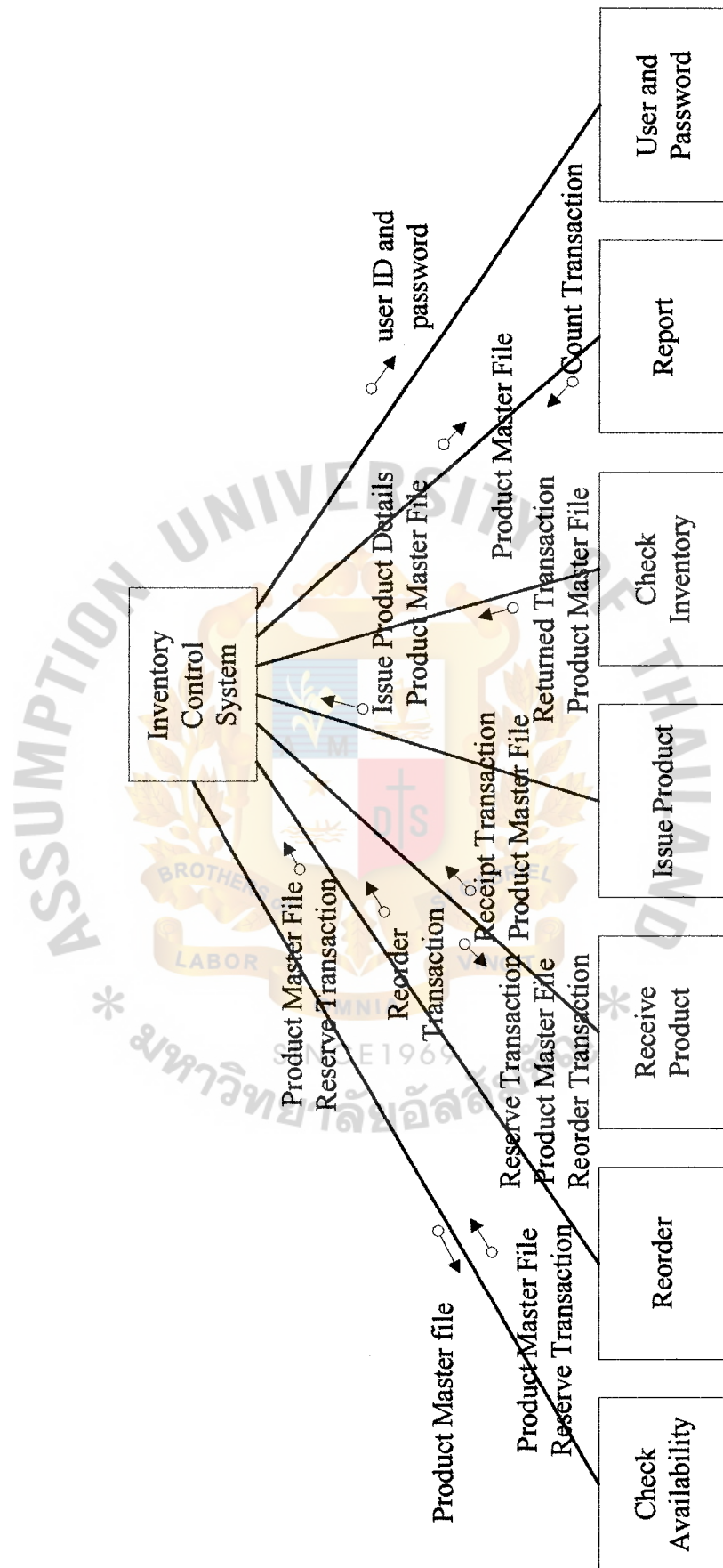


Figure H.1. Structure Chart of Inventory Control System.

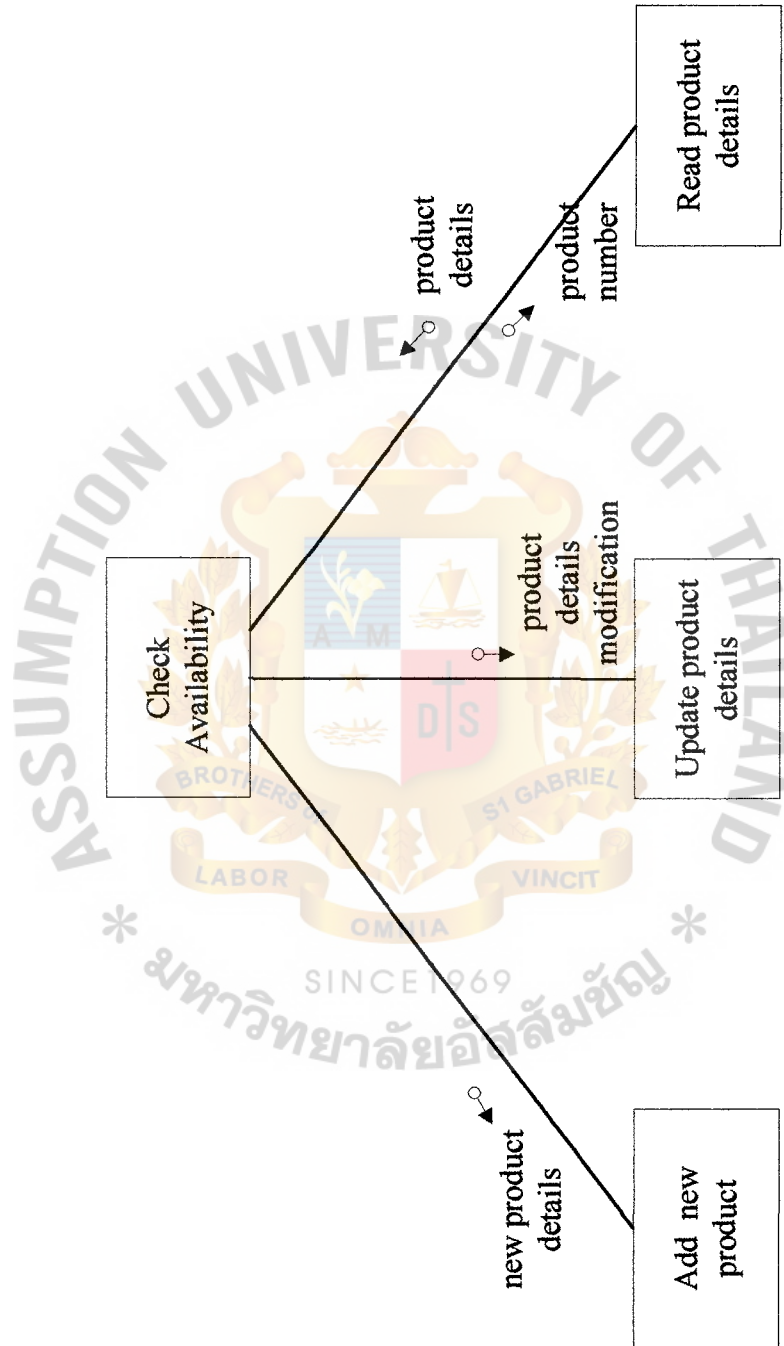


Figure H.2. Structure Chart of Check Availability.

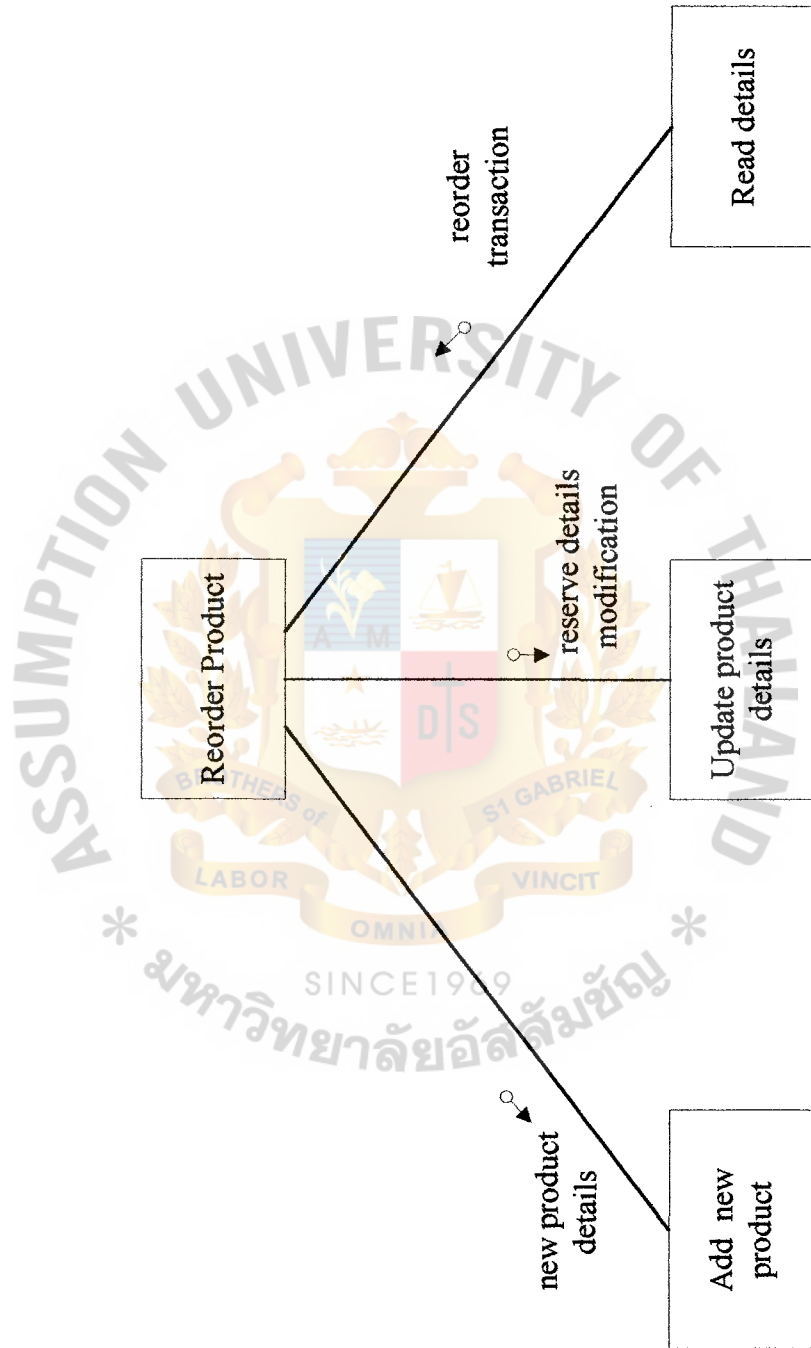


Figure H.3. Structure Chart of Reorder.

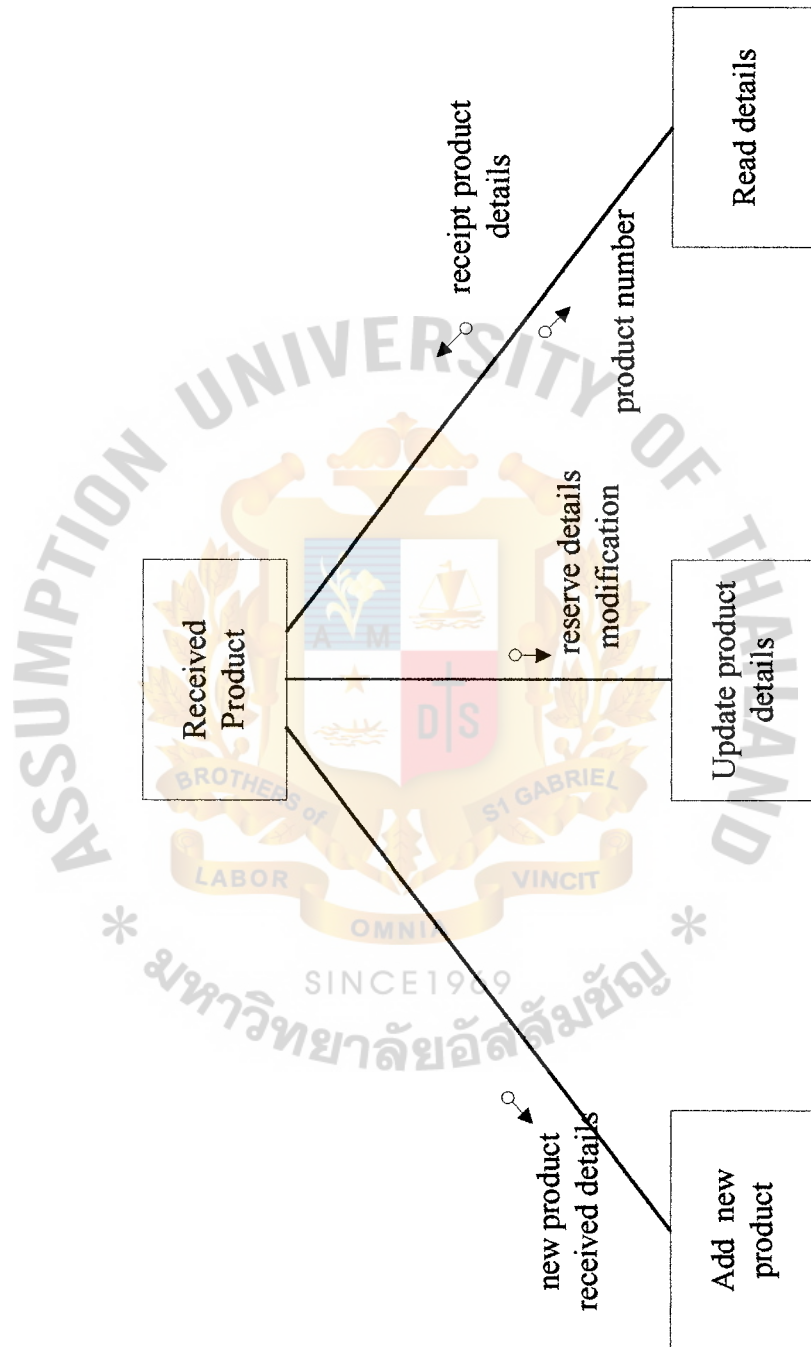


Figure H.4. Structure Chart of Receive Product.

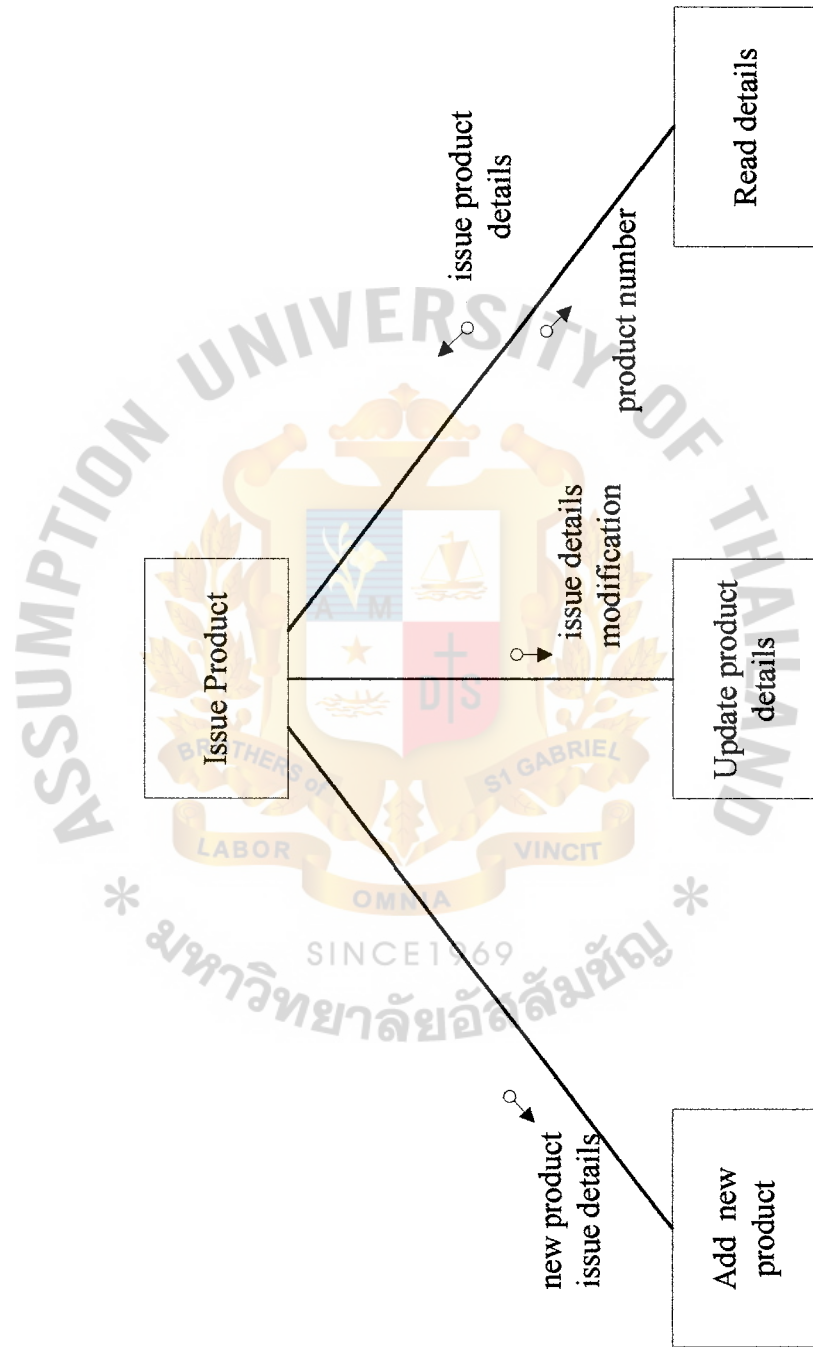


Figure H.5. Structure Chart of Issue Product.

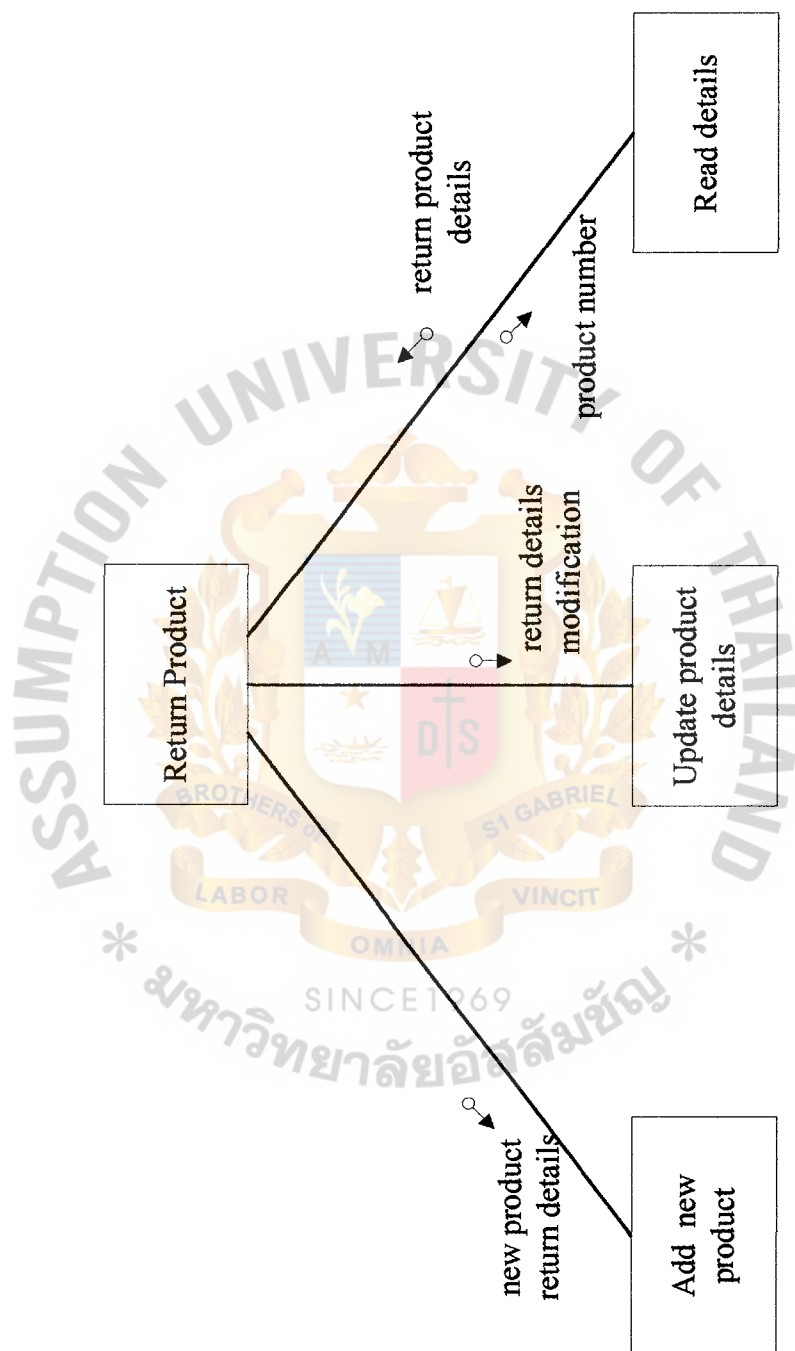


Figure H.6. Structure Chart of Returned Product.

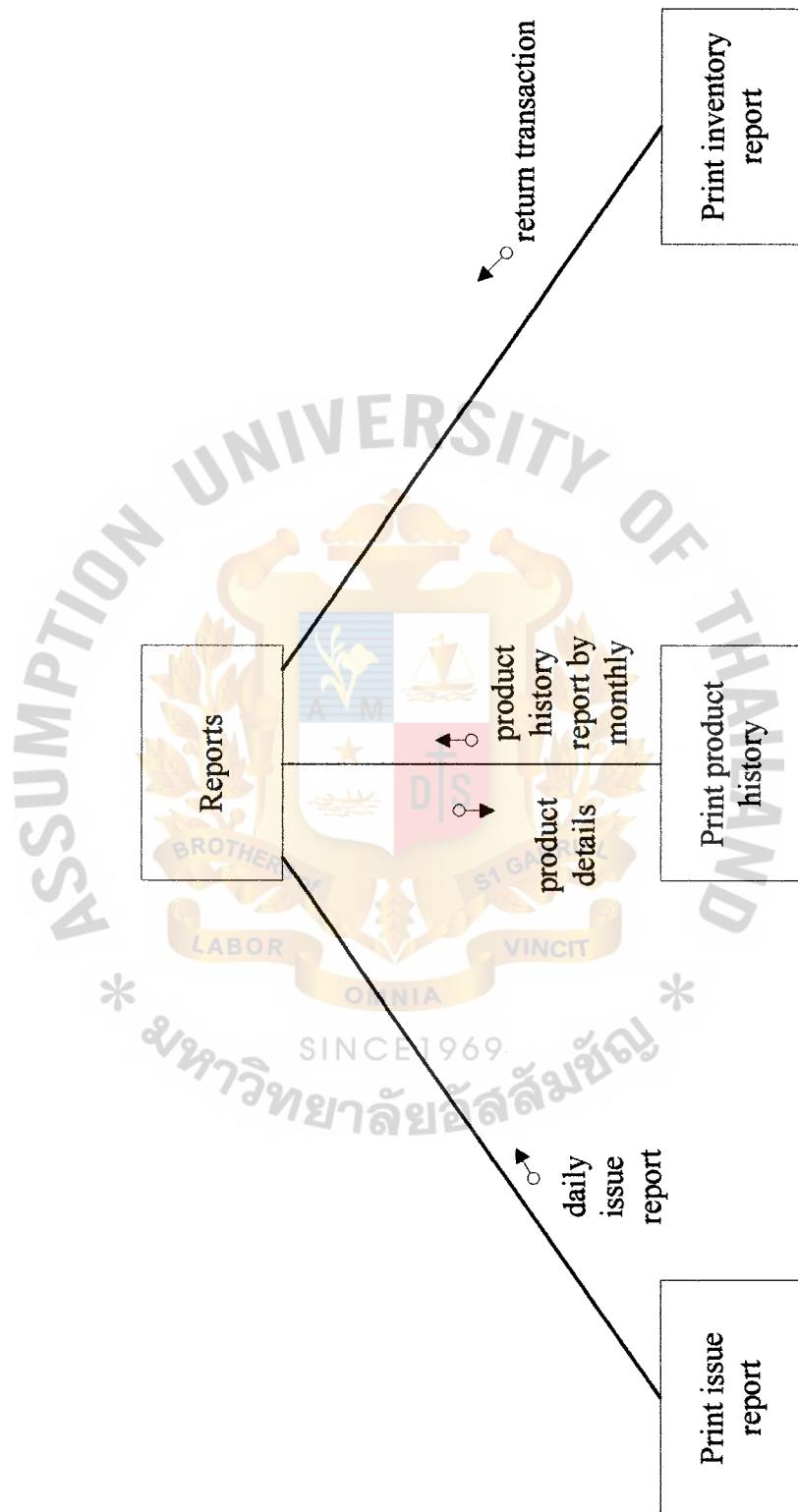


Figure H.7. Structure Chart of Check Inventory.

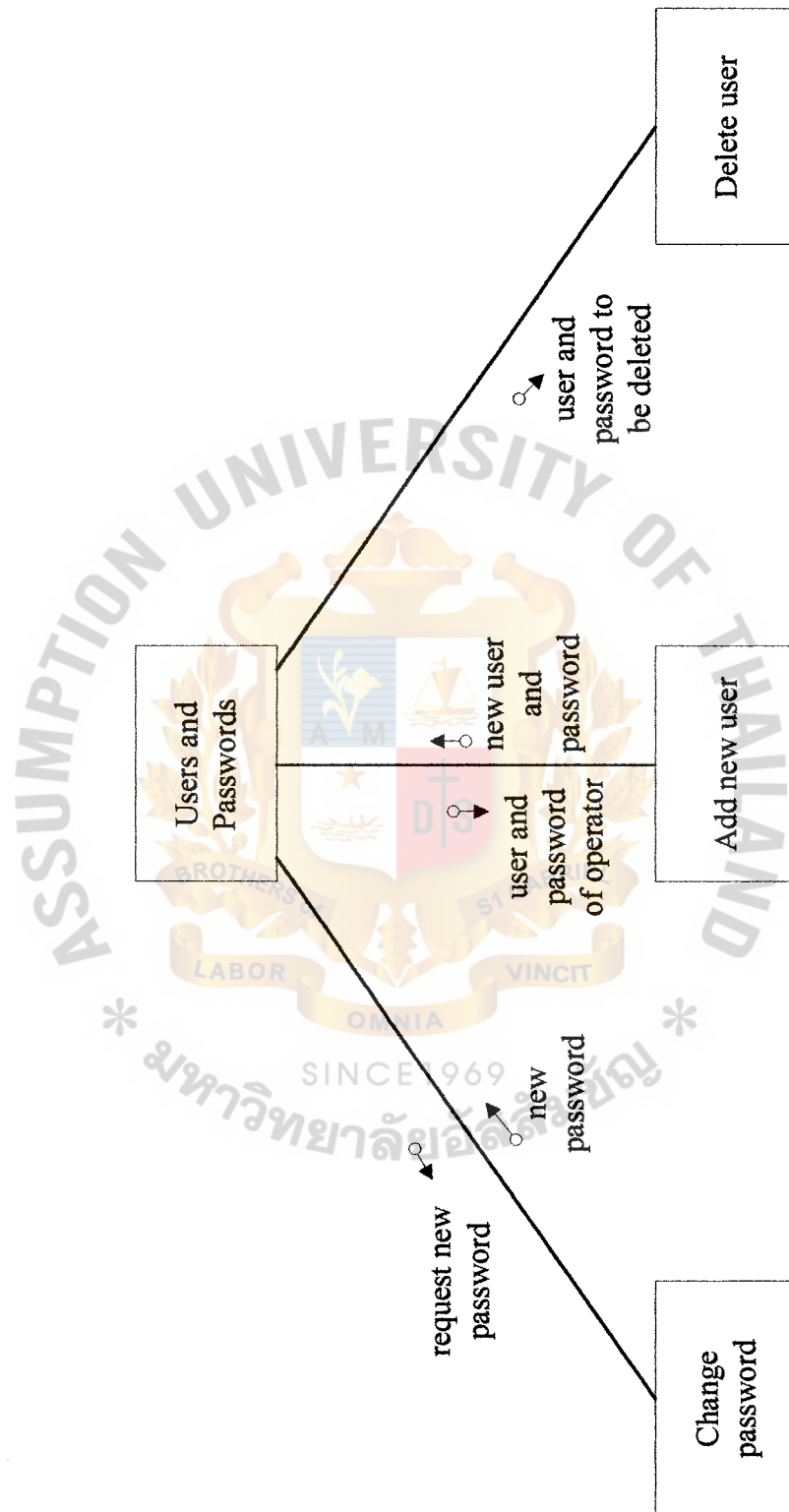


Figure H.8. Structure Chart of Users and Passwords.

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