



Raw Material Inventory Tracking System for Pacific Rubber Industry Co., Ltd.

by

Ms. Rungratsamee Laoarpasuwong

A Final Report of the Three - Credit Course
CS 6993 System Development Project

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

March 2000

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Project Title Raw Material Inventory Tracking System
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Academic Year March 2000

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.

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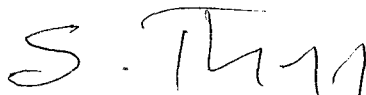


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ABSTRACT

This project covers the analysis, design and implementation of an information system for Pacific Rubber Industry Co., Ltd.(PRI). The scope of the project covers the part inventory section and its related activities.

The computer system is to be designed for the inventory tracking system of PRI which manufacturers canvas shoes for student customers as well as organization customers.

This is to analyze the existing system and to design the new computer system to meet the expectation and requirements of the users. The new system will give up-to-date information for production planning, sales planning and also financial planning. The computer system is to provide on-line reliable information that helps to reduce high risks in inventory and purchasing checking. The system will provide the efficiency and effectiveness for the inventory control and produce needed reports for all sections.

In recent years, the business of this company has been expanding rapidly in terms of revenue and profitability. The business expansion has impacts on the company's operation sections, especially the inventory sections which are confronting with overwhelming work. Therefore, to keep up with the workload, a computer system must be introduced to assist with the managing, organizing, and controlling department of the business process.

Microsoft Access version 7.0 has been chosen as the program development tool on the microcomputer network because it is easy to be used on modification as well as on interface between the programs.

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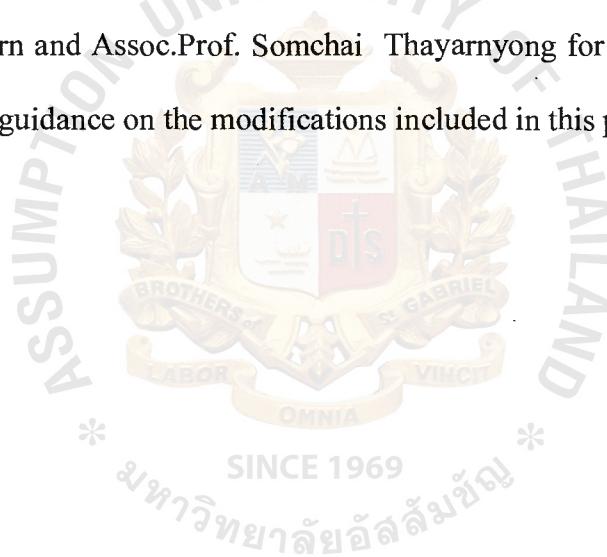


TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF FIGURES	iii
LIST OF TABLES	v
I. INTRODUCTION	1
1.1 Background of the Project	1
1.2 Objective of the Project	2
1.3 Scope of the Project	2
II. EXISTING SYSTEM	4
2.1 Background of Organization	4
2.2 Existing Business Functions	4
2.3 Current Problems and Areas for Improvement	6
III. PROPOSED SYSTEM	8
3.1 User Requirements	8
3.2 System Design	9
3.3 Hardware and Software Requirements	14
3.4 Process Design	18
3.5 Database Design	22
3.6 Interface and Output Design	22
3.7 Security and Controls	23
3.8 Cost and Benefit Analysis	27

<u>Chapter</u>	<u>Page</u>
IV. PROJECT IMPLEMENTATION	35
4.1 Overview of Project Implementation Schedule	35
4.2 Project Implementation	35
4.3 Testing	37
4.4 Complete the Documentation	38
V. CONCLUSIONS AND RECOMMENDATIONS	40
5.1 Conclusions	40
5.2 Recommendations	41
APPENDIX A PAYBACK ANALYSIS	43
APPENDIX B CONTEXT DIAGRAM	49
APPENDIX C DATA FLOW DIAGRAM	51
APPENDIX D STRUCTURE CHART	58
APPENDIX E FILE STRUCTURE	64
APPENDIX F DATA DICTIONARY	68
APPENDIX G PROCESS SPECIFICATION	70
APPENDIX H DATABASE DESIGN	76
APPENDIX I REPORT DESIGN	81
APPENDIX J SCREEN DESIGN	91
APPENDIX K PROJECT PLAN	99
BIBLIOGRAPHY	100

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
2.1 Organization Chart of Pacific Rubber Industry Co., Ltd.	6
3.1 Hardware Configuration of the Proposed System	17
3.2 Break-Even Chart	34
A.1 Payback Analysis Graph for Candidate Solution 1	44
A.2 Payback Analysis Graph for Candidate Solution 2	46
A.3 Payback Analysis Graph for Candidate Solution 3	48
B.1 Context Diagram of Existing System	49
B.2 Context Diagram of Proposed System	50
C.1 Data Flow Diagram Level 0	51
C.2 Data Flow Diagram Level 1 Process 1 : Raw Material Distribution	52
C.3 Data Flow Diagram Level 1 Process 2 : Inventory Tracking	53
C.4 Data Flow Diagram Level 1 Process 3 : Raw Material Verifying	54
C.5 Data Flow Diagram Level 1 Process 4 : Arrange Raw Material Detail	55
C.6 Data Flow Diagram Level 1 Process 5 : Prepare Report	56
C.7 Data Flow Diagram Level 1 Process 6 : Purchase Raw Material	57
D.1 Structure Chart of Raw Material Distribution Process	58
D.2 Structure Chart of Inventory Tracking Process	59
D.3 Structure Chart of Raw Material Verifying Process	60
D.4 Structure Chart of Arrange Raw Material Detail Process	61
D.5 Structure Chart of Prepare Report Process	62
D.6 Structure Chart of Purchase Raw Material Process	63

<u>Figure</u>	<u>Page</u>
H.1 Database Schema	76
H.2 Context Data Model	78
H.3 Key-Based Data Model	79
H.4 Fully Attribute Data Model	80
I.1 Raw Material Inventory Report (Arranged by Raw Material Number)	81
I.2 Raw Material Inventory Report (Arranged by Amount of Raw Material)	82
I.3 Used Raw Material Inventory Report (Arranged by Raw Material Number)	83
I.4 Used Raw Material Inventory Report (Arranged by Date)	84
I.5 Used Raw Material Inventory Report (Arranged by Amount)	85
I.6 Supplier Information Report	86
I.7 Supplier Report (Arrange by Supplier's Name)	87
I.8 Supplier Report (Arrange by Amount of Purchase)	88
I.9 Raw Material Purchasing Report (Arrange by Amount of Purchase)	89
I.10 Raw Material Purchasing Report (Arrange by Raw Material Number)	90
J.1 Main Menu Screen	91
J.2 Edit Raw Material Information Screen	92
J.3 Raw Material Distribution Screen	93
J.4 Update Raw Material Inventory Screen	94
J.5 raw Material Inventory Checking Screen	95
J.6 Edit Supplier Information Screen	96
J.7 Payment Checking Screen	97
J.8 Print Report Screen	98
K.1 Project Plan	99

LIST OF TABLES

<u>Table</u>	<u>Page</u>
3.1 Candidate System Matrix	12
3.2 Feasibility Analysis Matrix	13
3.3 Cost of Manual System	32
3.4 Cost of Computerized System	33
5.1 Degree of Achievement of the Proposed System	41
A.1 Payback Analysis for Candidate Solution 1	43
A.2 Payback Analysis for Candidate Solution 2	45
A.3 Payback Analysis for Candidate Solution 3	47
E.1 File Structure of Supplier File	64
E.2 File Structure of Raw Material File	64
E.3 File Structure of Supplied Raw Material File	65
E.4 File Structure of Delivered Raw Material File	65
E.5 File Structure of Requested Raw Material File	66
E.6 File Structure of Purchasing Order File	66
E.7 File Structure of Purchased Raw Material File	67
F.1 Data Dictionary	68

I. INTRODUCTION

1.1 Background of the Project

In manufacturing environment, inventories can be classified into:

- (1) Raw Material (RM)
- (2) Work In Process (WIP)
- (3) Finished Goods (FG)
- (4) Distribution Inventory

Inventories are important in both financial and production parts of the manufacturing company. Raw Material Inventory is one of the most important inventory because the effective raw material inventory management will keep production from begin interrupted from lack of raw material and at the same time reduce cost needed to order stock and handle those raw materials.

The existing raw material inventory and purchasing system in PRI are done by manual system which causes many ineffective and inefficient operations. Problems such as updating the stocks and checking the inventory status and valuation are difficult and time consuming because of the abundant information and stock items. Therefore, this effects many areas of organization such as purchasing planning, production planning, sales planning and also financial planning.

With lots of data involved and an accurate information required, the computerized raw material inventory and purchasing system is proposed to help dealing with inventory and purchasing management with other related activities.

1.2 Objectives of the Project

The objectives of the project on raw material inventory and purchasing system can be categorized as follows:

- (1) To study the existing manual inventory and purchasing system and design the new system development for inventory and purchasing system which will improve in more effectiveness and efficiency.
- (2) To design, develop and implement the computerized inventory management process for production department which should provide the following applications.
 - (a) To update the stocks timely on the easiest way and reduce redundancy and inaccuracy of information.
 - (b) To provide the information to achieve the minimization of the inventory level.
 - (c) To provide management with timely, meaningful and reliable information which effects management's decision making in planning and controlling in order to achieve the organization plan and goal.
 - (d) To develop Management Information System for the company.
- (3) To improve the raw material purchasing system for the company.

1.3 Scope of the Project

The scope of this project can be divided into 3 areas: they are the Scope of data, the Scope of processes, and the Scope of interfaces. The details in each area are the following.

- (1) The Scope of Data

This project includes all data or information that play as input or output in Raw Material Inventory System. The names are listed below.

- (a) Purchasing Order Information
- (b) Invoice Information
- (c) Production Order Information
- (d) Purchasing Requisition Information
- (e) Raw Material Information

(2) The Scope of Processes

In this project, all ongoing processes that occur in the Raw Material Inventory System will be studied and analyzed. The names of processes are listed below.

- (a) Raw Material Distribution Function
- (b) Raw Material Inventory Tracking Function
- (c) Raw Material Verifying Function
- (d) Raw Material Arrangement Function
- (e) Raw Material Purchasing Function
- (f) Preparing Report Function

(3) The Scope of Interfaces

The external entities concerning Raw Material Inventory System will be covered in this project as follows:

- (a) Supplier
- (b) Production Department
- (c) Purchasing Department
- (d) Management
- (e) Warehouse

II. EXISTING SYSTEM

2.1 Background of Organization

As a growing canvas shoe manufacturer, Pacific Rubber Industry Co., Ltd.(PRI) was founded 21 years ago(in1978). Initially, PRI produced both canvas shoes and slippers. Then in year 1983, Slipper lines were broken up and they only produced canvas shoes. At present, there are more than 16 models of shoe designs and the annual production capacity is 900,000 pairs. PRI consists of 5 departments and 185 employees. The amount of company's employees are varied by the company policy/plan (internal factor) and the economic conditions (external factor).

The target markets of PRI can be divided into 2 divisions, primary and secondary customers, due to its market size. The PRI primary customers are students which create 70% of the total revenue and the second group is the organization customers which create the revenue about 25% of the total sales.

2.2 Existing Business Functions

As mentioned earlier, there are 5 departments with different functions and responsibilities in PRI. The followings are details in each department. (see Organization Chart)

(1) Accounting and Financial Department

This department has 3 core functions that are to record all transactions which take place both inside and outside the company. Its duty is to prepare the financial and accounting report for the outside section and the company executives as well as to manage and control all the company's budgets.

(2) Purchasing Department

There are 4 functions in this department: finding and recording the list of suppliers which provide goods for organization, choosing appropriate suppliers, submitting issue to an executive for making decision to buy expensive goods, and purchasing Raw Materials and facilities.

(3) Production Department

There are 5 functions in this department: designing goods, producing goods, controlling quality of production, maintaining all machines to create the efficient and effective production, and controlling Raw Material Inventory.

(4) Personnel and Administration Department

Recruiting and selecting new employees is one of the duties in this department. Another 3 major duties are: controlling the company rules, recording the employee personnel records and issuing all mails and declaration to all related parties.

(5) Selling and Marketing Department

There are 4 functions in this department: selling and providing goods for customer, collecting information which is important to marketing activities, planning marketing researches, and receiving complaint from clients and declare to related operation.

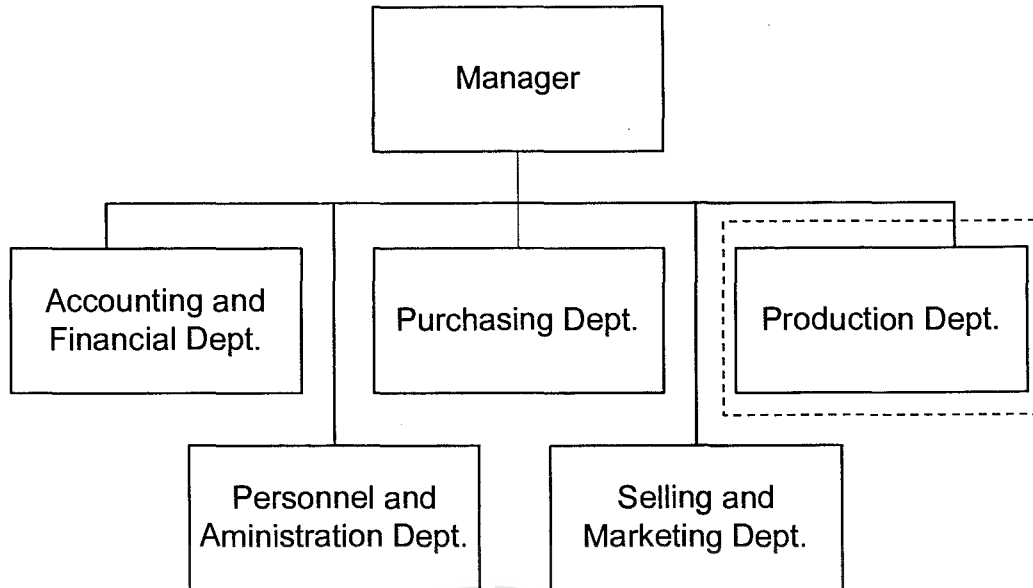


Figure 2.1. Organization Chart.

2.3 Current Problems and Areas for Improvement

The current problems and areas for improvement of the existing system can be summarized as follows:

- (1) Updating the stocks is too difficult because there are abundant information to store and many kinds of stock items.
- (2) It is difficult and it takes more time to check the inventory status and inventory valuation of all transactions.
- (3) It is difficult to implement the raw material purchasing process because raw material inventory system can not provide correct and on time information.
- (4) The erroneous of information which come from data entry people can occur easily because the manual system doesn't have an effective checking system.

- (5) Information base of raw material inventory is not sufficient for management to plan, forecast and determine marketing trend because there are limitations on the information's decorations.



III. PROPOSED SYSTEM

3.1 User Requirements

The users' requirements can be divided into 3 major categories: input, process and output requirements as shown in the followings.

3.1.1 Input Requirements:

- (1) To verify the correctness of input data by providing Automatic Data Collection (ADC).
- (2) To provide the familiar interface to the users who have little computerized skills.

3.1.2 Process Requirements:

- (1) To update raw material inventory automatically when raw material was distributed or purchased.
- (2) To inform about the purchasing raw material when they reach the reorder point.
- (3) To store the data in the suitable format, thus it guarantees no data redundancy.

3.1.3 Output Requirements:

- (1) To provide the information that support controlling and auditing raw material inventory process.
- (2) To provide the up-date and reliable information on time which is essential for managers in planning and making decision.
- (3) To provide the security for accessing to preserve data and protect the system from the unauthorized user.
- (4) To provide the overall efficient raw material inventory system.

- (a) To reduce data and report redundancy and conflict fact
- (b) To reduce manpower in non-productive manual work.
- (c) To increase the knowledge base among organization members.

3.2 System Design

In designing the proposed raw material inventory and purchasing system, we divide that into 3 major parts: process design, database design, and input and output design. The followings are about the detail of each design.

3.2.1 Candidate Solutions

The purpose of this activity is to identify all solutions for the business requirements defined during system analysis. Given the business requirement established in the definition phase of the system analysis, we have 3 candidate solutions for a proposed system.

(1) Candidate Solution 1

In the first solution, package software is purchased and the proposed system will satisfy inventory and prepare the report. The benefit of the first solution is it can be implemented easily.

(2) Candidate Solution 2

In the second solution, package software also is purchased but it gives more benefit than the first solution. In this candidate, it provides information which can be accessed by all managers immediately.

(3) Candidate Solution 3

In the last solution, the program will be written by in-house. This in-house writing program can provide high efficiency in customizing the usage of the proposed system.

3.2.2 Candidate System Matrix

A matrix is a useful tool to effectively capture, organize and communicate the characteristics for candidate solutions. The characteristics of candidate system matrix consists of Portion of System Computerized, Benefits, Servers and Workstations, Software Tools Needed, Application Software, Method of Data processing, Output Devices and Implications, Input Devices and Implications and Storage Devices and Implications.

3.2.3 Feasibility Analysis Design

Once alternative candidate design solutions have been identified, each candidate must be analyzed for feasibility. Feasibility analysis should be limited to costs and benefits. In our project we use four sets of criteria to evaluate the candidate solutions. The following are those criteria.

- (1) Technical feasibility
- (2) Operational feasibility
- (3) Economic feasibility
- (4) Schedule feasibility

In analyzing economic feasibility, we have 2 additional analysis tools. They are payback analysis and net present value analysis of each candidate solution. These 2 analysis will give more information and clear the picture of each solution which will be implemented analysis (See Appendix A).

In the first candidate solution, payback period is about 4 years 5 months. Although the cost of this candidate is lower than other candidate, it cannot generate high benefit, so payback period is longer than other candidate solutions.

In the second candidate solution, the payback period is about 3 years and 1 months. Although it has higher development cost than candidate solution 1, its payback period is shorter but longer than candidate solution 3.

The third candidate solution has the highest development cost but also gives the shortest payback period when compared with candidate solution 1 and 2. So its payback period does not depend on only the cost of system but also on both cost and benefit that can be generated from the system.

Feasibility Analysis Matrix which is shown in the next page shows the detail of analysis in each candidate solution feasibility.

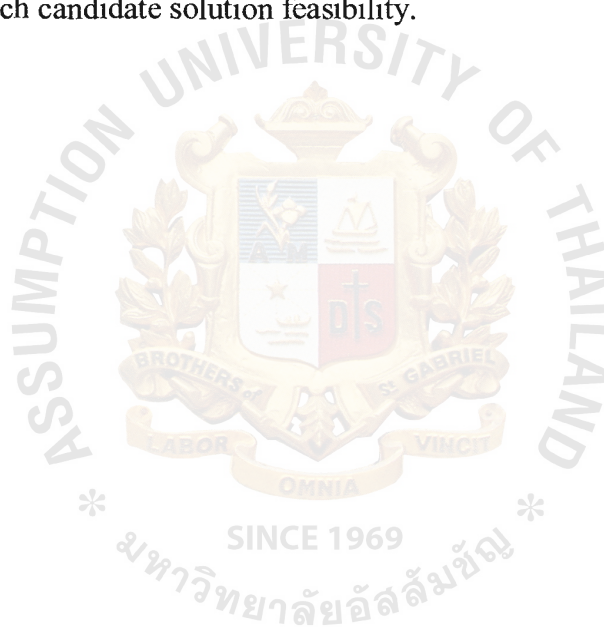


Table 3.1. Candidate System Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized	Package software would be purchased to satisfy inventory updated and prepare the reports.	Same as candidate 1 and all inventory information can be accessed by all managers immediately.	All inventory information can be accessed by all managers immediately.
Benefits	This solution can be implemented quickly because it's a purchased solution.	Quickly satisfy the requirement and provides more efficiency in accessing the data.	Provide more efficiency in accessing the data and gives more flexibility in long-term maintenance.
Servers and Workstations	No server. (2) Pentium II 450	(1) Pentium III 600 (Server) (2) Pentium II 450 (Client)	(1) Pentium III 600 (Server) (3) Pentium II 450 (Client)
Software Tools Needs	JAVA Language. Internet Explorer 5.0	Same as candidate 1	MS Visual Basic and MS Access to provide report writing and integration. Internet Explorer 5.0.
Application Software	Package Solution	Package Solution	Custom solution
Method of Data Processing	LAN and UNIX	Client/Server	Client/Server
Output Devices and Implications	(1) Epson 1170 LQ dot matrix printer. (1) Cannon BJC 4310 color bubble jet printer.	(1) Dot Matrix Printer Epson LQ-1170i. (1) Laser Printer Lexmark GPTRA E+	Same as candidate 2
Input Devices and Implications	Keyboard & Mouse	Keyboard & Mouse	Keyboard & Mouse
Storage Devices and Implications	(2) Sea-Gate Hard-Disk drive 8.2 GB.	Same as Candidate 1.	Same as candidate 1.

Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility	30%	Package Solution will provide faster updating , accessing and report making than the existing system. Score : 50	Package Solution with many clients will support more efficiency in accessing data for managers and executives which is used in decision making Score : 100	Same as Candidate 2 Score : 100
Technical Feasibility - Technology - Expertise	30%	The current package software has many limitations so company charges an additional fee for updating the program in the long term. Requires trainer to train end users. Score : 75	Same as candidate 1 Same as candidate 1 and programmer to setup network. Score : 50	The Visual Basic will support and increase capabilities of access software. It is not too difficult in maintenance. Required programmer to write VB and setup network. Score : 75
Economic Feasibility - Cost of develop: - Payback period (discounted): - Net Present Value: - Detailed calculations:	30%	Approximately 454,000 Baht Approximately 4 years and 5 months. Approximately 211,992 Baht See Appendix A Score : 50	Approximately 500,000 Baht Approximately 3 years and 1months. Approximately 553,122 Baht See Appendix A Score : 80	Approximately 524,000 Baht Approximately 2 years. Approximately 733,453 Baht See Appendix A Score : 100
Schedule Feasibility	10%	1-2 months Score : 100	2-3 months Score : 90	4-5 months Score : 80
Ranking	100%	62.5	78	90.5

3.3 Hardware and Software Requirement

The proposal of this new system is to provide all users with effective access, updated data and information. Networking system can achieve this proposal because it is the system that links computers together along with other peripheral equipment via communication lines. In this proposed system, data processing also is a centralized system by using one computer file server to serve the data processing needs of the entire organization.

The configuration of this proposed network system is 10 Base-T LAN that provides users at geographically dispersed location to share program, data and equipment. The followings are the detail of hardware and software that are required for this proposed network system.

3.3.1 Hardware Requirement

Hardware requirement in this new system can be divided into 4 components: Database File Server, Workstation Computer, Printer, and Other Devices.

(1) Database File Server

- Processor Pentium III 600
- External Cache 512 KB
- RAM/MAX 128 MB
- Floppy Drive 1.44
- CD-ROM Drive 50X
- Hard Disk 13 GB
- Bus Architecture 1 AGP, 4 PCI, 2 ISA
- Monitor Size/Type Standard Color 15" (800*600, 256 Color)
- Video Ram 8 MB

- Sound Card
- Network Card 10 Base-T standard card (32 bit) PCI

This database file server will provide a centralized system by serving the data processing and data storage for the entire organization, so it must have high speed in order to run the applications and to provide access to the data. For the storage space, this server has 13 GB to keep the application software and data for inventory and purchasing management system.

(2) Workstation Computer

- Processor Pentium II 450
- External Cache 512 KB
- RAM/MAX 64 MB
- Floppy Drive 1.44
- CD-ROM Drive 40X
- Hard Disk 4.3 GB
- Bus Architecture 3 PCI, 2 ISA
- Monitor Size/Type Standard Color 15" (800*600, 256 Color)
- Video Ram 8 MB
- Sound Card
- Network Card 10 Base-T standard card (32 bit) PCI

All workstation computers of this proposed system are installed with private software such as Microsoft Word 97, Microsoft Access 97, Microsoft Excel 97, and Microsoft PowerPoint 97. These software supports report preparation or information accessing as well as routine paper work generating such as word processing or Excel

spreadsheet. All workstations provide relatively large storage space to keep the software, application, and some data of the system.

(3) Printer

- Dot Matrix Printer Epson LQ 2180I
- Laser Printer Lexmark OPTRA E+

Dot matrix printer is used for purchasing order system that needs more than one copy and laser printer is used for general propose such as report printing the reports or other documents.

(4) Other Device

- UPS 1500 VA
- UPS 1200 VA

3.3.2 Software Requirement

(1) Operation System

- Microsoft Windows NT 4.0 Server (Thai)
- Microsoft Windows NT 4.0 Workstation (Thai)

(2) Software Package

- Microsoft Word 97
- Microsoft Access 97
- Microsoft Excel 97
- Microsoft PowerPoint 97

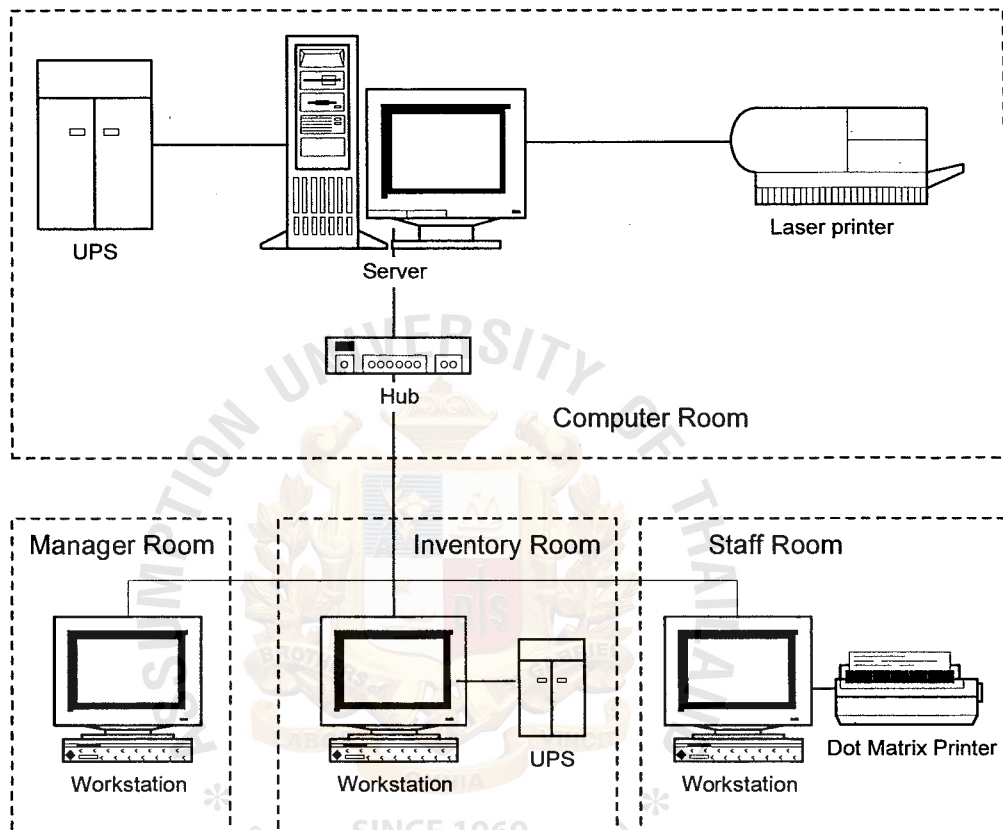


Figure 3.1. Hardware Configuration of the Proposed System.

3.4 Process Design

We designed the proposed processes based on Data Flow Diagram (DFD) concepts as being structured analysis and design tools. In designing the new process, we had to analyze the existing process and developed it to be the DFD shown in Appendix A. and the new proposed system is shown in Appendix B. Detail of the new system is described below.

3.4.1 The Context of the Proposed System

When production department wants to use raw material in manufacturing, he will send the production order to the system. If that production order is complete and the raw materials are sufficient, the system will send the confirmation form back to the department and it will also issue the picking ticket to the warehouse and update the amount of raw material inventories immediately. On the other hand, if requested raw materials are not sufficient, the system will return the unconfirmation form back to the production department.

When the amount of raw material is reduced to the reorder point, the system will prepare the purchasing requisition form and send it to the purchasing department. After the purchasing department orders the raw materials to the supplier, the slip of purchasing order will be sent into the system. This purchasing order slip will be used in verifying the raw material which is delivered from the supplier by comparing with the supplier invoice. If the delivered raw materials are not verified, the system will send the unverified raw materials back to the supplier.

The system also provides the report containing the information which can be requested from the company executives at anytime.

3.4.2 The Processes of the Proposed System

The new proposed inventory system consists of 5 processes as to achieve the project objectives as follows:

(1) Process 1: Raw Material Distribution

When the production department sends the production order informing about the required raw materials into the system, the system will check the completeness of that order first. If it is complete, the system will check the availability of requested raw material, if it is sufficient the system will issue the confirmation form and picking ticket back to the production department and warehouse respectively. On the other hand, if requested raw materials in inventory are not sufficient, the system will inform the production department by issuing the unconfirmation form.

After the system issues the picking ticket and confirmation form, the amount of raw materials in the inventory will be updated immediately.

(2) Process 2: Inventory Tracking

This process has 2 main functions: checking reorder point and preparing purchasing requisition form.

The system will check the reorder point automatically. When the amount of raw material reduces to the reorder point, the system will notify to the inventory staff, then purchasing requisition is prepared and sent to the purchasing raw material process.

(3) Process 3: Inventory Updating

This process has 5 main functions: verifying purchasing order, verifying invoice, verifying raw material, preparing unverified raw material form, and updating arrival raw material.

After the purchasing department orders the raw material, the slip of purchasing must be sent to be stored in the system. When supplier sends the raw material to the warehouse, the supplier's invoice must be verified by comparing with the slip of purchasing order. After that, the delivered raw materials are checked. If raw materials are not verified, unverified raw material form is prepared and sent back to supplier, if raw materials are verified, the amount of delivered raw material are updated to the inventory.

(4) Process 4: Arrange Raw Material

The function of this process is to create and update raw material list and detail. The production department will inform about the new raw materials that are required to be used in production.

(5) Process 5: Prepare Report

This process has 3 main functions, they are receiving query from manager or authorized person, collecting data and information, and preparing the report.

There are 2 kinds of report that are provided by the system, first is report that is prepared daily, weekly, monthly, quarterly or annually. Second is the report that managers or executives can retrieve at any time. When they want to know any information, they will send the query into the system.

After that the system will collect the data by retrieving the data from a specific data stored and arranging it in the form that is easy to use.

(6) Process 6: Purchasing Raw Material

When raw material requisitions are sent into this process, the system will compare the record of price information among the suppliers. After they find the best supplier, the system will prepare the purchasing order and send it to the supplier.

3.4.3 Structure Chart

In the software design process, we are concerned with how the programming specifications are presented to the computer programmer for implementation. Software design consists of modular design and packaging. Modular design is a decomposition of a program into modules. Packaging is the assembly of DATA, PROCESS, INTERFACE and GEOGRAPHY design specifications for each module.

The popular strategy for determining an optimal modular design for programs is called structured design. The primary tool used in the structured design is the structure chart. Structure charts are used to graphically depict a modular design of a program. They do not only show how the program has been partitioned into smaller, more manageable modules, but they also show the hierarchy and organization of those modules, as well as the communication interfaces between modules. Appendix D shows the structure chart of this project.

3.5 Database Design

Before we move to design the database, the analysis of database has to be developed. Data analysis is a process that prepares a data model for implementation as simple, non-redundant, flexible and adaptable database by using Entity Relationship Diagram (ERD) technique. The detail of ERD is shown in Appendix B.

After we get database in the 3rd normal form, we are ready to design our database by using a model called database schema. A database schema is the physical model or blueprint for a database. It represents the technical implementation of the logical data model. The database schema of the proposed system is presented in Appendix C.

3.6 Interface and Output Design

In designing the input, the on-line processing is selected as the input method. On-line input is the capture of data at its point of origin in the business and the direct inputting of that data to the computer, preferably as soon as possible after the data originates. The proposed system also uses GUI technology to enhance the user interface in its client/server application. The details of users interface are the followings.

Login screen will be used for security reason. Correct user name and password are a must to log in to a system.

- (1) Main Menu Screen shows the main function of the system that provides convenience for user interface.
- (2) Raw Material Editing Screen is used for managing raw material list and their detail including adding, deleting, and editing.
- (3) Raw Material Distribution Screen is used for raw material availability checking, picking ticket preparing, and raw material inventory updating.

- (4) Raw Material Adding Screen is used for updating raw material inventory when purchased from supplier. It also contains the information about invoice number, price per unit and total price.
- (5) Raw Material Inventory Checking Screen is used for presenting the amount of raw material inventory and the list of unavailable raw material.
- (6) Supplier Editing Screen is used for managing supplier list and their detail including adding, deleting, and editing.
- (7) Payment Checking Screen is used for checking the payment and delivery of ordered raw material.
- (8) Report Screen is used for preparing the document report.

The interface and output design of the proposed system is presented in Appendix I-J.

3.7 Security and Control

Security and control policies for the proposed system are as follows:

- (1) There must be passwords for login security control to prevent unauthorized users from accessing the system.
- (2) Data must be input on the same day or the day after the transactions occurred, in addition, the list of input data must be with input form.
- (3) Data correction must be made immediately after errors on the data listing report are found.
- (4) Report must be produced upon the predetermined number and schedule or management request as needed. The used report must be kept in sorted files and the unused reports must be kept in boxes for destruction.
- (5) There must be back up diskettes for all data and programs.

3.7.1 Security

In network operating systems, the server resembles a library which stores various programs and data files in a LAN and determines the person who can get access to the programs. The security is necessary in a network operating system. The security subject of this project is totally concerned with all the policy procedures and technical tools used to safeguard an information system from unauthorized access to data and applications alteration, theft and physical damage. To prevent the previous causes, the security implementation of an information system provides 2 levels as follows:

(1) Physical security

This level of security actually uses technical such as door locks, safer and guards to prevent physical access to areas containing sensitive information. In fact physical security alone is not sufficient to protect the data. Due to the fact that access to the database is available throughout the organization and many on-line systems also can be accessed, an uninterrupted power Supply (UPS) attached to the LAN and virus protection and prevention software are used. Therefore, the other security level; data access security, should be added.

(2) Data Access security

There are many data access security measures that are used to protect data. The data access security measures used in an information system for the proposed System are presented as follows:

(a) Identification / Authorization

To supply each user with a user identification number and after identification, a user must typically go through an authentication

procedure Authentication verifies that the person who has been identified is not an impostor. User authentication means providing some additional information supposedly known only to the user. Typically, this is password. The password controls access to network. The identification and authentication identifiers such as user names and passwords must be carefully protected by introducing a set of procedures which are listed as follows.

(b) User profiles

The user who is allowed to access files should receive trustee right to the directory where the files are located. Before users can copy or create files on a file server, they must have rights to the directory.

The trustee rights determine the ability to read, delete, view and update files and directories. Therefore the user groups must create directories. The trustee rights is given to the group. Moreover, the users should read the data and some Users update the data. Trustee rights are assigned to the directory or to files in a Directory. User views provide security at the table, record, and data element levels.

3.7.2 Controls

The control subject of this project is totally concerned with the specific technology and policies used to protect assets, accuracy and reliability of an information system. The type of controls which will be used is presented as follows:

(1) General controls

This type governs the security and accuracy of the over all computing environment. General controls ensure the following:

- (a) The security and reliability of computer hardware
- (b) The security and reliability of software
- (c) The security of data file
- (d) Consistent and correct computer operations
- (e) Proper management of systems development.

The areas covered by general control are hardware, software computer operation and data security. They include such safeguards as data security measures, routine error checks in hardware, restriction of access to programs requiring logs of Operation system activities, and establishing procedures for running computer jobs correctly.

(2) Application controls

There are three types of application controls corresponding to the three basic steps in computing input, processing and output. At each step, there are specific types of application control. It will check for error incompleteness of data when the data center for an information system processing controls ensure the accuracy and Completeness of data the results of computer processing are accurate, complete, and Properly distributed. The most important application control techniques are procedures. For authorizing and valid dating input and output and programmed edit checks.

3.8 Cost and Benefit Analysis

3.8.1 Cost Analysis

In analyzing the cost of the new proposed system, we can divide the total cost into 3 categories: investment cost, the implementation cost and the annual operation cost.

(1) The investment cost

The investment cost consists of 2 components: hardware and software cost. The detail of hardware and software specification are shown in the topic of hardware and software requirements. Tables below show the cost of hardware and software that are required in this new proposed system.

(a) Hardware Cost

- 1 set of File Server	100,000 Baht
- 3 sets of Workstation	114,000 Baht
- 1 set of Repeater (Hub)	10,000 Baht
- 1 set of Laser Printer	12,600 Baht
- 1 set of Dot Matrix	20,350 Baht
- 1 set of Cross Over	1,100 Baht
- 1 set of UPS 1500 VA	18,800 Baht
- 1 set of UPS 1200 VA	27,000 Baht
Total Hardware Cost	303,850 Baht

(b) Software Cost

- 1 set of Windows NT Server 4.0	46,600 Baht
- 3 sets of Windows NT Workstation 4.0	14,600 Baht
- 3 sets of MS Office (Thai)	45,000 Baht
Total Software Cost	106,200 Baht

- Software Development	100,000 Baht
- Installation and Startup	5,000 Baht
- Training	9,000 Baht
Total Implementation Cost	114,000 Baht

Total Investment Cost $(303,850 + 106,200 + 114,000) = 524,000$ Baht

(2) Annual Operating Cost

- Hardware: Part and Labor	5,000 Baht
- Software : Maintenance and Upgrade	5,000 Baht
- Software Support	5,000 Baht
Total Operating Cost $(5,000+5,000+5,000)=$	15,000 Baht

3.8.2 Benefit Analysis

The benefits of new inventory and purchasing system can be divided into to 2 categories: The first one is tangible benefit and the second is intangible benefit.

(1) Tangible Benefit

Tangible benefits of the proposed system are as follows:

- (a) Increase the efficiency of checking Raw Material inventory availability which reduces the checking time from 1 hr. to 15 minutes per production order.

- Wages/hours	48	Baht /person
- Person	1	Person
- Safe time	$60-15 = 45$	Min /Production order
- Safe cost per production order	$(48/60)*45 = 36$	Baht/production orders
- Average production order/day	4	Orders

- Cost saving /day 36*4=144 Baht
 - Cost saving /year (144*26*12)= 44,928 Baht
- (b) Reduce office supply expense
- Reduce from 2,500 bath/ month to 5,000 Baht/ month
 - Cost saving/ month 15,000 Baht
 - Cost saving/year 180,000 Baht
- (b) Increase the efficiency of purchasing raw material which reduces the price comparison and collecting price information from 4 hrs/ purchasing order to 30 mins/ purchasing order.
- Wages/ hour 48 Baht
 - Person 1 Person
 - Time saving (4-0.5)= 3.5 hrs/
 - Purchasing order
 - Cost saving/ purchasing order (3.5*48)= 168 Baht
 - Average purchasing order/ month 12 orders
 - Cost saving/ month (168*12)= 2,016 Baht
 - Cost saving/ year (2,016*12)= 24,192 Baht
- (c) Increase the efficiency of updating raw material inventory and reduce the error information from 4 hr. to zero time of updating.
- Wages/ hr. 48 Baht/person
 - Required person 3 persons
 - Time saving/ checking 4 hrs.
 - Cost saving/ checking ((4*48)*3)= 576 Baht
 - Average checking time/ month 8 Times.

- Cost saving/ month 4,608 Baht.
- Cost saving/ year 55,296 Baht.

(d) Reduce time for preparing report from 12 hrs. to 1 hr.

- Wages/ hr. 48 Baht/person
- Person requirement 3 Persons
- Time saving 11 hrs.
- Cost saving/preparation (48*3*11)= 1,584 Baht
- Average report preparation/ month 1 Times
- Cost saving/ month 1,580 Baht
- Cost saving/ year 19,008 Baht

Total tangible benefit (44,928+180,000+24,192+55,296+19,008) =
303,424 Baht

3.8.3 Calculations of Payback Period

$$\text{Payback Period} = \frac{I}{(1 - T) R}$$

I = Investment Cost

R = Average annual return on the investment
(tangible benefit subtracted by operating cost)

T = Corporate tax rate in percentage (30%)

$$\begin{aligned} \text{Payback Period} &= \frac{524,000}{(1 - 0.3) (303,424 - 15,000)} \\ &= 2.46 \text{ years} \end{aligned}$$

Payback period (after tax) for the proposed system is 2.46 years.

3.8.4 Calculations of Break Even Year

(1) Break Even Analysis

It is reasonable to apply the concept of break-even analysis to compare between the current system and the proposed system. In this case, the cost of the new system is compared with the cost of the current system to determine whether the new system costs the same as the old one.

Figure 3.2 shows such the break-even analysis, in which the cost of the new system initially would be higher than the current system. In 2 years and 2 months, the new system would have reached the break-even point and thereafter, becomes more economical to operate than the current system.



(2) Cost of Manual System

The cost of manual system is summarized as the table below:

Table 3.3. Cost of the Manual System.

Cost items	Years				
	1	2	3	4	5
1. Personal					
- Supervisor (1 person and 15,000 + 10% increase)	180,000	198,000	217,800	239,580	263,538
- Operators (3 persons and 10,000 + 10% increase)	360,000	396,000	435,000	479,160	527,076
2. Office Equipment					
- Office Facilities	70,000	80,000	90,000	100,000	110,000
- Paper Work and Document	30,000	40,000	50,000	60,000	70,000
- Utility and Other Expenses	80,000	90,000	100,000	110,000	120,000
Total Cost (Baht)	720,000	804,000	893,000	988,740	1,090,614
Accumulative Cost (Baht)	720,000	1,524,000	2,417,000	3,406,140	4,496,754

(3) Cost of Computerized System

The cost of computerized system is summarized as the table below:

Table 3.4. Cost of the Computerized System.

Cost items	Years				
	1	2	3	4	5
1. Investment Cost					
- Hardware	303,850	75,962	75,962	75,962	75,962
- Software	106,200	26,550	26,550	26,550	26,550
2. Implementation Cost	114,000	-	-	-	-
3. Manpower					
- Supervisor	180,000	198,000	217,800	239,580	217,800
- Operator	240,000	264,000	290,400	319,440	351,384
(10% increase/year)					
4. Operating Cost					
- Hardware: Part and Labor	-	3,500	5,000	5,000	5,000
- Software: Maintenance and Upgrade	-	5,000	5,000	5,000	5,000
- Software Support	-	5,000	5,000	5,000	5,000
5. Utility	60,000	66,000	72,600	79,860	87,846
(10% increase/year)					
Total Cost (Baht)	1,004,050	644,012	698,312	756,392	747,660
Accumulative Cost (Baht)	1,004,050	1,648,062	2,346,374	3,102,766	3,850,426

(4) Comparison between Cost of the Manual System & Cost of the Computerized System.

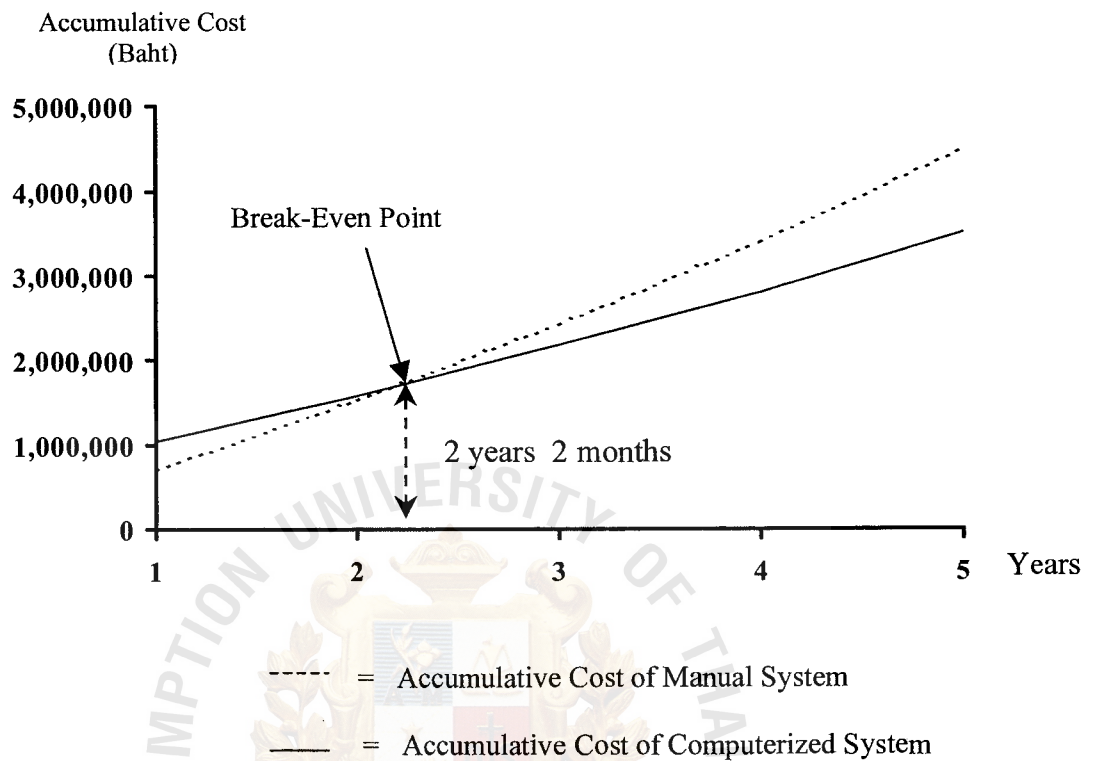


Figure 3.2. Break-Even Chart.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation Schedule

The Project Schedule is activity chart of the estimated time that is assigned to each job. In this case, it takes about 6 months from the beginning until the end. The Project Schedule can be divided into 3 main stages:

- (1) System Analysis Stage
- (2) System Design Stage
- (3) Implementation Stage

System Analysis Stage is the survey and planning of the system and project. It also includes the study and analysis of the existing business functions and current problems and areas for improvement.

System Design Stage is the evaluation of alternative solutions and the specification of a detailed computer-based solution. In this stage; it comprises of process design, database design, interface design, hardware and software requirements, security and control design, cost and benefit analysis.

Implementation stage is the last requirement of the project. It is to implement all designs realistically. The implementation part consists of a lot of works to be done such as the following job: Screen Layout, Report Layout, Programming, Data Conversion, Testing, Training, Documentation, this activity takes about 10 weeks.

4.2 Project Implementation

The project implementation includes all activities that take place from the removal of the current system to the installation of the new system. Implementing a new system involves three primary activities: training, conversion and post-implementation review.

4.2.1 Training

Training will deal with the users who will be associated with the proposed system.

The user training will involve:

- (1) Equipment usage(where applicable)
- (2) Equipment troubleshooting(where applicable)
- (3) Application familiarization
- (4) Data capture and coding
- (5) Data Handling (Addition of records/ Deletion of records/Edition of records)
- (6) Information retrieval
- (7) Information utilization

This is to make sure that the necessary personnel will be ready for the new computer-based system.

4.2.2 Conversion

To change the existing system to the proposed one, there are many methods of handling a system conversion. Parallel approach is considered. The existing system is operated along with the proposed system so that the existing system can take over if errors are found or if the usage problems occur. This approach offers greatest security.

The conversion plan includes a description of all the activities that must occur in implementing the proposed system and put it into operation as follows:

- (1) List all files for conversion.
- (2) Identify all data required to build new files during conversion.
- (3) Identify all controls to be used during conversion.
- (4) Assign responsibility for each activity.
- (5) Verify conversion schedules.

4.2.3 Post-implementation Review

After the proposed system is implemented and conversion is completed, the review of a system is usually conducted to make sure how it has been accepted or whether adjustments are needed. The most important thing concerned during the post-implementation review is whether the system has met its objective. The methods for collecting details of the new systems are questionnaire, interview, observation, sampling and record inspection.

4.3 Testing

The quality of the computerized system depends on system reliability and maintainability. System testing is the critical process for program development. The program must prove that there are no errors.

The testing must include both unit and system testing. The unit test is conducted first on each module, independently after one another, to locate errors. The errors in coding and logic that are contained within the module can be detected because the interaction between modules are initially avoided. System testing involves testing the integration of each module in the entire system. The test must also verify that file sizes are adequate and the system can achieve the result modules expected. There are another six proposed tests as follows:

(1) Peak load testing

Determine whether the system will handle the volume of activities that occur when the system is at the peak of its processing demand.

(2) Storage testing

Determine the capacity of the system to store transaction data on a disk or in other files.

(3) Performance time testing

Determine the length of the system used by the system to process transaction data.

(4) Recovery testing

Determine ability of user to recover data or restart system after failure.

(5) Procedure testing

Determine clarity of documentation on operation and use of system by having users do exactly what manual requests.

(6) Human factors testing

Determine how users will use the system when processing data or preparing documents or reports.

4.4 Complete the Documentation

After completion of the testing, documentation of the program, set of programs, all program models are done. Three equally important forms of documentation are the followings:

(1) Design/development documentation

(2) User documentation

(3) Operation documentation

Design/development provides a detailed understanding of a system. The greater quality and completeness of this form of documentation it is, the easier to understand the framework and inner workings of the system it is. The easier to understand a system, the easier it is to maintain the system it is. It is the responsibility of IS managers to make sure that this form of documentation retains its quality and completeness.

User confidence in a system directly affects system maintenance. A system without well written, completed documentation appears faulty to users. The question of its validity and reliability; therefore, is important to the maintenance effort. User documentation retains its quality and completeness throughout the life of the system.

Finally, IS manager must make sure that the documentation created for the operation staff retains its quality and completeness. This documentation represents instructions for execution setup, output distribution, scheduling and other forms of operational instructions accompanying a system. Poor-quality operation documentation may lead to improper system execution. This may result in more maintenance activity than it is actually necessary and a loss of user confidence.



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study of this project is to analyze, design and implement the inventory information system for Pacific Rubber Industry Co., Ltd. (PRI). During the analysis of the existing system, some problems are found. A large amount of Raw Material types, Raw Material quantities and transactions occur each day. The process of daily transactions seems to be busy and difficult in manual operation. The stocks are out of items. Some of them are missing or misplaced, some are obsolete and their quantities do not match the production demand. The company's cash flow is tight as there is too much investment in the inventory. The computerized system is then developed to support the work of this business.

The proposed computerized procedure and database system will help inventory control operation instead of manual system. It also provides several benefits such as it saves time expenses, it provides timely reorder point information, it provides information about stock location, it increases the efficiency and effectiveness in inventory control and provides up-to-date and it also accurate information of inventory for the management.

By using such data flow diagrams, the new system can be designed and information flow can be described. The input from screen design and output reports are shown in Appendix I-J for this computer information system. The security and control system includes data accuracy control, backup control for authorized person and source document control for interrelated sections.

Table 5.1. Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
Raw Material Distribution	10 mins.	2 mins.
Inventory Tracking	1 hrs.	15 mins.
Raw Material verifying	30 mins.	2 mins.
Arrange Raw Material Detail	15 mins.	2 mins.
Prepare Report	12 hrs.	1 hrs.
Purchase Raw Material	4 hrs.	30 mins.
Total	17 hrs. 55 mins	1 hrs. 51 mins.

5.2 Recommendations

The scope of this project deals with only Raw Material Inventory System which was designed to serve the immediate needs of management. However, for further development, the fully computerized system should be established not only for this section but also for all sections in the organization which may consist of the following functions:

- (1) Accounting and Finance Information System
- (2) Purchasing Information System
- (3) Production Control Information System
- (4) Personnel Information System
- (5) Sales Information System

Each function can be developed individually and integrated as soon as possible by connecting through LAN (Local Area Network). Information as well as other resources such as file server, print server. Electric Mail (E-mail) is recommended for enabling operators to send written message to each other in computer manner through telephone network through a modem. The proposed automated system will provide the needed ability to support future growth and expansion of the company.

All the source documents must be kept separately for a period of time. The operator must be well to operate and control the proposed system.





APPENDIX A
PAYBACK ANALYSIS

Table A.1. Payback Analysis for Candidate Solution 1, in Baht.

Cost items	Years					
	0	1	2	3	4	5
Investment Cost	- 454,000					
Operation Cost	-	20,000	- 22,000	- 24,200	- 26,620	- 29,282
Discount Factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost	- 454,000	- 17,860	- 17,534	- 17,230	- 16,930	- 16,603
Cumulative Time-adjusted cost over lifetime	- 454,000	- 471,860	- 489,394	- 506,624	- 523,555	- 540,158
Benefits derived from operation of new system	0	100,000	140,000	180,000	220,000	260,000
Discount Factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost	0	89,300	111,580	128,160	139,920	147,420
Cumulative Time-adjusted cost over lifetime	0	89,300	200,880	329,040	468,960	616,380
Cumulative lifetime time-adjusted cost+benefit	- 454,000	- 382,560	- 288,514	- 177,584	- 54,595	76,222

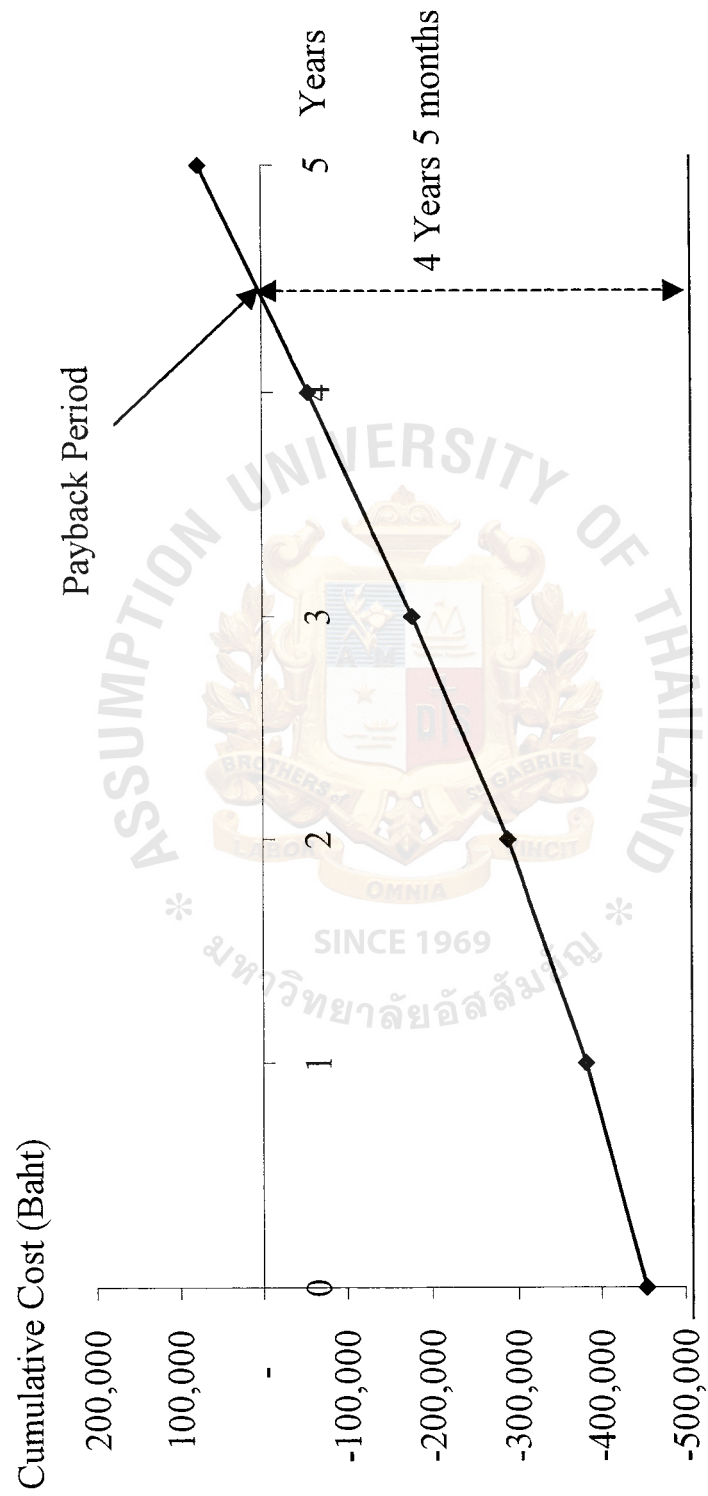


Figure A.1. Payback Analysis Graph for Candidate Solution 1.

Table A.2. Payback Analysis for Candidate Solution 2, in Baht.

Cost items	Years					
	0	1	2	3	4	5
Investment Cost	- 500,000					
Operation Cost		- 20,000	- 22,000	- 24,200	- 26,620	- 29,282
Discount Factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost	- 500,000	- 17,860	- 17,534	- 17,230	- 16,930	- 16,603
Cumulative Time-adjusted cost over lifetime	- 500,000	- 517,860	- 535,394	- 552,624	- 569,555	- 586,158
Benefits derived from operation of new system	0	150,000	220,000	290,000	360,000	400,000
Discount Factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost	0	133,950	175,340	206,480	228,960	226,800
Cumulative Time-adjusted cost over lifetime	0	133,950	309,290	515,770	744,730	971,530
Cumulative lifetime time-adjusted cost+benefit	- 500,000	- 383,910	- 226,104	- 36,854	175,175	385,372

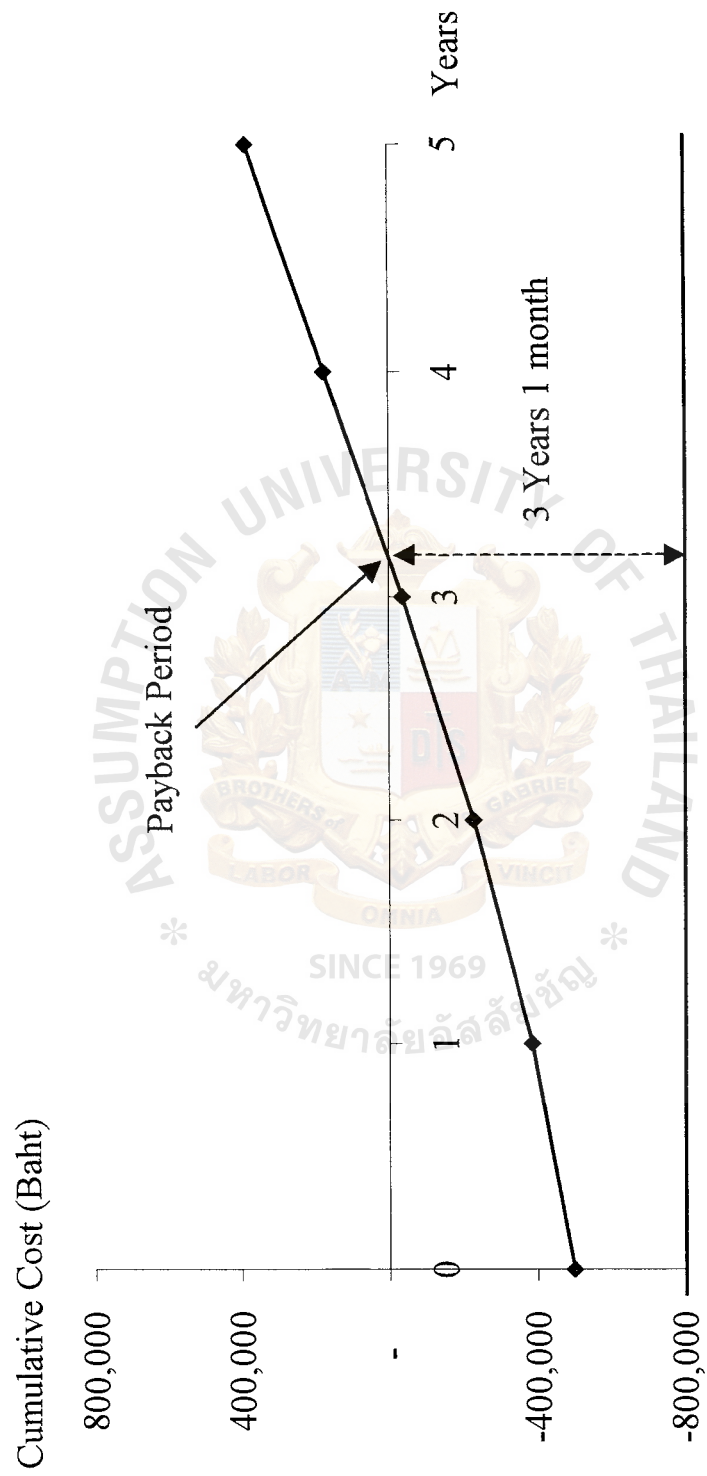


Figure A.2. Payback Analysis Graph for Candidate Solution 2.

Table A.3. Payback Analysis for Candidate Solution 3, in Baht.

Cost items	Years					
	0	1	2	3	4	5
Investment Cost	- 524,000					
Operation Cost		- 15,000	- 17,000	- 19,000	- 21,000	- 23,000
Discount Factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost	- 524,000	- 13,395	- 13,549	- 13,528	- 13,356	- 13,041
Cumulative Time-adjusted cost over lifetime	- 524,000	- 537,395	- 550,944	- 564,472	- 577,828	- 590,869
Benefits derived from operation of new system	0	323,424	330,000	360,000	390,000	420,000
Discount Factor for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost	0	288,818	263,010	256,320	248,040	238,140
Cumulative Time-adjusted cost over lifetime	0	288,818	551,828	808,148	1,056,188	1,294,328
Cumulative lifetime time-adjusted cost+benefit	- 524,000	- 248,577	884	243,676	478,360	703,459

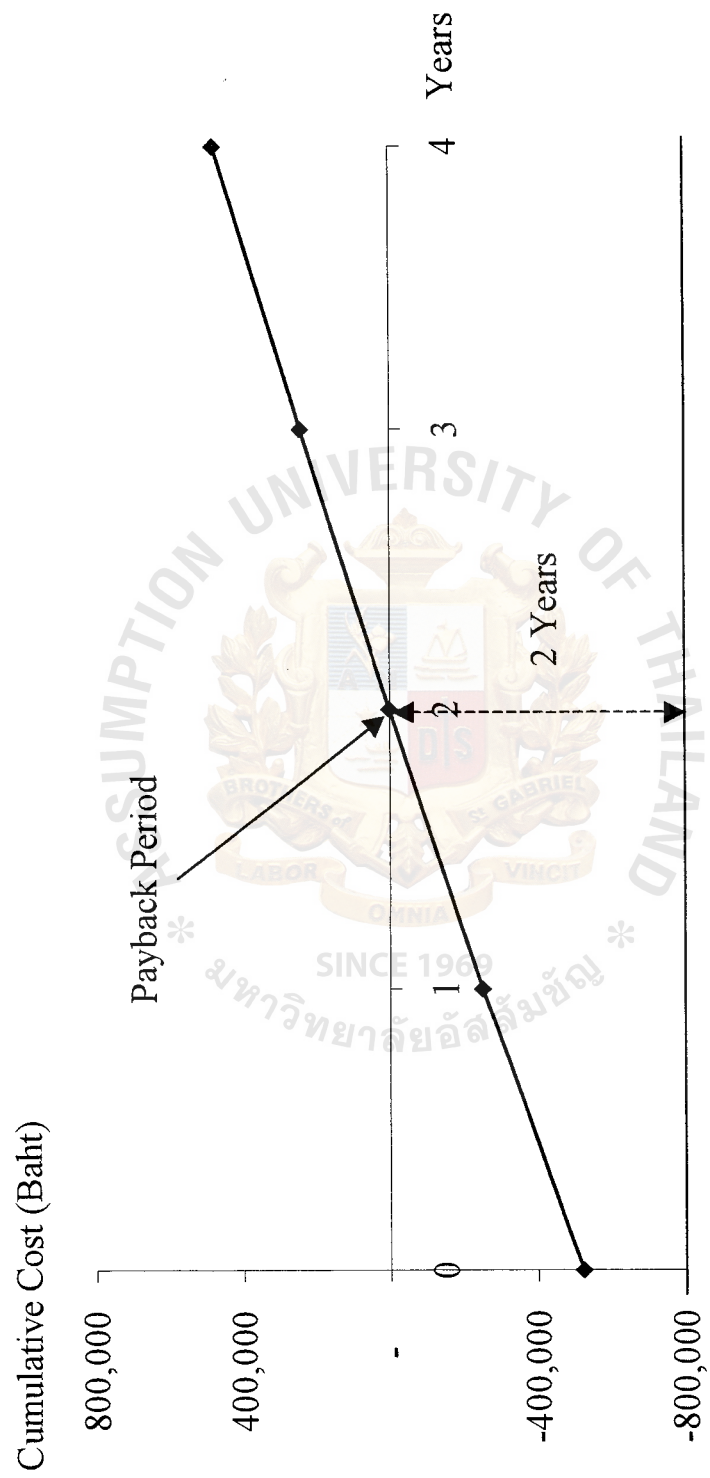


Figure A.3. Payback Analysis Graph for Candidate Solution 3.



APPENDIX B
CONTEXT DIAGRAM

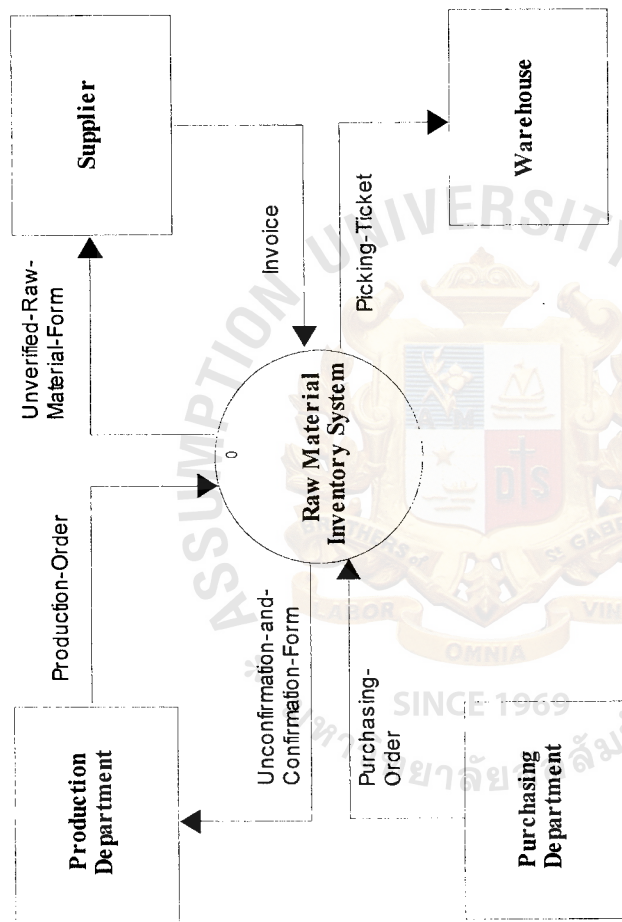


Figure B.1. Context Data Flow Diagram of Existing System.

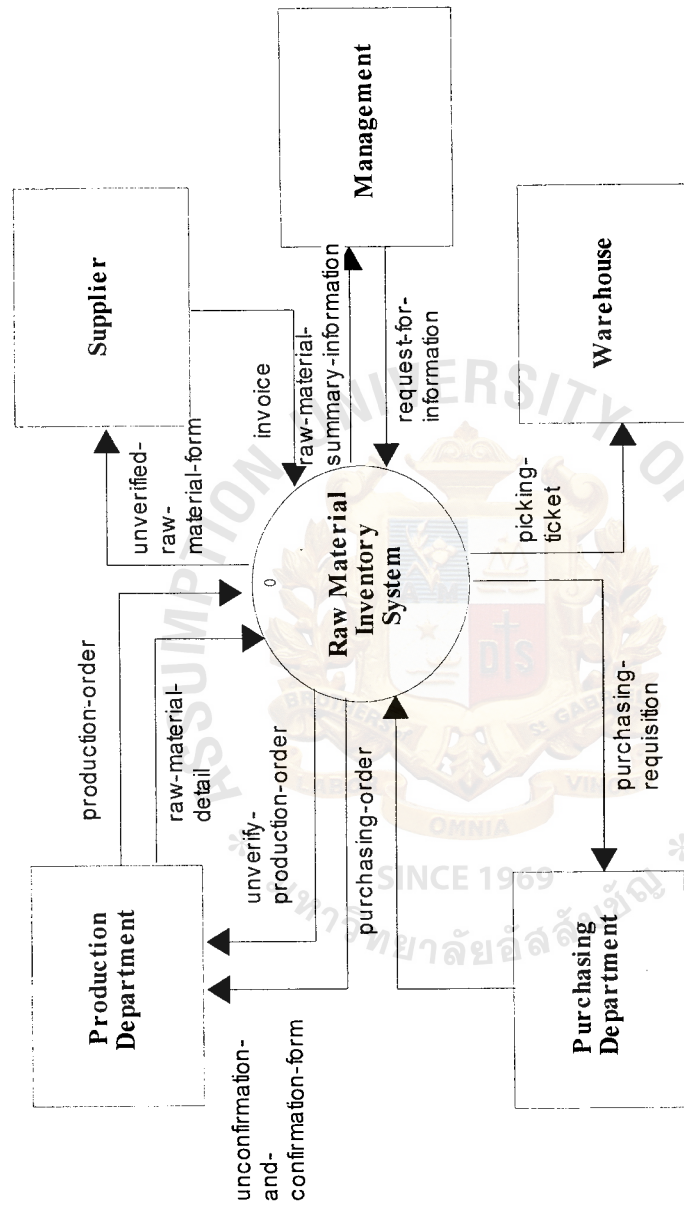


Figure B.2. Context Data Flow Diagram of Proposed System.



APPENDIX C
DATA FLOW DIAGRAM

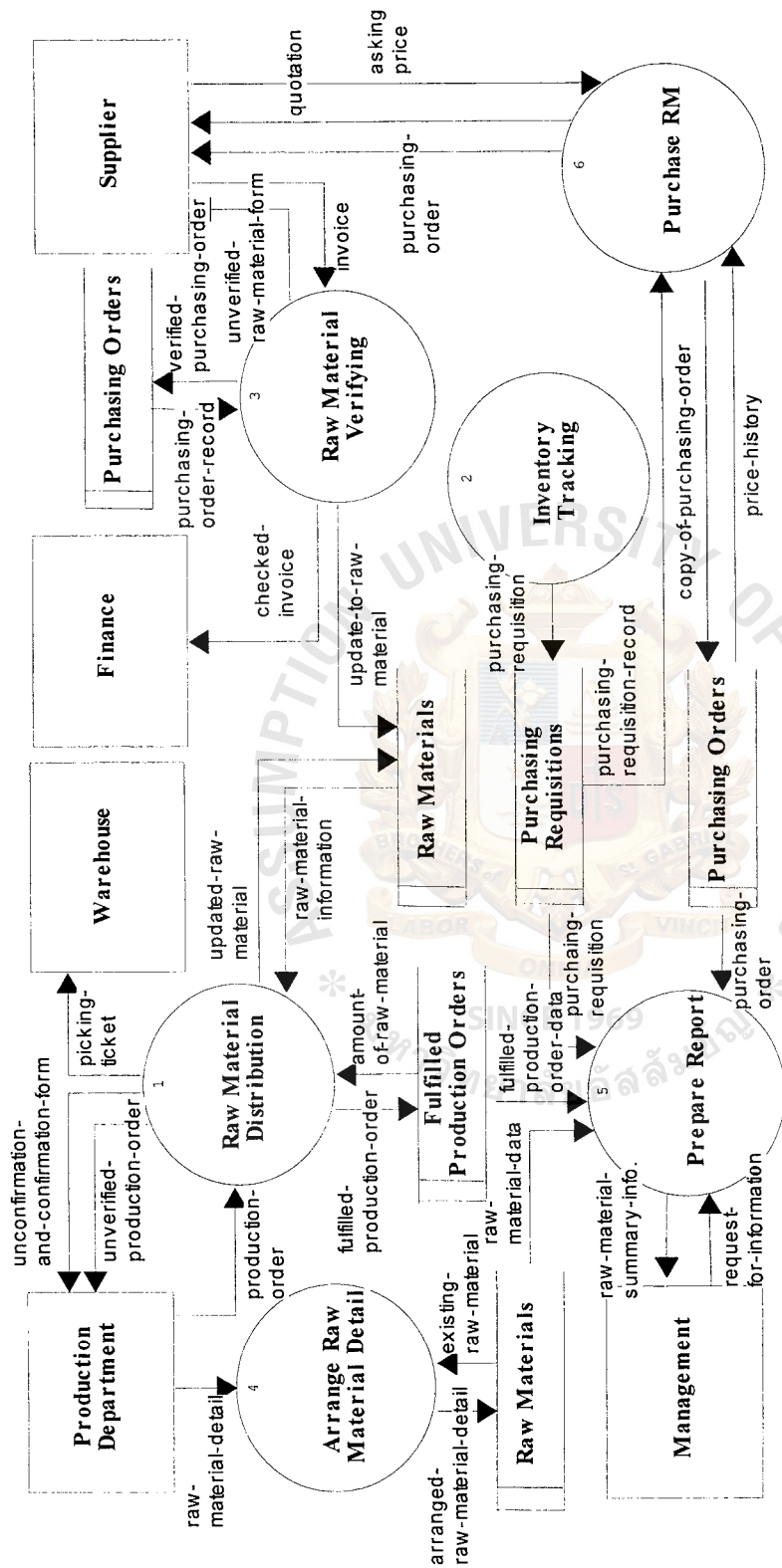


Figure C.1. Level 0 Data Flow Diagram.

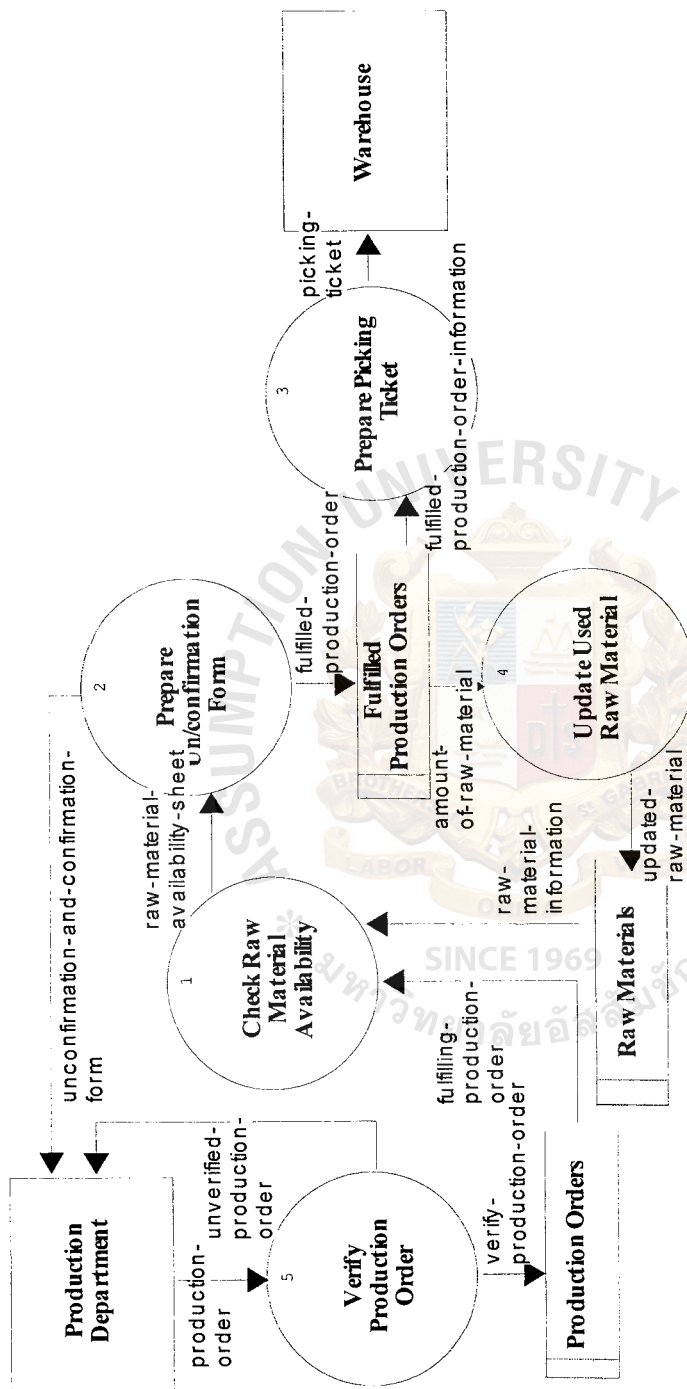


Figure C.2. Level 1 Process 1 Data Flow Diagram.

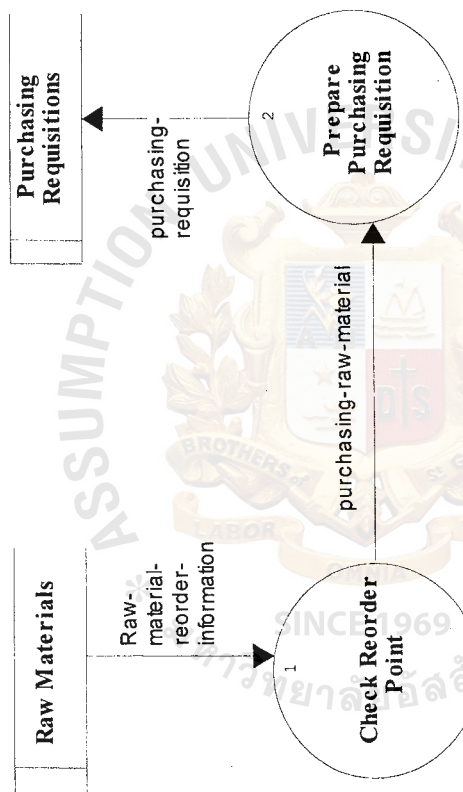


Figure C.3. Level 1 Process 2 Data Flow Diagram.

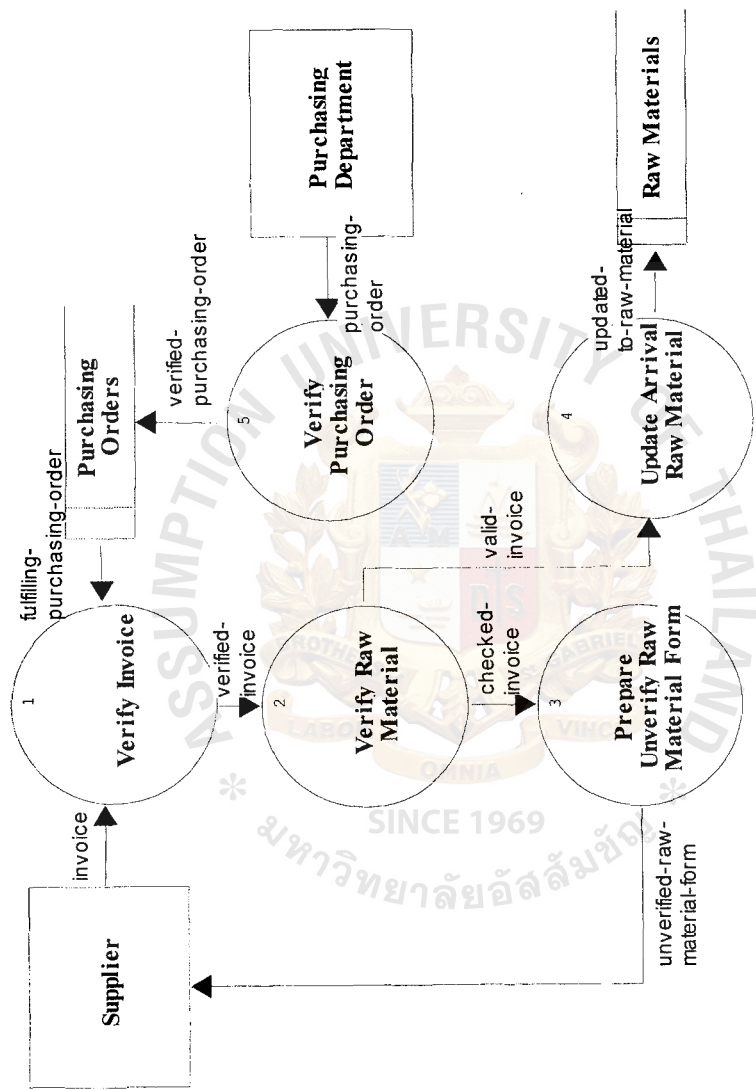


Figure C.4. Level 1 Process 3 Data Flow Diagram.

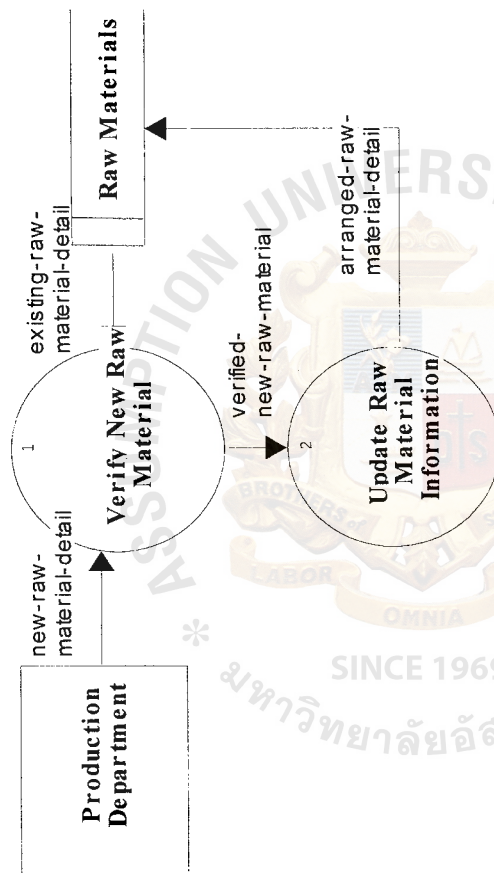
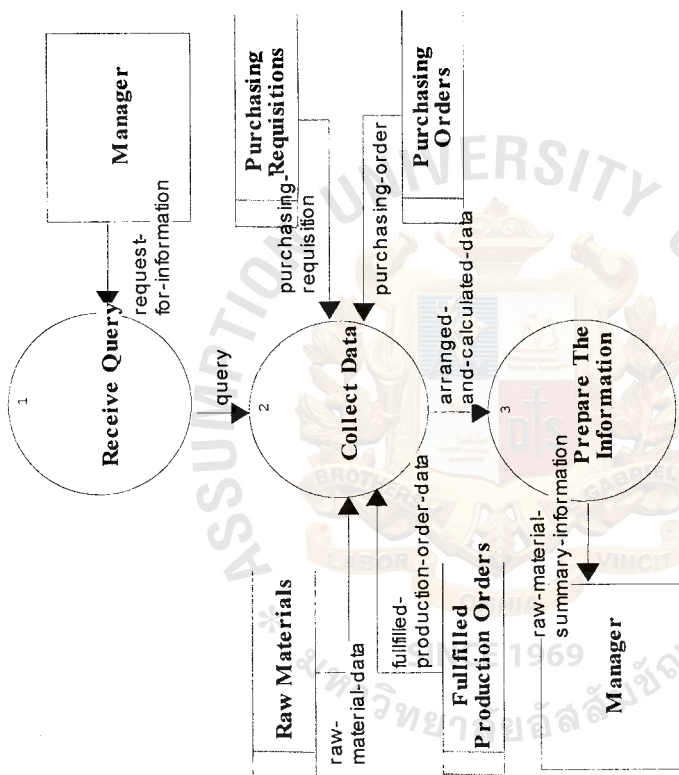


Figure C.5. Level 1 Process 4 Data Flow Diagram.



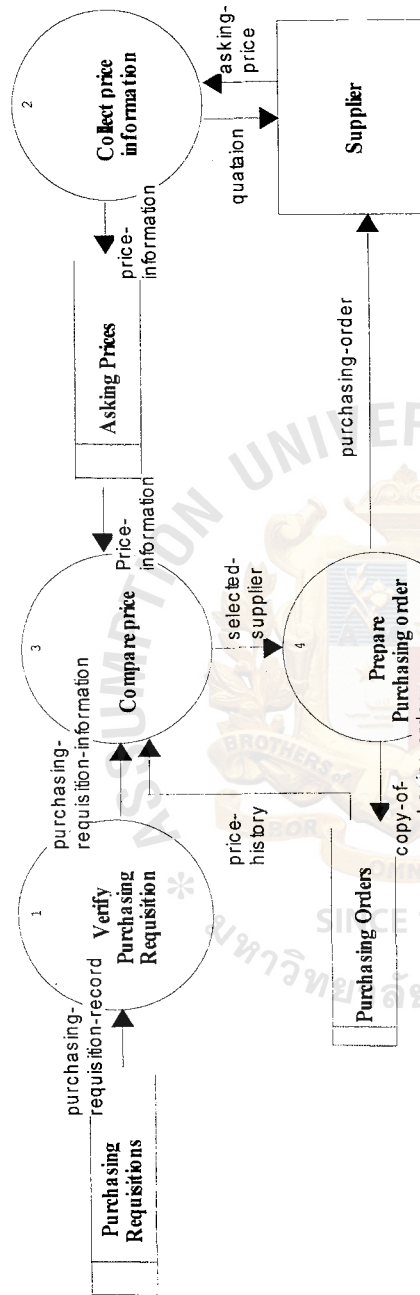


Figure C.7. Level 1 Process 6 Data Flow Diagram.



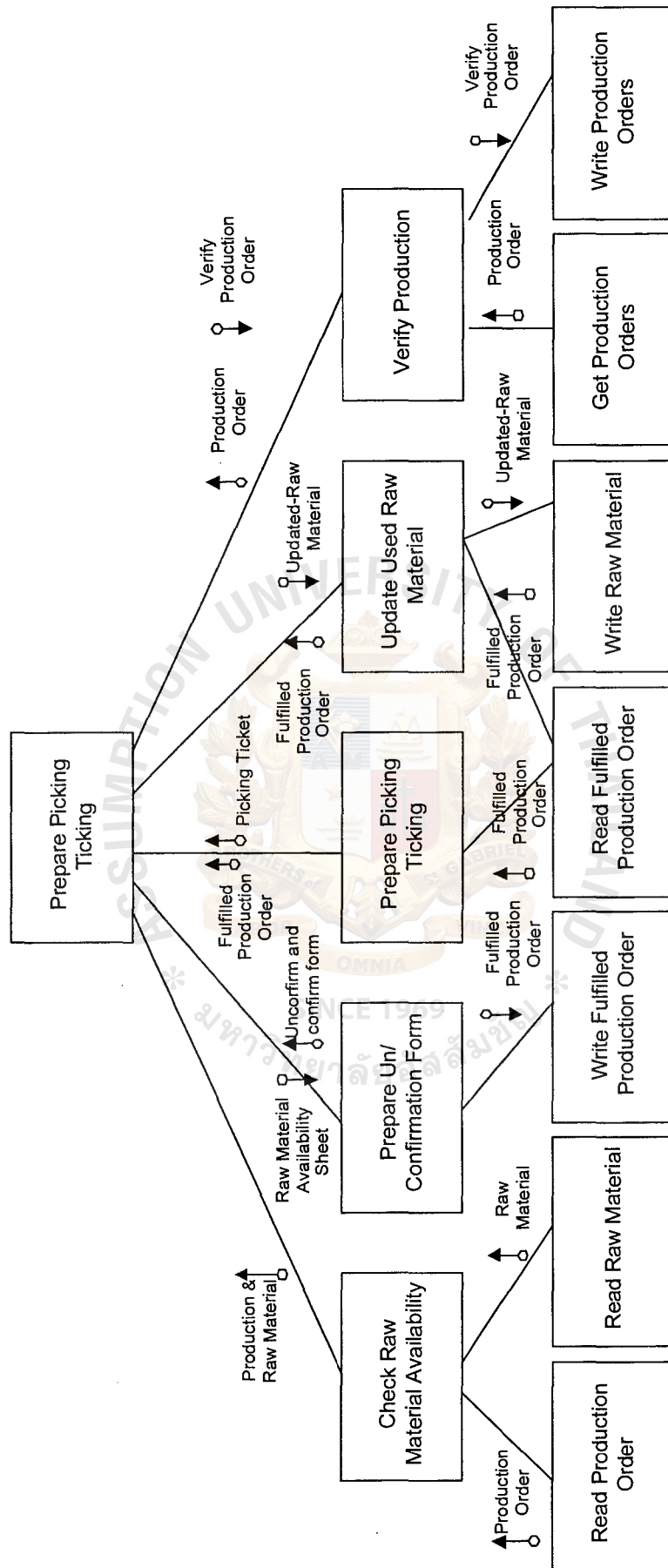


Figure D.1. Structure Chart of Raw Material Distribution Process.

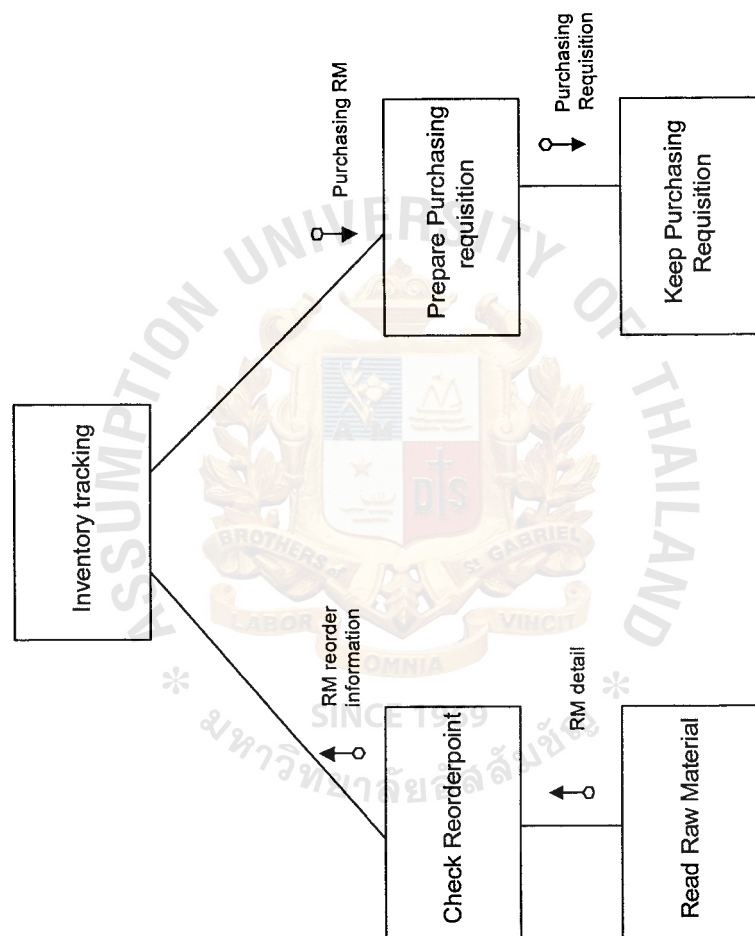


Figure D.2. Structure Chart of Inventory Tracking Process.

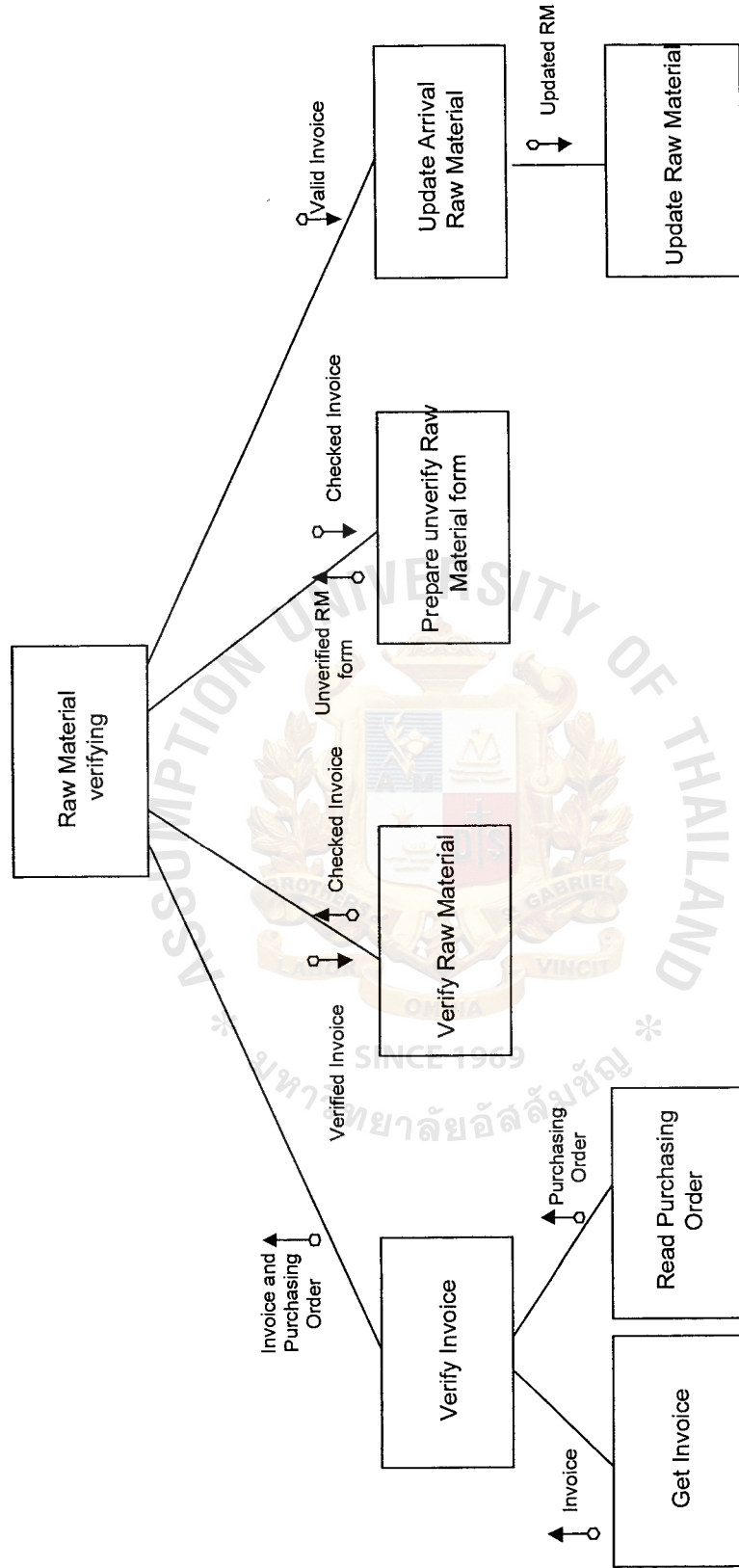


Figure D.3. Structure Chart of Raw Material Verifying Process.

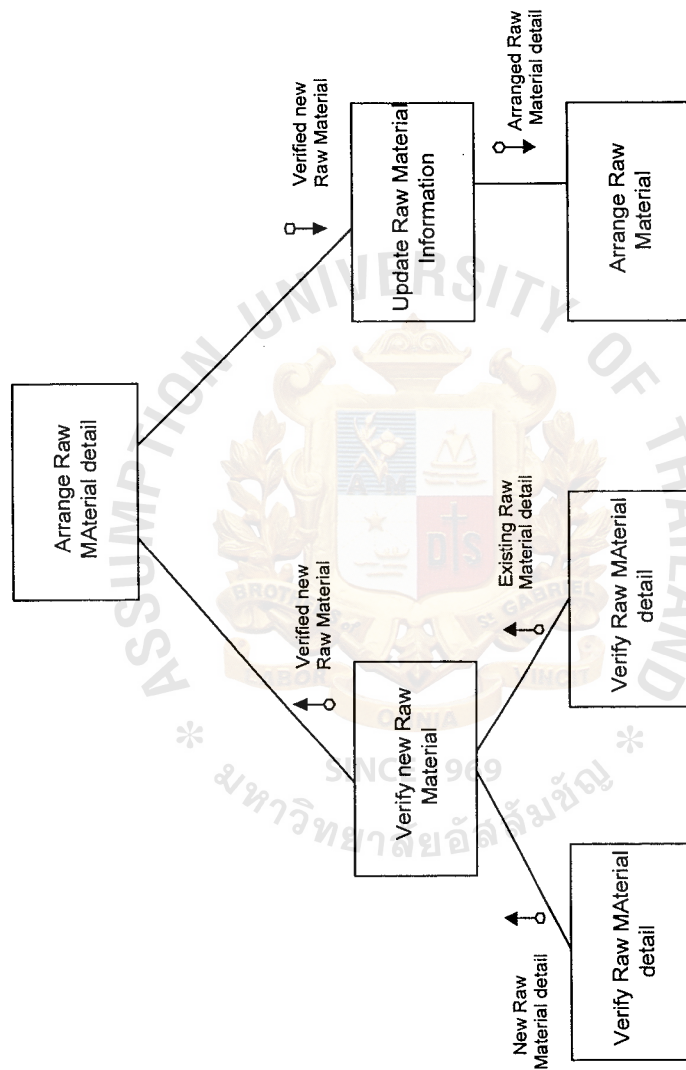


Figure D.4. Structure Chart of Arrange Raw Material Detail Process.

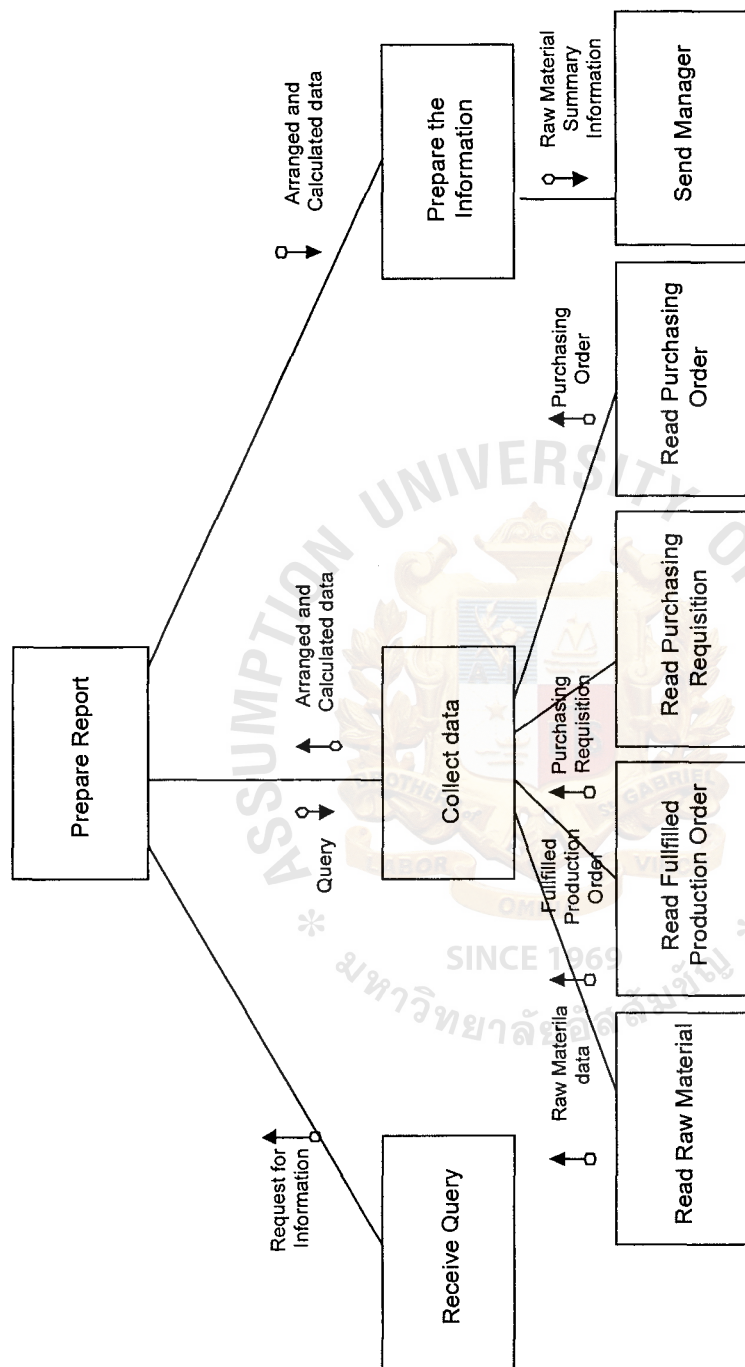


Figure D.5. Structure Chart of Prepare Report Process.

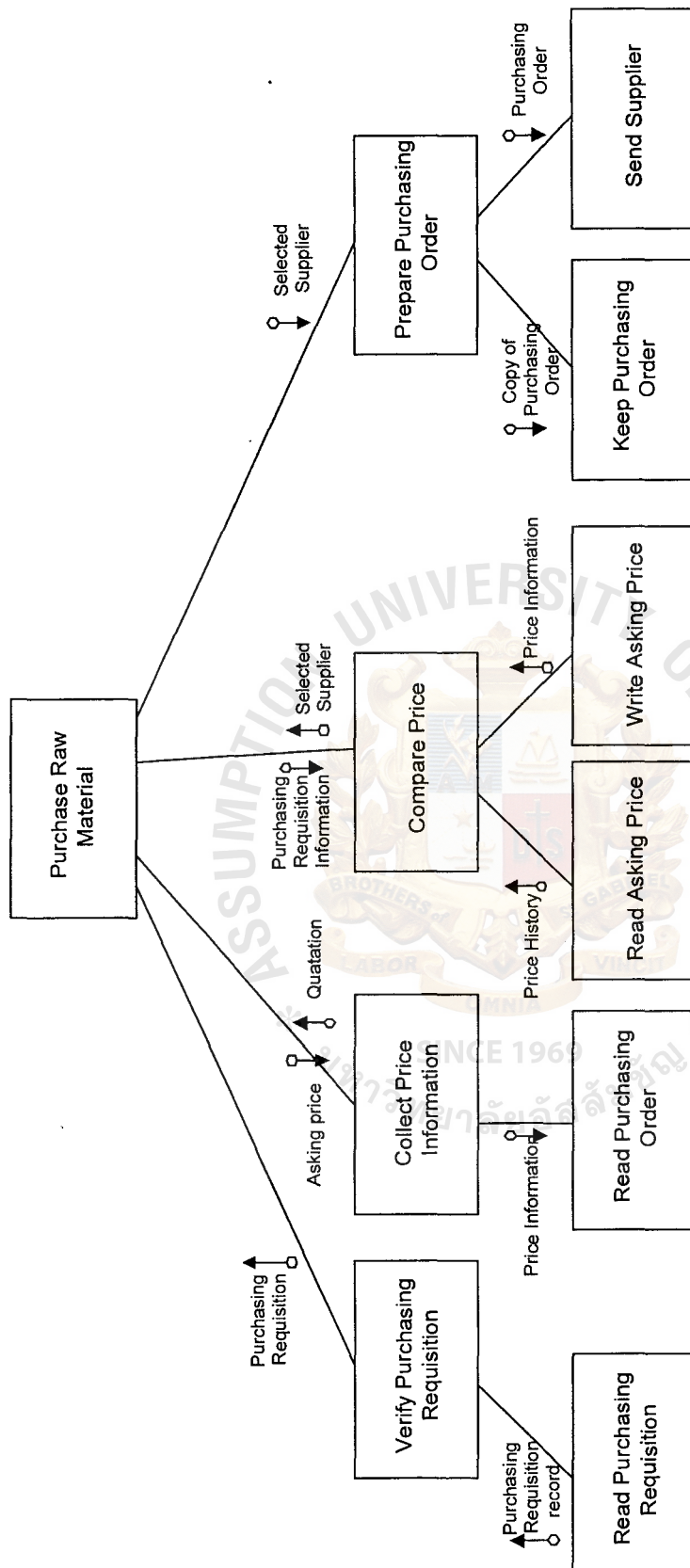


Figure D.6. Structure Chart of Purchase Raw Material Process.



APPENDIX E
FILE STRUCTURE

Table E.1. File Structure of Supplier File.

FILE STRUCTURE			
FILE NAME :		SUPPLIER FILE	
FIELD NAME	TYPE	WIDTH	DEC
S_NUMBER	CHARACTER	7	
S_NAME	CHARACTER	50	
ADDR	CHARACTER	30	
TEL1	CHARACTER	10	
TEL2	CHARACTER	10	
TEL3	CHARACTER	10	

Table E.2. File Structure of Raw Material File.

FILE STRUCTURE			
FILE NAME :		RAW MATERIAL FILE	
FIELD NAME	TYPE	WIDTH	DEC
RM_NUMBER	CHARACTER	7	
RM_NAME	CHARACTER	20	
REORDERPOINT	NUMERIC	10	
RM_UNIT	CHARACTER	7	
RM_QTY	NUMERIC	10	

Table E.3. File Structure of Supplied Raw Material File.

FILE STRUCTURE			
FILE NAME :		SUPPLIED RAW MATERIAL FILE	
FIELD NAME	TYPE	WIDTH	DEC
SRM_NUMBER	CHARACTER	7	
S_NUMBER	CHARACTER	7	
RM_NUMBER	CHARACTER	7	
SRM_QTY	NUMERIC	10	

Table E.4. File Structure of Delivered Raw Material File.

FILE STRUCTURE			
FILE NAME :		DELIVERED RAW MATERIAL FILE	
FIELD NAME	TYPE	WIDTH	DEC
DRM_NUMBER	CHARACTER	7	
SRM_NUMBER	CHARACTER	7	
DRM_DATE	DATE	8	
INVOICE_NUMBER	CHARACTER	7	
DRM_QTY	NUMERIC	10	

Table E.5. File Structure of Requested Raw Material File.

FILE STRUCTURE			
FILE NAME :		REQUESTED RAW MATERIAL FILE	
FIELD NAME	TYPE	WIDTH	DEC
RQ_NUMBER	CHARACTER	7	
RM_NUMBER	CHARACTER	7	
RQ_DATE	DATE	8	
RQ_QTY	NUMERIC	10	

Table E.6. File Structure of Purchasing Order File.

FILE STRUCTURE			
FILE NAME :		PURCHASING ORDER FILE	
FIELD NAME	TYPE	WIDTH	DEC
P1_NUMBER *	CHARACTER	7	
P1_DATE	DATE	8	
P1_QTY	NUMERIC	10	
S_NUMBER	CHARACTER	7	

Table E.7. File Structure of Purchased Raw Material File.

FILE STRUCTURE			
FILE NAME :		PURCHASED RAW MATERIAL FILE	
FIELD NAME	TYPE	WIDTH	DEC
P2_NUMBER	CHARACTER	7	
RM_NUMBER	CHARACTER	7	
P2_QTY	NUMERIC	10	
PRICE	NUMERIC	10	2



APPENDIX F
DATA DICTIONARY

Table F.1. Data Dictionary.

FIELD NAME	DESCRIPTION	DATA STORE
ADDR	Address of Supplier	Supplier File
DRM_DATE	Delivery date	Delivered Raw Material File
DRM_NUMBER	Delivered Raw Material's number	Delivered Raw Material File
DRM_QTY	The amount of Delivered Raw Material	Delivered Raw Material File
INVOICE_NUMBER	Invoice's number	Delivered Raw Material File
P1_DATE	Purchasing date	Purchasing Order File
P1_NUMBER	Purchasing order's number	Purchasing Order File
P1_QTY	The amount of purchasing order	Purchasing Order File
P2_NUMBER	Purchased Raw Material's number	Purchased Raw Material File
P2_QTY	The amount of Purchased Raw Material	Purchased Raw Material File
PRICE	Cost of Purchased Raw Material	Purchased Raw Material File
REORDERPOINT	The amount of Raw Material should reorder	Raw Material File

Table F.1. Data Dictionary (Continued).

FIELD NAME	DESCRIPTION	DATA STORE
RM_NAME	Raw Material's name	Raw Material File
RM_NUMBER	Raw Material's number	Raw Material File
RM_QTY	The amount of Raw Material	Raw Material File
RM_UNIT	Unit of Raw Material	Raw Material File
RQ_DATE	End Date of Project	Delivered Raw Material File
RQ_NUMBER	Expense Date	Delivered Raw Material File
RQ_QTY	The amount of requested Raw Material	Requested Raw Material File
S_NAME	Supplier's name	Supplier File
S_NUMBER	Supplier's number	Supplier File
SRM_NUMBER	Supplied Raw Material	Supplied Raw Material File
SRM_QTY	The amount of Supplied Raw Material	Supplied Raw Material File
TEL1	Telephone	Supplier File
TEL2	Telephone	Supplier File
TEL3	Telephone	Supplier File



APPENDIX G
PROCESS SPECIFICATION

PROCESS SPECIFICATION

Process Name: Raw Material Distribution System

Process Number: 1.0

Input:

- Production Order
- Amount of used raw material
- Raw Material Information

Output:

- Unconfirmation and Confirmation form
- Unverified production Order
- Picking Ticket
- Updated Raw Material

Process:

Begin

- Get Production order that contains information about requested raw material detail and its amount.
- Verify production order.
- If production order is not completed, send it back to production department in the form of unverified production orders.
- If production order is verified, get raw material information and check raw material availability.
- If raw material is unavailable, send unconfirmation back to production dept.
- If raw material is available, send confirmation form back to production dept.
- Prepare picking ticket.
- Update raw material inventory.

End.

Process Name: Raw Inventory Tracking

Process Number: 2.0

Input: - Raw material order information

Output: - Purchasing Requisitions

Process:

Begin

- Get raw material information.
- Check raw material reorder point
- If raw material inventory reach reorder point, prepare purchasing requisitions.

End.



St. Gabriel's Library

Process Name: Raw Material Verifying

Process Number: 3.0

Input: - Purchasing Order Record

- Invoice

Output: - Verified Purchasing Order

- Unverified Raw Material Form

- Checked Invoice

- Added raw material

Process:

Begin

- Get invoice information and purchasing orders information.
- Verify invoice.
- Verify raw material by comparing with invoice.
- If raw material does not match with invoice, and the unverified raw material form back to supplier
- If raw material match with invoice, update raw material inventory.

End.

Process Name: Arrange Raw Material Detail

Process Number: 4.0

Input: - Raw Material Information

- Existing Raw Material

Output: - Arranged Raw Material

Process:

Begin

- Get raw material detail.
- Get existing raw material detail.
- Verify new raw material information.
- If new raw material detail does not match with existing raw material detail, update raw material inventory, information.
- If new raw material detail matches with existing raw material detail, reject the information.

End.

Process Name: Prepare Report

Process Number: 5.0

Input:

- Request for information
- Raw material date
- Fulfilled production order date
- Purchasing requisition
- Purchasing order

Output: - Report

Process:

Begin

- Get information request
- Get data recording to the request
- Arrange the data in the usable information form.
- Prepare report.

End.

Process Name: Purchasing Raw Material

Process Number: 6.0

Input: - Asking price

- Price history

Output: - Purchasing order

- Quotation

- Copy of purchasing order

Process:

Begin

- Get purchasing requisition.
- Get asking price.
- Find the best price from supplier by comparing price information.
- Prepare purchasing order.

End.



SUPPLIER

<u>S_Number</u>	S_Name	Addr	Tel1	Tel2	Tel3
-----------------	--------	------	------	------	------

PK

RAW MATERIAL

<u>RM_Number</u>	RM_Name	Reorderpoint	RM_Unit	RM_Qty
------------------	---------	--------------	---------	--------

PK

SUPPLIED RAW MATERIAL

<u>SRM_Number</u>	S_Number	RM_Number	SRM_Qty
-------------------	----------	-----------	---------

PK

FK

FK

Figure H.1. Database Schema.

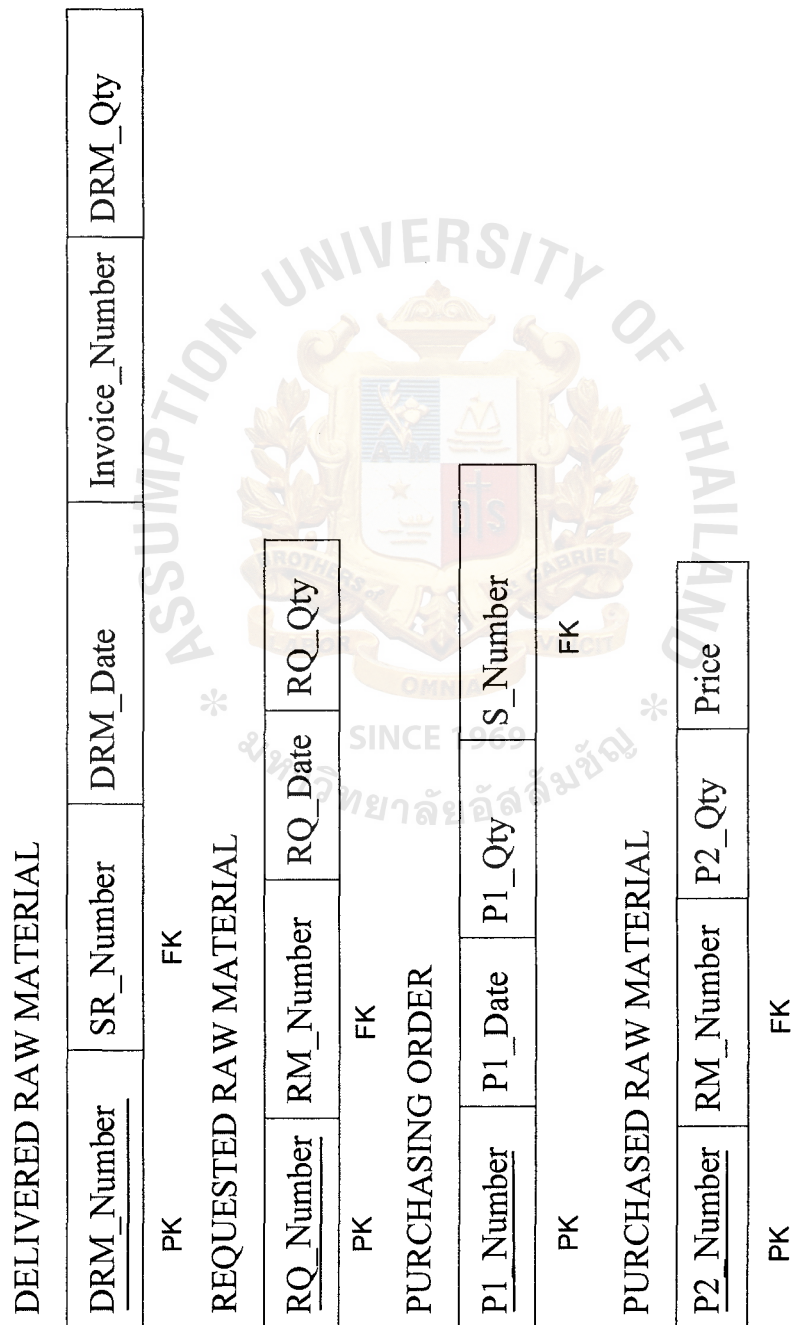


Figure H.1. Database Schema (Continued).

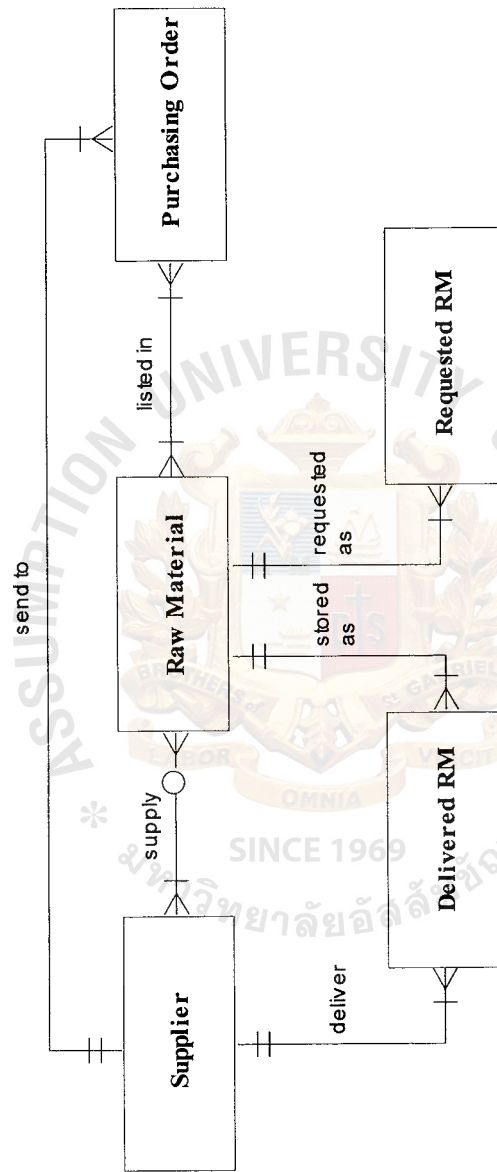


Figure H.2. Context Data Model.

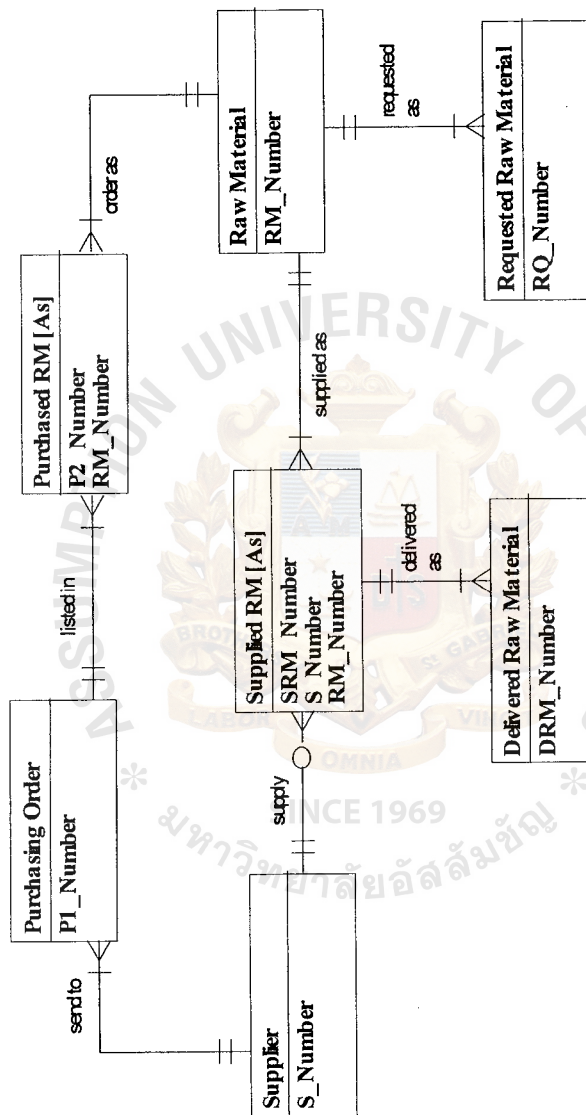


Figure H.3. Key-Based Data Model.

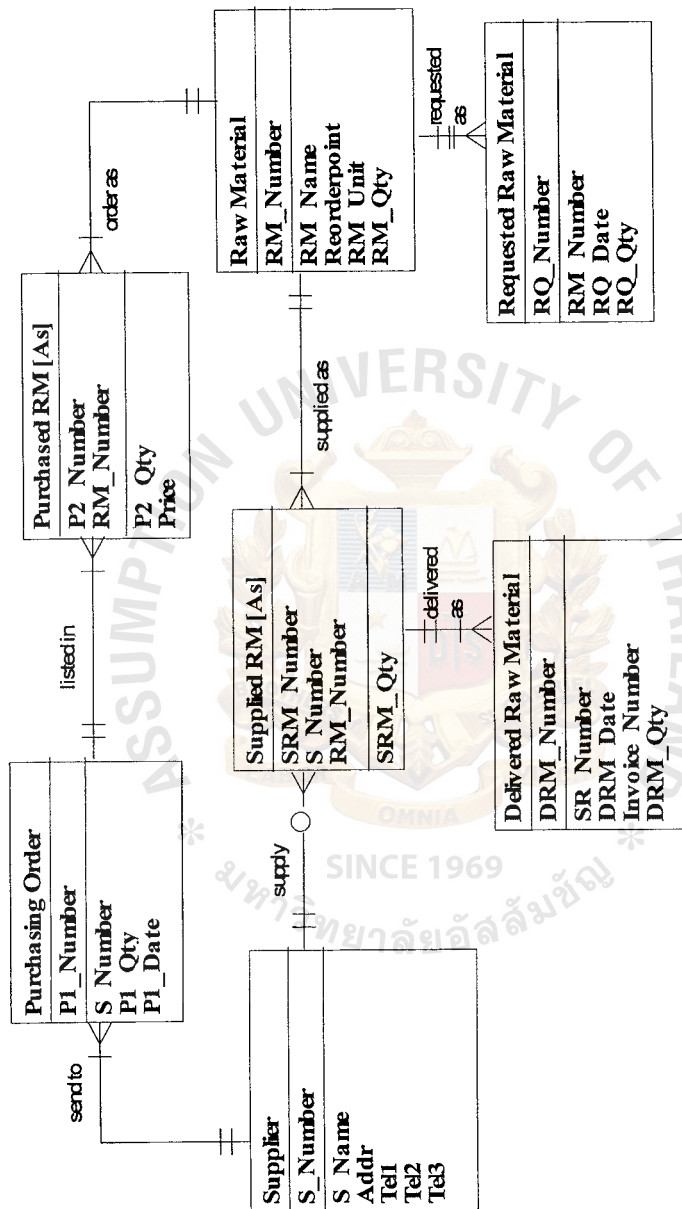


Figure H.4. Fully Attribute Data Model.



APPENDIX I
REPORT DESIGN

PACIFIC RUBBER INDUSTRY CO., LTD.

Raw Material Inventory Report (Arrange by Raw Material Number)

RM No.	Raw Material Name	Amount	Unit

Figure I.1. Raw Material Inventory Report (Arrange by Raw Material Number).

PACIFIC RUBBER INDUSTRY CO., LTD.

Raw Material Inventory Report(Arrange by Amount of Raw Material)

RM No.	Raw Material Name	Amount	Unit

Figure I.2. Raw Material Inventory Report (Arrange by Amount Raw Material).

PACIFIC RUBBER INDUSTRY CO., LTD.

Used Raw Material Inventory Report (Arrange by Raw Material Number)

Date	RM No.	Raw Material Name	Amount of Used	Unit

Figure I.3. Used Raw Material Inventory Report (Arrange by Date).

PACIFIC RUBBER INDUSTRY CO., LTD.
Used Raw Material Inventory Report (Arrange by Date)

Date	RM No.	Raw Material Name	Amount of Used	Unit

Figure I.4. Used Raw Material Inventory Report (Arrange by Date).

PACIFIC RUBBER INDUSTRY CO., LTD.
Used Raw Material Inventory Report (Arrange by Amount)

Date	RM No.	Raw Material Name	Amount of Used	Unit

Figure I.5. Used Raw Material Inventory Report (Arrange by Amount).

PACIFIC RUBBER INDUSTRY CO., LTD.

Supplier Information Report

Date xx/xx/2000

Supplier No.	Supplier Name	Address	Telephone	Supply Raw Material

Figure I.6. Supplier Information Report.

PACIFIC RUBBER INDUSTRY CO., LTD.

Supplier Report (Arrange by Supplier's Name)

Date xx/xx/2000

Supplier No.	Supplier Name	Amount of Purchase	Amount of Payment	Amount of Payable

Figure I.7. Supplier Report (Arrange by Supplier's Name).

PACIFIC RUBBER INDUSTRY CO., LTD.
Supplier Report (Arrange by Amount of Purchase)

Date XX/XX/2000

RM No.	Raw Material Name	Purcahsed Amount	Total Price	Status

Figure I.8. Client Report.

PACIFIC RUBBER INDUSTRY CO., LTD.

Raw Material Purchasing Report(Arrange by Amount of Purchase)

Date	RM No.	Raw Material Name	Purcahsed Amount	Total Price	Status

Figure I.9. Raw Material Purchasing Report(Arrange by Amount of Purchase).

PACIFIC RUBBER INDUSTRY CO., LTD.

Raw Material Purchasing Report(Arrange by Raw Material Number)

Date	RM No.	Raw Material Name	Purcahsed Amount	Total Price	Status

Figure I.10. Raw Material Purchasing Report(Arrange by Raw Material Number).



APPENDIX J
SCREEN DESIGN

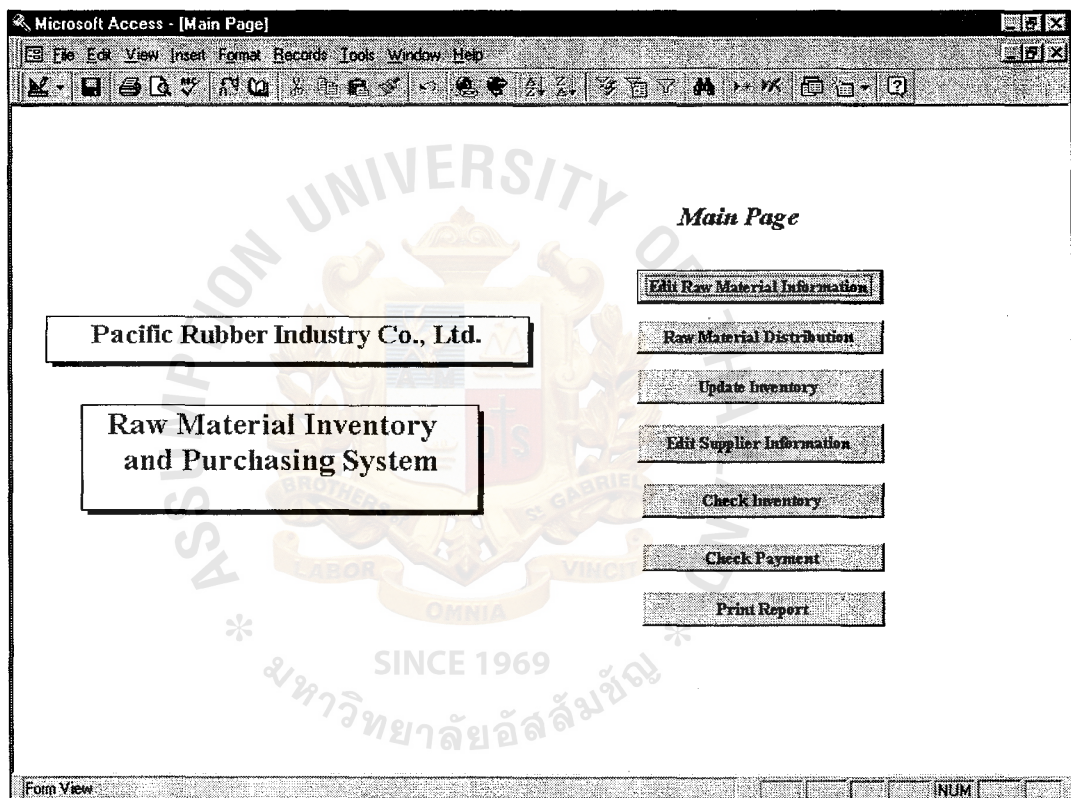


Figure J.1. Main Page.

Microsoft Access - [2 Edit RM information : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.
Edit Raw Material Information

Raw Material Code

Raw Material Name

Reorder Point Unit

Description

SEARCH ADD DELETE MENU

Record: 1 of 1

Form View NUM

Figure J.2. Edit Raw Material Information.

Microsoft Access - [3 RM Distribution : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.
Raw Material Distribution

Production Order Number

Raw Material Number	Raw Material Name	Amount	Unit	Availability Amount

Check Availability Prepare Picking MENU

Record 1 of 1

Form View

Figure J.3. Raw Material Distribution.

Microsoft Access - [4 Update Inventory : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.
Update Raw Material Information

Purchasing Order Number Supplier Name DATE
INVOICE NO.

RM. Number	Raw Material Name	Amount	Unit	Price/Unit	VAT	Total Price
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Add Inventory Main Menu

Record 1 of 1
Form View NUM

Figure J.4. Update Raw Material Inventory.

Microsoft Access - [6 Inventory Checking : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.
Inventory Checking

Production Order Number

Raw Material Number	Raw Material Name	Amount	Unit	Availability Amount

Search Available RM Unavailable RM MENU

Record: 1 of 1

Form View

Figure J.5. Raw Material Inventory Checking.

Microsoft Access - [5 Edit Supplier Information : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.
Edit Supplier Information

Supplier Number

Supplier Name

Address

Telephone Numbers FAX

Raw Material

SEARCH ADD DELETE MENU

Record: 1 of 1

Form View

Figure J.6. Edit Supplier Information.

Microsoft Access - [7 Payment Checking : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.

Payment Checking

Purchasing Order Number Supplier Name DATE

Invoice Number	RM. Number	Raw Material Name	Amount	Unit	Price/Unit	VAT	Total Price	Paid
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Search Print Payment list Main Menu

Record: 1 of 1

Form View NUM

Figure J.7. Payment Checking.

Microsoft Access - [8 Print Report : Form]

File Edit View Insert Format Records Tools Window Help

Pacific Rubber Industry Co., Ltd.
Print Report

Raw Material Inventory Report (Arrange by Raw Material Number)	Supplier Information Report
Raw Material Inventory (Arrange by Amount of Raw Material)	Supplier Report (Arrange by Supplier's Name)
Used Raw Material Inventory Report (Arrange by Date)	Supplier Report (Arrange by Amount of Purchase)
Used Raw Material Inventory Report (Arrange by Date)	Raw Material Purchasing Report(Arrange by Amount of Purchase)
Used Raw Material Inventory Report (Arrange by Amount)	Raw Material Purchasing Report(Arrange by Raw Material Number)

Main Menu

Record: 1 of 1
Form View

Figure J.8. Print Report.



APPENDIX K
PROJECT PLAN

Activities	September				October				November				December				January				February			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
System Analysis :																								
1. Identify Problems																								
2. Identify Existing Working Process																								
3. Develop Work Flow of the System																								
4. Identify the contents of Work Flow																								
Detail Analysis and Design :																								
5. Gather Information																								
6. Develop DFD of the Proposed																								
7. Identify the contents of DFD																								
8. Data Dictionary																								
9. Structured Charts																								
Implementation :																								
10. Screen Layout																								
11. Report Layout																								
12. Programming																								
13. Data Conversion																								
14. Testing																								
15. Training																								
16. Documentation																								

Figure K.1. Project Plan.

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