



Inventory Management System for Chemical Substances Distributor

by

Mr. Yosapol Cheevasathieporn

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
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Project Title Inventory Management System for Chemical Substances
Distributor


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ABSTRACT

Today, information systems spread worldwide. It provides the communication and analytical power which supports dealing business and business management. Furthermore, hardware and software are a plenty to ease decision making which enables the firm to gain a competitive advantage and ready for changing. Every business has a rapid expansion and strong competition. Several companies need to keep pace with such growth. This project is developed from the manual system to be computerized for Inventory Management Department of Inta Enterprise Company Limited Partnership.

The goal of the new system creation is to let the company have more opportunities for growth and expansion by the computerized system. Therefore, this project focuses on designing the new system which upgrades the existing operation in the inventory field instead of using manual operation.

The proposed system is developed due to the systems analysis and design methods. It includes the user requirements, analysis, design, hardware and software requirement, security and control, cost and benefit analysis, and system implementation. The new system will serve computerized operations and produce input, process and generate output more efficiently.

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TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF FIGURES	v
LIST OF TABLES	viii
I. INTRODUCTION	1
1.1 Background of the Project	1
1.2 Objectives of the Project	1
1.3 Scope of the Project	2
1.4 Deliverables	2
1.5 Project Plan	3
II. THE EXISTING SYSTEM	5
2.1 Background of the Organization	5
2.2 Existing Business Function	9
2.3 Current Problems and Areas for Improvement	14
III. THE PROPOSED SYSTEM	22
3.1 System Specification	22
3.2 System Design	25
3.3 Hardware and Software Requirement	52
3.4 Security and Control	55
3.5 Cost and Benefit Analysis	57

<u>Chapter</u>	<u>Page</u>
IV. PROJECT IMPLEMENTATION	70
4.1 Overview of Project Implementation	70
4.2 Test Plan	74
4.3 Training	75
4.4 Conversion	75
V. CONCLUSIONS AND RECOMMENDATIONS	77
5.1 Conclusions	77
5.2 Recommendations	79
APPENDIX A SCREEN DESIGN	80
APPENDIX B REPORT DESIGN	93
APPENDIX C DATABASE DESIGN	112
APPENDIX D PROCESS SPECIFICATION	120
APPENDIX E DATA DICTIONARY	134
APPENDIX F FEASIBILITY ANALYSIS	142
APPENDIX G STRUCTURE DIAGRAM	154
BIBLIOGRAPHY	163

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Project Plan of Inta Enterprise Information System	4
2.1 Organization Chart of Existing System.	8
2.2 Context Diagram of Existing System	11
2.3 Data Flow Diagram Level 0 of Existing System	12
3.1 Network Architecture of Inventory Management Information System	23
3.2 The Organization Chart of Proposed System	34
3.3 Context Diagram of Proposed System	37
3.4 Functional Decomposition Diagram	38
3.5 Data Flow Diagram Level 0 of Proposed System	39
3.6 Data Flow Diagram Level 1 of Accept Order Request	41
3.7 Data Flow Diagram Level 1 of Check Product Availability	42
3.8 Data Flow Diagram Level 1 of Update Level of Stock	43
3.9 Data Flow Diagram Level 1 of Check Minimum Reorder Point Product	44
3.10 Data Flow Diagram Level 1 of Create Purchase Order	45
3.11 Data Flow Diagram Level 2 of Create Purchase Order of Get Order Product Details	46
3.12 Data Flow Diagram Level 1 of Receive Product	47
3.13 Data Flow Diagram Level 1 of Generate Report	48
3.14 Context Diagram of Entity Relationship Diagram	49
3.15 Key-based Diagram of Entity Relationship Diagram	50
3.16 Fully Attribute Diagram of Entity Relationship Diagram	51

<u>Figure</u>	<u>Page</u>
3.17 Cost Comparison between Existing and Proposed System	65
3.18 Payback Chart for the Proposed System	69
4.1 Schedule of Project Implementation of Inventory Management System	72
A.1 Access to the System Form	80
A.2 Login to the System Form	81
A.3 Main Menu for Inventory System	82
A.4 Main Menu for Product Inventory System	83
A.5 Product Arrival Interface	84
A.6 Product Stock Interface	85
A.7 Ordered Product Interface	86
A.8 Purchase Order Interface	87
A.9 Product Master Interface	88
A.10 Employee Interface	89
A.11 Supplier Interface	90
A.12 Customer Interface	91
A.13 Report Interface	92
B.1 Product Stock Report	93
B.2 Customer Report	94
B.3 Employee Report	95
B.4 Supplier Report	97
B.5 Ordered Product Report	98

<u>Figure</u>	<u>Page</u>
B.6 Purchase Order Report	99
B.7 Product Master Report	100
B.8 Product Arrival Report	102
B.9 Daily Report	103
B.10 Packing List Report	104
B.11 Stock Level Report	105
B.12 Expired Date Report	106
B.13 Price List Report	107
B.14 Stock In Report	108
B.15 Stock Out Report	109
B.16 Damage Product Report	110
B.17 Return Product Report	111
G.1 Structure Chart of Inventory Management System	154
G.2 Structure Chart of Accept Order Request	155
G.3 Structure Chart of Check Product Availability	156
G.4 Structure Chart of Update Level of Stock	157
G.5 Structure Chart of Check Minimum Reorder Point Product	158
G.6 Structure Chart of Create Purchase Order	159
G.7 Structure Chart of Create P/O of Get Order Product Details	160
G.8 Structure Chart of Receive Product	161
G.9 Structure Chart of Generate Report	162

LIST OF TABLES

<u>Table</u>	<u>Page</u>
2.1 Problem Statement	17
2.2 Problem, Opportunities, Directives and Constraints Matrix	19
3.1 Candidate Systems Matrix	27
3.2 Feasibility Analysis Matrix	32
3.3 The Hardware Specification for the Database Server	52
3.4 The Software Specification for the Database Server	53
3.5 The Hardware Specification for Each Client Machine	54
3.6 The Hardware Specification for Each Client Machine (Continued)	54
3.7 The Software Specification for Each Client Machine	54
3.8 Other Hardware Requirements	55
3.9 Existing System Cost Analysis, Baht	57
3.10 Five Years Accumulated Existing System Cost, Baht	58
3.11 Proposed System Cost Analysis, Baht	59
3.12 Five Years Accumulated Proposed System Cost, Baht	60
3.13 The Comparison of the System Cost, Baht	61
3.14 Payback Analysis for the Proposed System, Baht	67
5.1 The Degree of Achievement of the Proposed System	78
C.1 Structure of Customer Table	112
C.2 Structure of Supplier Table	113
C.3 Structure of Ordered Product Table	114
C.4 Structure of Purchase Order Table	115
C.5 Structure of Employee Table	116

<u>Table</u>	<u>Page</u>
C.6 Structure of Product Master Table	117
C.7 Structure of Product Arrival Table	118
C.8 Structure of Product Stock Table	119
D.1 Process Specification of Process 1.1 Revise Order	120
D.2 Process Specification of Process 1.2 Confirm Order	120
D.3 Process Specification of Process 2.1 Search Product List	121
D.4 Process Specification of Process 2.2 Order Preparation	121
D.5 Process Specification of Process 2.3 Deliver Product	122
D.6 Process Specification of Process 3.1 Update & Balance by Selling	122
D.7 Process Specification of Process 3.2 Update & Balance by Returning	123
D.8 Process Specification of Process 4.1 Product Stock Checking	123
D.9 Process Specification of Process 4.2 Product Quantity Overview	124
D.10 Process Specification of Process 5.1 Accept Reorder Request	125
D.11 Process Specification of Process 5.2 Get Order Product Detail	125
D.12 Process Specification of Process 5.2.1 Validate Supplier	126
D.13 Process Specification of Process 5.2.2 Validate Product	126
D.14 Process Specification of Process 5.2.3 Add New Supplier Information	127
D.15 Process Specification of Process 5.2.4 Enter Product Require	127
D.16 Process Specification of Process 5.2.5 Create Pending Order	128
D.17 Process Specification of Process 5.3 Launch Purchase Order	128
D.18 Process Specification of Process 5.4 Approve Purchase Order	129
D.19 Process Specification of Process 6.1 Check Product With Delivery Note	129

<u>Table</u>	<u>Page</u>
D.20 Process Specification of Process 6.2 Update Stock	130
D.21 Process Specification of Process 6.3 Return Damage Product	130
D.22 Process Specification of Process 6.4 Validate Product	131
D.23 Process Specification of Process 7.1 Validate Report Name	131
D.24 Process Specification of Process 7.2 Retrieve Information From Database	132
D.25 Process Specification of Process 7.3 Create Report	132
D.26 Process Specification of Process 7.4 Present Report	133
E.1 Data Dictionary of Product Master Database	134
E.2 Data Dictionary of Supplier Database	135
E.3 Data Dictionary of Ordered Product Database	136
E.4 Data Dictionary of Customer Database	137
E.5 Data Dictionary of Employee Database	138
E.6 Data Dictionary of Purchase Order Database	139
E.7 Data Dictionary of Product Arrival Database	140
E.8 Data Dictionary of Product Stock Database	141
F.1 Proposed System Cost of Candidate 1	142
F.2 Proposed System Cost of Candidate 2	144
F.3 Proposed System Cost of Candidate 3	146
F.4 Accumulated Cost Table	147
F.5 Payback Period Analysis of Candidate 1	148
F.6 Payback Period Analysis of Candidate 2	149
F.7 Payback Period Analysis of Candidate 3	150
F.8 Net Present Value Analysis of Candidate 1	151

<u>Table</u>	<u>Page</u>
F.9 Net Present Value Analysis of Candidate 2	152
F.10 Net Present Value Analysis of Candidate 3	153



I. INTRODUCTION

1.1 Background of the Project

Nowadays, information system plays a major role to support the firm and offers new opportunities to businesses. Furthermore, it provides the communication and analytical power that firms need for conducting trade and managing businesses. Technical change moves faster than humans and the trend of the organization is changing. To gain the competitive advantage, redesigning should be the best focus. Information Technology simplifies communication, collaboration and eliminate waste time and work.

Therefore, inventory system needs to capture effective management and competent planning control. A computer-aided design system might support this technology activity, helping an organization to cut unnecessary costs by balancing inventory size and cost.

Inta Enterprise Co., Ltd Partnership still applies a manual system to operate and run all the current inventory system. The new implementation of the system can solve the complex methods and problems of the current situation smoothly and effectively.

1.2 Objectives of the Project

- (1) To be able to develop an efficient inventory system that can integrate both physical and logical aspects in controlling stock flow in the warehouse, balancing on dead stock and shortage after the implementation of the project.
- (2) To identify information system requirements as the information feed to new system and processes need to be defined to make sure whether the whole system fully functions.

- (3) To design and develop a new information system based on all requirements including functional and non-functional requirements specified by users.
- (4) To support the ever enlarging information scale within the information system.
- (5) To improve the efficiency and effectiveness of the organization and reduce costs in regards to elimination of the problems identified in existing system as per detail in previous sub section.

1.3 Scope of the Project

To be able to develop an efficient inventory system that can integrate both physical and logical aspects in controlling stock flow in the warehouse, balancing on dead stock and shortage after the implementation of the project.

To describe some of the problems in the warehouse we would like to give the example of the using inquiry card to purchase stock from the warehouse. The stock inquiry cards are collected through the warehouse office acting as the gateway of stock flow. There is inconsistency and ineffective practice all throughout the company making the process a burden to our employees and the payback is not up to expectation.

1.4 Deliverables

The deliverables of the project on information system are as follows:

- (1) Process Modeling (Context Diagram, Data Flow Diagram)
- (2) Data Modeling (ER Diagram)
- (3) System Specification (Hardware and Software Specification)
- (4) Cost Benefit Analysis (Payback Period, Net Present Value)
- (5) Input Design (Input Screen of Proposed system)
- (6) Output Design (Reports from proposed system)
- (7) Structured Design (Structured Charts)

- (8) Process Specification (Detail of each process of proposed system)
- (9) Data Dictionary

1.5 Project Plan

This project plan of Inta Enterprise Ltd. Partnership Information System can be illustrated as follows:



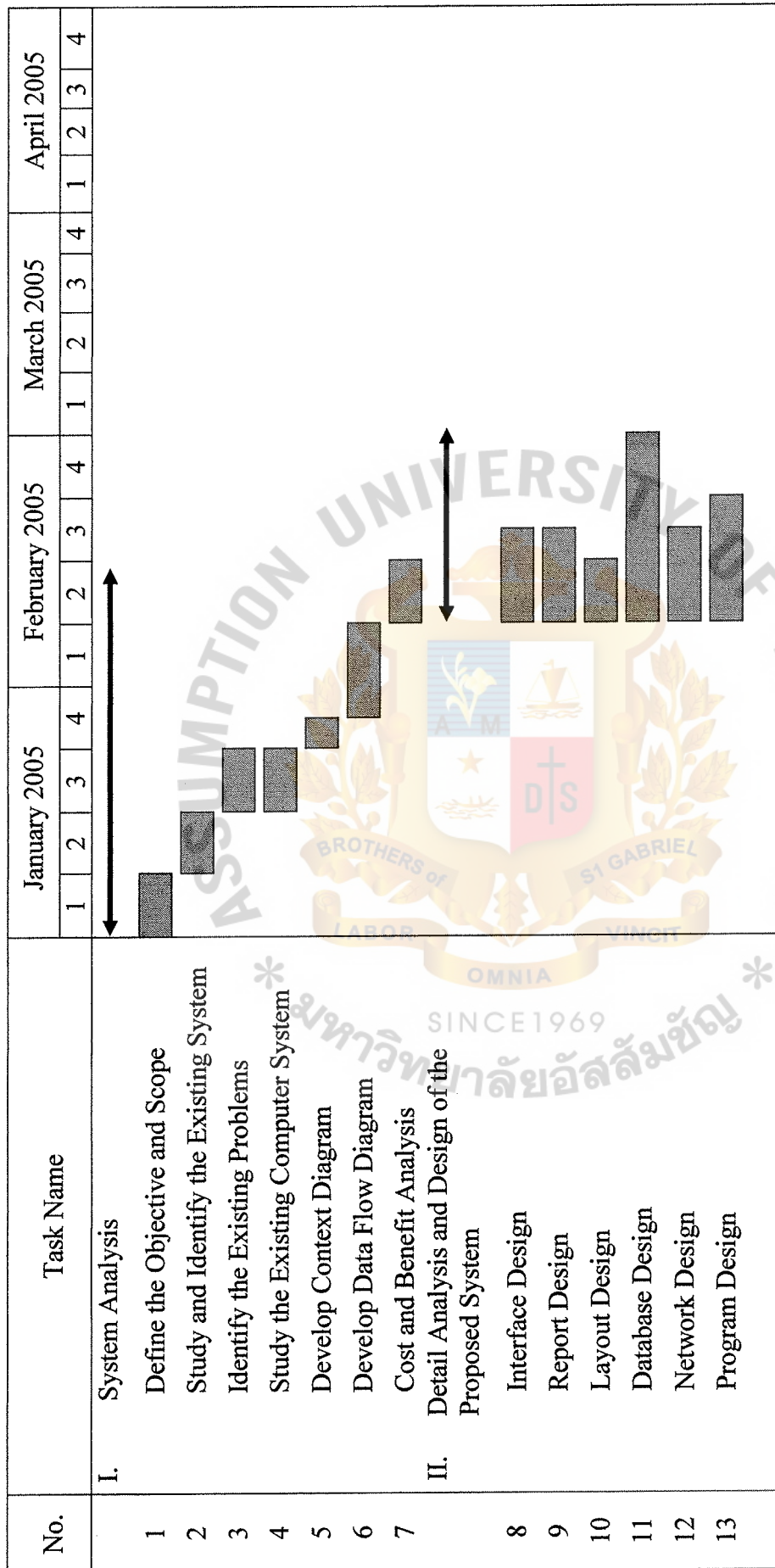


Figure 1.1. Project Plan of Intra Enterprise Information System.

II. THE EXISTING SYSTEM

2.1 Background of the Organization

Inta Enterprise is a medium size, sole distributor business located at 1040/27 Trok Wat Chan-Nai, Rama 3 Rd., Bangpongpan, Yannawa, Bangkok 10120. It has been established for 10 years and registered under Thai FDA (Food and Drugs Association) by importing and distributing chemical substances, fundamental ingredients for many businesses production.

Covering 7 fields which are Food additives, Painting Adhesive and Rubber, Cosmetics, Textile (Fixing Agent), Filler, Filter Aids and Antioxidant.

Since the competition has grown intensively, cash management and electrical communication has come to great concern. This would consolidate our present market share and be able to advance to new markets.

Our products' appearances are as a raw material for the manufacturer to use or blend it with their product. Packaging is verified such as bags, drums, boxes and etc. We don't break bulk our products to any customers. Normally, we deal business base on the whole package (20-25 kilograms per bag, 25 kilograms per box, 250 kilograms per drum and etc).

We use a human intensive work force responsible for warehousing. Now we consider that we have too many people as members and some of them can't cooperate well with full efficiency. Some mistakes always happen like input the wrong data, laziness and etc. Our policy is to use people creating high performance of work. Another point is weakness in forecasting the stock.

We will adopt the new system to help us to reengineer the work process and enhance the power of technologies to guide a standard format throughout the

organization. Therefore, we can cut unnecessary cost, increase the profit and better control workflow system.

All our functions must deal with a huge amount of commodities, which is related to the field of warehouse management. Warehousing plays a role to much in our real life. It covers about stock in and out. As per this report, we focus on warehouse. Our role is to supply all the raw materials to final consumers as well as do TQM in receiving the inputs. There are four main departments in Inta Enterprise.

(1) Purchasing Department

The main duty focuses on dealing with marketing department in order to cooperate with suppliers for purchasing the products.

(2) Finance & Accounting Department

It deals with all figures in the firm such as making general accounting standard, payroll of all staffs, payment for debt, payment for tax, receiving money and checking money from selling products. This department also cooperates with purchasing department in receiving and approving purchase orders that are sent to suppliers.

(3) Marketing Department

It responds to selling the product of the company and also launches the promotion to attract the customer with the products lay on 7 fields as follows:

- (a) Food additives – such as Potassium Sorbate, Sodium Bicarbonate and etc.
- (b) Painting Adhesive and Rubber – such as Petroleum resin SK-120 and etc.
- (c) Cosmetics – such as Glycerine and etc.

- (d) Textile (Fixing Agents) – such as Sodium Sulfate and etc.
 - (e) Filler – such as Talcum Powder and etc.
 - (f) Filter Aids – such as Sigmalite and etc.
 - (g) Antioxidant – such as BHT and etc.
- (4) Warehouse Department

It is responsible for stock in and out all the items by authorized slips from the warehouse. And also plan in advance for reorder point.

The organization chart of Inta Enterprise is shown in Figure 2.1.



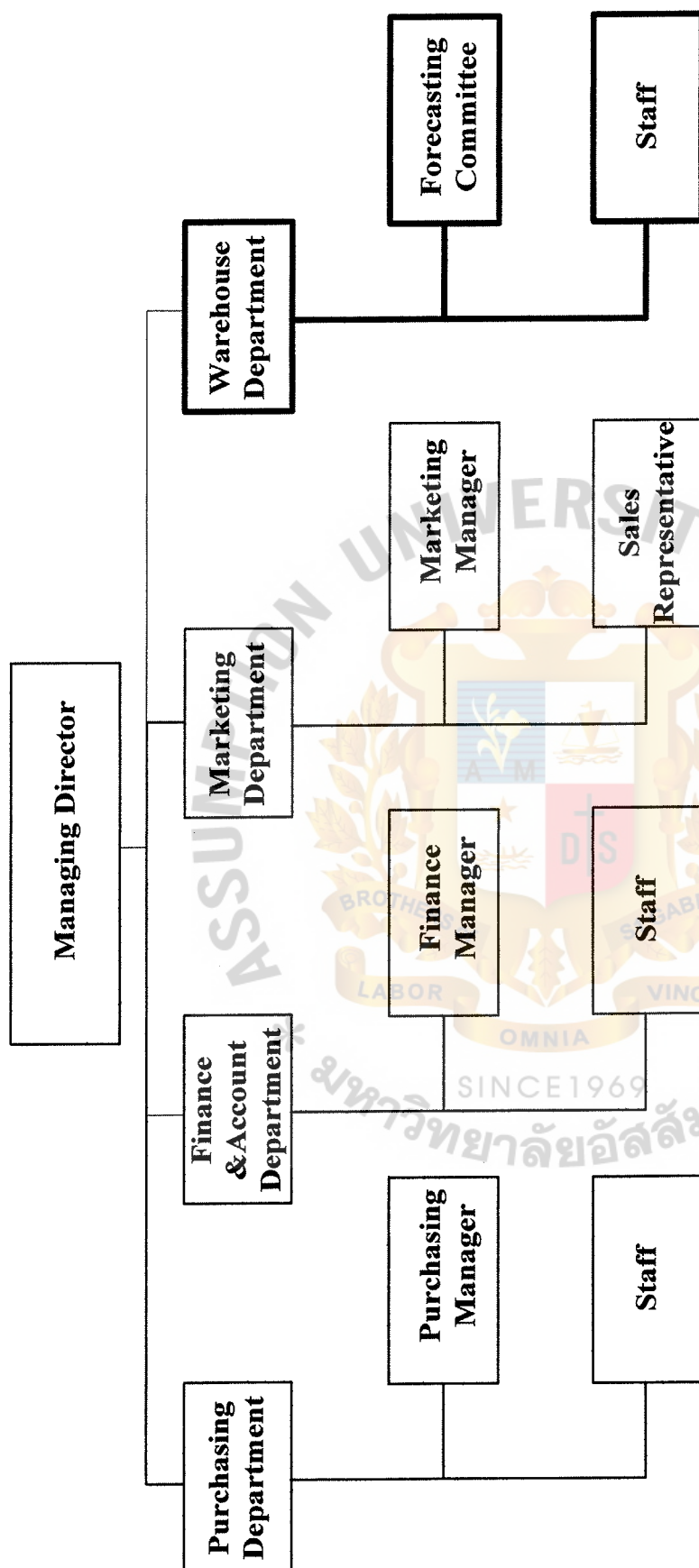


Figure 2.1. The Organization Chart of Existing System

2.2 Existing Business Functions

The existing functions normally are recorded in the paper forms that are very difficult and take a long time to retrieve and reuse for any purpose. Moreover, mistakes always cause a big problem for availability of product. For example, worker counts the wrong quantity of the product which leads the stock uncertainty. Finally, the information is difficult to access for management and planning in competitive strategies and quality improvement.

The business functions of the existing system, Inventory Management Information System (a manual system) of Inta Enterprise can be summarized as follows:

(1) Accept order request

A staff at front office accepts a product order list from a customer.

(2) Check product availability

After the staff acknowledges the order request, he/she will check the product against the stock record or the warehouse. If the product is available, product delivery will be created.

(3) Update level of stock

After completeness of selling transaction, the staff will record all the details in the stock record of the warehouse. And also calculate the remaining stock.

(4) Check minimum reorder point product

At the end of the day, the forecasting committee checks the level of each product. Reorder point based on ordering calculation system of each product.

(5) Create purchase order

The forecasting committee lists all the products that should be reordered and then submit the reorder point report to the purchasing department for approval.

(6) Generate report

The forecasting committee generates a monthly report such as stock status report, damaged product report, and reorder point product report. And then propose all the reports to the managing director.

The existing system of the company is shown in Figure 2.2. and Figure 2.3.



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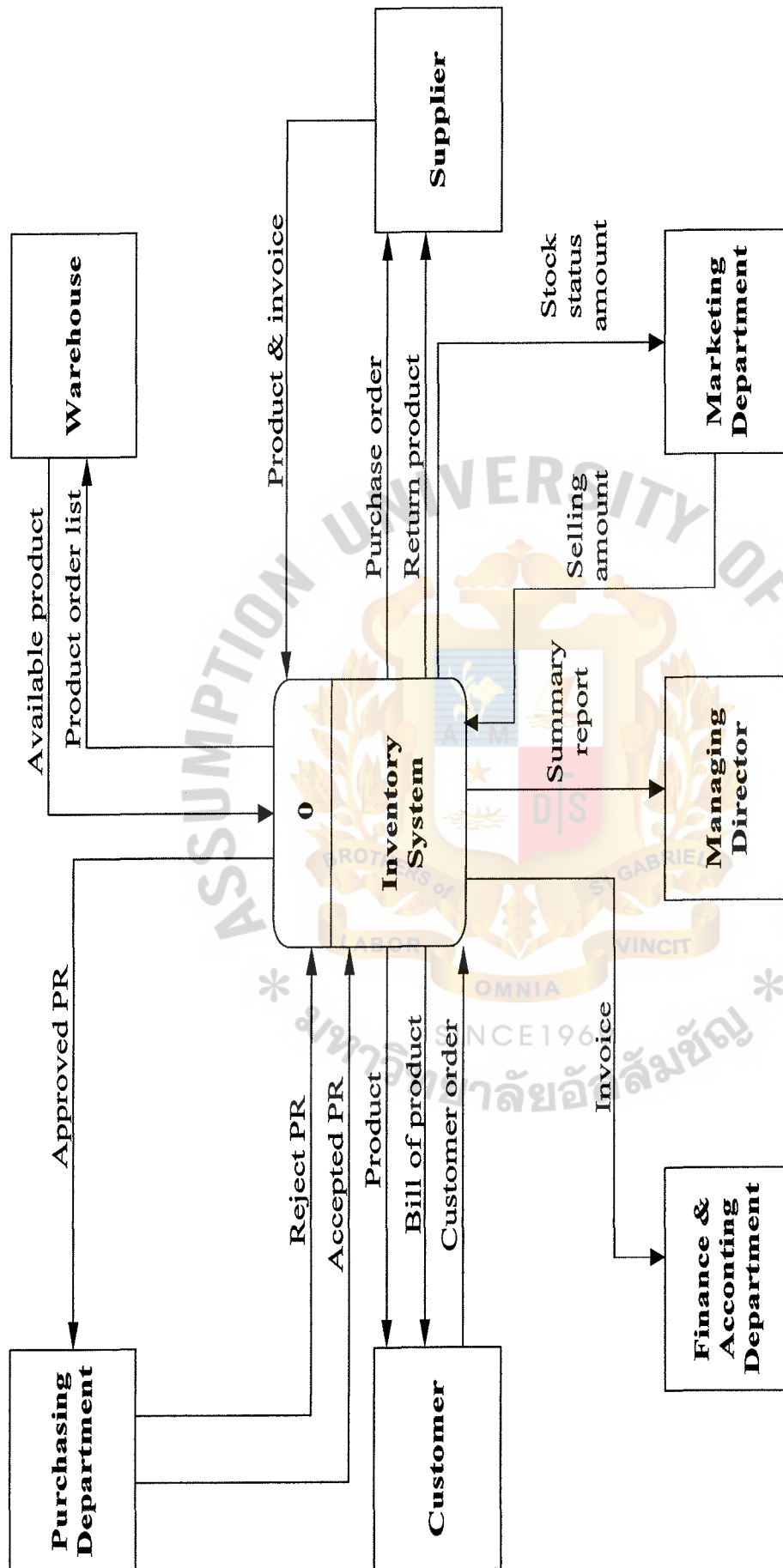


Figure 2.2. Context Diagram of Existing System.

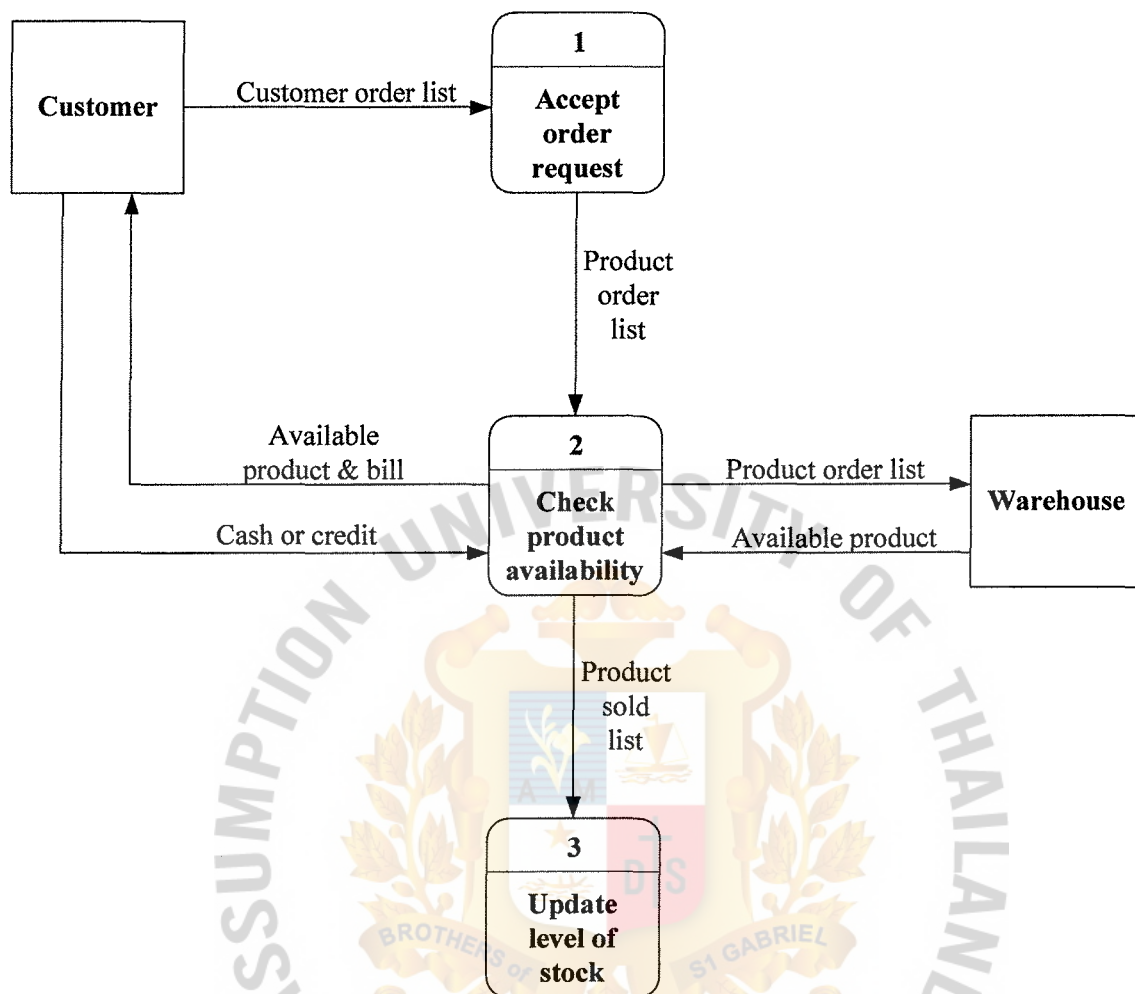


Figure 2.3. Data Flow Diagram Level 0 of Existing System.

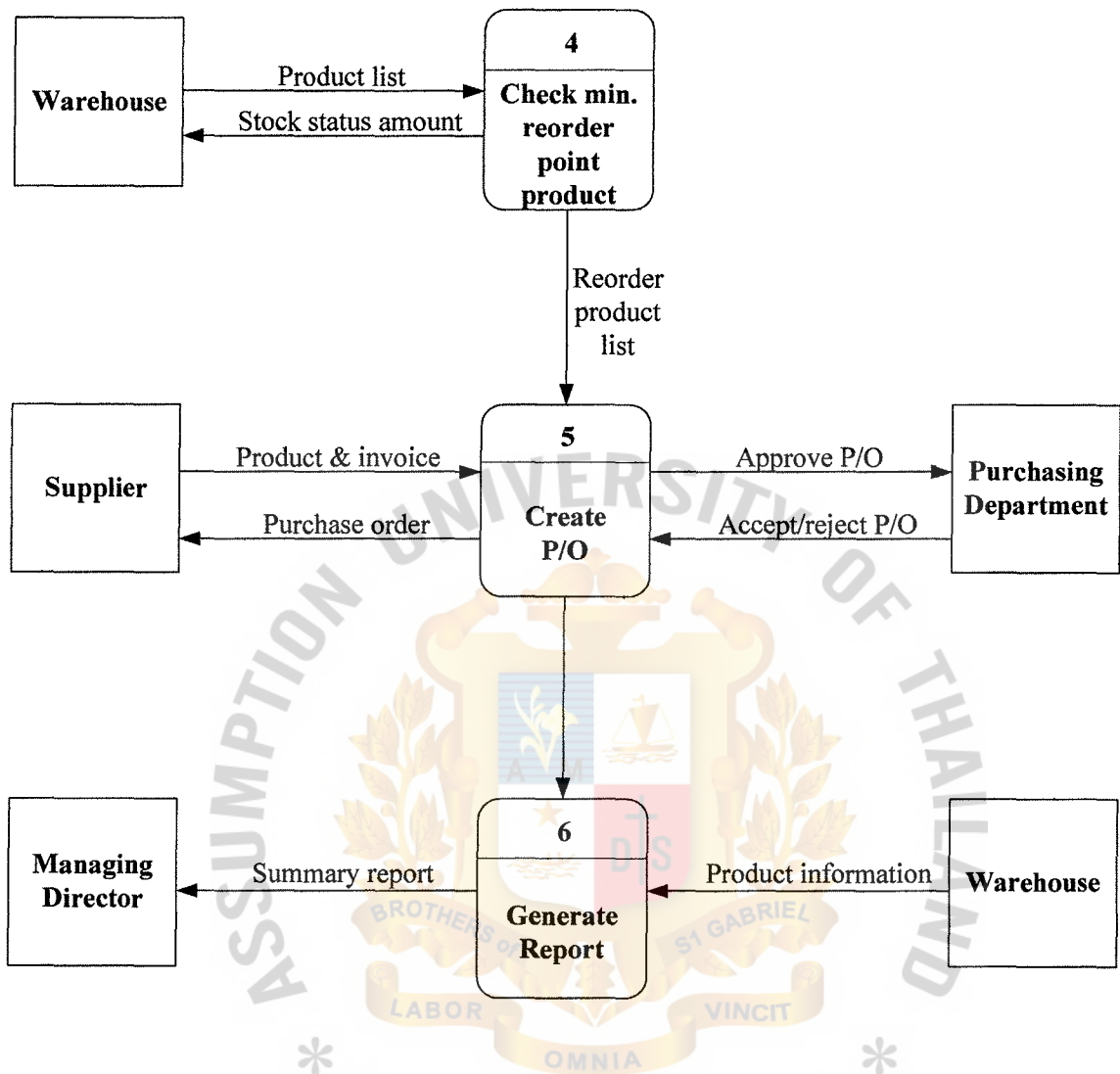


Figure 2.3. Data Flow Diagram Level 0 of Existing System (Continued).

2.3 Current Problems and Areas of Improvement

The current problems of the existing system of Inta Enterprise will be clarified by using PIECES method. This will describe in terms of Performance, Information, Economic, Control, Efficiency and Service.

P = Performance

Throughput

Current inventory system generates insufficient data. We can track only one or two reports per day which is hard to complete all the stock updates per day.

Response Time

It consumes 4 hours to generate a report which creates Bureaucratic red tape in the working process.

I = Information

Output

- (1) As the documents are written down, the information is not accurate.
- (2) The information is not up to date because of requiring many hours to conclude.
- (3) The information is hard to investigate beneath missing format.

Input

- (1) Manual system creates inaccurate data.
- (2) Data does not match with our requirement that makes trouble to the part of generating report.
- (3) No official fixed format which adversely causes low in integrity data.

Stored Data

- (1) Manual record leads to redundant information.
- (2) Information kept in different storage promotes difficult to create, read, update and delete.
- (3) Hard to track the necessary file to support the business in time.

E = Economic

Cost

- (1) The cost is undiscovered which is a burden to the company's budget plan and implementation.
- (2) High cost due to unplanned office paper documentation.
- (3) Too much employees which waste resources of an organization.

Benefit

- (1) The new inventory system will strengthen the process of an organization.
- (2) Create competitive advantage over the competitors.
- (3) Smooth flow of business operation.
- (4) Promote time optimization.

C = Control

Too little control and security

Information can be leaked out to other competitors. Employees will be lazy. The work flow process is clumsy and also causes low performance in output. Furthermore, dead stock is increased because of low profile in forecast.

Too much control and security

Employees will feel uncomfortable to work. Bureaucracy red tapes the process of other lines. Lastly, delays will be the follow effect.

E = Efficiency

People

Too much employees creates some to be lazy. If an employee is absent, the work flow will be roughly stuck and stop. Untrained employees are the obstacles and promote inverse direction of new technology integration.

Process

Current process is too slow which creates useless time utilization. No standard format to ease the work flow. Hand recording doubles time to check and recheck the process. No standard or consistent method to support.

S = Service

Manual System is inflexible to cover new or exceptional situations; it also produces inconsistent and inaccurate results. Changing and adaptation are difficult to apply. Connection can not link to all the organization system.

And in this stage, two methodologies are used to study the problem domain for more understanding. First is problem statement and second is problem, opportunities, objectives, and constraints matrix.

2.3.1 Problem Statement

After classifying the problems, opportunity and directive, the officer studies and analyzes each of the problems in the current system. Each problem, opportunity and directive is assessed with respect to urgency visibility, tangible benefits and priority. The result is summarized in terms of Urgency, Visibility, Priority and Possible solution as shown in Table 2.1 Problem Statement.

Table 2.1. Problem Statement.

Brief Statements of Problem, Opportunity or Directive	Urgency	Visibility	Priority/ Rank	Proposed solution
1. Delay in external data and transmissions and response time.	3 months	Medium	1	New Development
2. The data available in existing program format is difficult to convert to serve the need of other programs.	4 Months	High	3	New Development
3. There is an opportunity to have a centralized processing which is suitable to manage information.	3 Months	Medium	2	New Development
4. There is an opportunity to improve security system of existing system for accessing and retrieving of data from the system.	2 Month	High	1	Quick fix; then new development Use Password for Authorization
5. The existing program lack of efficiency and convenient for users.	3 Months	High	2	After implementing new system, provide user manual, which is easy to learn
6. Information sharing between different departments of the Inta Enterprise run roughly.	3 Months	High	1	New development
7. The present response time is too slow.	3 Months	Medium	2	New development

2.3.2 Problems, Opportunities, Directives and Constraints Matrix.

The most effective problem solving is to analyze the problem for causes and effects. Cause-and-effect analysis is a technique in which problems are studied to determine their causes and effects. The cause-effect analysis is shown in Table 2.2 Problems, Opportunities, and Constraints Matrix.



Table 2.2. Problems, Opportunities, Directives, and Constraints Matrix.

Cause and Effect Analysis		System Improvement Objectives	
Problem or Opportunities	Causes and Effects	System Objectives	System Constraints
1. Delay in external data and transmissions and response time	1. Data transmissions are slow because of delivering by using mails and messengers. 2. Takes a long time for officer to get customer information. 3. Makes customers unsatisfied because of long waiting time and slow throughput rate.	1. Create the network system for decreasing transmission and response time.	1. The new network system must support and be compatible with the paper-based system.
2. The data available in existing program format is difficult to convert to serve the need of other programs.	1. There is no support feature in existing program to convert data to another program. 2. The data available in the database cannot be fully utilized (It can be used by only the existing program)	1. Create module for existing program to convert data into various format.	1. There are huge amounts of existing data that need tremendous time to modify in order to be able to convert into other program file formats.

Table 2.2. Problems, Opportunities, Directives, and Constraints Matrix (Continued).

Cause and Effect Analysis		System Improvement Objectives	
Problem or Opportunities	Causes and Effects	System Objectives	System Constraints
3. There is an opportunity to have a centralized processing which is suitable to manage information.	<p>1. The is no integrated information available in the company</p> <p>2. The company cannot use data from all department effectively (Do not utilize the data store in database).</p>	1. It integrated all information flow at one place.	1. Need to create new module that links program from all the centres together.
4. There is an opportunity to improve security system of existing system for accessing and retrieving of data from the system.	1. Unauthentic user can access sensitive information of the company.	1. Improve security system for accessing information of the company.	<p>1. There are many tools and programs available in the market to facilitate hacker or intruder to hack into the system.</p> <p>2. Higher level of protection might create more procedure for the work, which might cause wasting of time.</p>
5. The existing program lack of efficiency and convenient for users.	1. It takes a long time for new officers to learn how to use the system.	<p>1. Reduce the learning time of the new user by 50%.</p> <p>2. Create a user manual for users.</p>	1. The format of the program must be easy to understand by all users.

Table 2.2. Problems, Opportunities, Directives, and Constraints Matrix (Continued).

Cause and Effect Analysis		System Improvement Objectives	
Problem or Opportunities	Causes and Effects	System Objectives	System Constraints
6. Information sharing between different departments of the Inta Enterprise run roughly.	1. The staff does not know which parts are done by the others.	1. Increase information sharing between different departments by 50% 2. Utilize the computer network of Inta Enterprise.	1. Any system developed for application must be compatible with Windows XP desktop standard and Windows Server 2003 Enterprise.
7. The present response time is too slow.	1. Lack of base database system, so access time is very slow. 2. No complete data in system and not update, so there is inaccuracy of data. 3. Data flow problem so that there are data redundancies in each section.	1. Eliminate paper work and keyboard data entry by 70 % 2. Establish proper database system	1. The workforce must not be increased. 2. New system must be compatible with Windows XP.

From the above table, most of the problems fall on the current process being operated manually. Once the new system is applied, it will help to utilize the time spent for updating, searching, and accessing information. The information generated from the system will be more reliable and accurate an existing system.

III. THE PROPOSED SYSTEM

3.1 System Specification

Application Architecture serves as the framework for general design. It defines the technologies used to build and use in the information system of the project in terms of Network Architecture, Data Architecture, Interface Architecture, and Process Architecture. Following are its application architecture.

3.1.1 Network Architecture

The objective is to promote sharing resources that are database or information, application programs and hardware. This network allows multiple users to access resources at the same period of time. This system is designed by using Star topology that uses Hub to be the centre of the connecting workstations. The components of the network configuration are defined as follows:

- (1) Network Topology : Star Topology
- (2) Interconnection : Hub 12 ports
- (3) Wiring and cable : UTP 4 pairs CAT-5
- (4) Server : PCs File Server
- (5) Workstation : PCs
- (6) Network operation : Microsoft Windows NT
- (7) Network interface card

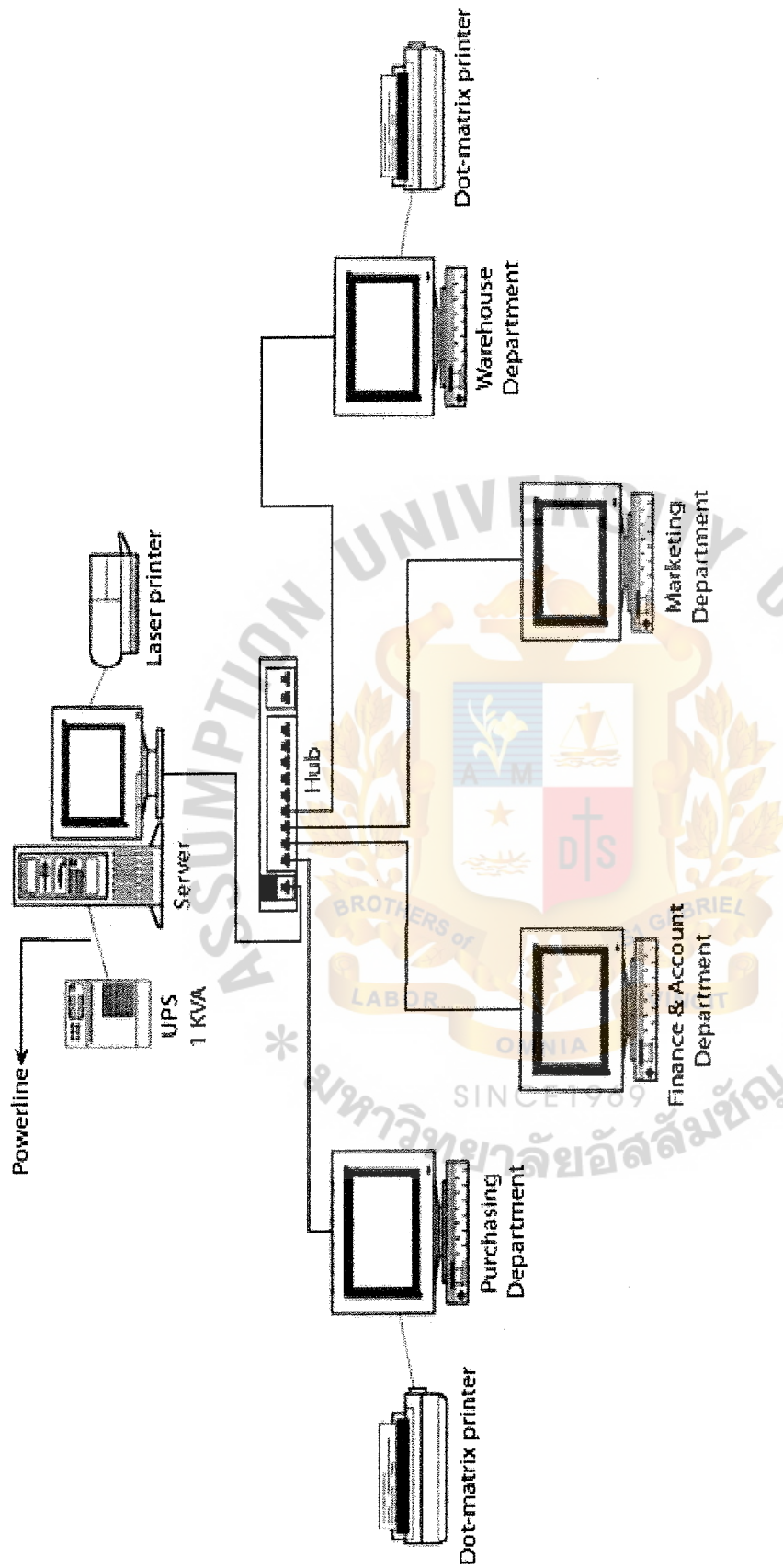


Figure 3.1. Network Architectures of Inventory Management Information System.

3.1.2 Database Architecture

Relational Database Model will be adapted into the system. All data will be stored in the format of tables or relations that are integrated as the relation database. Microsoft Access grants the authority to log in and off and maintenance of the stored data also to support backup, recovery and security of data.

The most database recognition language to be used is SQL(Structured Query Language). SQL facilitates data definition, query, and update. Hence, it is both the DDL (Data Definition Language) and DML (Data Maintenance Language).

3.1.3 Interface Architecture

The interface architecture is online processing. Not all personal computers can access to the Inventory Management Information System. The system can keep track of product, the remaining of the stock and etc. With online processing, when the user uses program on the client machine and if the work concerns update, insert, or delete data in the database, the program will send the database command to the database server to manipulate that data immediately; no need to repeat update information many times and reduce redundancy information.

Online processing will always keep the data in the system up-to-date; online system enables business transactions and requires to be processed immediately when they occur. It permits greater human interaction in making decisions. The required today transactions, remaining stock information and report can be generated immediately. In addition, updating the data online can increase the validation of data.

3.1.4 Process Architecture

Microsoft Visual Basic (VB 6) is the software language tools for developing the business application programs for the system, for the proposed Inventory Management Information System, it consists of Windows Server NT 4.0, Microsoft Office 2000 Professional, Microsoft Visual Basic 6.0, and Microsoft Access.

Microsoft Visual Basic 6.0 is the programming language complied for replication and execution on client PCs.

3.2 System Design

In order to accomplish system specifications, various types of solutions are designed as alternatives. There are 3 candidate solutions for Inta Enterprise to set up the Inventory Management System. Each candidate is shown as follows:

(1) Candidate Solution 1

The first candidate solution is the Commercial off-the-shelf package software (COTS) from the market which is IVM (Inventory Management) application software. This solution eases the operation and can quick develop. The cost is the cheapest when compared with other solutions. . All databases are stored at server. One main disadvantage is inflexibility. It is not designed for specific company and requirement. Compatibility of the solution is limited. The package solution has to be modified to satisfy the specific needs of the company. As a result of modification, the development is done redundantly.

(2) Candidate Solution 2

MS Visual Basic .NET is applied for designing the entire business requirement. My SQL Server is used to develop the database. This solution consumes too much time to develop. The cost of development is higher than the previous solution. It is expensive either for development cost or a longer time to develop the solution.

Flexibility is the advantage which it promotes. The solution is developed according to the requirement of the company. The growth of the company is also included in the design of the solution. Due to the compatibility and ease in using the solution, the operation cost is reduced as well as the efficiency of operation increased.

(3) Candidate Solution 3

We applied MS Visual Basic .Net as a tool to develop the application and uses oracle to develop the database. Oracle supports larger amount of database. The database is stored in server and processing is done at the client. The application is designed to fit the requirement of user. The application is very flexible and easy to use. The period to develop the application takes longer than the previous solution. The cost of development is too high for the company.

These three candidates are compared in various aspects as shown in Table 3.1.

Table 3.1. Candidate Systems Matrix.

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of that portion of the system that would be computerized in this candidate.	COTS package will be purchased and customized to satisfy business requirement.	Inventory Management System will be developed by our own developer	Same as candidate 2
Benefits Brief description of the business benefits that would be realized for this candidate.	It can be done quickly because it's a purchased solution	This solution fully supports user requirement and flexible for the future growth	Same as candidate 2
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Technically architecture dictates Pentium IV, MS Windows 2000 Class servers and workstations	Same as candidate 1	Same as candidate 1

Table 3.1. Candidate System Matrix.(Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Software Tools Needed Software tools needed to design and build the candidate (e.g. database management system, operating systems, etc.). Not generally applicable if applications software packages are to be purchased.	None (Package solution)	MS Visual Basic .Net and My SQL Server 2000 and	MS Visual Basic .Net and Oracle 8.0
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Package Solution (named Inventory Management Software)	MS Office 2000 and EditPlus V2.0	Same as candidate 2
Method of Data Processing Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	Client/Server with powerful database server	Same as candidate 1	Same as candidate 1

Table 3.1. Candidate System Matrix.(Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Output Devices and Implications A description of output devices that would be used, special output requirements, (e.g. network, pre-printed forms, etc.), and output considerations (e.g., timing constraints).	Monitor All in one 1300 PSC HP Printer	Same as candidate 1	Same as candidate 1
Input Devices and Implications A description of Input methods to be used, input devices (e.g., keyboard, mouse, etc.), special input requirements, (e.g. new or revised forms from which data would be input), and input considerations (e.g., timing of actual inputs).	Keyboard and Mouse	Same as candidate 1	Same as candidate 1

Table 3.1. Candidate System Matrix.(Continued).

Characteristics	Candidate 1	Candidate 2	Candidate 3
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity would be needed, and how data would be organized.	MS SQL Server DBMS with 80GB storage capacities.	Same as candidate 1	Oracle SQL Server DBMS with 80GB storage capacities.

After all the candidate solutions are completely identified, feasibility analysis will be the next step to weigh each candidate solution with the interested criteria. These feasibility analyses ease the company to make a decision for choosing the appropriate solution. The criteria, which are used in these feasibility analyses, are as follows:

(1) Operational Feasibility

This criterion measures each candidate whether it fulfills the user's requirement or not. Candidate 2 and Candidate 3 can fulfill the requirement of the user.

(2) Technical Feasibility

This criterion measures the compatibility of the candidate with the existing technology of the company. The level of expertise of the company's user, which is the skill needed for the user is also measured by this criterion. The candidate 2 has the highest score in this criterion.

(3) Economic Feasibility

This criterion compares all candidates about the economic value such as the investment to set up the system, payback period, or the net present value of the system. Candidate 2 gets the highest score in this criterion.

(4) Schedule Feasibility

The schedule criterion measures the period for developing the solution. The longer period gets the lower score. For this criterion, Candidate 2 and Candidate 3 get the highest score.

The feasibility analysis of all candidates with the above criteria is shown in Table 3.2.

Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
<p><u>Operational Feasibility</u></p> <p>Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work.</p> <p>Political. A description of how well received this solution would be by user management, user, and organization perspective.</p>	35%	<p>Only supports Inventory Management System requirements and current business processes would have to be modified to take advantage of software functionality</p> <p>Score: 70</p>	<p>Fully supports user-required functionally.</p> <p>Score: 90</p>	<p>Same as candidate 2.</p> <p>Score: 90</p>
<p><u>Technical Feasibility</u></p> <p>Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate.</p> <p>Expertise. An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.</p>	35%	<p>Programmer is familiar with Package Solution so this reduces development process.</p> <p>Requires hiring the expertise to perform modifications for integration requirements.</p> <p>Score: 75</p>	<p>Programmer is familiar with Microsoft products so this reduces development process.</p> <p>Requires training the employee to use the solution.</p> <p>Score: 80</p>	<p>Oracle is the leading DBMS software that provides high efficiency. But programmers are not familiar with oracle product.</p> <p>Requires training the employee to use the solution.</p> <p>Score: 70</p>

Table 3.2. Feasibility Analysis Matrix (Continued).

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Economic Feasibility				
Cost to develop:	20%	Approximately 1,068,000.00	Approximately 1,220,000.00	Approximately 1,305,000.00
Payback period		Approximately 1.5 years	Approximately 2.1 years	Approximately 2.5 years
Net present value:		Approximately 1,758,204.05	Approximately 1,828,983.56	Approximately 1,721,260.61
Detailed calculations:		Appendix F Score: 75	Appendix F Score: 85	Appendix F Score: 80
Schedule Feasibility				
An assessment of how long the solution will take to design and implement	10%	Less than 3 months Score: 90	3 months Score: 85	4 months Score: 80
Ranking	100%	74.75	85	80

From the above table, the Candidate 2 is the best solution to be the system of the company. Although Candidate 2 has a development period longer than the first candidate, overall score indicates that Candidate 2 is the best solution. After the decision is made, the proposed system is designed.

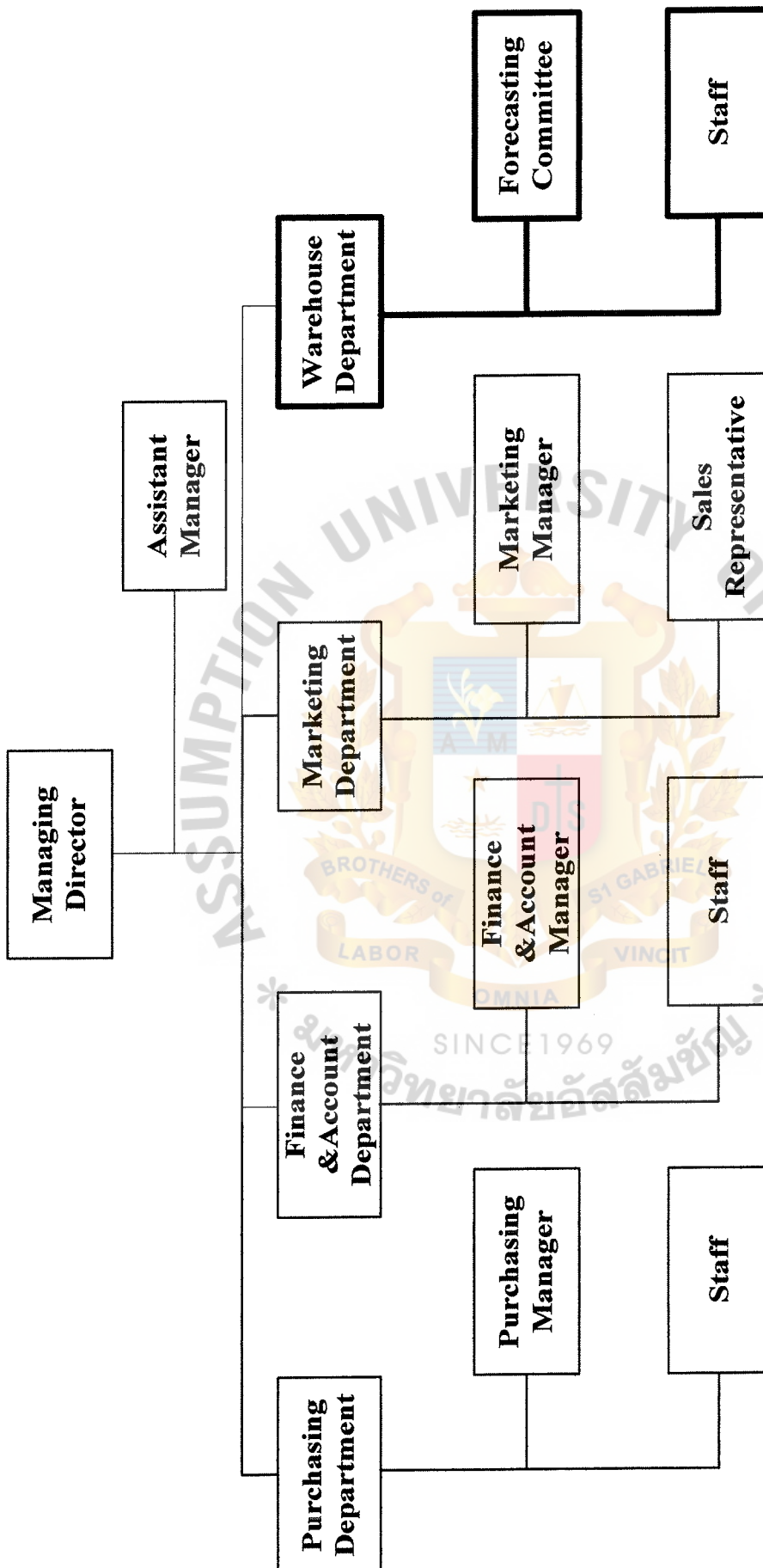


Figure 3.2. The Organization Chart of Proposed System.

The function of the proposed system (see figure 3.1, 3.2) can be summarized as follows.

(1) Accept order request

A staff at front office accepts a product order list from a customer.

(2) Check product availability

With the power of computer, the staff can check the ordered product easily by searching from the Product Stock Repository. If the ordered product is available, the product will be shipped from the warehouse to the front office.

(3) Update level of stock

When a buying transaction of any product occurred, the staff will record the number of the product in the Product Master Repository that updates and calculates the remaining quantity of products automatically.

(4) Check minimum reorder point product

The forecasting committee can view the products which should be reordered from the Product Stock File.

(5) Create purchase order

After receiving the reordered product list, an assistant manager will issue the purchase order(s) and then send it (them) to the purchasing department for approval. The information of the purchase order will automatically be linked to the supplier information, product information, etc.

(6) Product arrival

After receiving products from suppliers, the staff will input the details and quantity of the arrival of the products in the Product Master Repository and sometimes update the supplier information.

(7) Generate report

The forecasting committee can easily generate monthly reports such as stock status report and sold products from the inventory system and then send them to management team.



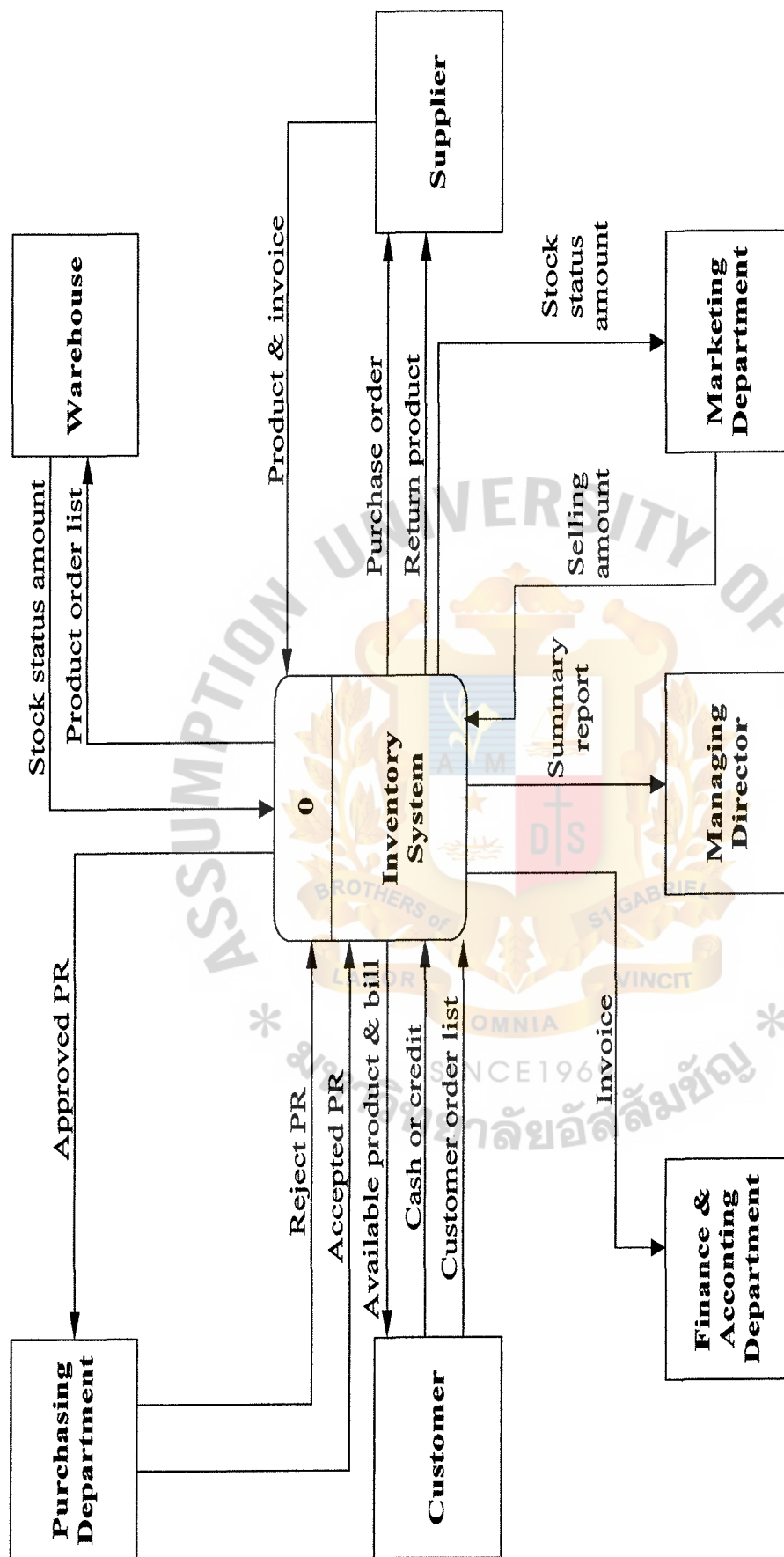


Figure 3.3. Context Diagram of Proposed System.

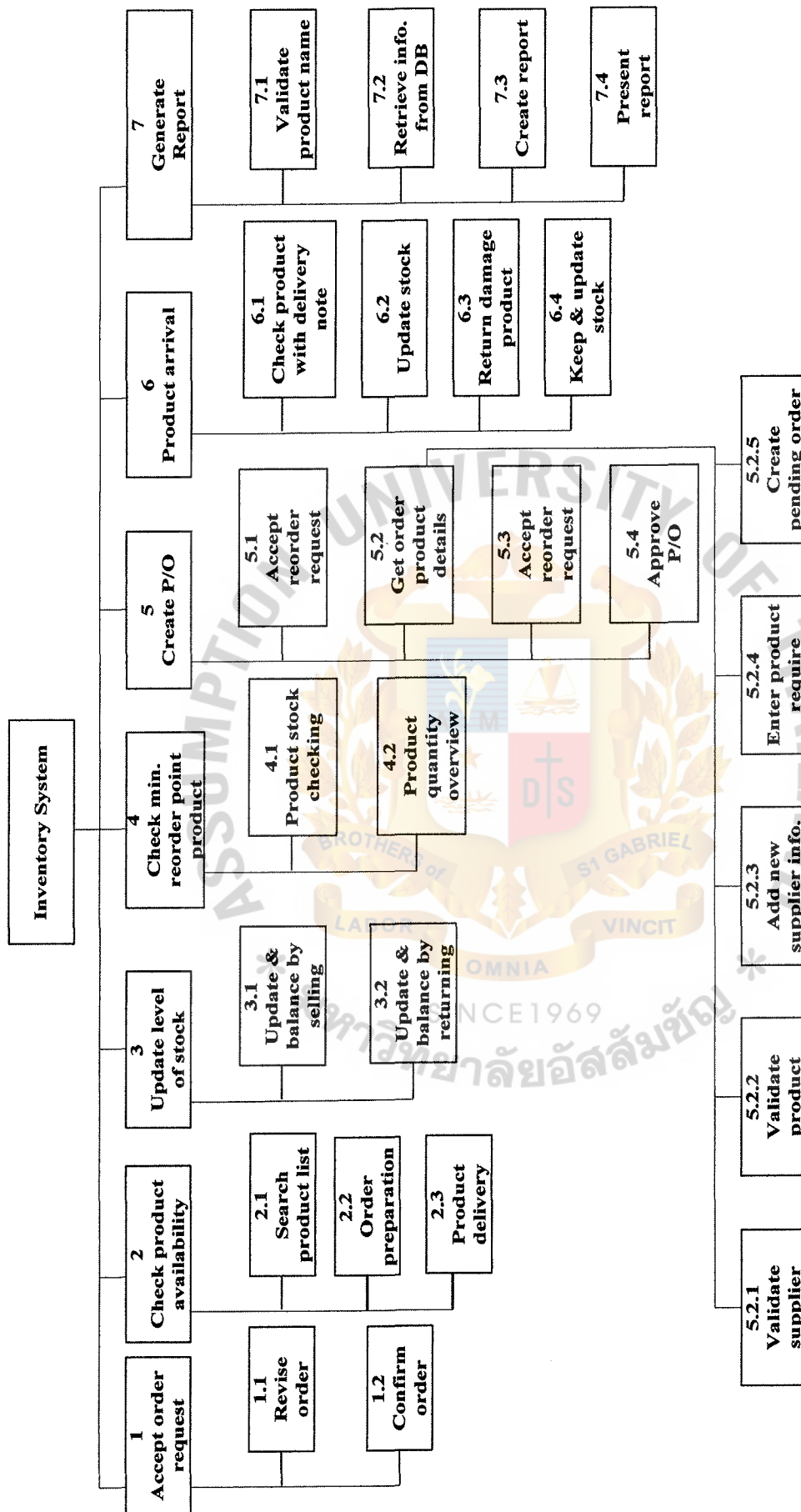


Figure 3.4. Functional Decomposition Diagram.

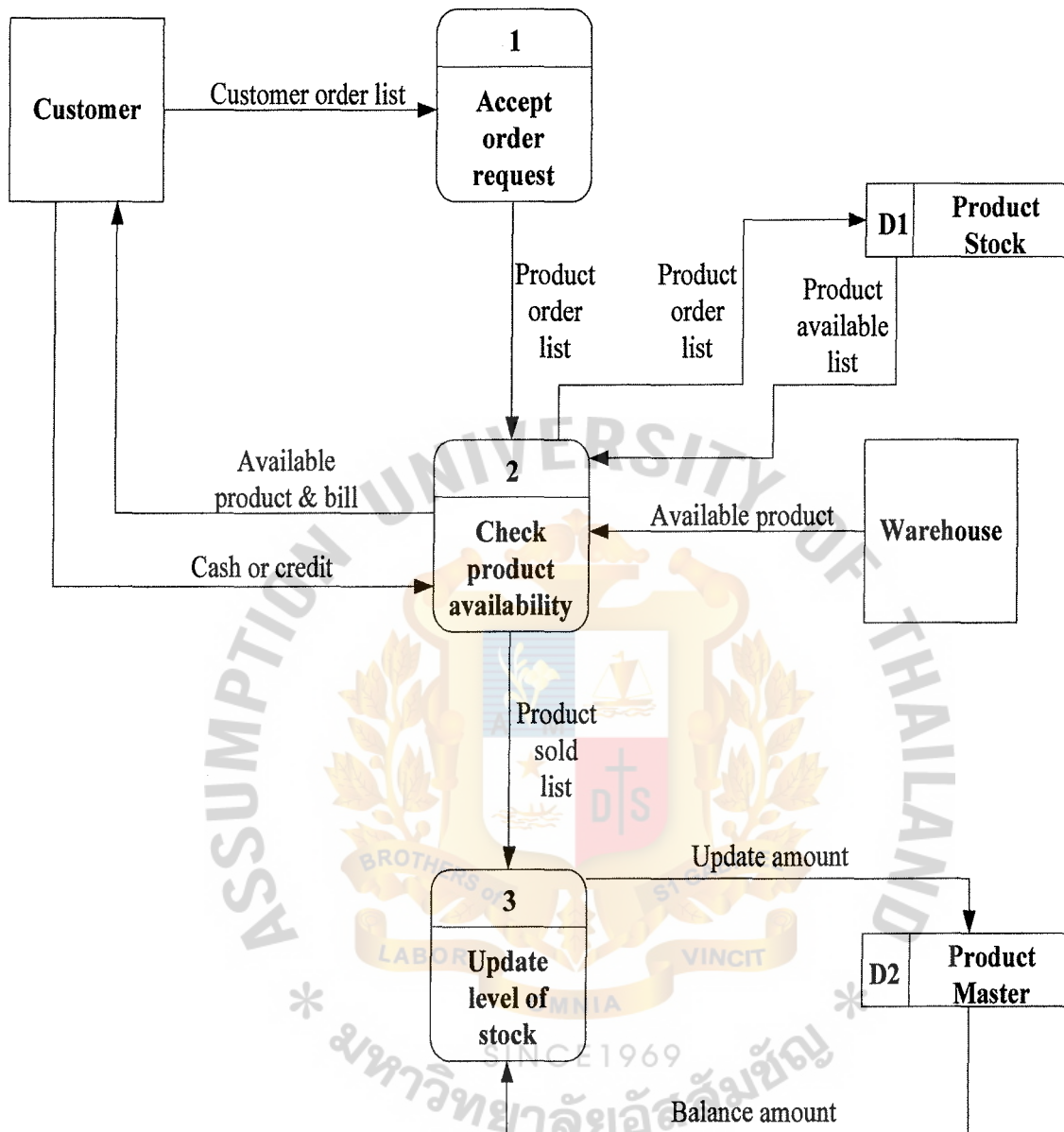


Figure 3.5. Data Flow Diagram Level 0 of Proposed System.

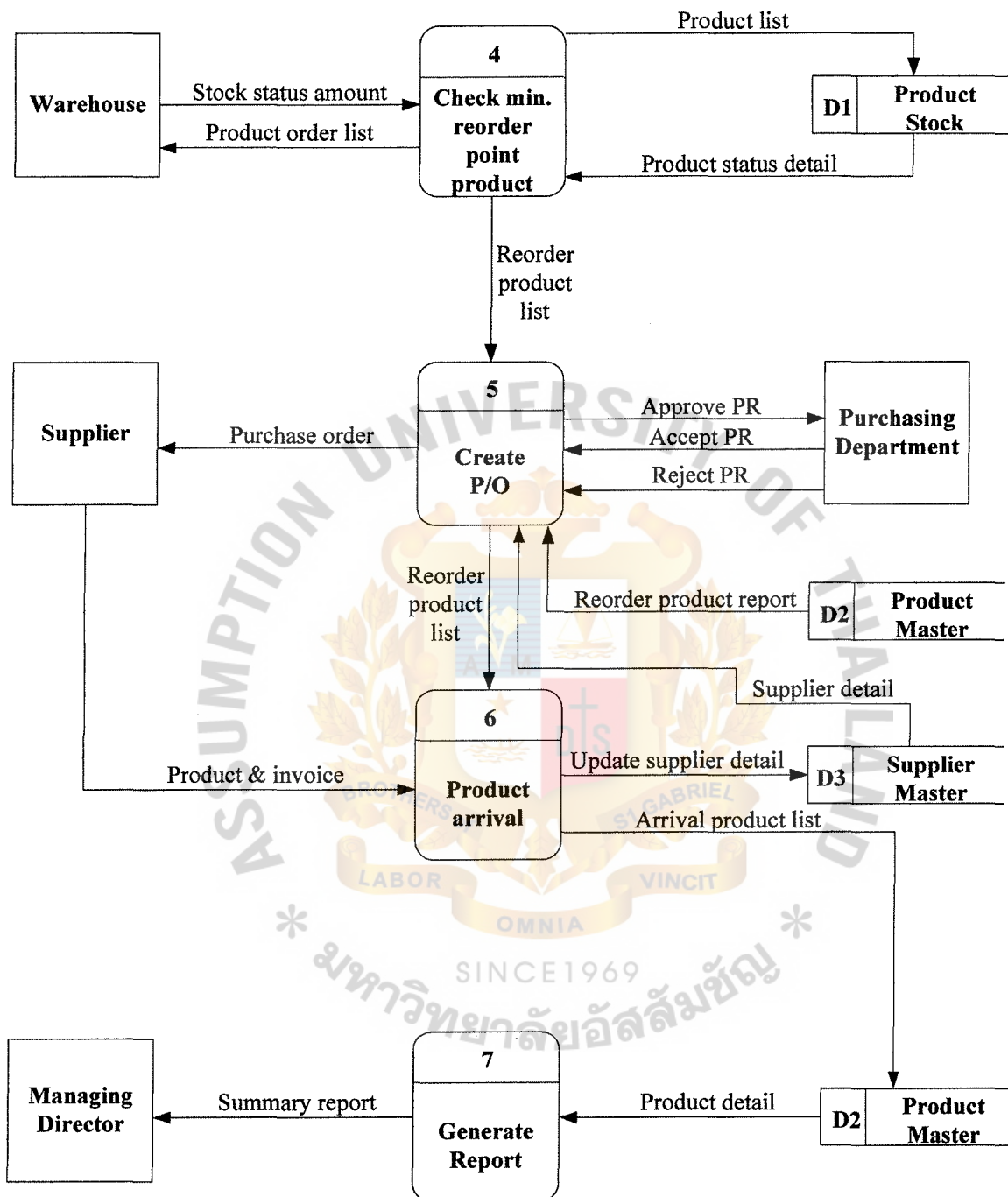


Figure 3.5. Data Flow Diagram Level 0 of Proposed System. (Continued).

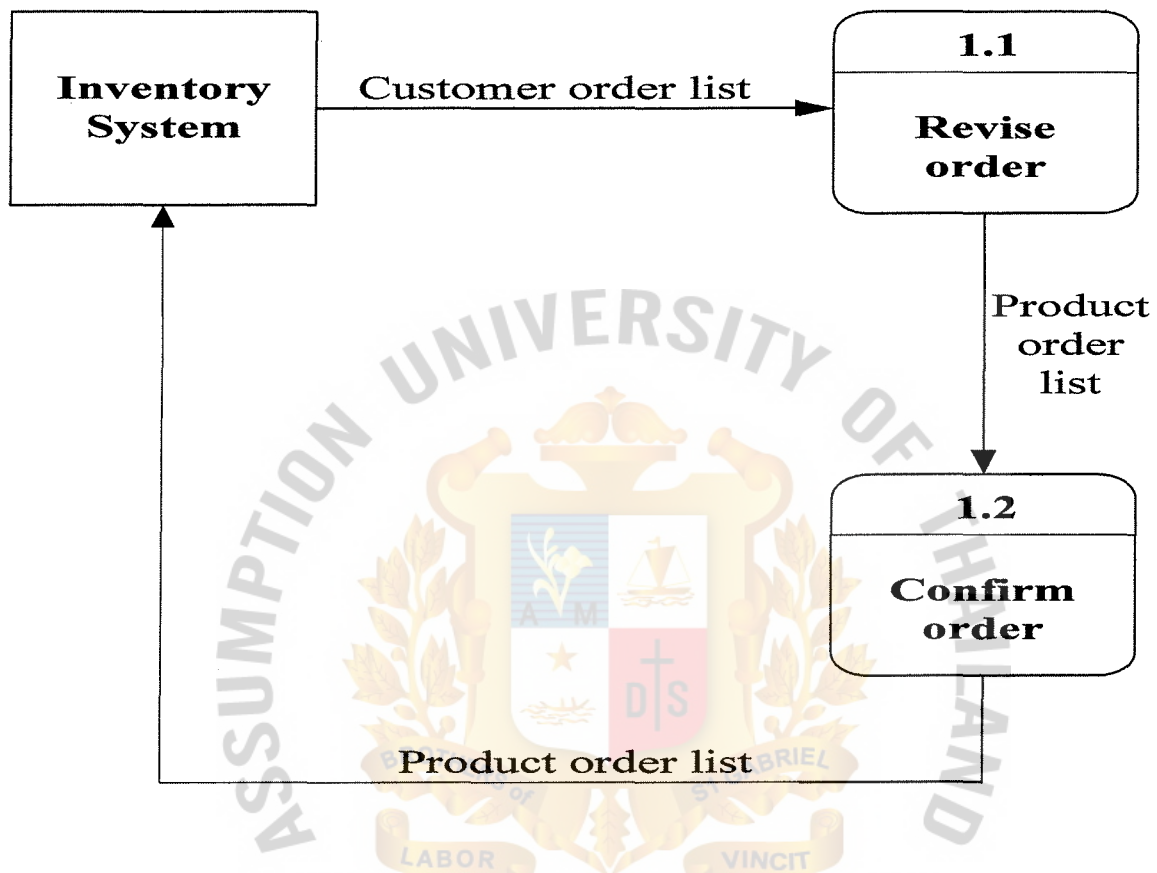


Figure 3.6. Data Flow Diagram Level 1 of Accept Order Request.

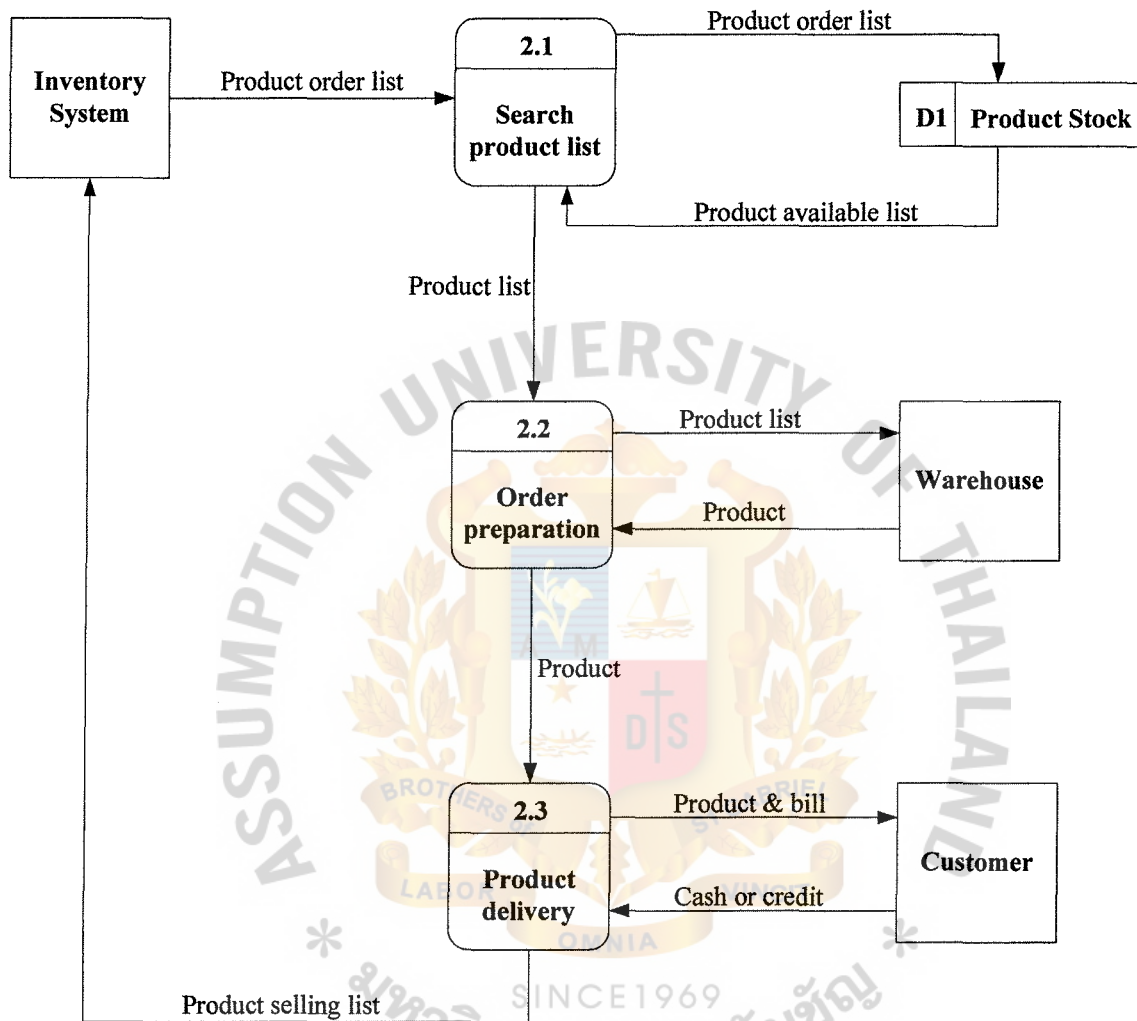


Figure 3.7. Data Flow Diagram Level 1 of Check Product Availability.

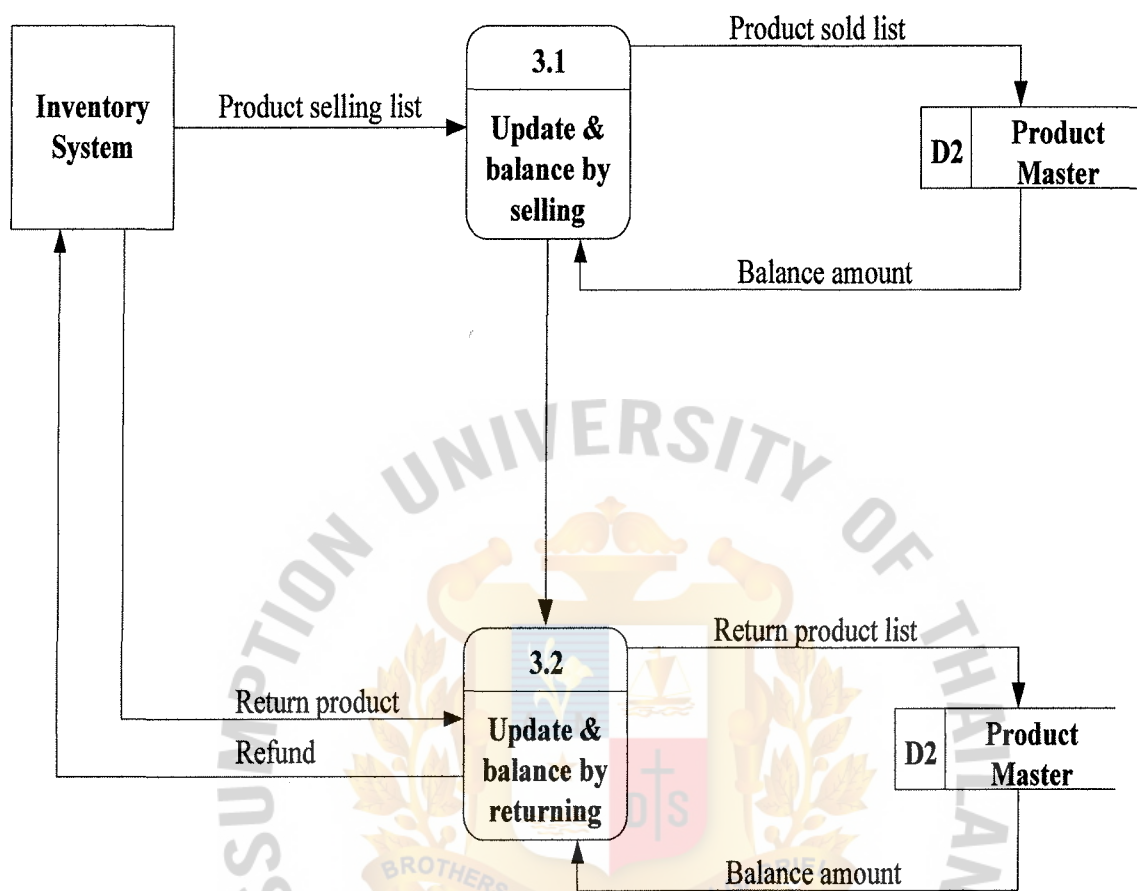


Figure 3.8. Data Flow Diagram Level 1 of Update Level of Stock.

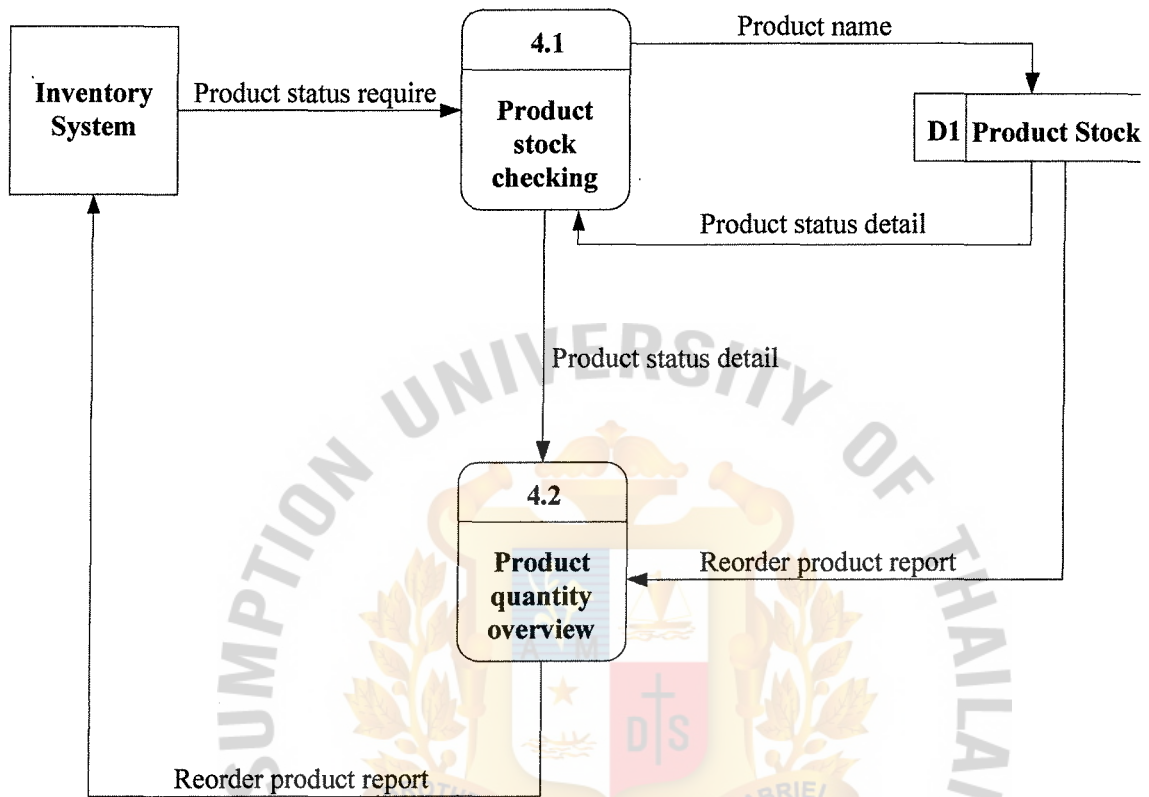


Figure 3.9. Data Flow Diagram Level 1 of Check Minimum Reorder Point Product.

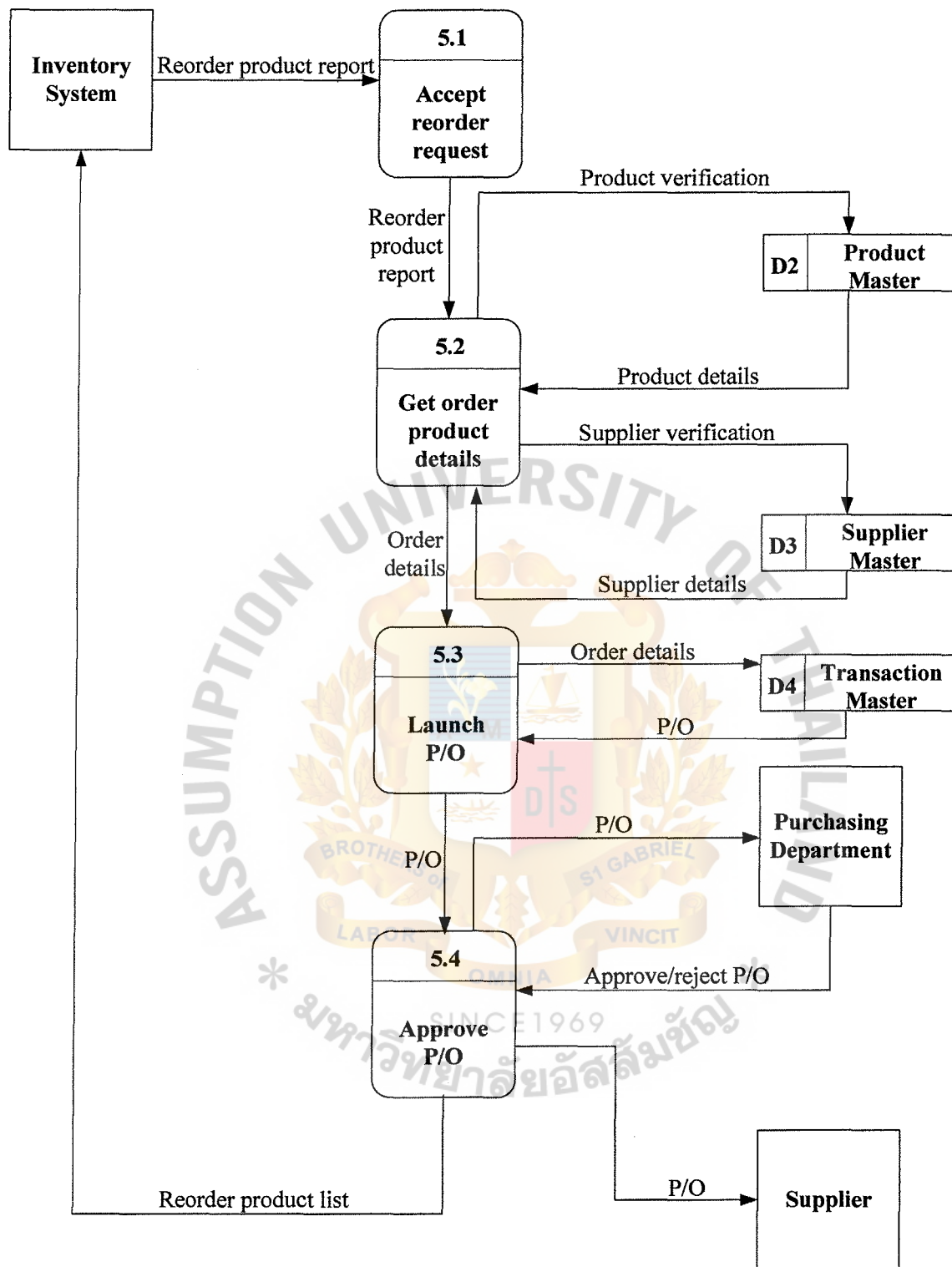


Figure 3.10. Data Flow Diagram Level 1 of Create Purchase Order.

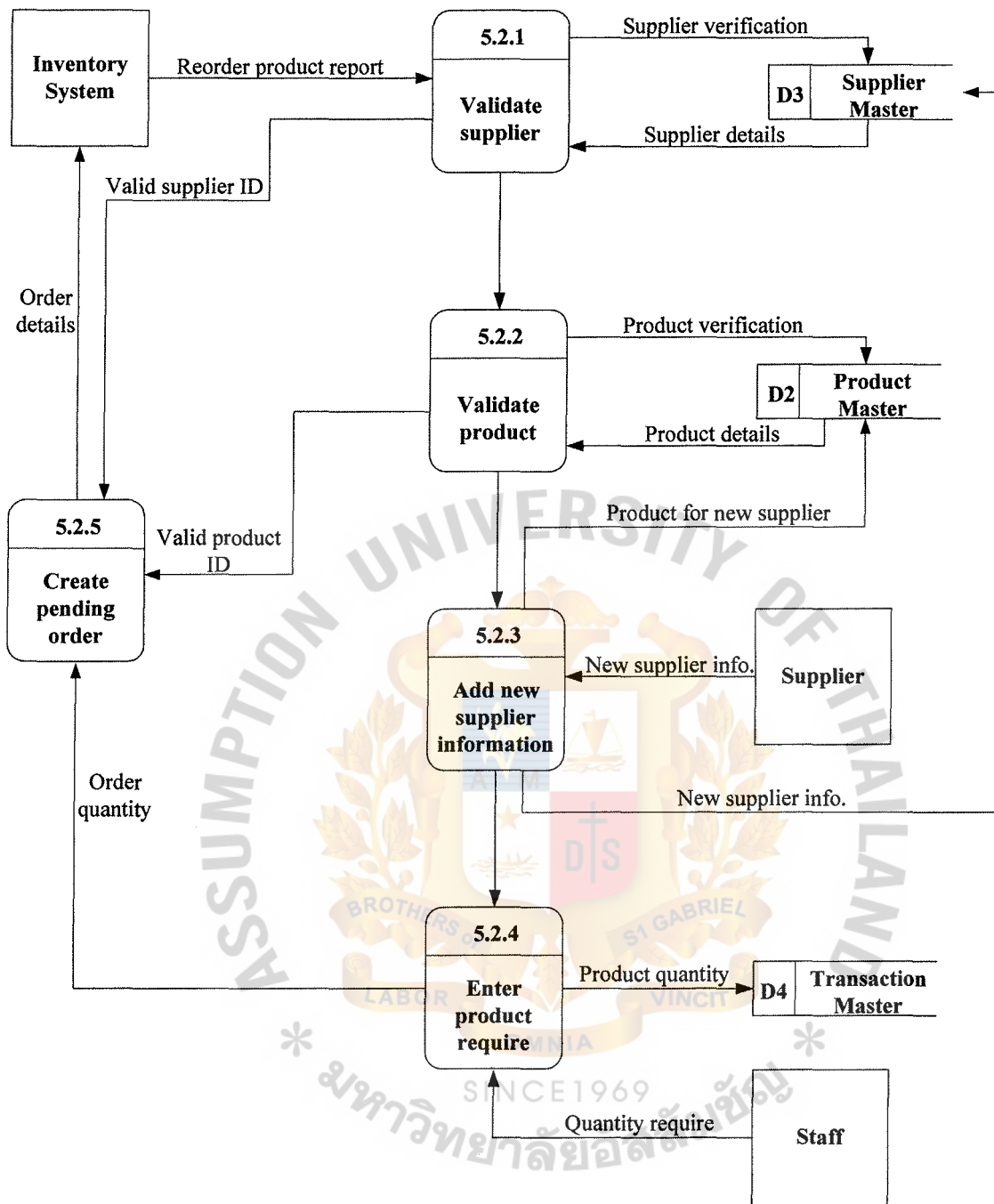


Figure 3.11. Data Flow Diagram Level 2 of Create Purchase Order of Get Order Product Details.

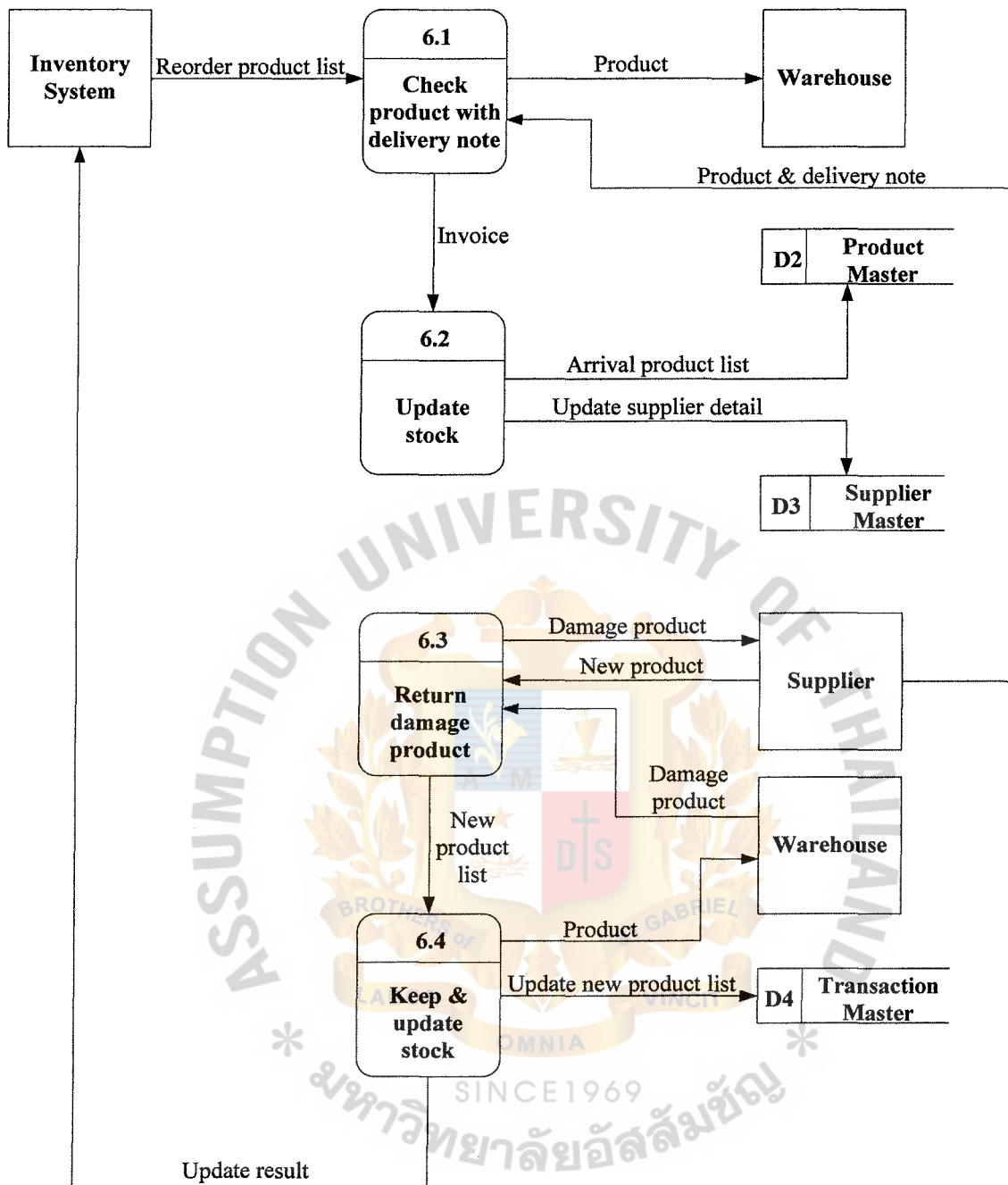


Figure 3.12. Data Flow Diagram Level 1 of Receive Product.

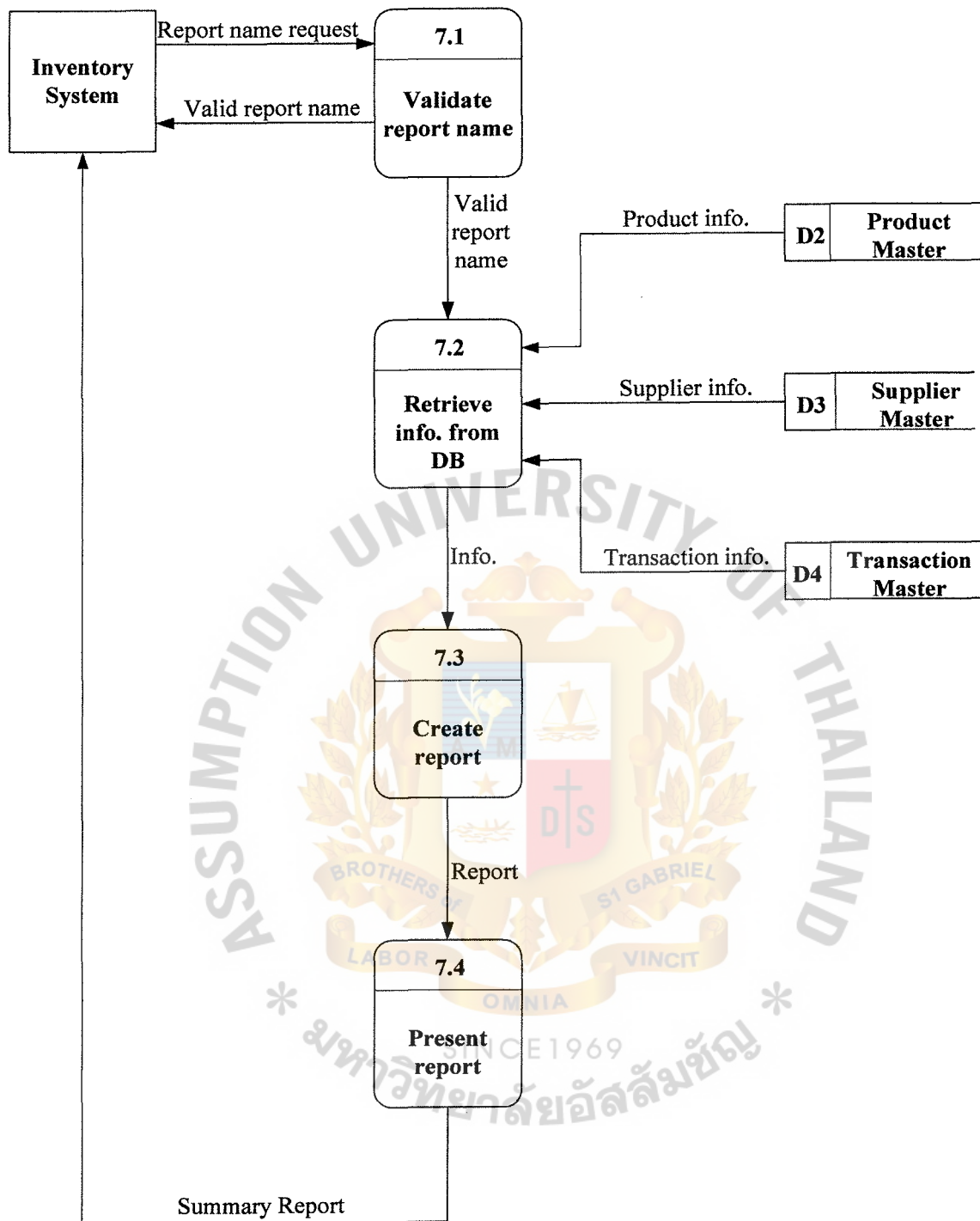


Figure 3.13. Data Flow Diagram Level 1 of Generate Report.

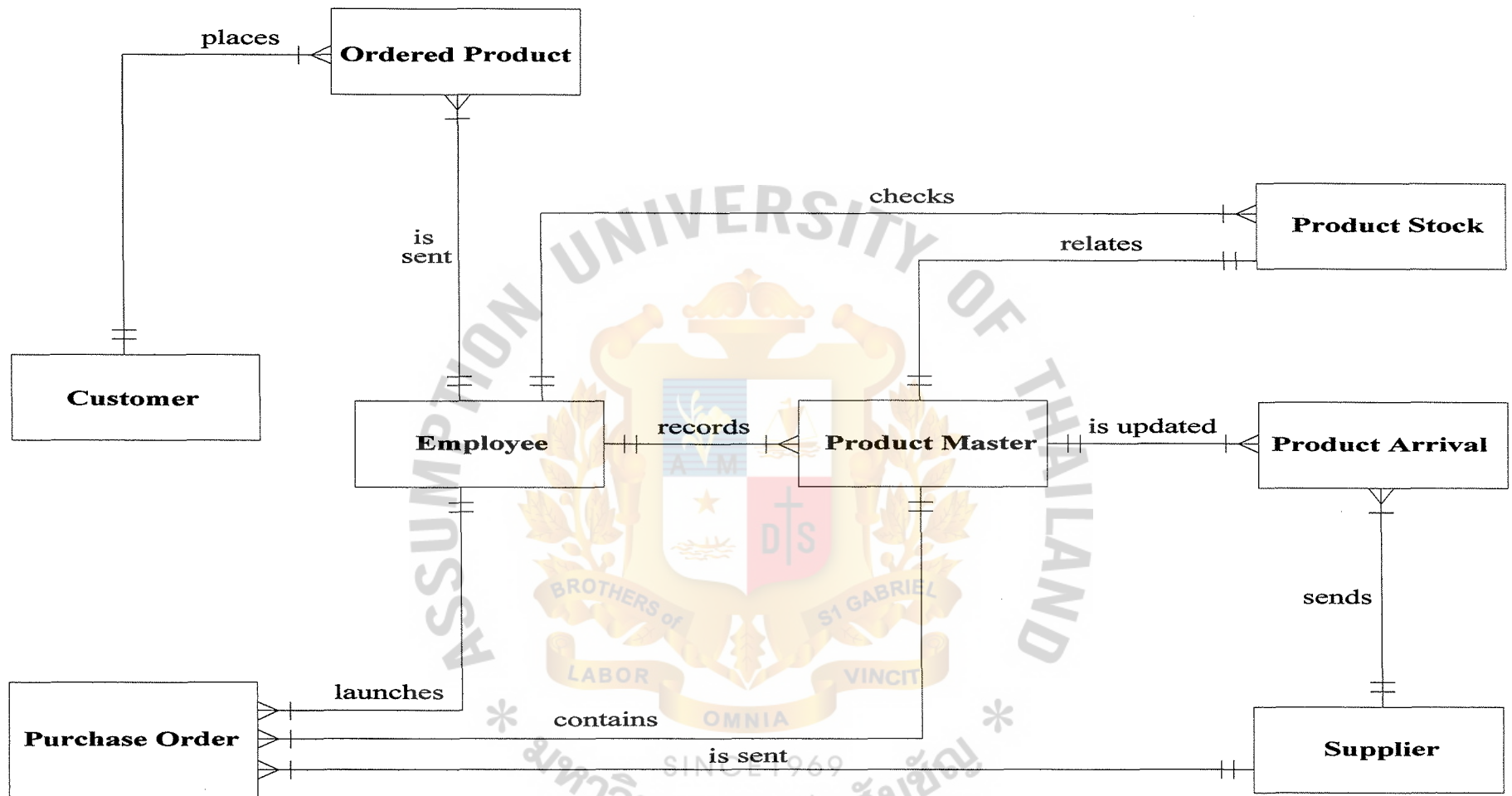


Figure 3.14. Context Diagram of Entity Relationship Diagram.

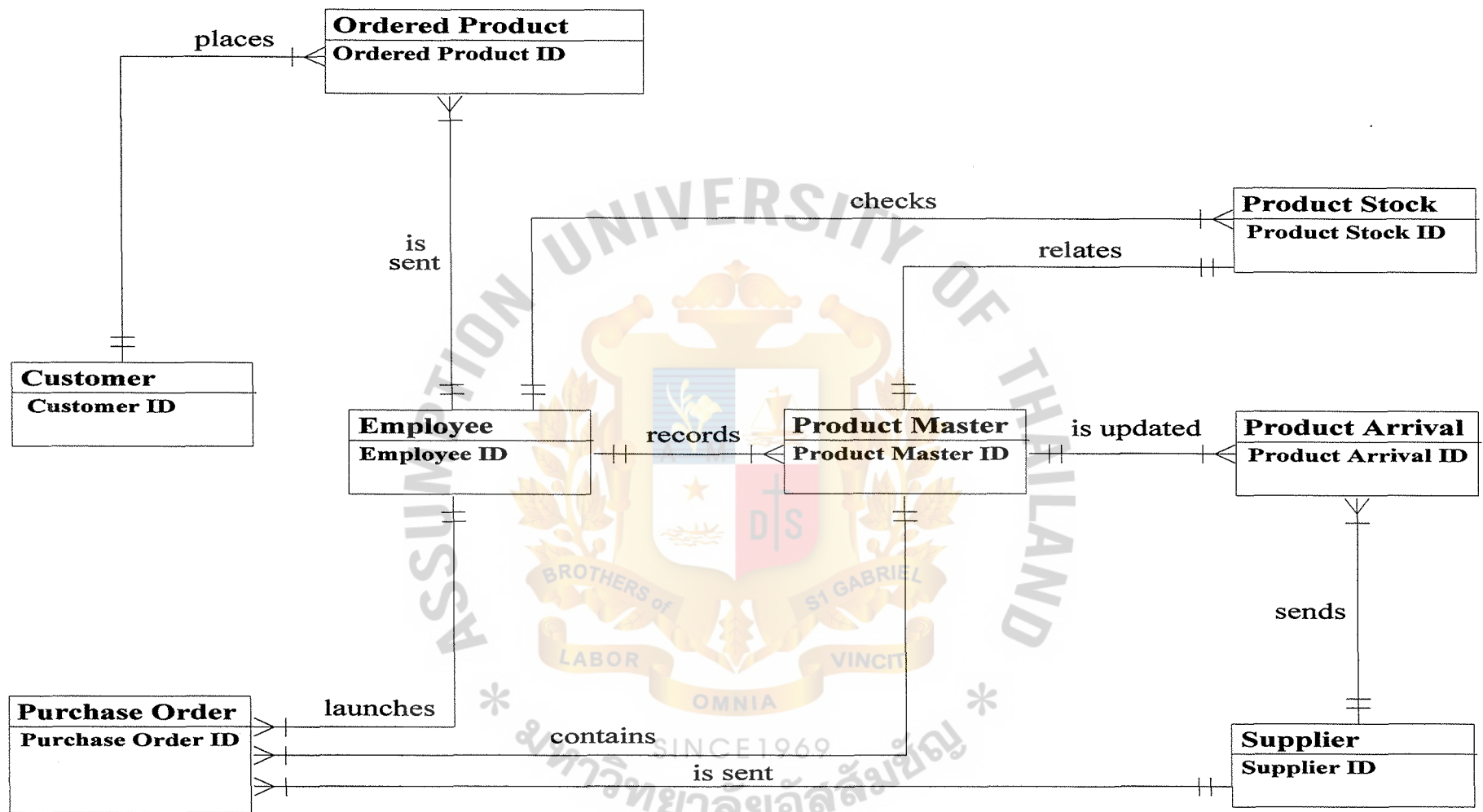


Figure 3.15. Key-based Diagram of Entity Relationship Diagram.

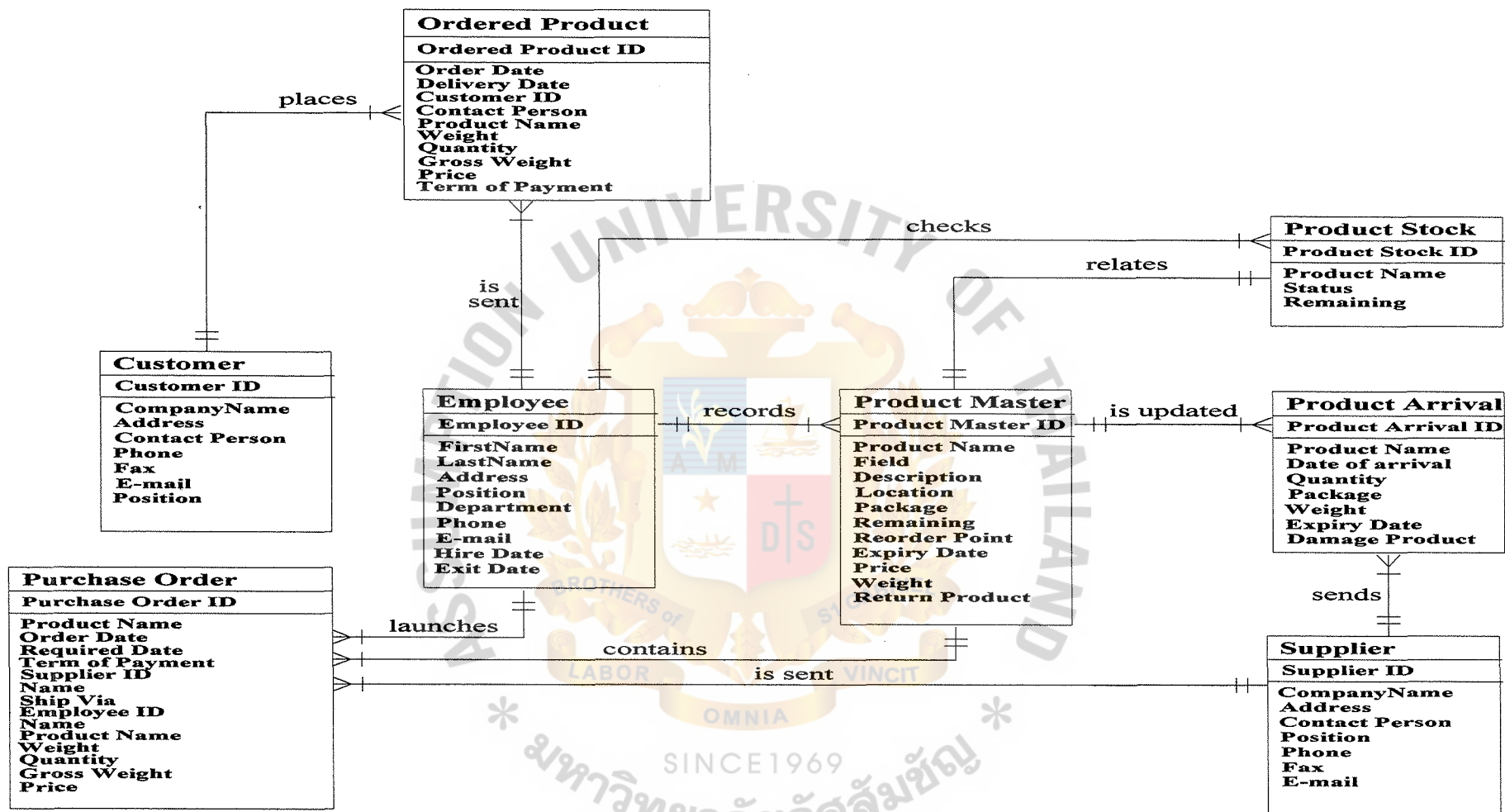


Figure 3.16. Fully Attribute Diagram of Entity Relationship Diagram.

3.3 Hardware and Software Requirement

3.3.1 Hardware and Software Requirement for Server

The proposed Inventory Management System will be developed in the form of windows based. Microsoft Visual Studio 6.0 Enterprise Edition for Visual Basic 6.0 is major software tools used to develop the input and output design of the system. Microsoft Windows NT Server 4.0 (Service Pack 3) will be used as the server's operating system. Therefore, the hardware specification of server must support Microsoft Windows NT Server 4.0 and all other software in the suite. The hardware and software specifications for the proposed database server are shown in Table 3.3 and Table 3.4 respectively.

Table 3.3. The Hardware Specification for the Database Server.

Hardware	Specification
CPU	Pentium IV 800 MHz Support 2 CPU or higher
Cache	1 GB or higher
Memory	512 MB or higher
Hard Disk	SCSI RAID 5 40 GBx3
CD-Write Dot	4x4x32 or higher
CD-ROM Drive	52x
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10/100 UTP – Connect
Display Adapter	SVGA Card
Display	17" Monitor
UPS	1000 VA

Table 3.4. The Software Specification for the Database Server.

Software	Specification
Operating System	Microsoft Windows NT Server 4.0 (Service Pack 3)
Application Server	Microsoft Visual Studio 6.0 Enterprise Edition
Database Server	Microsoft Access

3.3.2 Hardware and Software Requirement for Client.

For the proposed system, Inventory Management System, the client machines have to possess capabilities to run the programs developed by Microsoft Visual Studio 6.0 Enterprise Edition for Visual Basic 6.0. The client machines specification should also be good enough to run other office automation software, such as spread sheet, word processing, etc. As a standard, the hardware specification and client machines must therefore be good enough to support Microsoft Windows 98 and Microsoft Office 2000 professional. The hardware and software specifications for each client machine are shown in Tables 3.3 and 3.4 respectively.

Table 3.5. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Pentium IV 800 MHz or higher
Cache	256 KB or higher
Memory	128 MB or higher
Hard Disk	10 GB or higher
CD-ROM Drive	52x
Floppy Drive	1.44 MB

Table 3.6. The Hardware Specification for Each Client Machine (Continued).

Hardware	Specification
Network Adapter	Ethernet 10/100 UTP – Connect
Display Adapter	SVGA Card
Display	15” Monitor
Printer	Laser and Dot Printer

Table 3.7. The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 2000
Developer Software	Microsoft Visual Studio 6.0 Enterprise Edition
Application Software	Microsoft Office 2000 Professional Edition

3.3.3 Other Hardware Requirement

Other important hardware needed for the proposed system is switch, network printer and cable. The specification of this hardware is illustrated in Table 3.5 as below:

Table 3.8. Other Hardware Requirements.

Hardware	Specification
Switch	Share switch 24 ports
Printer	Laser Printer
Cache	LAN Cable UTP

3.4 Security and Control

The information in Inventory Management System concerned and related to many departments. Data should be available to track or use every time we invoke it from the database. Shared Management must be well served and the unauthorized access should be in focus. The following security and controls will be delivered by the proposed system.

(a) User-Oriented Access Control

- (1) Only authorized persons will receive the user identification and password. The screen interface will ask the user to provide both security codes for logging into the network.
- (2) The system allows only the person who has a valid user ID and password to run the process.

- (3) Class or privilege can be classified by user ID and password. The worker who has high hierarchy such as Managing Director can look into the deep information or quote the price list than the others.

(b) Physical Security

- (1) UPS (Uninterruptible Power Supply) will be linked and adapted to the system which prevents the immediate light off while working on process. This can guarantee the smooth flow of electric power because we have a reserved one.
- (2) Eating, Drinking or Smoking will not be allowed while using the computer. These can lead to unintentional harm to the computer.
- (3) Special detectors combined with removal or extractor fans and filters in the computer room and surrounding area are installed in order to protect against smoke and gas.

(c) Other Security

- (1) Back up should be created everyday to prevent hard disk depreciation in advance.
- (2) Error report should be hurried solving after the mistake is detected.
- (3) Historical and current data reports should be kept in categorized file for managerial planning.
- (4) A virus-checking program will be installed in order to screen out the defected file before running any program. Anti-Virus will be updated and effected once a week.

3.5 Cost and Benefit Analysis

The cost and benefit analysis is used to determine whether the project is worth or not. The average inflation rate is forecasted to be 10% through out the next 5 years. We are using straight line method in calculating the depreciation. Following are the details of the cost for the new proposed system, Inventory Management Information System, compared to the existing system, a manual system.

3.5.1 Cost of Existing System

Table 3.9. Existing System Cost Analysis, Baht.

Cost items	Year				
	1	2	3	4	5
<u>Fixed Cost</u>					
Personal Computer					
Cost 2 units	45,000.00	-	-	-	-
Type Writer 2					
units @ 4,000	8,000.00	-	-	-	-
Dot Printer 1 unit					
@ 15,000	15,000.00	-	-	-	-
Calculator 10					
units @ 450	4,500.00	-	-	-	-
Software Cost	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Maintenance Cost	-	5,000.00	5,500.00	6,050.00	6,655.00
Total Fixed Cost	76,500.00	9,000.00	9,500.00	10,050.00	10,655.00
<u>Operating Cost</u>					
<u>Salary Cost:</u>					
Managers 4 people					
@ 30,000	120,000.00	132,000.00	145,200.00	159,720.00	175,692.00
<u>Staff:</u>					
Supervisors 6					
people @ 15,000	90,000.00	99,000.00	108,900.00	119,790.00	131,769.00
Salepeople 4					
people @ 12,000	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Workers 6 people @					
6500	39,000.00	42,900.00	47,190.00	51,909.00	57,099.90
Total Monthly					
Salary Cost	297,000.00	326,700.00	359,370.00	395,307.00	434,837.70
Total Annual					
Salary Cost	3,564,000.00	3,920,400.00	4,312,440.00	4,743,684.00	5,218,052.40

Table 3.9. Existing System Cost Analysis, Baht. (Continued)

Cost items	Year				
	1	2	3	4	5
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationery 2,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Paper 4,000 per month	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Miscellaneous 4,000 per month	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Total Annual Office Supplies & Miscellaneous Cost	120,000.00	132,000.00	145,200.00	159,720.00	175,692.00
<u>Utility Cost:</u>					
Electricity 40,000 per month	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Water 6,000 per month	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Telephone 20,000 per month	240,000.00	264,000.00	290,400.00	319,440.00	351,384.00
Total Utility Cost	360,000.00	396,000.00	435,600.00	479,160.00	527,076.00
Total Operating Cost	4,044,000.00	4,448,400.00	4,893,240.00	5,382,564.00	5,920,820.40
Total Existing System Cost	4,120,500.00	4,457,400.00	4,902,740.00	5,392,614.00	5,931,475.40

Table 3.10. Five Years Accumulated Existing System Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	4,120,500	4,120,500
2	4,457,400	8,577,900
3	4,902,740	13,480,640
4	5,392,614	18,873,254
5	5,931,475.4	24,804,729.4
Total	24,804,729.4	

3.5.2 Cost of Proposed System

Table 3.11. Proposed System Cost Analysis, Baht.

Cost items	Year				
	1	2	3	4	5
<u>Fixed Cost</u> <u>(Development Cost)</u>					
Hardware Cost:					
Computer Server Cost	300,000.00	-	-	-	-
Personal Computer Cost	500,000.00	-	-	-	-
Laser Printer 2 units @ 25,000	50,000.00	-	-	-	-
Dot Matrix Printer 2 units @ 15,000	30,000.00	-	-	-	-
UPS + Router = 10 units @ 18000	180,000.00	-	-	-	-
Total Hardware Cost	1,060,000.00	-	-	-	-
Software Cost	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Network Cost	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
System Architecture Cost	30,000.00	-	-	-	-
Training Cost	30,000.00	-	-	-	-
Maintenance Cost	-	48,500.00	53,350.00	58,685.00	64,553.50
Total Fixed Cost	1,220,000.00	148,500.00	153,350.00	158,685.00	164,553.50
<u>Operating Cost</u> <u>Salary Cost:</u>					
Manager					
4 people @ 30,000	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
<u>Staff</u>					
supervisors 6 people @ 15,000	90,000.00	99,000.00	108,900.00	119,790.00	131,769.00
Salespeople 4 people @ 12,000	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Workers 3 people @ 6500	19,500.00	21,450.00	23,595.00	25,954.50	28,549.95
System Engineer 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
Total Monthly Salary Cost	194,500.00	213,950.00	235,345.00	258,879.50	284,767.45
Total Annual Salary Cost	2,334,000.00	2,567,400.00	2,824,140.00	3,106,554.00	3,417,209.40

Table 3.11. Proposed System Cost Analysis, Baht. (Continued)

Cost items	Year				
	1	2	3	4	5
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationery 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Paper 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Miscellaneous 4,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost	67,200.00	73,920.00	81,312.00	89,443.20	98,387.52
<u>Utility Cost:</u>					
Electricity 45,000 per month	540,000.00	594,000.00	653,400.00	718,740.00	790,614.00
Water 6,000 per month	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Telephone 19,000 per month	228,000.00	250,800.00	275,880.00	303,468.00	333,814.80
Total Utility Cost	840,000.00	924,000.00	1,016,400.00	1,118,040.00	1,229,844.00
Total Operating Cost	3,241,200.00	3,565,320.00	3,921,852.00	4,314,037.20	4,745,440.92
Total Proposed System Cost	4,461,200.00	3,713,820.00	4,075,202.00	4,472,722.20	4,909,994.42

Table 3.12. Five Years Accumulated Proposed System Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	4,461,200.00	4,461,200.00
2	3,713,820.00	8,175,020.00
3	4,075,202.00	12,250,222.00
4	4,472,722.20	16,722,944.20
5	4,909,994.42	21,632,938.62
Total	21,632,938.62	

3.5.3 Cost Comparison and Breakeven Analysis

Table 3.13. The Comparison of the System Costs, Baht.

Year	Accumulated Existing System Cost	Accumulated Proposed System Cost
1	4,120,500.00	4,461,200.00
2	8,577,900.00	8,175,020.00
3	13,480,640.00	12,250,222.00
4	18,873,254.00	16,722,944.20
5	24,804,729.40	21,632,938.62



Benefit Analysis

Benefits are classified as tangible and intangible.

(a) Tangible benefit

Tangible benefits compose of operating time saving, and office supplies expense reduction.

Tangible benefits are divided into two main aspects as follows:

(1) Fixed Cost

The fixed cost is increased from setting up the computerized system, but there are some benefits from using the computer system. The electric typewriter is no longer used in the office, resulting in the decrease of fixed cost.

(2) Operation Cost

The operation cost of an existing system is decreased due to the use of the proposed system. The requirement of office supplies is decreased. The computerized system can replace the manual system thus the number of employees is also reduced. So the reduction of salary is one of the major benefits of the system. The other major benefit of using the proposed system is better business operation. Better business operation means faster response time, more accuracy of data, increased productivity, and space utilization.

Cost reduction is the major benefit of the proposed system. In addition, the resource utilization will be more efficient. Salary cost, office supplies and miscellaneous cost, and utility cost are saved as shown below:

$$\begin{aligned}\text{Benefit for the 1}^{\text{st}} \text{ year} &= (3,564,000 - 2,334,000) + (120,000 - \\ &\quad 67,200.00) + (360,000 - 840,000) \\ &= 802,800 \quad \text{Baht/year}\end{aligned}$$

$$\begin{aligned}\text{Benefit for the 2}^{\text{nd}} \text{ year} &= (3,920,400 - 2,567,400) + (132,000 - \\ &\quad 73,920) + (396,000 - 924,000) \\ &= 883,080 \quad \text{Baht/year}\end{aligned}$$

$$\begin{aligned}\text{Benefit for the 3}^{\text{rd}} \text{ year} &= (4,312,440 - 2,824,140) + (145,200 - \\ &\quad 81,312) + (435,600 - 1,016,400) \\ &= 971,388 \quad \text{Baht/year}\end{aligned}$$

$$\begin{aligned}\text{Benefit for the 4}^{\text{th}} \text{ year} &= (4,743,684 - 3,106,554) + (159,720 - \\ &\quad 89,443.20) + (479,160 - 1,118,040) \\ &= 1,068,526.80 \quad \text{Baht/year}\end{aligned}$$

$$\begin{aligned}\text{Benefit for the 5}^{\text{th}} \text{ year} &= (5,218,052.4 - 3,417,209.40) + (175,692.00 - \\ &\quad 98,387.52) + (527,076 - 1,229,844) \\ &= 1,175,379.48 \quad \text{Baht/year}\end{aligned}$$

(b) Intangible benefits

Intangible benefits are those benefits believed to be difficult or impossible to quantify. User requires the shortest response time and reliable output. The proposed system can increase user satisfaction indirectly by increasing speed and reliability of the system. Data will be kept and used in an accurate format. The system can generate the output faster and with more reliability. It also increases the speed of work with more reliable output. It can also minimize data redundancy, increase security and control of the system, and facilitate the processes among relevant units.

(1) Cost-Benefit Evaluation

(a) Breakeven Analysis

The principle objective of the comparison between costs and benefit is to evaluate the break-even point representing the time when the benefit is equal to the investment cost.

For the new proposed system, hardware and software cost will be amortized into 5 years; therefore, the cost will be equal through to year 5. Implementation cost, in the first year, is considerable due to installation of both the hardware and software.

The breakeven point is the period when cost difference of both existing and proposed system is equal to zero. It is calculated with interpolation technique by summing the number of years, where the cost difference between both systems is still positive in fraction of year, when the cost difference is still positive.

The break-even analysis chart of cost comparison of the existing system and the proposed system is shown in Figure 3.40

Cost Comparison & Breakeven Point

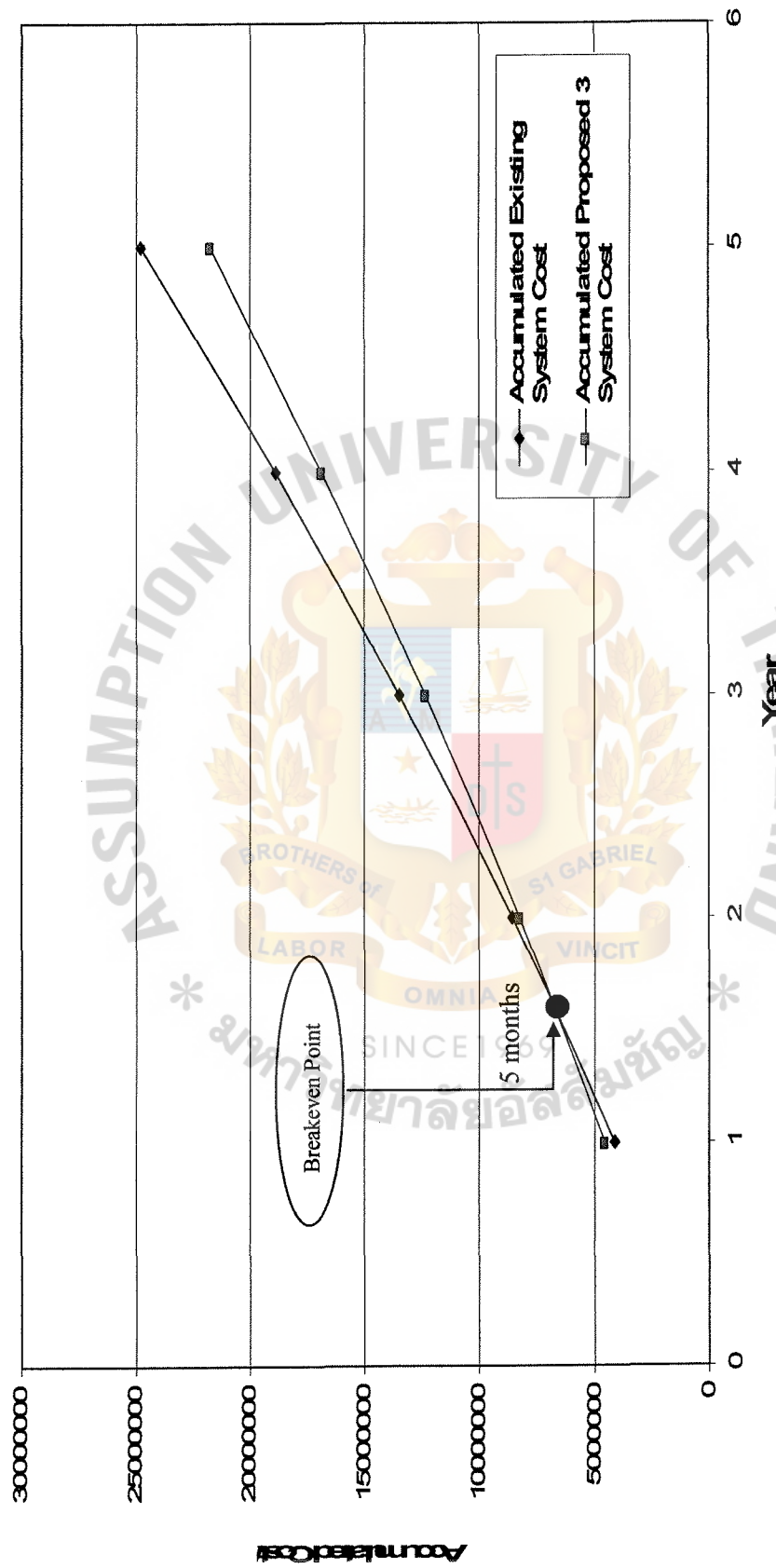


Figure 3.17. Cost Comparison between Existing and Proposed System.

(b) Payback Period

The payback analysis technique is a simple and popular method for determining if and when an investment will pay for itself. It is a commonly used technique to evaluate the investment value of the project. The payback analysis is determined from how much time will lapse before accrued benefits overtake accrued and continuing cost. This period of time is called the payback period that cash inflow can recover all initial investment of the project. The maximum pay back period must be specified. The specified payback period is based on the management perspectives on size of investment, which is around two to five years. There is discount rate or opportunity cost for the time value of money.

The Discount Rate is the percentage that you earn from saving money with the bank. This technique calculates the present value of money value for the year investing in the new system. The discount rate for this company is 10%. The result of the payback period is close to the breakeven point which shows that it does not take a long time to cover the cost of investment. Table 3.12 illustrates the picture of payback period.

Table 3.14. Payback Analysis for the Proposed System, Baht.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,220,000.00					
Operation & maintenance cost:		-148,500.00	-153,350.00	-158,685.00	-164,553.50	-171,008.85
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes costs (adjusted to present value):	-1,220,000.00	-134,986.50	-126,667.10	-119,172.44	-112,390.04	-106,196.50
Cumulative time-adjusted costs over lifetime:	-1,220,000.00	-1,354,986.50	-1,481,653.60	-1,600,826.04	-1,713,216.08	-1,819,412.57
Benefits derived from operation of new system:	0.00	802,800.00	883,080.00	971,388.00	1,068,526.80	1,175,379.48
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes benefits (current of present value):	0	729,745.20	729,424.08	729,512.39	729,803.80	729,910.66
Cumulative time-adjusted benefits over lifetime:	0.00	729,745.20	1,459,169.28	2,188,681.67	2,918,485.47	3,648,396.13
	0	1	2	3	4	5
Cumulative lifetime time-adjusted costs + benefits:	-1,220,000.00	-625,241.30	-22,484.32	587,855.63	1,205,269.40	1,828,983.56

The payback period can be calculated by the formula as follows:

$$P = \frac{\text{Last year of negative Cash flow difference} + \text{Cumulative Different last negative year}}{\text{Absolute value of cumulate difference (Last negative plus first year positive year)}}$$

Where P = Payback Period

$$P = 2 + \frac{22,484.32}{(22,484.32 + 587,855.63)} = 2.04 \text{ years or 2 years 1 month.}$$

Therefore, the payback period is about 2 years 1 month.



Payback Period of Candidate 2

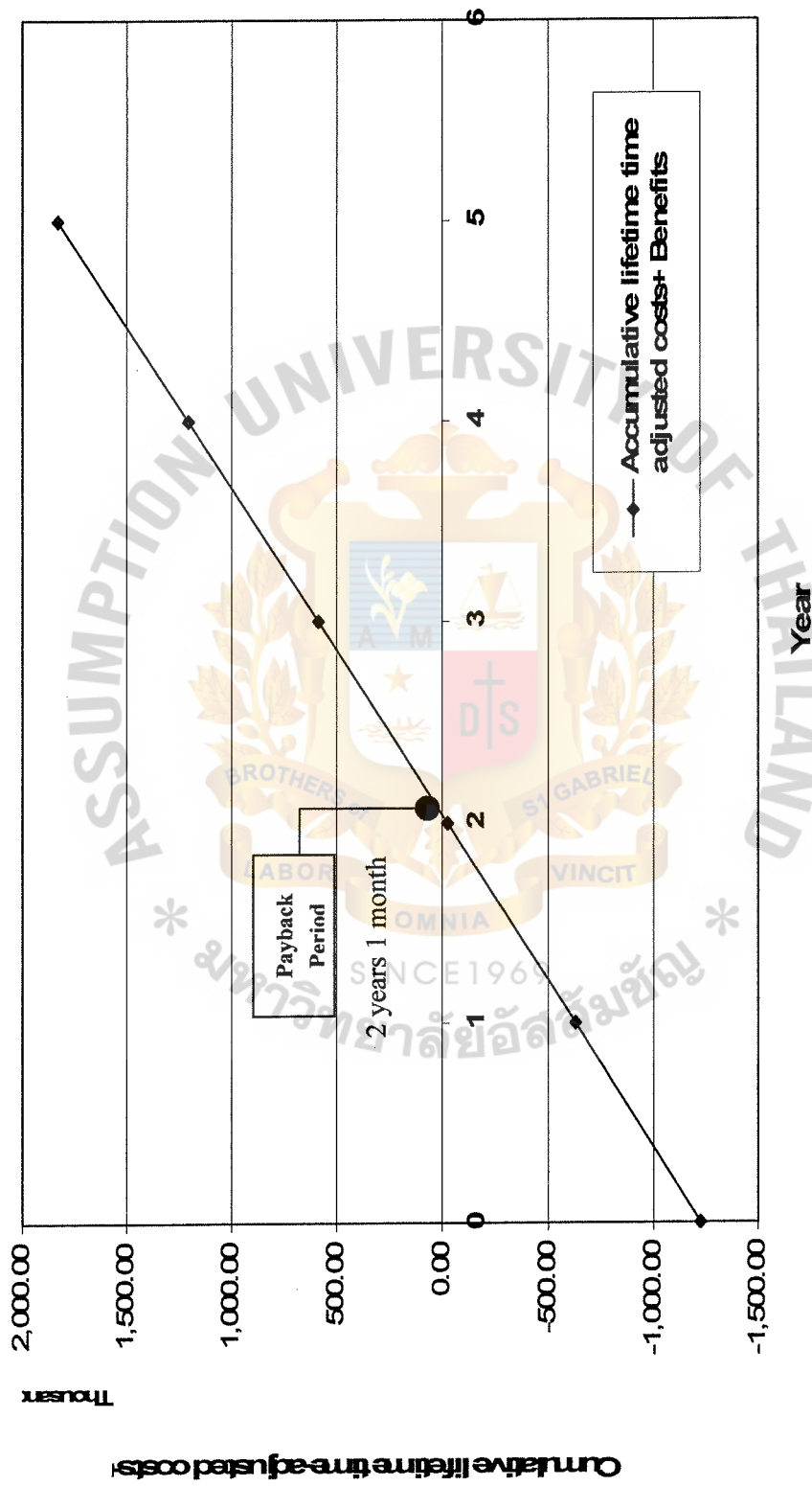


Figure 3.18. Payback Chart for the Proposed System.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

System Implementation is the planned and orderly conversion from the current existing system, a manual system, to the new proposed system, Inventory Management System. The main goal of the system implementation is to build and test a functional system that fulfils business and design requirements and to smoothly convert from the old system to the new system.

The project implementation can be divided into 3 main parts, System Analysis, Detail Analysis and Design, and Implementation.

(1) System Analysis

This main function is to gather all information about the existing system, including data flows, how data relate to each other, and how data are kept. Then the studying area must be identified, and the problems must be studied. The next function is to identify the Objectives and Scope of the project. At this stage the context diagram and the data flow diagrams of the existing system are created and adjusted following the user requirements and existing problems. The entity relationship diagram is initialled from the existing system and changed following the new proposed system with additional functions. The cost and benefit analysis between the existing system and the proposed system is also done.

(2) Detail Analysis and Design

The major function is to develop the workflow of the existing system to be the new workflow with additional functions of the proposed system. The context diagram and the data flow diagram at many different levels will be designed with an aim to solve the problems and add more functions from the existing system. The relationship of data in each table is studied in order to define the best relation for the system. Moreover, there are considerations in related systems with other departments. Steps of work at each process are carefully defined in order to reduce the traffic of network. All screens, such as input/output screens and various kinds of reports, are also designed.

(3) Implementation

The main function is to physically implement all the designed to become the real thing. Programs that support the workflow have to be created. All input/output screens and report layouts are also generated to support the designed workflow. The programs and the data conversion have been tested by the developers. The data conversion must be correct and complete. After the program and the data conversion is complete and correct, the user training has to be conducted in order to train the users how to use the system so that the users can test the system by themselves. After testing, if the users are not satisfied with the system, they can ask the system developers to correct the system until they accept it.

The project implementation schedule is shown in the following Gantt Chart.

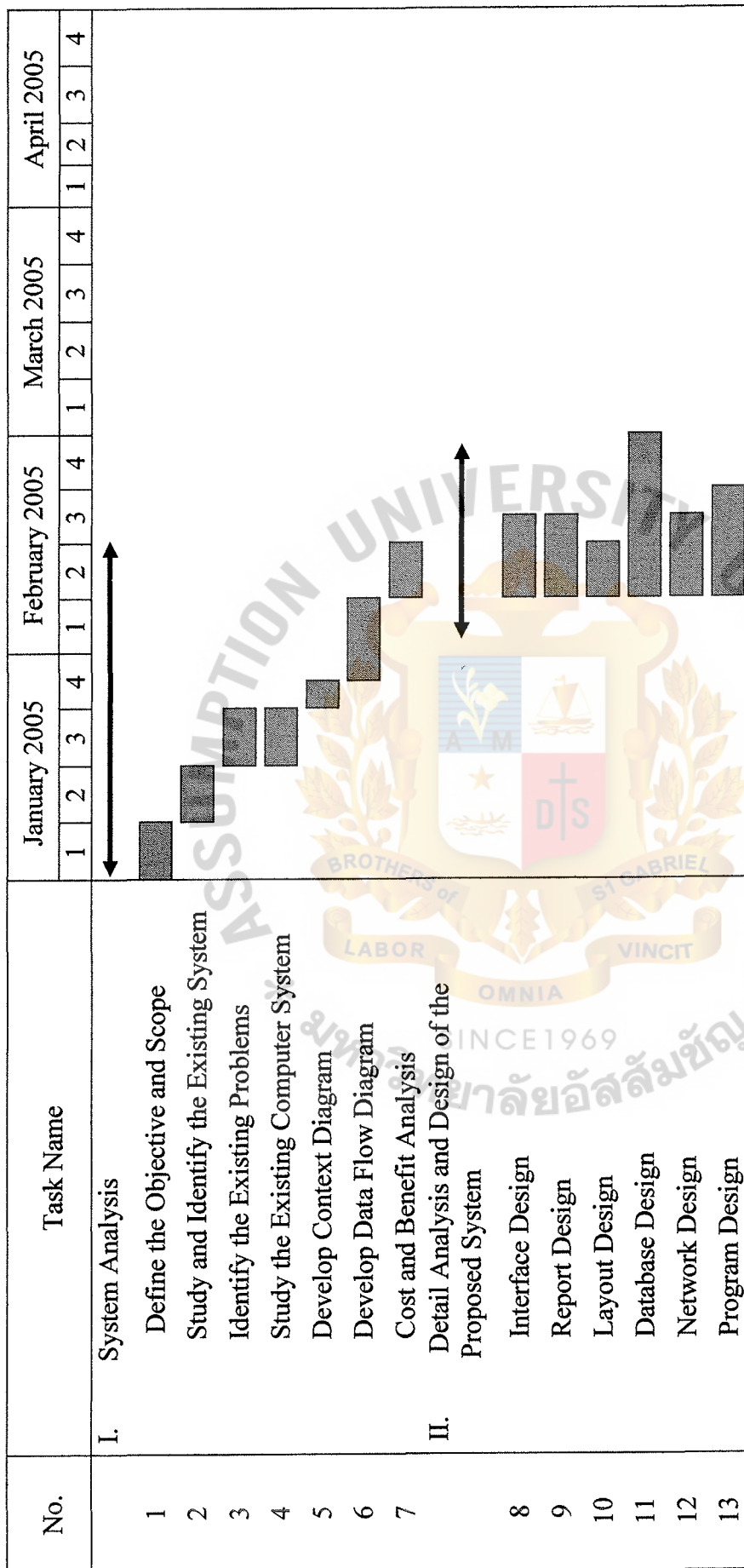


Figure 4.1. Schedule of Project Implementation of Inventory Management System.

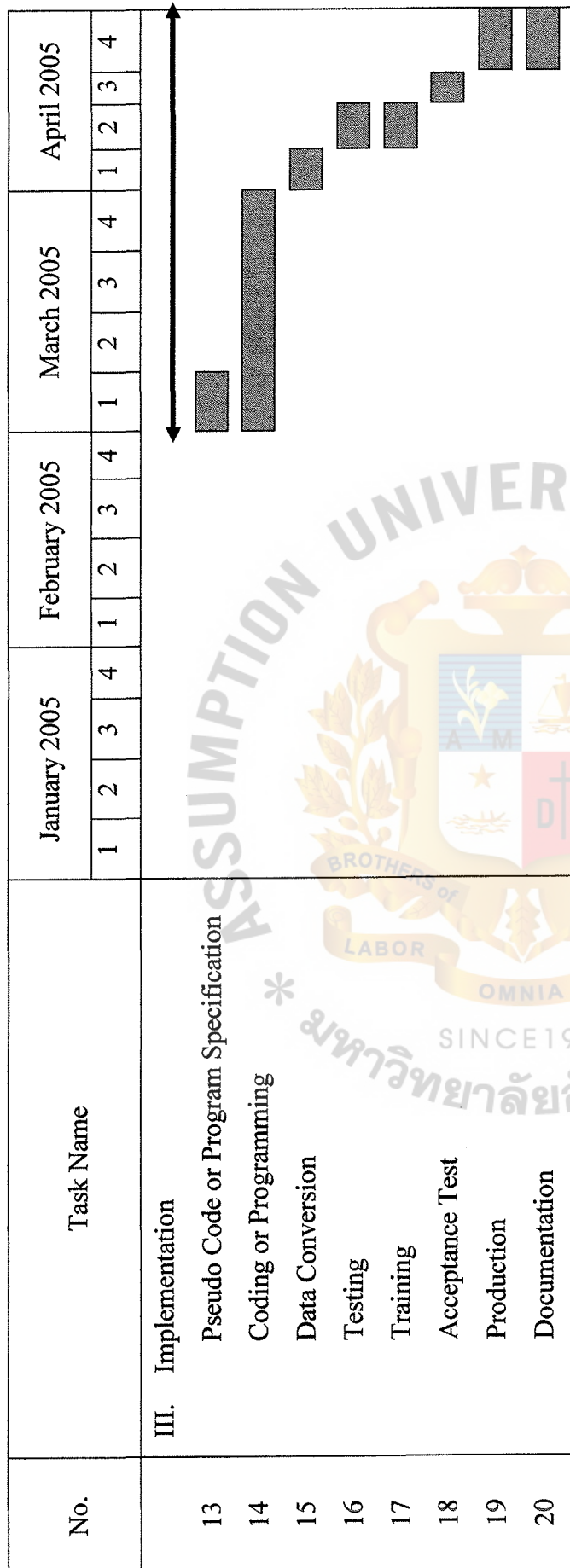


Figure 4.1. Schedule of Project Implementation of Inventory System (Continued).

4.2 Test Plan

(a) Network Testing

Test the new network as a real battle field whether it matched with our design requirement or not. Starting by reviewing outlined in the technical design statement developed during system design. Then, Construct and test to find bugs. Finally, revise network specifications for future reference.

(b) Database Testing

This should be the most important to hurry and develop because it's a base land whereby every information and other necessary document need to be shared. First of all, review the design statement for database design requirements. Second, position production databases that may contain representative data for testing database tables. Otherwise, generate test data for database tables. Third, construct databases per design specification. Fourth, load tables with sample data. Finally, revise the schema and keep as necessary for future reference.

(c) Program Testing

After the completion of program has been written, testing will be next concerned before launching it for usage. Begin by reviewing the design specifications. The project team should be established next and delegate job responsibilities. After that write and document programs and perform unit testing. Program document will rethink to establish quality standards. System testing will be the next step to make sure that all programs work smoothly. If the bugs happen, we should retest it again. If it can happen once, next time it will reoccur. Then, debug the program and retest until the fault has been removed. Update the project repository with revised program documentation for future referencing. Finally, place the new programs and reusable components in the software library.

4.3 Training

As the new system is not familiar with the user, so system users need to be trained and guided all step-by-step. To cut off waste time, group training (5 persons per group) is the choice that we apply, because it likes word of mouth. People from the first group can teach others in the next generation group.

First, collect documentation that may prove useful in developing user documentation and training guides. Next, establish a manual which is easy to understand and outright to the point. Then, reconsider the training needs of the system users. After that create schedule training sessions. Finally, implement the training sessions and distribute user documentation.

4.4 Conversion

Data conversion is essential before implementing the new system. The system developer should be assured that the data conversion from the existing to the new system are not different and must be complete and correct. The system developer can check the correctness and completeness of the system by using parallel run concept. By applying this concept, the process will work on both the existing and the new proposed system for a period of time until the total data and the output from the calculation of both systems at least are the same with the existing system and provide additional requirements. This strategy minimizes the risk of major flow in the new system causing irreparable harm to the business. The system developer will do the data conversion only on the first time of implementing the new system. So the testing of the data conversion occurs only on the first time of implementing a new system. After the system developer assures the completeness and the correctness of the data conversion, they give the new system to the users to test the new system.

Nevertheless, it also means the cost of running two systems over some period must be incurred. Parallel conversion is suitable for the change from the manual system to the computerized system, although it increases the cost of running two systems over some period and consumes more time with double workload for employees. When employees can run the new system smoothly and all major problems are solved, the double workload will be reduced.



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The Inventory Management System is designed to control the stock of Inta Enterprise Co. Ltd. Part. The manual system of Inventory Management Information System causes many problems since most data are stored in paper forms, inaccurate, unshared and no link among several departments. Furthermore, the large amount of product types, product quantities and transactions cause the process of daily transactions to be busy and difficult in the manual system. It is even worse because the steps of the procedures have to be done separately by each staff. The causes that mostly exist are much time spent in operation, or error from staff's working. For example, it is difficult to track the exactly availability of products and Inventory order repetition. These mentioned above can lead to excess or shortage of inventory and degrade the customer satisfaction.

Therefore, the proposed system will establish automation which provides the database for inventory. The accomplishment of the system is to increase the customer satisfaction and reduce costs of managing inventory for future expansion.

Table 5.1 shows the time performance on each process of the proposed system compared to the existing system. It shows that each process of the proposed system spends less time than each process of the existing system which has to pass many manual work steps. Moreover, the proposed system provides more useful functions that are their responsibilities and make customers satisfied. The proposed system protects from mistakes and provides management reports to measure the effectiveness of employees in Inventory Management System.

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

Process	Existing System	Proposed System
Accept order request	5 minutes	3 minutes
Check product availability	15 minutes	4 minutes
Update level of stock	10 minutes	3 minutes
Check minimum reorder point product	15 minutes	4 minutes
Create purchase order	20 minutes	5 minutes
Product arrival	-	5 minutes
Generate report	3 hours 15 minutes	5 minutes

For Accept order request, both existing system and proposed system need the staff to acknowledge the document back to the customer. So, the time is not different.

For Check product availability, the existing system keeps all the records in paper form in which the storage is sporadic and damaged. The proposed system classified the information type-by- type. So it's easy to keep track and retrieve.

For Update level of stock, the existing system is recorded by hand. So the mistake can easily happen which reduces the integrity and accurate information. The proposed system uses the keyboard and mouse as the main key input to reduce the mistake.

For Check minimum reorder point product out and Reorder point, the existing system is not accurate which complicates the companies system to know the exact stock on hand. The new one performs a more accurate task and saves the time.

For Create purchase order, the existing system consumes much time due to the reference source from many departments. The new one has no need to wait so long

from other department because all the transactions proceed much quicker and spend less time to complete.

For Product arrival, the existing system is not involved in this process. That causes complexity in the flow of stock in. Then, the proposed system established this process to key in all product details and solved the problem.

For Generated report, the existing system consumes much time to gather all of the relevant information in contrast to the new system which the output is created in a few minutes.

In conclusion, the proposed system helps reduce the number of staffs and time for processing, increase security and control, solve the problem of manual system, decrease the high maintenance cost, and support the management's decision making with the accuracy and completeness of the information and reports.

5.2 Recommendations

After the proposed system is implemented, Feedback should be focused and continuously monitor until the end of period of time. The company should train the user and make a manual of the procedure process for the new user in using the Inventory Management Information System.

The security and control should be paid attention. It is a crucial part to prevent unauthorized users to access the Inventory Management Information System. The new system should have the user profile for granting the level of authority to access the functions and the database and strict control to update virus definition.

In the future, we can improve the security system by adding password changing for users. In addition, the computerized system of other manual department systems will be developed. Experience and results benefit us to solve and make the system adapt to the new trend of future expansion.





Figure A.1. Access to the System Form.

Inta Chemical Enterprise Inventory Management Information System

Inta Chemical Enterprise Inventory Management Information System

User ID

User ID

Password

Figure A.2. Login to the System Form.

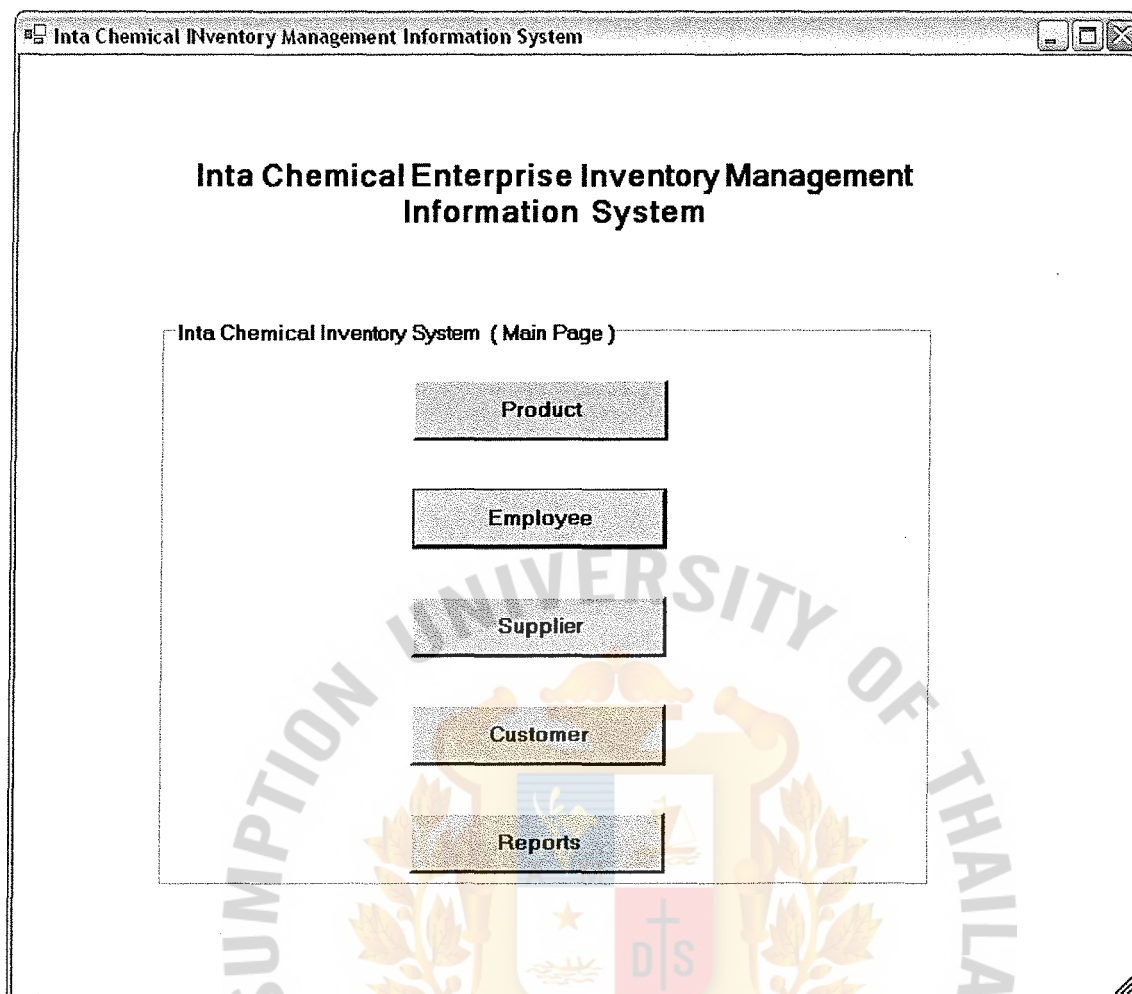


Figure A.3. Main Menu for Inventory System.

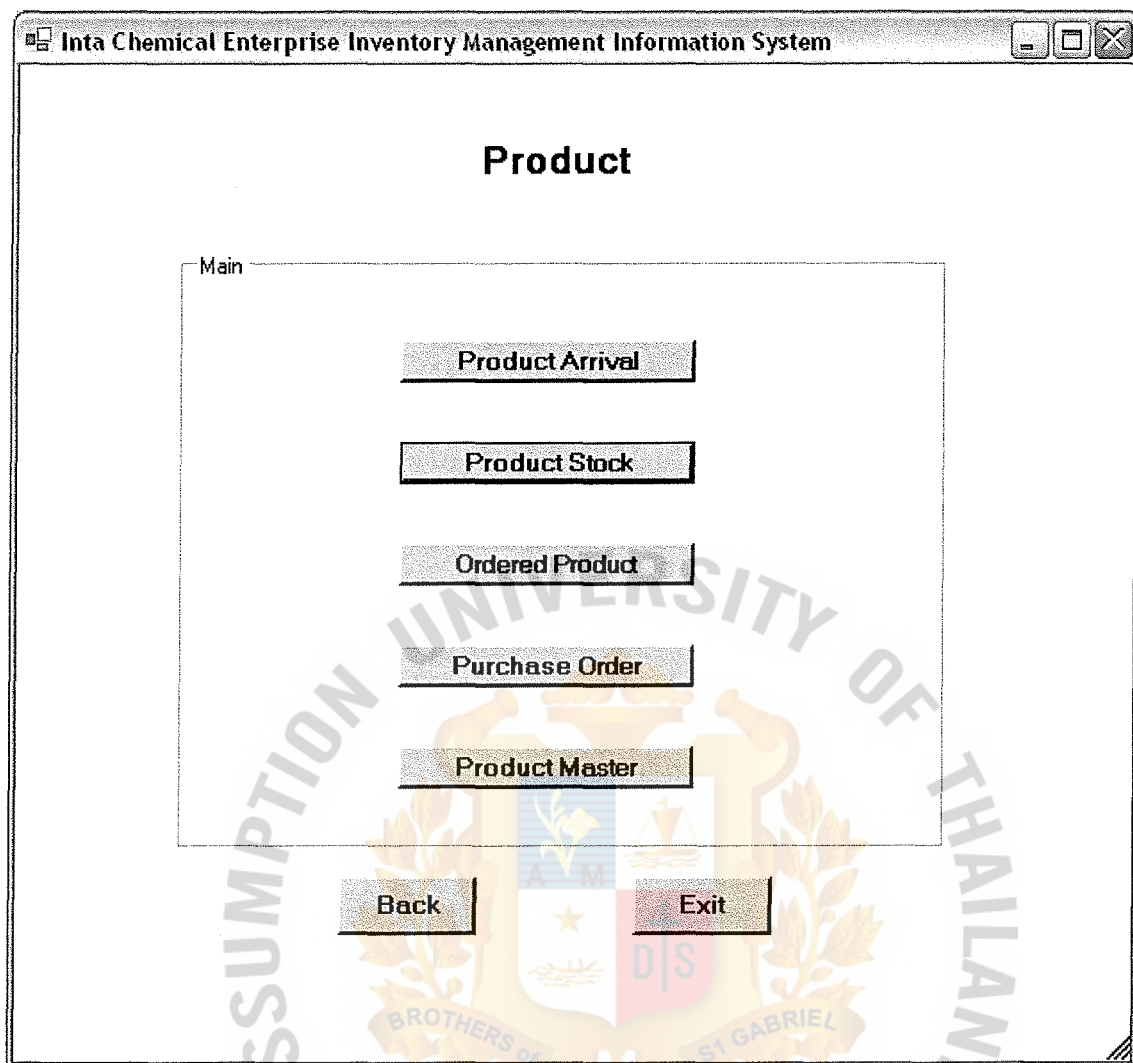


Figure A.4. Main Menu for Product Inventory System.

Inta Chemical Enterprise Inventory Management Information System

Product Arrival

Product Arrival ID

Product Name

Date of Arrival

Quantity

Package

Weight

Expiry Date

Damage Product


Figure A.5. Product Arrival Interface.

Inta Chemical Enterprise Inventory Management Information System

Product Stock

Product Master ID

Product Name

Field 

Description

Location

Package

Remaining Weight

Reorder Point Price

Expiry Date Return Product

Figure A.6. Product Stock Interface.

Inta Chemical Enterprise Inventory Management Information System

Ordered Product

Ordered Product ID	<input type="text"/>		
Product Name	<input type="text"/>	Order Date	<input type="text"/>
Weight	<input type="text"/>	Delivery Date	<input type="text"/>
Quantity	<input type="text"/>	Customer ID	<input type="text"/>
Gross Weight	<input type="text"/>	Contact Person	<input type="text"/>
Price	<input type="text"/>		
Term of Payment	<input type="text"/>		

Figure A.7. Ordered Product Interface.

Inta Chemical Enterprise Inventory Management Information System

Purchase Order

PO ID	<input type="text"/>	Order Date	<input type="text"/>
Employee ID	<input type="text"/>	Required Date	<input type="text"/>
Employee Name	<input type="text"/>	Shipping Via	<input type="text"/>
Supplier ID	<input type="text"/>	Term of Payment	<input type="text"/>
Supplier Name	<input type="text"/>		

Product

Product ID	<input type="text"/>
Product Name	<input type="text"/>
Weight	<input type="text"/>
Quantity	<input type="text"/>
Gross Weight	<input type="text"/>
Price	<input type="text"/>

Figure A.8. Purchase Order Interface.

Inta Chemical Enterprise Inventory Management Information System

Product Master

Product Master ID

Product Name

Field

Description

Location

Package Remaining

Expiry Date Reorder Point

Weight Return Product

Price

Figure A.9. Product Master Interface.

Inta Chemical Enterprise Inventory Management Information System

Employee Records

Employee ID

First Name

Last Name

Position

Department

Address

Phone

E-Mail

Hire Date

Exit Date

Figure A.10. Employee Interface.

Inta Chemical Enterprise Inventory Management Information System

Supplier Information

Update Supplier Information

Supplier ID	<input type="text"/>
Company Name	<input type="text"/>
Address	<input type="text"/>
Contact Person	<input type="text"/>
Position	<input type="text"/>
Phone	<input type="text"/>
FAX	<input type="text"/>
Email	<input type="text"/>

Figure A.11. Supplier Interface.

Inta Chemical Enterprise Inventory Management Information System

Customer Records

Customer ID

Company Name

Address

Contact Person

Phone

FAX

Email Address

Position

Figure A.12. Customer Interface.

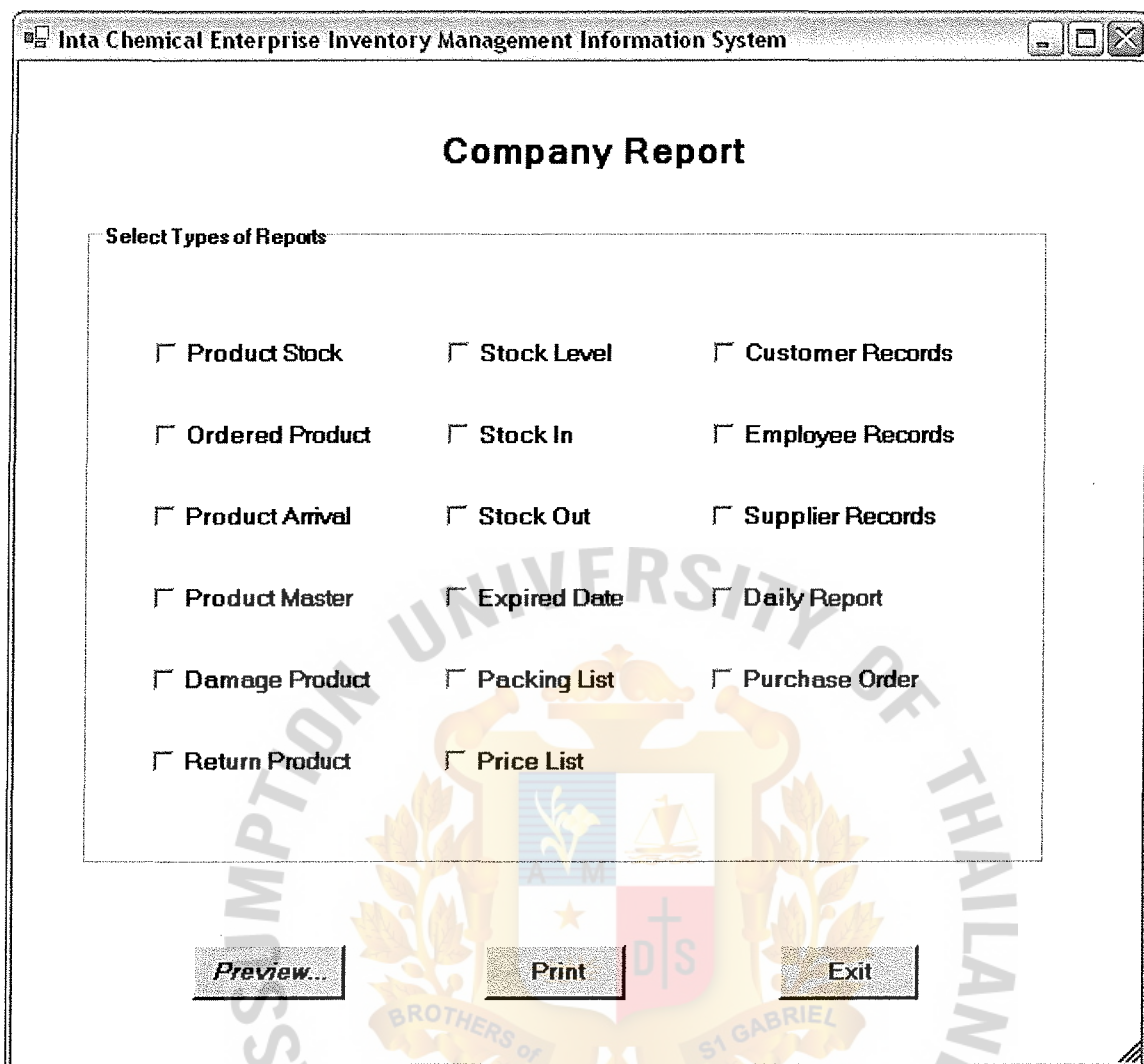


Figure A.13. Report Interface.





Inta Enterprise Inventory Management System

Product Stock Report

Date:15/01/2005

Product Stock ID	Product Name	Status	Remaining/kg.
ST0001	Sodium Bicarbonate	Available	80,000
ST0002	Petroleum Resin SK-120	Available	90,000
ST0003	Glycerine	Available	50,000
ST0004	Sodium Sulfate	Available	40,000
ST0005	Talcum Powder	Available	30,000
ST0006	Sigmalite	Unavailable	-
ST0007	BHT	Available	60,000
ST0008	Potassium Sorbate	Available	20,000
ST0009	Malic Acid	Unavailable	-
ST0010	Gelatin 150 bloom	Available	10,000

Figure B.1. Product Stock Report.



Inta Enterprise Inventory Management System

Customer Report

Date: 7/1/2005

Customer ID	Company Name	Address	Contact Person	Phone	Fax	E-mail	Position
C0001	JinSeng	2/3 Nonsee Rd., Yannawa BKK Thailand 10120	Mr. Chao SaeTung	+662- 2435111	+662- 2435112	A@yahoo.com	Purchasing Staff
C0002	Lama	66/1 Daeng Rd., Vuthakard BKK Thailand 10300	Mr. Krit Uma	+662- 7654890	+662- 7654891	B@hotmail.co m	Stock Manager
C0003	Uthit	34 Dum Rd., Bangkokpi BKK Thailand 22110	Mr. Suwit Doodee	+662- 2122243	+662- 2122244	C@gmail.com	Purchasing Manager
C0004	Lanna	1 Udom Rd., Bangpongpan BKK Thailand 14235	Mr. Kamol Rukdee	+662- 2225678	+662- 2225679	D@walla.com	Staff Coordinator
C0005	Red Bean	23 Sweet Rd., Yannawa BKK Thailand 22213	Ms. Kitiya Kaona	+662- 5884376	+662- 5884377	E@msn.com	Inventory Manager

Figure B.2. Customer Report.



Inta Enterprise Inventory Information System

Employee Report

Date:7/1/2005

Employee Number	FirstName	LastName	Address	Position	Department	Phone
E0001	Mr. Daeng	Kerdmadee	2/3 Nonsee Rd., Yannawa BKK Thailand 10120	Purchasing Manager	Purchasing	+662-2435111
E0002	Ms. Jinda	Jumrud	66/1 Daeng Rd., Vuthakard BKK Thailand 10300	Forecasting Committee	Warehouse	+662-7654890
E0003	Mr. Uthai	Yimyam	34 Dum Rd., Bangkapi BKK Thailand 22110	Sales Representative	Marketing	+662-21222423
E0004	Mrs. Lanna	Jaroenpol	90/23 Pink Rd., Yenarkard BKK Thailand 10500	Marketing Manager	Marketing	+662-4424344
E0005	Mr. Tossapol	Tumdee	544/78 Sukumwit 15, Ladaya BKK Thailand 10110	Assistant Manager	-	+662-7675678

Figure B.3. Employee Report. (Page1)



Inta Enterprise Inventory Information System

Employee Report

		Date: 7/1/2005	
E-mail	Hire Date (D/M/Y)	Exit Date(D/M/Y)	
Daeng@yahoo.com	5/1/1999	-	
Jinda@gmail.com	4/5/2000	-	
Uthai@msn.com	3/3/2001	-	
Lanna@walla.com	3/2/1998	27/8/2003	
Tos@hotmail.com	16/3/1999	-	

Figure B.3. Employee Report. (Page 2)



Inta Enterprise Inventory Management System

Supplier Report

Date: 7/1/2005

Supplier ID	CompanyName	Address	Contact Person	Position	Phone	Fax	E-mail
S0001	A	45 Hon Road, Sake 666 Nagasaki, Japan	Mr. Takeshi Sade	Sales Manager	+662- 2435456	+662- 2435457	A@yahoo.com
S0002	B	67 Apple Road, Lake 10000 New York, USA	Mr. Simon Brown	Marketing Manager	+662- 7654123	+662- 7654124	B@hotmail.com
S0003	C	8 Yue Road, Xing 9000 Jieng Nam, China	Mr. Ching Yan	Export Manager	+662- 2122113	+662- 2122114	C@gmail.com
S0004	D	3/3 Alovera Road, Fish 45678 Sydney, Australia	Ms. Alis Tam	Sales Representative	+662- 2225987	+662- 2225988	D@walla.com
S0005	E	84 Yu Road, Ang Mo Kio 21234, Singapore	Ms. Chris Green	Marketing representative	+662- 5884067	+662- 5884068	E@msn.com

Figure B.4. Supplier Report.



Inta Enterprise Co., Ltd. Part.	
1040/27 Trok Wat Chan-Nai, Rama 3 Rd.,	
Bangpongpan, Yannawa, Bangkok 10120	
Thailand	
Tel : +662-2949616-7	Fax : +662-2945420

Order Date	7/4/2005	Customer ID	C0001
Ordered Product ID	OP0001	Contact person	Mr. Chao Saetung
Delivery Date	13/4/2005		
Term of Payment	30 Days		

Ordered From:

JinSeng Co., Ltd.
2/3 Nonsee Road
Yannawa, BKK 10120
Thailand

Product Name	Weight/kg.	Quantity	Gross Weight/kg.	Price	Subtotal (Baht)
Sodium Bicarbonate	25	10	250	20	5,000
Potassium Sorbate	25	30	750	195	146,250
Order Total					151,250 Baht
Vatt 7 %					10,587.5 Baht
Total					161,838 Baht

Figure: B.5. Ordered Product Report.



Inta Enterprise Co., Ltd. Part.	
1040/27 Trok Wat Chan-Nai, Rama 3 Rd.,	
Bangpongpan, Yannawa, Bangkok 10120	
Thailand	
Tel : +662-2949616-7	Fax : +662-2945420

Order Date	5/4/2005	Supplier ID	S0001
P/O ID	PO00001	Name	Mr. Takeshi Sade
Required Date	13/4/2005	Ship Via	Ship
Term of Payment	CIF	Employee ID	E0020
		Name	Mr. Ian Naewbhanij

Ordered To:

A Co., Ltd
45 Hon Road,
Sake 666, Nagasaki
Japan

Product Name	Weight/kg.	Quantity	Gross Weight/kg.	Price	Subtotal (Baht)
Sodium Bicarbonate	25	800	20,000	15	300,000
Potassium Sorbate	25	1200	30,000	180	5,400,000
Order Total		5,700,000 Baht			
Vatt 7 %		399,000 Baht			
Total		6,099,000 Baht			

Figure B.6. Purchase Order Report.



Inta Enterprise Inventory Management System

Product Master Report

Product Master ID	Product Name	Field	Description	Location	Package	Remaining (Kg.)	Reorder Point (Kg.)	Expiry Date
P0001	Sodium Bicarbonate	Food Additive	Food ingredient	A1	Bag	40,000	10,000	5/6/2006
P0002	Petroleum Resin SK-120	Painting, Adhesive and Rubber	To create painting color	A2	Bag	50,000	30,000	27/7/2007
P0003	Glycerine	Cosmetic	Medicine	A3	Drum	80,000	15,000	3/8/2007
P0004	Sodium Sulfate	Textile (Fixing Agent)	Cloth Industry	B1	Bag	70,000	9,000	16/3/2006
P0005	Potassium Sorbate	Food Additive	Food ingredient	B2	Box	30,000	20,000	27/6/2005

Date:7/1/2005

Figure B.7. Product Master Report. (Page1)



Inta Enterprise Inventory Management System
Product Master Report

		Date: 7/1/2005	
Price per kg. (Baht)	Weight (Kg.)	Return Product (Kg.)	
15	25	-	-
50	25	-	-
60	250	-	-
70	50	2,000	-
180	25	1,000	-

Figure B.7. Product Master Report. (Page2)



Inta Enterprise Inventory Management System

Product Arrival Report

Product Arrival ID	Product Name	Date of Arrival	Quantity	Package	Weight (Kg.)	Expiry Date	Damage Product (Kg.)
PA0001	Sodium Bicarbonate	2/4/2004	1,200	Bag	25	2/4/2006	-
PA0002	Petroleum Resin SK-120	18/12/2004	1,500	Bag	25	18/12/2005	-
PA0003	Glycerine	25/10/2005	1,000	Drum	250	25/10/2006	-
PA0004	Sodium Sulfate	1/9/2005	2,000	Bag	50	1/9/2006	-
PA0005	Potassium Sorbate	20/7/2004	2,500	Box	25	20/7/2006	2,000

Date: 7/2/2005

Figure B.8. Product Arrival Report.



Inta Enterprise Inventory Management System
Daily Report

		Date:15/01/2005	
Product Master ID	Field	Product Name	Quantity
P0001	Food Additive	Sodium Bicarbonate	700
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	400
P0003	Cosmetic	Glycerine	10
P0004	Textile (Fixing Agent)	Sodium Sulfate	30
P0005	Filler	Talcum Powder	45
		Company Name (Customer)	Status
		A	Pending
		B	Approve
		C	Approve
		D	Approve
		E	Approve

Figure B.9. Daily Report.



Inta Enterprise Inventory Management System
Packing List Report

Product Master ID	Field	Product Name	Package	Weight/kg.
P0001	Food Additive	Sodium Bicarbonate	Bag	25
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	Bag	25
P0003	Cosmetic	Glycerine	Drum	250
P0004	Textile (Fixing Agent)	Sodium Sulfate	Bag	50
P0005	Filler	Talcum Powder	Bag	25

Date:20/01/2005

Figure B.10. Packing List Report.



Inta Enterprise Inventory Management System
Stock Level Report

Product Master ID	Field	Product Name	Remaining (Kg.)	Reorder Point (Kg.)
P0001	Food Additive	Sodium Bicarbonate	70,000	10,000
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	80,000	30,000
P0003	Cosmetic	Glycerine	90,000	15,000
P0004	Textile (Fixing Agent)	Sodium Sulfate	60,000	9,000
P0005	Filler	Talcum Powder	55,000	10,000

Date:8/02/2005

Figure B.11. Stock Level Report.



Inta Enterprise Inventory Management System
Expired Date Report

Product Master ID	Field	Product Name	Date of Arrival	Expiry Date	Expiration Status
P0001	Food Additive	Sodium Bicarbonate	4/1/2004	2/4/2006	OK
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	5/6/2004	18/12/2005	OK
P0003	Cosmetic	Glycerine	9/12/2004	6/1/2005	Expired
P0004	Textile (Fixing Agent)	Sodium Sulfate	2/1/2005	1/9/2006	OK
P0005	Filler	Talcum Powder	4/5/2004	20/7/2006	OK

Date: 7/1/2005

Figure B.12. Expired Date Report.



Inta Enterprise Inventory Management System

Price List Report

Product Master ID	Field	Product Name	Company Name (Customer)	Price/kg. (Baht)
P0001	Food Additive	Sodium Bicarbonate	A	20
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	B	50
P0003	Cosmetic	Glycerine	C	80
P0004	Textile (Fixing Agent)	Sodium Sulfate	D	30
P0005	Filler	Talcum Powder	E	35

Date:7/1/2005

Figure B.13. Price List Report.



Inta Enterprise Inventory Management System Stock In Report

Product Master ID	Field	Product Name	Date of arrival	Product Stock ID
P0001	Food Additive	Sodium Bicarbonate	4/1/2004	ST0010
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	5/6/2004	ST0011
P0003	Cosmetic	Glycerine	9/12/2004	ST0012
P0004	Textile (Fixing Agent)	Sodium Sulfate	2/1/2005	ST0013
P0005	Filler	Talcum Powder	4/5/2004	ST0014

Date:7/1/2005

Figure B.14. Stock In Report.



Inta Enterprise Inventory Management System
Stock Out Report

Product Master ID	Field	Product Name	Delivery Date	Product Stock ID
P0001	Food Additive	Sodium Bicarbonate	8/1/2004	ST0010
P0002	Painting, Adhesive and Rubber	Petroleum Resin SK-120	9/6/2004	ST0011
P0003	Cosmetic	Glycerine	28/12/2004	ST0012
P0004	Textile (Fixing Agent)	Sodium Sulfate	7/1/2005	ST0013
P0005	Filler	Talcum Powder	18/5/2004	ST0014

Date:7/1/2005

Figure B.15. Stock Out Report.



Inta Enterprise Inventory Management System

Damage Product Report

Date: 7/2/2005

Damage Product (Kg.)	Product Arrival ID	Product Name	Date of Arrival	Quantity	Package	Weight (Kg.)	Supplier ID	Company Name
5,000	PA0001	Sodium Bicarbonate	2/4/2004	1,200	Bag	25	S0001	A
4,000	PA0002	Petroleum Resin SK-120	18/12/2004	1,500	Bag	25	S0002	B
3,000	PA0003	Glycerine	25/10/2005	1,000	Drum	250	S0003	C
6,000	PA0004	Sodium Sulfate	1/9/2005	2,000	Bag	50	S0004	D
2,000	PA0005	Potassium Sorbate	20/7/2004	2,500	Box	25	S0005	E

Figure B.16. Damage Product Report



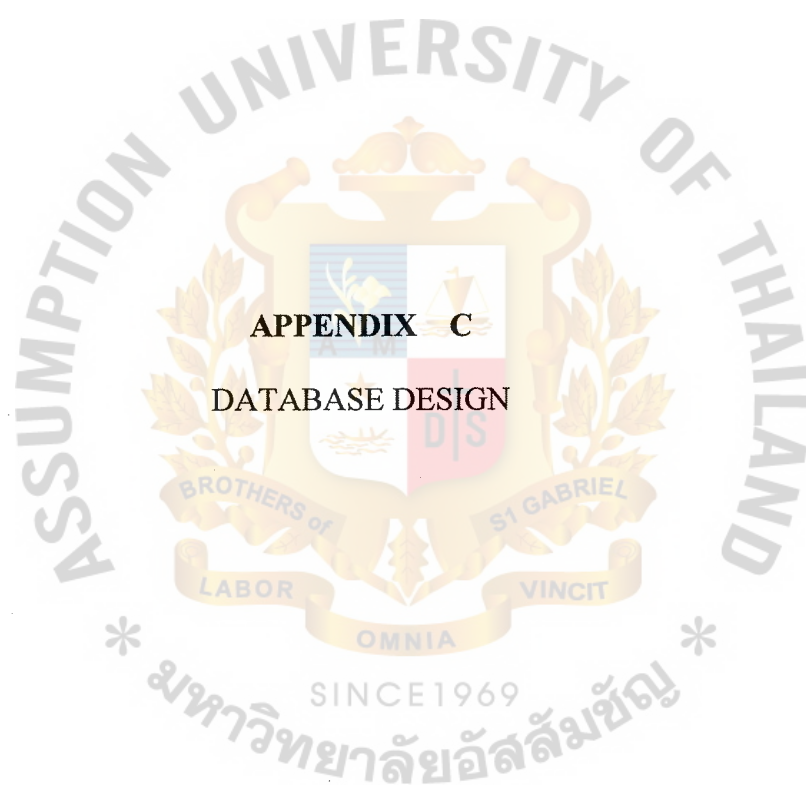
Inta Enterprise Inventory Management System

Return Product Report

Date:7/1/2005

Ordered Product ID	Product Name	Customer ID	Company Name	Return Product (Kg.)	Product Stock ID
OP0001	Sodium Bicarbonate	C0001	JinSeng	100	ST0001
OP0002	Petroleum Resin SK-120	C0002	Lama	200	ST0002
OP0003	Glycerine	C0003	Uthit	50	ST0003
OP0004	Sodium Sulfate	C0004	Lanna	500	ST0004
OP0005	Potassium Sorbate	C0005	Red Bean	300	ST0005

Figure B.17. Return Product Report.



APPENDIX C

DATABASE DESIGN

Customer Database

Table C.1. Structure of Customer Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Customer ID	Char	Y	Y				PrimaryKey
2	Company Name	Char (20)	Y					Attribute
3	Address	Char						Attribute
4	Contact Person	Char (50)						Attribute
5	Phone	Integer (20)						Attribute
6	Fax	Integer (20)						Attribute
7	E-mail	Char						Attribute
8	Position	Char (20)						Attribute

Supplier Database

Table C.2. Structure of Supplier Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Supplier ID	Char	Y	Y				Primary Key
2	Company Name	Char (20)	Y					Attribute
3	Address	Char						Attribute
4	Contact Person	Char (50)						Attribute
5	Position	Char (20)						Attribute
6	Phone	Integer (20)						Attribute
7	Fax	Integer (20)						Attribute
8	E-mail	Char						Attribute

Ordered Product Database

Table C.3. Structure of Ordered Product Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Ordered Product ID	Char	Y	Y				Primary Key
2	Order Date	Char (15)	Y					Attribute
3	Delivery Date	Char (15)	Y					Attribute
4	Customer ID	Char	Y	Y				Attribute
5	Contact Person	Char (50)						Attribute
6	Product Name	Char (50)	Y					Attribute
7	Weight	Integer						Attribute
8	Quantity	Integer						Attribute
9	Gross Weight	Integer						Attribute
10	Price	Integer						Attribute
11	Term of Payment	Char (15)						Attribute

Purchase Order Database

Table C.4. Structure of Purchase Order Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Purchase Order ID	Char	Y	Y				Primary Key
2	Order Date	Char (15)	Y					Attribute
3	Required Date	Char (15)	Y					Attribute
4	Term of Payment	Char (15)						Attribute
5	Supplier ID	Char	Y	Y				Attribute
6	Name	Char (50)	Y					Attribute
7	Ship Via	Char (10)						Attribute
8	Employee ID	Char	Y	Y				Attribute
9	Name	Char (50)	Y					Attribute
10	Product Name	Char (50)	Y					Attribute
11	Weight	Integer						Attribute
12	Quantity	Integer						Attribute
13	Gross Weight	Integer						Attribute
14	Price	Integer						Attribute

Employee Database

Table C.5. Structure of Employee Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Employee ID	Char	Y	Y				Primary Key
2	FirstName	Char	Y					Attribute
3	LastName	Char	Y					Attribute
4	Address	Char						Attribute
5	Position	Char (15)						Attribute
6	Department	Char (20)						Attribute
7	Phone	Integer						Attribute
8	E-mail	Char						Attribute
9	Hire Date	Char	Y					Attribute
10	Exit Date	Char	Y					Attribute

Product Master Database

Table C.6. Structure of Product Master Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Product Master ID	Char	Y	Y				Primary Key
2	Product Name	Char (50)	Y					Attribute
3	Field	Char(25)	Y					Attribute
4	Description	Char						Attribute
5	Location	Char (5)	Y					Attribute
6	Package	Char (10)	Y					Attribute
7	Remaining	Integer	Y					Attribute
9	Reorder Point	Integer						Attribute
10	Expiry Date	Char	Y					Attribute
11	Price	Integer						Attribute
12	Weight	Integer						Attribute
13	Return Product	Integer						Attribute

Product Arrival Database

Table C.7. Structure of Product Arrival Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Product Arrival ID	Char	Y	Y				Primary Key
2	Product Name	Char (50)	Y					Attribute
3	Date of Arrival	Char	Y					Attribute
4	Quantity	Integer						Attribute
5	Package	Char						Attribute
6	Weight	Integer						Attribute
7	Expiry Date	Char	Y					Attribute
8	Damage Product	Integer						Attribute

Product Stock Database

Table C.8. Structure of Product Stock Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Product Stock ID	Char	Y	Y				Primary Key
2	Product Name	Char (50)	Y					Attribute
3	Status	Char (15)						Attribute
4	Remaining	Integer						Attribute



APPENDIX D
PROCESS SPECIFICATION

Table D.1. Process Specification of Process 1.1.

Items	Description
Process Name	Revise Order
Data In	Customer Order List
Data Out	Product Order List
Process	(1) Receive new order from Customer (2) Check the correctness of an order (3) Then, go to the next step
Attachment	-

Table D.2. Process Specification of Process 1.2.

Items	Description
Process Name	Confirm Order
Data In	Product Order List
Data Out	Product Order List
Process	(1) Receive order list from Process 1.1 (2) Check availability of the product (3) Go to the next step
Attachment	(1) Inventory System

Table D.3. Process Specification of Process 2.1.

Items	Description
Process Name	Search Product List
Data In	Product Order List
Data Out	Product Available List
Process	(1) Check the stock remaining in Product Stock Stores (2) See the result of available items (3) Go to next step
Attachment	(1) Product Stock

Table D.4. Process Specification of Process 2.2.

Items	Description
Process Name	Order Preparation
Data In	Product List
Data Out	Product
Process	(1) Receive Product List (2) Pass it to the warehouse (3) Ship the products out follow the order (4) Move to next step
Attachment	(1) Warehouse

Table D.5. Process Specification of Process 2.3.

Items	Description
Process Name	Deliver Product
Data In	Product
Data Out	Product Selling List
Process	(1) Receive the product from the Warehouse (2) Ship it to the customer (3) Get the payment from customer
Attachment	(1) Customer (2) Inventory System

Table D.6. Process Specification of Process 3.1.

Items	Description
Process Name	Update & Balance by Selling
Data In	Product Sold List
Data Out	Balance amount
Process	(1) Receive Product Sold List (2) Send it to update in Product Master Stores (3) Go to next step
Attachment	(1) Product Master

Table D.7. Process Specification of Process 3.2.

Items	Description
Process Name	Update & Balance by Returning
Data In	Return Product List
Data Out	Balance Amount
Process	(1) Customer returns the product (2) Update the stock level on hand in Product Master Stores
Attachment	(1) Product Master

Table D.8. Process Specification of Process 4.1.

Items	Description
Process Name	Product Stock Checking
Data In	Product Name
Data Out	Product Status Detail
Process	(1) Input product name to check availability (2) Retrieve the data from Product Stock Stores (3) Go to next step
Attachment	(1) Product Stock

Table D.9. Process Specification of Process 4.2.

Items	Description
Process Name	Product Quantity Overview
Data In	Product Status Detail
Data Out	Reorder Product Report
Process	(1) Receive product status detail (2) Get the reorder product report as a result
Attachment	(1) Inventory System



Table D.10. Process Specification of Process 5.1.

Items	Description
Process Name	Accept Reorder Request
Data In	Reorder Product Report
Data Out	Reorder Product Report
Process	(1) Receive reorder product report (2) Approve it (3) Go to next step
Attachment	-

Table D.11. Process Specification of Process 5.2.

Items	Description
Process Name	Get Order Product Detail
Data In	Reorder Product Report
Data Out	Order Details
Process	(1) Receive reorder product report (2) Validate the supplier against Supplier Master Stores (3) Validate the product against Product Master Stores (4) Get the order details as a result
Attachment	(1) Product Master (2) Supplier Master

Table D.12. Process Specification of Process 5.2.1.

Items	Description
Process Name	Validate Supplier
Data In	Supplier Verification
Data Out	Valid Supplier ID
Process	(1) Check the supplier information against Supplier Master Stores (2) Get the supplier details (3) Valid Supplier ID as a output result
Attachment	(1) Supplier Master

Table D.13. Process Specification of Process 5.2.2.

Items	Description
Process Name	Validate Product
Data In	Product Verification
Data Out	Valid Product ID
Process	(1) Check the product information against Product Master Stores (2) Get the product details (3) Valid Product ID as a output result
Attachment	(1) Product Master

Table D.14. Process Specification of Process 5.2.3.

Items	Description
Process Name	Add new supplier information
Data In	New supplier information
Data Out	Update new supplier information
Process	(1) Complete the detail of supplier information (2) Keep it in Supplier Master Stores (3) And also bring it into Product Master Stores
Attachment	(1) Product Master (2) Supplier Master

Table D.15. Process Specification of Process 5.2.4.

Items	Description
Process Name	Enter Product Require
Data In	Quantity Required
Data Out	Order Quantity
Process	(1) Staff keys in the quantity required (2) Update the product quantity in Transaction Master Stores (3) Order Quantity will be sent to the next step
Attachment	(1) Staff (2) Transaction Master

Table D.16. Process Specification of Process 5.2.5.

Items	Description
Process Name	Create Pending Order
Data In	(1) Valid Supplier ID (2) Valid Product ID (3) Order Quantity
Data Out	Order Details
Process	(1) All Data In will be concluded (2) The result is Order Details, it will be sent to Process 5.3
Attachment	(1) Inventory System

Table D.17. Process Specification of Process 5.3.

Items	Description
Process Name	Launch Purchase Order
Data In	Order Details
Data Out	Purchase Order
Process	(1) Receive an order detail (2) Record it in Transaction Master Stores (3) Purchase Order is issued as an output
Attachment	(1) Transaction Master

Table D.18. Process Specification of Process 5.4.

Items	Description
Process Name	Approve Purchase Order
Data In	Purchase Order
Data Out	Approved Purchase Order
Process	(1) Purchase Order will pass through Purchasing Department for approval (2) Purchasing Manager get approved the document (3) P/O will be sent to the supplier
Attachment	(1) Purchasing Department (2) Supplier

Table D.19. Process Specification of Process 6.1.

Items	Description
Process Name	Check Product With Delivery Note
Data In	Product & Delivery Note
Data Out	Invoice
Process	(1) Receive product and delivery note from Supplier (2) Keep the product in the Warehouse (3) Issue Invoice to the next step
Attachment	(1) Warehouse (2) Supplier

Table D.20. Process Specification of Process 6.2.

Items	Description
Process Name	Update Stock
Data In	Invoice
Data Out	(1) Update Supplier Detail (2) Arrival Product List
Process	(1) Receive Invoice (2) Update Supplier Detail in Supplier Master Stores (3) Update Arrival Product List in Product Master Stores
Attachment	(1) Product Master (2) Supplier Master

Table D.21. Process Specification of Process 6.3.

Items	Description
Process Name	Return Damage Product
Data In	New Product
Data Out	(1) Damage Product (2) New Product List
Process	(1) Discover the damaged product from the Warehouse (2) Return it to the supplier (3) Supplier brings the new product as exchange
Attachment	(1) Warehouse (2) Supplier

Table D.22. Process Specification of Process 6.4.

Items	Description
Process Name	Keep & Update Stock
Data In	New Product List
Data Out	(1) Product (2) Update New Product List
Process	(1) Receive the new products from Supplier (2) Send them to the Warehouse for work in process (3) Update New Product List in Product Master Stores
Attachment	(1) Product Master (2) Warehouse

Table D.23. Process Specification of Process 7.1.

Items	Description
Process Name	Validate Report Name
Data In	Report Name Request
Data Out	Valid Report Name
Process	(1) Employee requests for the report (2) System validates the report (3) Go to next step
Attachment	(1) Inventory System

Table D.24. Process Specification of Process 7.2.

Items	Description
Process Name	Retrieve Information From Database
Data In	(1) Valid Report Name (2) Product Information (3) Supplier Information (4) Transaction Information
Data Out	Information
Process	(1) Receive Valid Report Name (2) Retrieve Supplier Information from Supplier Master Stores (3) Retrieve Product Information from Product Master Stores (4) Retrieve Transaction Information from Transaction Master Stores
Attachment	(1) Product Master (2) Supplier Master (3) Transaction Master

Table D.25. Process Specification of Process 7.3.

Items	Description
Process Name	Create Report
Data In	Information
Data Out	Report
Process	(1) Gather all of needed information (2) Then, use that to create the report as the output
Attachment	-

Table D.26. Process Specification of Process 7.4.

Items	Description
Process Name	Present Report
Data In	Report
Data Out	Summary Report
Process	(1) Receive the report (2) Then conclude all to create Summary Report
Attachment	(1) Inventory System





APPENDIX E

DATA DICTIONARY

DATA DICTIONARY

Table E.1. Data Dictionary of Product Master Database.

Field Name	Meaning
Product Master ID	The product ID that is unique. Each product has only one product ID. This ID is auto generated by the computer.
Product Name	The name of the product.
Field	The group of the product which contains 7 fields. There're Food additives, Painting Adhesive and Rubber, Cosmetics, Textile (Fixing Agent), Filler, Filter Aids and Antioxidant.
Description	Describe the usage of the product.
Location	The address of the product.
Package	The packing of the product such as drum, box, bag and etc.
Remaining	The current product's volume on hand.
Reorder Point	Minimum quantities set for reordering the product.
Expiry Date	The date which the product spoiled.
Price	A measure in term of baht per kg. for selling transaction.
Weight	The whole weight per one product package.
Return Product	The product which has the problem and return by customer.

Table E.2. Data Dictionary of Supplier Database.

Field Name	Meaning
Supplier ID	The supplier ID that is unique. Each supplier has only one ID. This ID is auto generated by the computer.
Company Name	The company name of the supplier.
Address	Location of the supplier's company.
Contact Person	The name of supplier to keep in touch.
Position	The current function of supplier.
Phone	The number to keep the contact.
Fax	The number to forward or pass the document from one country to another country.
E-mail	The address to send a message to supplier.

Table E.3. Data Dictionary of Ordered Product Database.

Field Name	Meaning
Ordered Product ID	The order ID that is unique. Each order has only one number. This number is auto generated by the computer.
Order Date	The date which the order is created.
Delivery Date	The date for product delivery.
Customer ID	The customer ID that is unique. Each customer has only one ID. This number is auto generated by the computer.
Contact Person	The name of customer to keep in touch.
Weight	The whole weight per one product package.
Quantity	The volume that the customer wants.
Gross Weight	Weight multiply by Quantity to get the result.
Price	A measure in term of baht per kg. for selling transaction.
Term of Payment	Disbursement by customer e.g. Cash, Credit Term 30 Days and etc.

Table E.4. Data Dictionary of Customer Database.

Field Name	Meaning
Customer ID	The customer ID that is unique. Each order has only one ID. This number is auto generated by the computer.
Company Name	The company name of the customer.
Address	Location of the customer's company.
Contact Person	The name of customer to keep in touch.
Phone	The number to keep the contact.
Fax	The number to forward or pass the document from one country to another country.
E-mail	The address to send a message to customer.
Position	The current function of customer.

Table E.5. Data Dictionary of Employee Database.

Field Name	Meaning
Employee ID.	The employee ID that is unique. Each employee has only one ID. This number is auto generated by the computer.
FirstName	The name of the employee.
LastName	The surname of the employee.
Address	The place where the employee lives in.
Position	The current function of the employee.
Department	The field which the employee in.
Phone	The number to keep the contact.
E-mail	The address to send a message to employee.
Hired Date	The date when the employee starts work.
Exit Date	The date when the employee quits the job.

Table E.6. Data Dictionary of Purchase Order Database.

Field Name	Meaning
Purchase Order ID	The purchase order ID that is unique. Each purchase has only one number. This number is auto generated by the computer.
Require Date	The date which the product is required.
Term of Payment	Disbursement to supplier e.g. Cash, Credit Term 30 Days and etc.
Supplier ID	The supplier ID that is unique. Each supplier has only one ID. This number is auto generated by the computer.
Name	The supplier's name.
Ship Via	The way the product transfers to the destination e.g. Ship, Airplane and etc.
Employee ID	The employee ID that is unique. Each employee has only one number. This number is auto generated by the computer.
Name	The employee's name.
Product Name	The name of the product.
Weight	The whole weight per one product package.
Quantity	The volume of the product.
Gross Weight	Weight multiply by Quantity to get the result.
Price	A measure in term of baht per kg. for selling transaction.

Table E.7. Data Dictionary of Product Arrival Database.

Field Name	Meaning
Product Arrival ID	The product arrival ID that is unique. Each product arrival has only one ID. This ID is auto generated by the computer.
Product Name	The name of the product.
Date of Arrival	The date when the product is arrived.
Quantity	The volume of the product.
Package	The packing of the product such as drum, box, bag and etc.
Weight	The whole weight per one product package.
Expiry Date	The date which the product spoiled.
Damage Product	The number of product which is not come in good appearance.

Table E.8. Data Dictionary of Product Stock Database.

Field Name	Meaning
Product Stock ID	The product stock ID that is unique. Each product stock has only one ID. This number is auto generated by the computer.
Product Name	The name of the product.
Status	The event to tell that product is available or unavailable.
Remaining	The current product's volume on hand.





APPENDIX F
FEASIBILITY ANALYSIS

Table F.1. Proposed System Cost of Candidate 1, in Baht.

Cost items	Year				
	1	2	3	4	5
<u>Fixed Cost (Development Cost)</u>					
Hardware Cost:					
Computer Server Cost	250,000.00	-	-	-	-
Personal Computer Cost	500,000.00	-	-	-	-
Laser Printer 2 units @ 25,000	50,000.00	-	-	-	-
Dot Matrix Printer 2 units @ 15,000	30,000.00	-	-	-	-
UPS + Router = 6 units @ 18000	108,000.00	-	-	-	-
Total Hardware Cost	938,000.00	-	-	-	-
Software Cost	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Network Cost	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
System Architecture Cost	30,000.00	-	-	-	-
Training Cost	20,000.00	-	-	-	-
Maintenance Cost	-	35,000.00	38,500.00	42,350.00	46,585.00
Total Fixed Cost	1,068,000.00	115,000.00	118,500.00	122,350.00	126,585.00
<u>Operating Cost</u>					
<u>Salary Cost:</u>					
Manager					
4 people @ 30,000	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
<u>Staff:</u>					
supervisors 6 people @ 15,000	90,000.00	99,000.00	108,900.00	119,790.00	131,769.00
Salepeople 4 people @ 12,000	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Workers 4 people @ 6500	26,000.00	28,600.00	31,460.00	34,606.00	38,066.60
System Engineer 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
Total Monthly Salary Cost	201,000.00	221,100.00	243,210.00	267,531.00	294,284.10
Total Annual Salary Cost	2,412,000.00	2,653,200.00	2,918,520.00	3,210,372.00	3,531,409.20
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationery 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Paper 1,900 per month	22,800.00	25,080.00	27,588.00	30,346.80	33,381.48
Miscellaneous 4,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost	68,400.00	75,240.00	82,764.00	91,040.40	100,144.44

Table F.1. Proposed System Cost of Candidate 1, in Baht. (Continued).

Cost items	Year				
	1	2	3	4	5
Utility Cost:					
Electricity 45,000 per month	540,000.00	594,000.00	653,400.00	718,740.00	790,614.00
Water 6,000 per month	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Telephone 19,000 per month	228,000.00	250,800.00	275,880.00	303,468.00	333,814.80
Total Utility Cost	840,000.00	924,000.00	1,016,400.00	1,118,040.00	1,229,844.00
Total Operating Cost	3,320,400.00	3,652,440.00	4,017,684.00	4,419,452.40	4,861,397.64
Total Proposed System Cost	4,388,400.00	3,767,440.00	4,136,184.00	4,541,802.40	4,987,982.64



Table F.2. Proposed System Cost of Candidate 2, in Baht.

Cost items	Year				
	1	2	3	4	5
<u>Fixed Cost (Development Cost)</u>					
Hardware Cost:					
Computer Server Cost	300,000.00	-	-	-	-
Personal Computer Cost	500,000.00	-	-	-	-
Laser Printer 2 units @ 25,000	50,000.00	-	-	-	-
Dot Matrix Printer 2 units @ 15,000	30,000.00	-	-	-	-
UPS + Router = 10 units @ 18000	180,000.00	-	-	-	-
Total Hardware Cost	1,060,000.00	-	-	-	-
Software Cost	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Network Cost	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
System Architecture Cost	30,000.00	-	-	-	-
Training Cost	30,000.00	-	-	-	-
Maintenance Cost	-	48,500.00	53,350.00	58,685.00	64,553.50
Total Fixed Cost	1,220,000.00	148,500.00	153,350.00	158,685.00	164,553.50
<u>Operating Cost</u>					
<u>Salary Cost:</u>					
Manager					
4 people @ 30,000	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
<u>Staff:</u>					
supervisors 6 people @ 15,000	90,000.00	99,000.00	108,900.00	119,790.00	131,769.00
Salespeople 4 people @ 12,000	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Workers 3 people @ 6500	19,500.00	21,450.00	23,595.00	25,954.50	28,549.95
System Engineer 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
Total Monthly Salary Cost	194,500.00	213,950.00	235,345.00	258,879.50	284,767.45
Total Annual Salary Cost	2,334,000.00	2,567,400.00	2,824,140.00	3,106,554.00	3,417,209.40
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationery 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Paper 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Miscellaneous 4,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost	67,200.00	73,920.00	81,312.00	89,443.20	98,387.52

Table F.2. Proposed System Cost of Candidate 2, in Baht. (Continued)

Cost items	Year				
	1	2	3	4	5
<u>Utility Cost:</u>					
Electricity 45,000 per month	540,000.00	594,000.00	653,400.00	718,740.00	790,614.00
Water 6,000 per month	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Telephone 19,000 per month	228,000.00	250,800.00	275,880.00	303,468.00	333,814.80
Total Utility Cost	840,000.00	924,000.00	1,016,400.00	1,118,040.00	1,229,844.00
Total Operating Cost	3,241,200.00	3,565,320.00	3,921,852.00	4,314,037.20	4,745,440.92
Total Proposed System Cost	4,461,200.00	3,713,820.00	4,075,202.00	4,472,722.20	4,909,994.42



Table F.3. Proposed System Cost of Candidate 3, in Baht.

Cost items	Year				
	1	2	3	4	5
<u>Fixed Cost (Development Cost)</u>					
Hardware Cost:					
Computer Server Cost	350,000.00	-	-	-	-
Personal Computer Cost	500,000.00	-	-	-	-
Laser Printer 2 units @ 25,000	50,000.00	-	-	-	-
Dot Matrix Printer 2 units @ 15,000	30,000.00	-	-	-	-
UPS + Router = 10 units @ 20000	200,000.00	-	-	-	-
Total Hardware Cost	1,130,000.00	-	-	-	-
Software Cost	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Network Cost	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
System Architecture Cost	45,000.00	-	-	-	-
Training Cost	30,000.00	-	-	-	-
Maintenance Cost	-	53,500.00	58,850.00	64,735.00	71,208.50
Total Fixed Cost	1,305,000.00	153,500.00	158,850.00	164,735.00	171,208.50
<u>Operating Cost</u>					
<u>Salary Cost:</u>					
Manager					
4 people @ 30,000	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
<u>Staff:</u>					
supervisors 6 people @ 15,000	90,000.00	99,000.00	108,900.00	119,790.00	131,769.00
Salepeople 4 people @ 12,000	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Workers 3 people @ 6500	19,500.00	21,450.00	23,595.00	25,954.50	28,549.95
System Engineer 1 person @ 25,000	25,000.00	27,500.00	30,250.00	33,275.00	36,602.50
Total Monthly Salary Cost	194,500.00	213,950.00	235,345.00	258,879.50	284,767.45
Total Annual Salary Cost	2,334,000.00	2,567,400.00	2,824,140.00	3,106,554.00	3,417,209.40
<u>Office Supplies & Miscellaneous Cost:</u>					
Stationery 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Paper 1,800 per month	21,600.00	23,760.00	26,136.00	28,749.60	31,624.56
Miscellaneous 4,000 per month	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Total Annual Office Supplies & Miscellaneous Cost	67,200.00	73,920.00	81,312.00	89,443.20	98,387.52

Table F.3. Proposed System Cost of Candidate 3, in Baht. (Continued)

Cost items	Year				
	1	2	3	4	5
<u>Utility Cost:</u>					
Electricity 45,000 per month	540,000.00	594,000.00	653,400.00	718,740.00	790,614.00
Water 6,000 per month	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Telephone 19,000 per month	228,000.00	250,800.00	275,880.00	303,468.00	333,814.80
Total Utility Cost	840,000.00	924,000.00	1,016,400.00	1,118,040.00	1,229,844.00
Total Operating Cost	3,241,200.00	3,565,320.00	3,921,852.00	4,314,037.20	4,745,440.92
Total Proposed System Cost	4,546,200.00	3,718,820.00	4,080,702.00	4,478,772.20	4,916,649.42

Table F.4. Accumulated Cost Table, in Baht.

Year	Existing Cost	Candidate 1	Candidate 2	Candidate 3
1	4,120,500.00	4,388,400.00	4,461,200.00	4,546,200.00
2	8,577,900.00	8,155,840.00	8,175,020.00	8,265,020.00
3	13,480,640.00	12,292,024.00	12,250,222.00	12,345,722.00
4	18,873,254.00	16,833,826.40	16,722,944.20	16,824,494.20
5	24,804,729.40	21,821,809.04	21,632,938.62	21,741,143.62

Table F.5. Payback Analysis of Candidate 1.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,068,000.00					
Operation & maintenance cost:		-115,000.00	-118,500.00	-122,350.00	-126,585.00	-131,243.50
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes costs (adjusted to present value):	-1,068,000.00	-104,535.00	-97,881.00	-91,884.85	-86,457.56	-81,502.21
Cumulative time-adjusted costs over lifetime:	-1,068,000.00	-1,172,535.00	-1,270,416.00	-1,362,300.85	-1,448,758.41	-1,530,260.62
Benefits derived from operation of new system:	0.00	723,600.00	795,960.00	875,556.00	963,111.60	1,059,422.76
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes benefits (current of present value):	0	657,752.40	657,462.96	657,542.56	657,805.22	657,901.53
Cumulative time-adjusted benefits over lifetime:	0.00	657,752.40	1,315,215.36	1,972,757.92	2,630,563.14	3,288,464.67
Cumulative lifetime time-adjusted costs + benefits:	-1,068,000.00	-514,782.60	44,799.36	610,457.07	1,181,804.73	1,758,204.05

Table F.6. Payback Analysis of Candidate 2.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,220,000.00					
Operation & maintenance cost:		-148,500.00	-153,350.00	-158,685.00	-164,553.50	-171,008.85
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes costs (adjusted to present value):	-1,220,000.00	-134,986.50	-126,667.10	-119,172.44	-112,390.04	-106,196.50
Cumulative time-adjusted costs over lifetime:	-1,220,000.00	-1,354,986.50	-1,481,653.60	-1,600,826.04	-1,713,216.08	-1,819,412.57
Benefits derived from operation of new system:	0.00	802,800.00	883,080.00	971,388.00	1,068,526.80	1,175,379.48
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes benefits (current of present value):	0	729,745.20	729,424.08	729,512.39	729,803.80	729,910.66
Cumulative time-adjusted benefits over lifetime:	0.00	729,745.20	1,459,169.28	2,188,681.67	2,918,485.47	3,648,396.13
Cumulative lifetime time-adjusted costs + benefits:	-1,220,000.00	-625,241.30	-22,484.32	587,855.63	1,205,269.40	1,828,983.56

Table F.7. Payback Analysis of Candidate 3.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,305,000.00					
Operation & maintenance cost:		-153,500.00	-158,850.00	-164,735.00	-171,208.50	-178,329.35
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes costs (adjusted to present value):	-1,305,000.00	-139,531.50	-131,210.10	-123,715.99	-116,935.41	-110,742.53
Cumulative time-adjusted costs over lifetime:	-1,305,000.00	-1,444,531.50	-1,575,741.60	-1,699,457.59	-1,816,392.99	-1,927,135.52
Benefits derived from operation of new system:	0.00	802,800.00	883,080.00	971,388.00	1,068,526.80	1,175,379.48
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621
Time-adjustes benefits (current of present value):	0	729,745.20	729,424.08	729,512.39	729,803.80	729,910.66
Cumulative time-adjusted benefits over lifetime:	0.00	729,745.20	1,459,169.28	2,188,681.67	2,918,485.47	3,648,396.13
Cumulative lifetime time-adjusted costs + benefits:	-1,305,000.00	-714,786.30	-116,572.32	489,224.08	1,102,092.48	1,721,260.61

Table F.8. Net Present Value Analysis of Candidate 1.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	-1,068,000.00						
Operation & maintenance cost:		-115,000.00	-118,500.00	-122,350.00	-126,585.00	-131,243.50	
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621	
Time-adjustes costs (adjusted to present value):	-1,068,000.00	-104,535.00	-97,881.00	-91,884.85	-86,457.56	-81,502.21	
Total Present Value of Life Time Cost:							-1,530,260.62
Benefits derived from operation of new system:	0.00	723,600.00	795,960.00	875,556.00	963,111.60	1,059,422.76	
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621	
Time-adjustes benefits (current of present value):	0	657,752.40	657,462.96	657,542.56	657,805.22	657,901.53	
Total Present Value of Life Time Benefit:	0.00	657,752.40	1,315,215.36	1,972,757.92	2,630,563.14		3,288,464.67
Net Present Value of this candidate:							1,758,204.05

Table F.9. Net Present Value Analysis of Candidate 2.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	-1,220,000.00						
Operation & maintenance cost:		-148,500.00	-153,350.00	-158,685.00	-164,553.50	-171,008.85	
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621	
Time-adjustes costs (adjusted to present value):							
	-1,220,000.00	-134,986.50	-126,667.10	-119,172.44	-112,390.04	-106,196.50	
Total Present Value of Life Time Cost:							-1,819,412.57
Benefits derived from operation of new system:	0.00	802,800.00	883,080.00	971,388.00	1,068,526.80	1,175,379.48	
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621	
Time-adjustes benefits (current of present value):							
	0	729,745.20	729,424.08	729,512.39	729,803.80	729,910.66	
Total Present Value of Life Time Benefit:							3,648,396.13
Net Present Value of this candidate:							1,828,983.56

Table F.10. Net Present Value Analysis of Candidate 3.

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	-1,305,000.00						
Operation & maintenance cost:		-153,500.00	-158,850.00	-164,735.00	-171,208.50	-178,329.35	
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621	
Time-adjustes costs (adjusted to present value):	-1,305,000.00	-139,531.50	-131,210.10	-123,715.99	-116,935.41	-110,742.53	
Total Present Value of Life Time Cost:							-1,927,135.52
Benefits derived from operation of new system:	0.00	802,800.00	883,080.00	971,388.00	1,068,526.80	1,175,379.48	
Discount factors for 10%	1.000	0.909	0.826	0.751	0.683	0.621	
Time-adjustes benefits (current of present value):	0	729,745.20	729,424.08	729,512.39	729,803.80	729,910.66	
Total Present Value of Life Time Benefit:							3,648,396.13
Net Present Value of this candidate:							1,721,260.61



APPENDIX G

STRUCTURE DIAGRAM

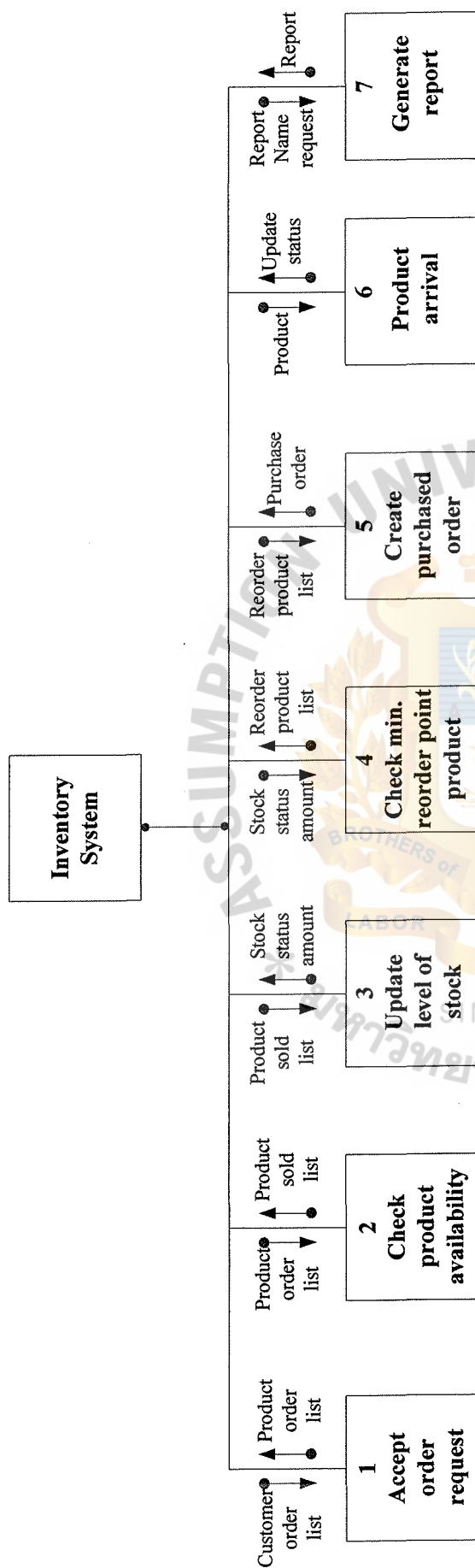


Figure G.1. Structure Chart of Inventory Management System.



Figure G.2. Structure Chart of Accept Order Request.

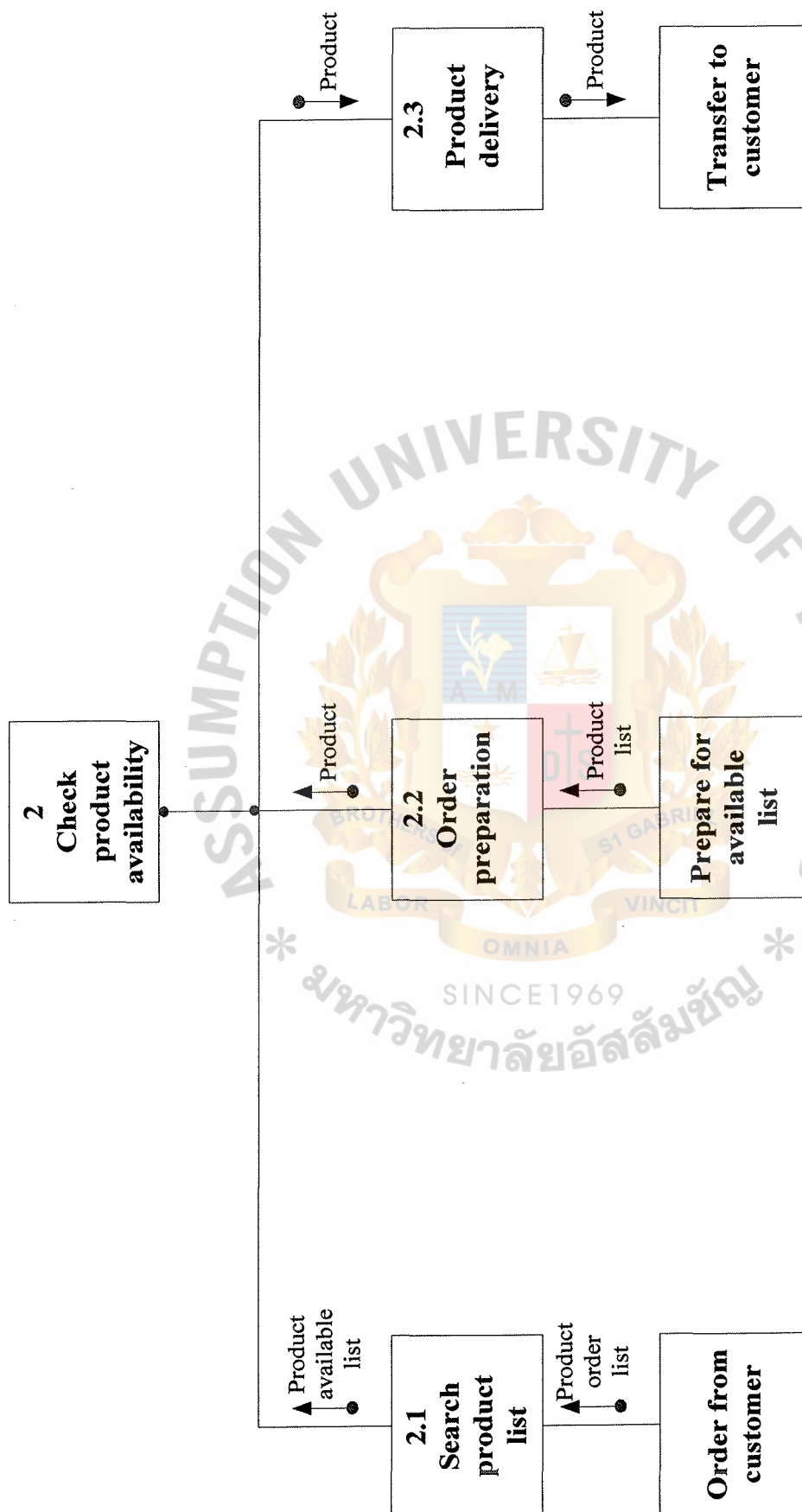


Figure G.3. Structure Chart of Check Product Availability.

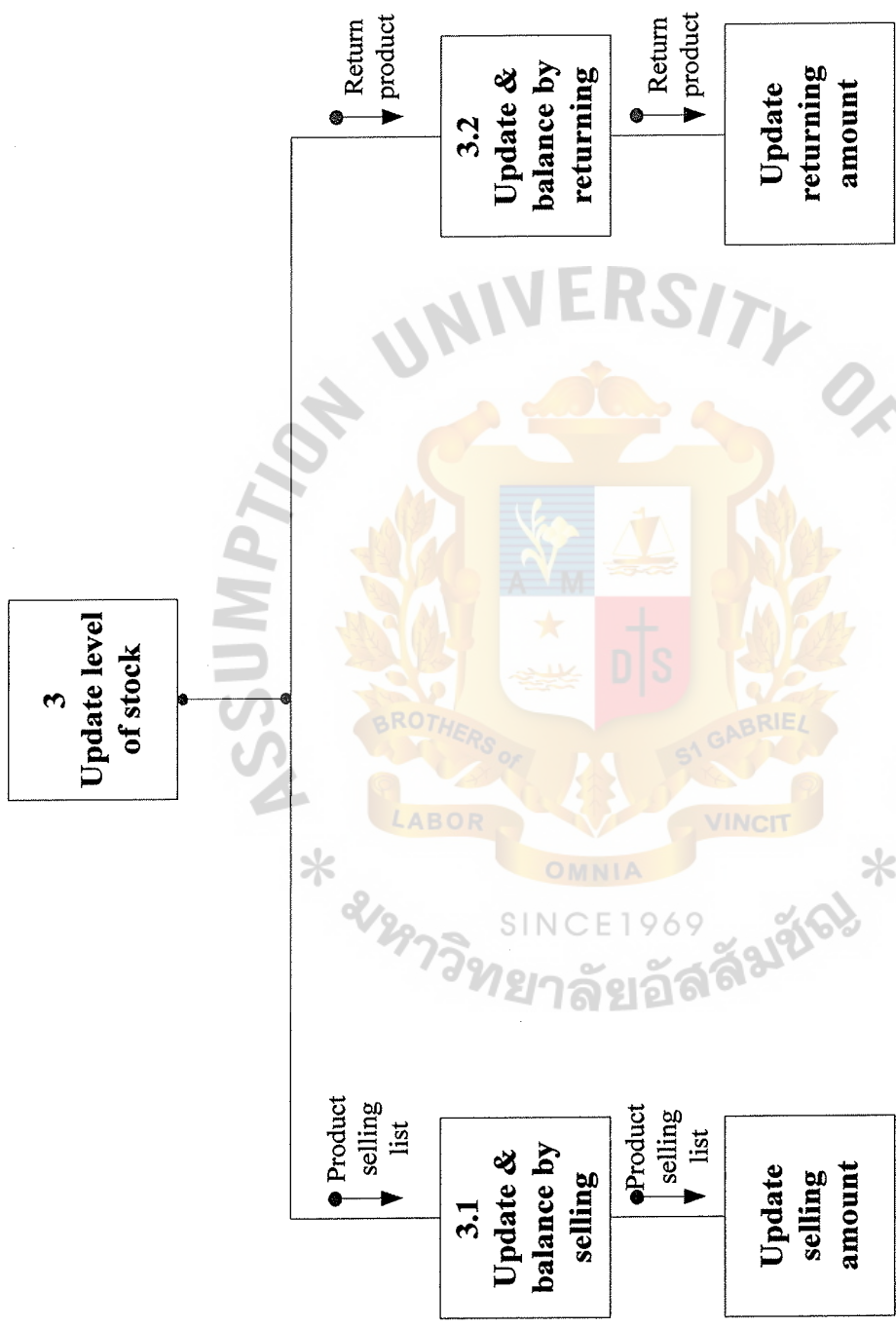


Figure G.4. Structure Chart of Update Level of Stock.



Figure G.5. Structure Chart of Check Minimum Reorder Point Product.

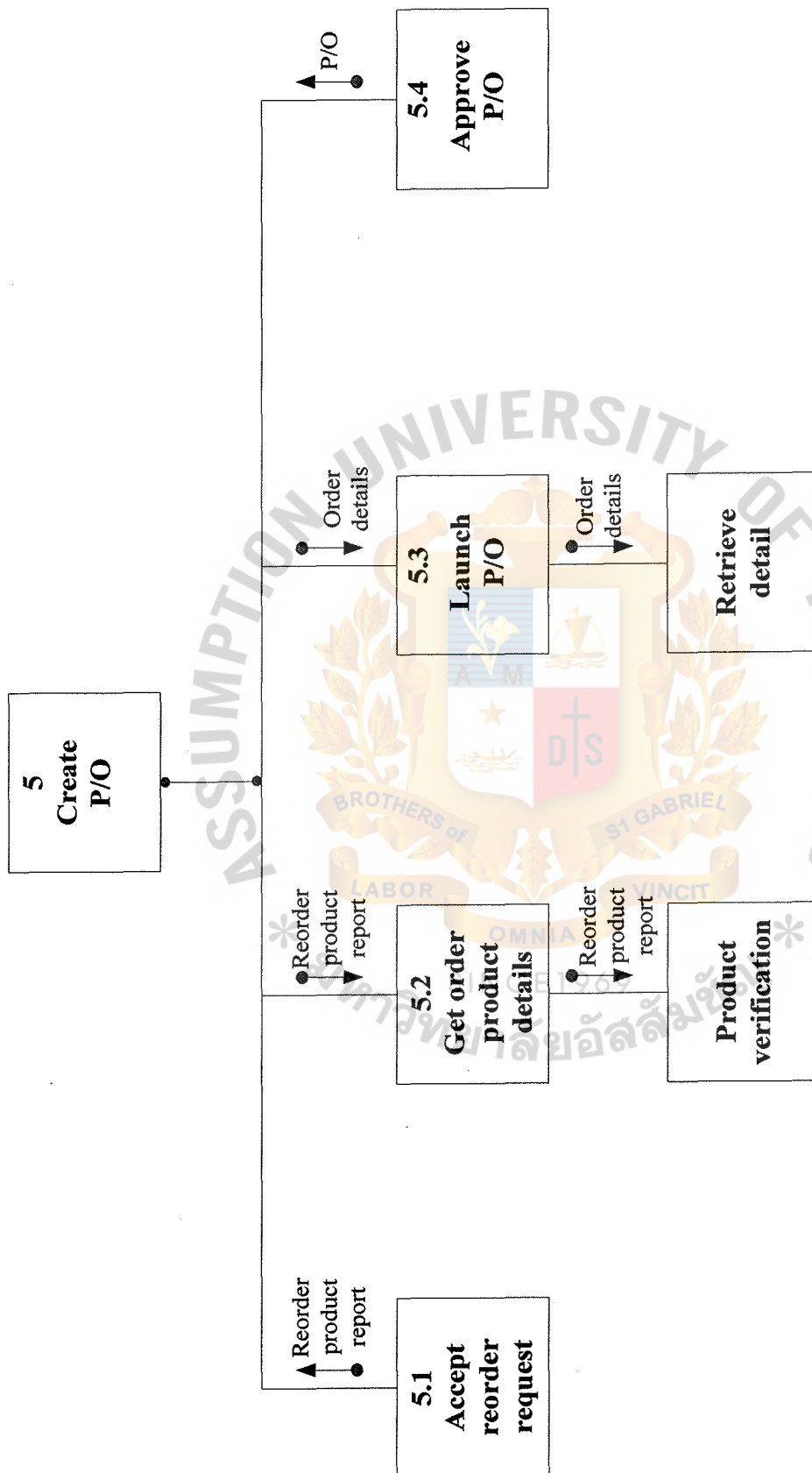


Figure G.6. Structure Chart of Create Purchase Order.

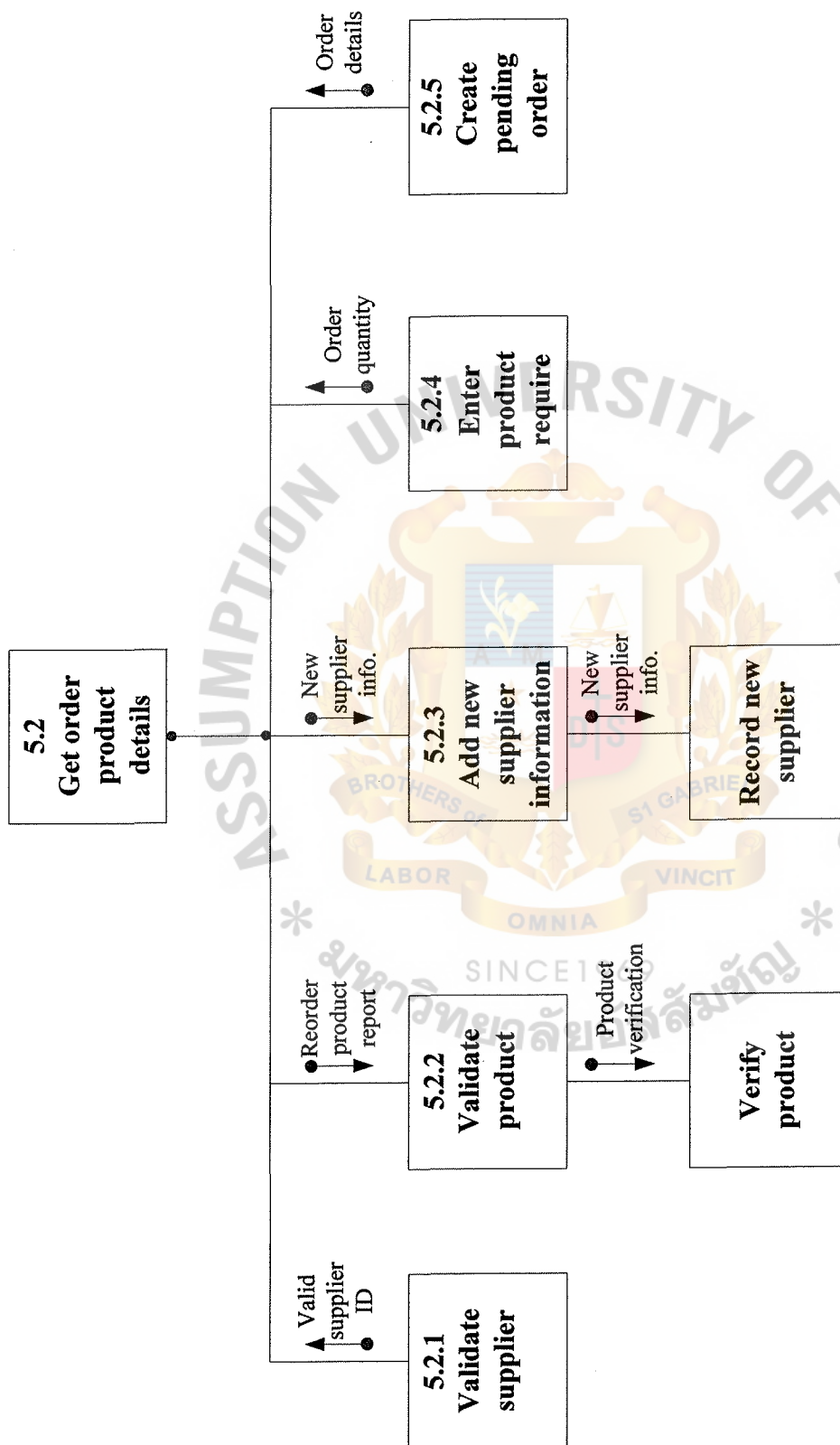


Figure G.7. Structure Chart of Create P/O of Get Order Product Details.

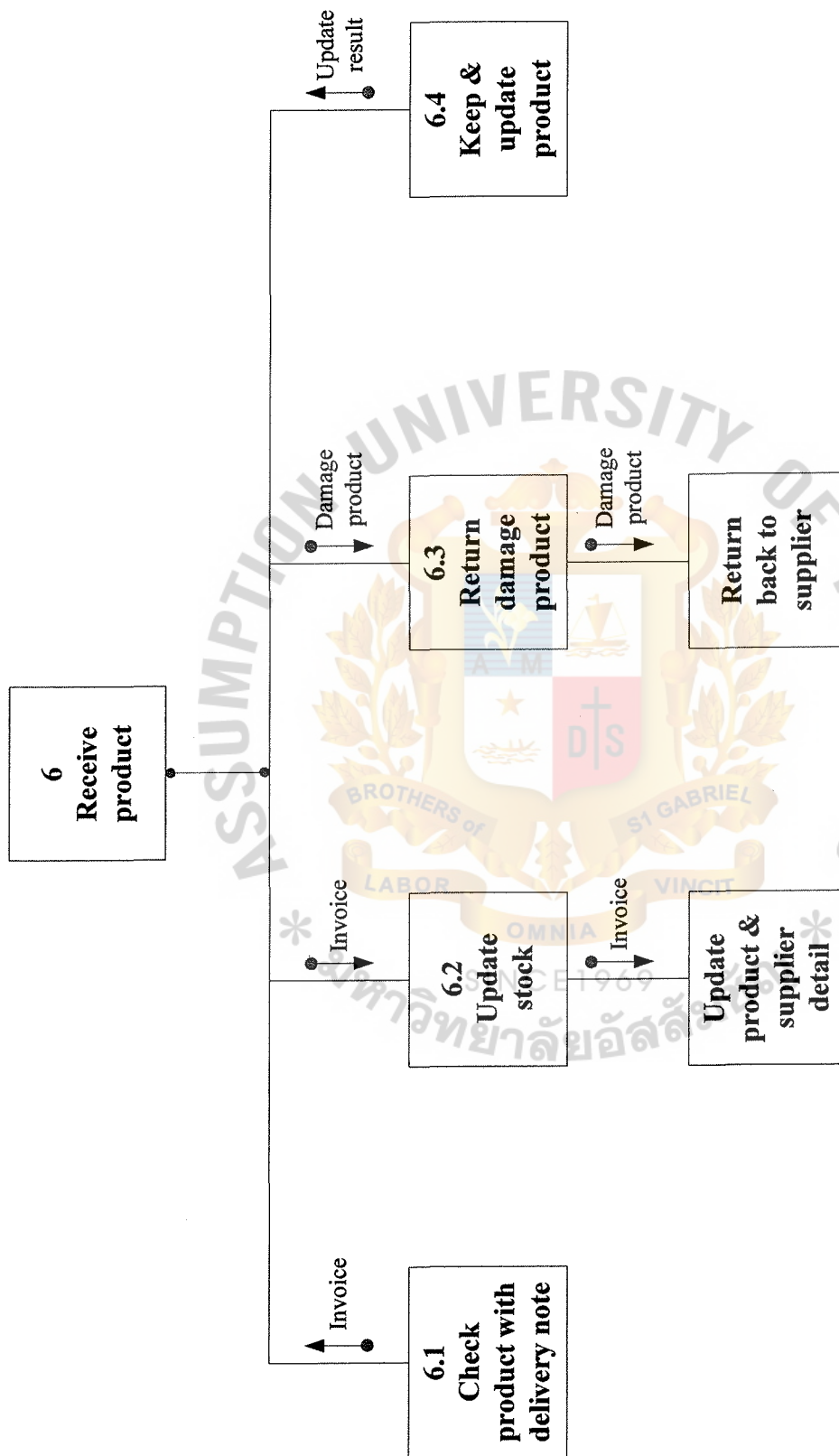


Figure G.8. Structure Chart of Receive Product.

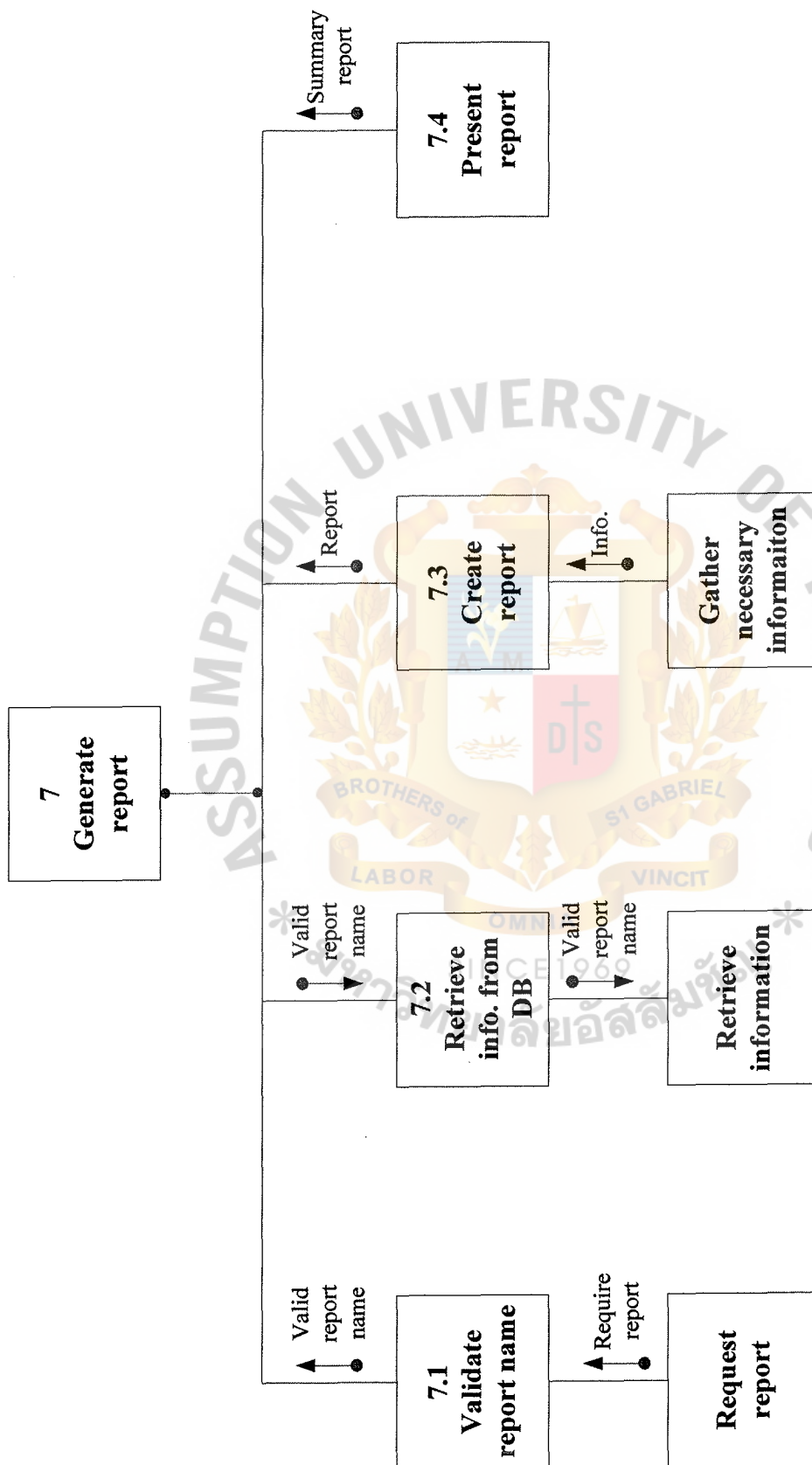


Figure G.9 Structure Chart of Generate Report.

BIBLIOGRAPHY

1. Down E., Clare P .Coe I., Structured Systems Analysis and Design, Method: Application and Contest, (Prentice-Hall, 1998)
2. Fitz Gerald, Jerry and Ardra F. Fiz Gerald. Fundamentals of Systems Analysis: Using Structured Analysis and Design Techniques, Third Edition. NY: John Wiley, 1987.
3. Foster, Dennis L. VIP: An Introduction to Hospitality. OH: McGraw-Hill, 1993.
4. Kasavana, Michael L. Hotel Information Systems. NY: ACBI Book, 1978.
5. Kendall, Kenneth E, and Julie E. Kendall. System Analysis and Design, Third Edition. NJ: Prentice Hall, 1995.
6. Korth, F.Henry and Abraham Silberschats, Database System Concepts. New York: McGraw-Hill International, Inc., 1991.Date, C.J. An Introduction to Database System. Seventh Edition. Addison Wesley, 1999.
7. Laudon, Kenneth C. and Jane Price Laudon. Management Information Systems: A Contemporary Perspective. NY: Macmillan, 1988.
8. Loomis, Mary E. S. Data Management and File Structures, Second Edition. London: Pretince-Hall International, 1989.
9. Page-Jones, Meilir. The Practical Guide to Structured System Design, Second Edition. NJ: Prentice Hall, 1988.
10. Sean Nolan and Tom Huguelet Microsoft SQL Server 2000 System Administration. Microsoft Corporation, 2000.
11. Vallen, Gray K. Check-In Check-Out, Sixth Edition. NJ: Prentice Hall, 2000.
12. Yourdon, Edward. Modern Structure Analysis. New York: Prentice Hall, 1989.
13. Whitten, Jeffery L., Lonnie D. Dentley and Kevin C. Dittman. System Analysis and Design Methods. Fifth Edition. McGraw-Hill, 2002.