

# Inventory Control System For Thai Audio Company Limited

By

Ms. Sangravee Lungaramfha

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

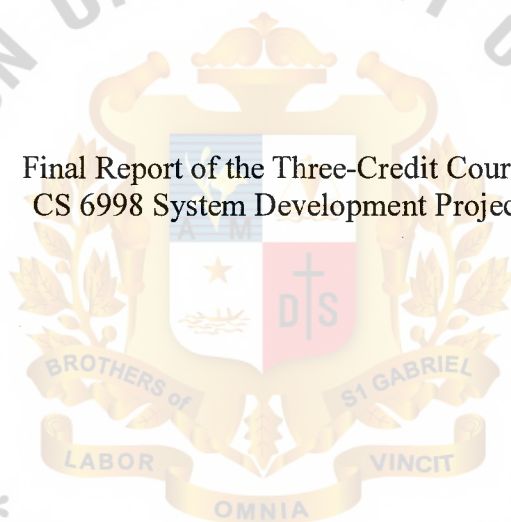
Submitted in Partial Fulfillment  
of the Requirements for the Degree of  
Master of Science  
in Computer Information Systems  
Assumption University

March, 1999

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Project Title            Inventory Control System for Thai Audio Company Limited  
Name                    Ms.Sangravee Lungaramfha  
Project Advisor        Air Marshal Dr.Chulit Meesajjee  
Academic Year        1999

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

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## **ABSTRACT**

This project presents its analysis and design for Inventory Control System of Thai Audio Co., Ltd. The Inventory Control System is the important section of Thai Audio Co., Ltd. Therefore, the company wishes to develop the inventory control system in order to serve the customer's requirement quickly and to improve work flow and data flow within the company.

At present, the company operates its business activity manually so it causes many problems such as delay response for customer's need, inaccurate information of goods in stock and disorderly function between inventory and sales staffs. Under this circumstance, the company decides to operate its business by using a computerized system instead of the manual based system. The study of the proposed system concerns the data flow diagram for improving work flow of the company. The system is implemented on Microsoft Access as the software tool. The cost analysis and cost comparison of the proposed system is determined by using the payback methods. Also, we are concerned with the break-even analysis in which we use the accumulating cost to determine the break-even point between the existing system and the proposed system. As a result, the graph on page 26 shows that at the averaged year 1.4, the new system costs the same as the old one. With regard to implementing the proposed system, the employees will work in parallel between the existing system and the proposed system until they are familiar with the new one. At the same time, they will be trained to use the computer system on how to enter the main menu and exit the screen.

After the implementation, it is satisfactory to the company's performance even if there are some problems in using the computer system at first. We found that the transaction process of the proposed system provides about 10 records of stock available in 1 minute whereas the same records take at least 15 minutes by the manual system. We can say that the new system gains many advantages such as rapid time in response to the customer's requirements as well as orderly employee function within each section. As for the coming future, the company would bring Microsoft Excel to implement with accounting section. This would enhance the company's performance promptly.

## ACKNOWLEDGEMENTS

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## **I. INTRODUCTION**

### **1.1 Background of The Project**

Thai Audio Company Ltd. is a wholesaler and a retailer regarding spare parts for audio. Though it is a family company, the shareholders wish to solve its present problem as well as to improve and develop Inventory Control System that is the main activity of the company.

Nowadays, Thai Audio Co., Ltd. operates its business activities based on the manual system. This causes so many problems for the inventory control system. There are many problems in human and documentation's which bring trouble to all employees. Therefore, Thai Audio Co., Ltd. would bring the computer system to operate the Inventory Control System.

With the continuous growth of the company and its aim to satisfy the customers' need, Thai Audio Co., Ltd. is now moving ahead to further pursuit information technology and to replace the manual based system by the computer based system.

### **1.2 Objectives of The Project**

- To study the existing system of Inventory Section.
- To analyze the existing system, understand problems and user's requirements.
- To design a computer based system of Inventory Control System.
- To implement a program for Inventory Control System.

### **1.3 Scope of The Project**

The study will concentrate on the inventory status (keeping all information and details of spare parts for audio) and will be implemented on PC-based computerized system using Microsoft Access 97.

#### 1.4 Project Plan (Gantt Chart)

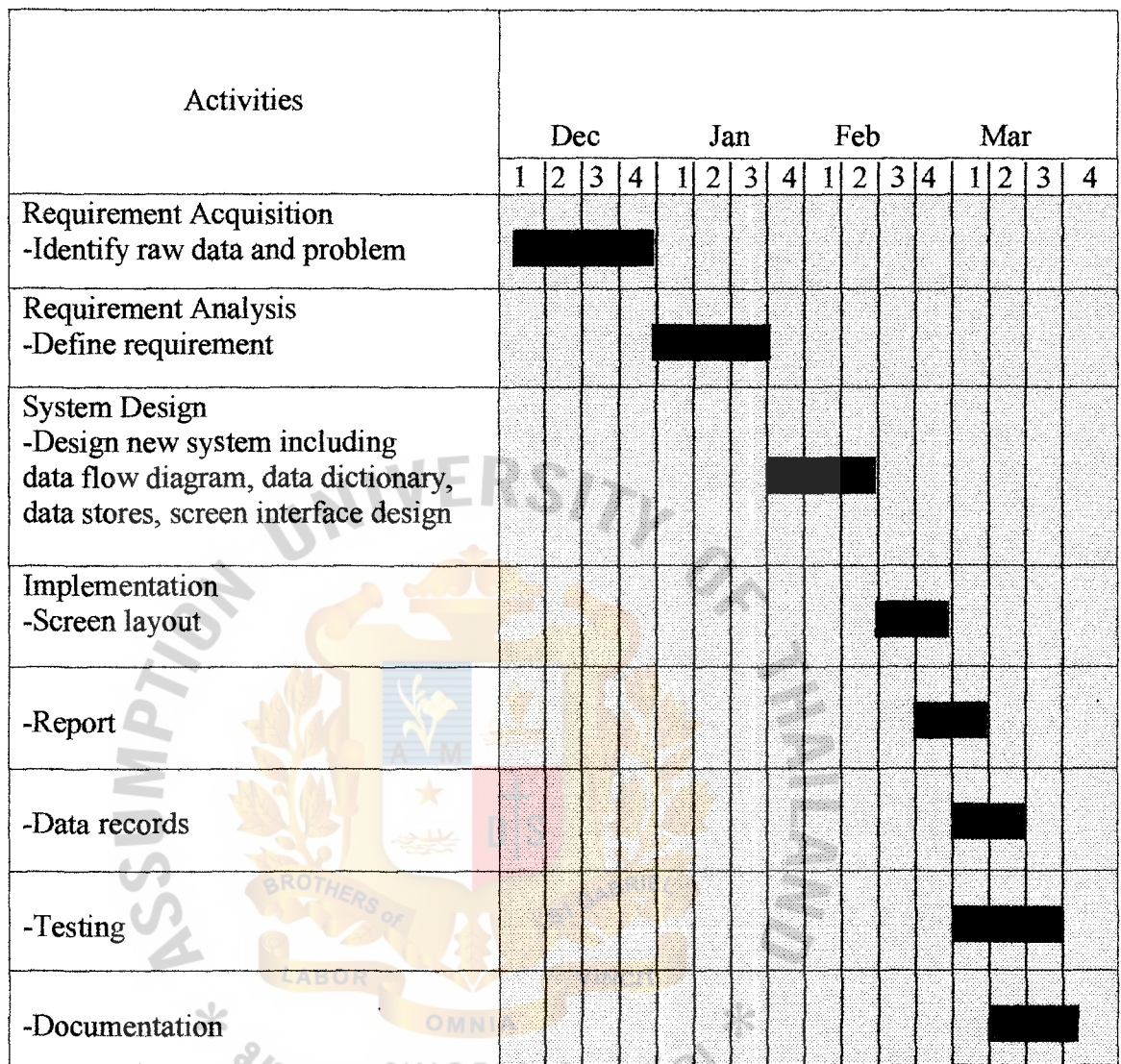


Figure 1.1. Gantt Chart for project plan



## **II. THE EXISTING SYSTEM**

### **2.1 Background of the Company**

Thai Audio Co., Ltd. was established in 1990 with the registered capital of 300,000 Bahts and 10 employees. The company's business activity is a wholesaler and a retailer regarding spare parts for audio.

At present, the company has grown rapidly with larger customers. The company also has more business contracts with domestic vendor and foreigner vendor. Sales and Inventory section are the major functions of the company. Sales section deal directly with the customer and try to sell as much goods as possible. By the way, Inventory section would provide an accurate information of goods for the sales section.

As the majority of goods is small spare parts for audio, there are many spare parts within the inventory section. The problem is that the work is done manually by the staffs of inventory section and they always cannot inform the accurate information for Sales staff's requirement. This causes so much current problem for the company.

Under this circumstance, the company would bring the computerized control system to replace the manual system for the hope to improve and develop the Inventory Control System.

### **2.2 The Existing Business Functions**

Thai Audio Co., Ltd. consists of 3 main sections:

1. Sales Section acts as the nerve center and has the responsibility for selling and serving customer.

2. Inventory Section is responsible for ordering goods and checking the stock according to sales staffs' requirement.
3. Accounting Section is responsible for billing and all accounting transactions of the company(e.g. payroll system).

The above 3 mentioned sections has been supervised and controlled by the General Manager. Figure 2.1 shows the organization chart of the company.

We can say that the Inventory Section is the important function of the company since it has controlled the goods or stock and deal with other sections. Efficiency inventory control would support all other functions as well.

### **2.3 Current Problems and Areas for Improvements**

The current problem and area for improvement is the Inventory Section. The present inventory control system has been controlled by the manual based system. The staffs have checked the movement of stock by paper records. There are many problems to check for accurate information of the stock. Moreover, there is no plan to specify to the staffs to do the specific function. It will depend on who is free at that time. The related problem is that sales and inventory staffs have interchanged their work somehow. We show the context diagram of the existing system in figure 2.2.

Upon overview of the present problem, the inventory control system should be improved by using the computerized system to control and check the stock. In addition, the function of sales and inventory section should be handled separately according to circumstance.

## Organization Chart of Thai Audio Company Limited

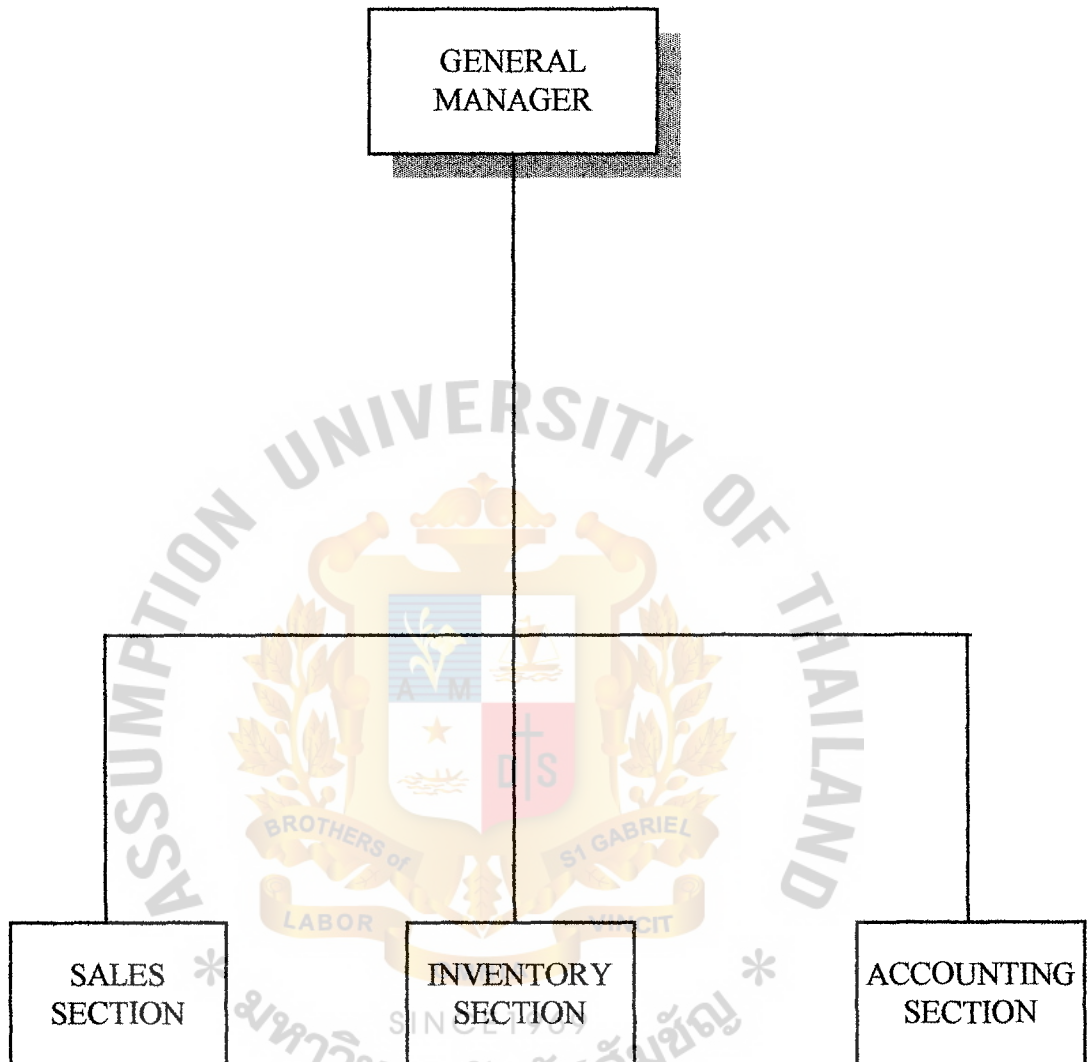


Figure 2.1. Organization Chart

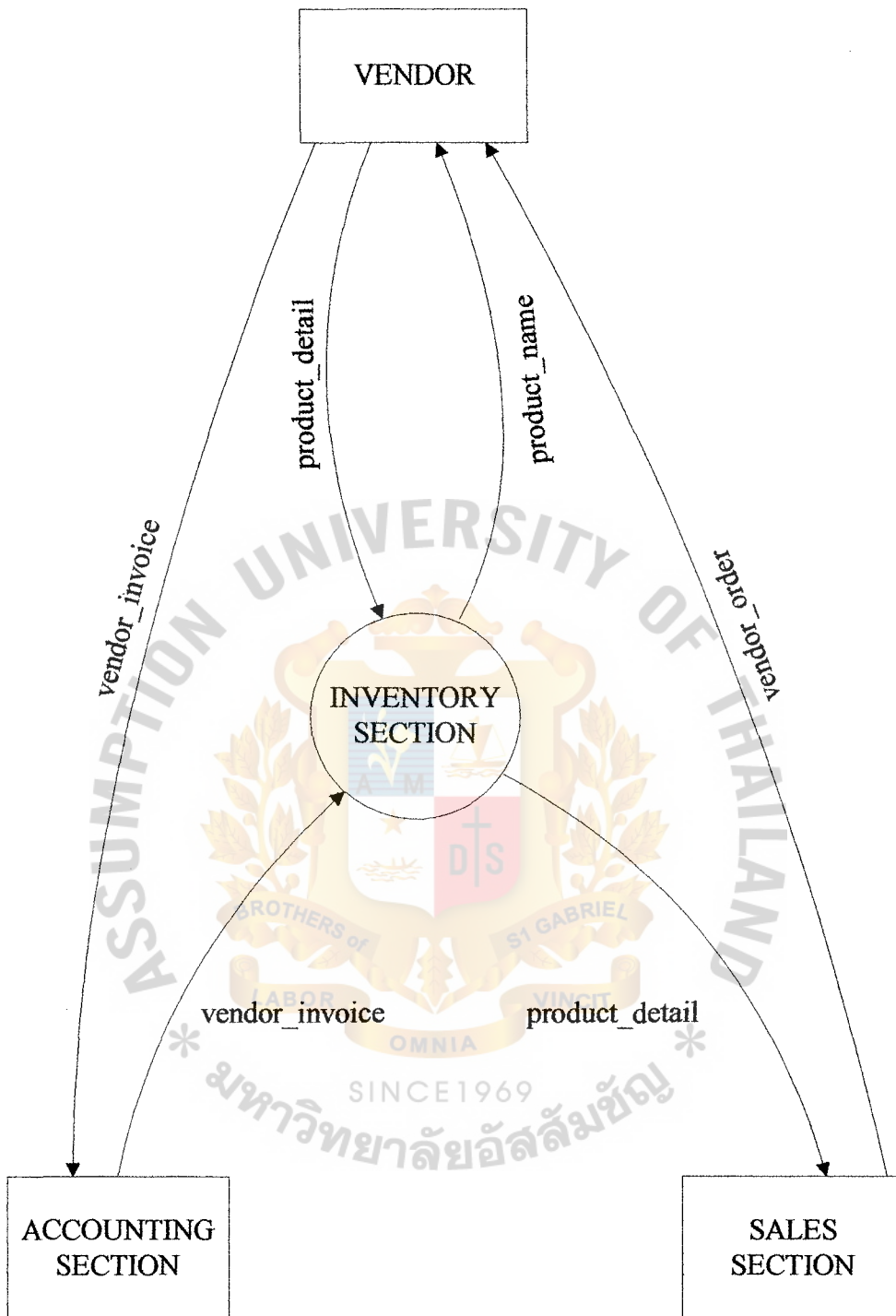


Figure 2.2. Context Diagram of the Existing System



### **III. THE PROPOSED SYSTEM**

The proposed system is designed to replace the existing manual system. The proposed computerized system will control all information of all sections, especially the inventory section. The main objective is to increase performance for the inventory section, resulting in good performance for other related sections.

#### **3.1 User Requirements**

We can say that the following sections are the users of the proposed system:

1. The Inventory section controls the stocks and updates them perfectly through the computer system in daily transaction so that he can inform the accurate information to sales section.
2. The Sales section is important to end user. He must have knowledge to find the required information for the customer's need through a computerized system.
3. The Accounting section is also the other end user related in case he would find the related information (e.g customer invoice for billing). But he is not authorized to update or edit the inventory control program.

After we have specified the user's functions, we also should prepare the appropriate hardware and software for the company's performance. The following information system is designed for end users:

1. Daily Transaction for the related users:
  - Stock
  - Customer Order
  - Vendor Order
  - Customer Invoice

2. Daily Record for the related users:

- Customer
- Vendor
- Product
- Vendor Invoice

3. Daily Reports and Monthly Reports for management level:

- Daily Stock Report
- Customer Order Report
- Vendor Order Report
- Out of Stock Report
- Top Sales Daily Report
- Monthly Stock Report
- Out of Stock Monthly Report
- Sales Report
- Inventory Status Report
- Top Sales Monthly Report

**3.2 Systems Design**

3.2.1 Overview of the Proposed System

The proposed system is designed to support better performance of the inventory control system. The computer program that we use to perform the system is Microsoft Access 97. As for other section, especially accounting section, we use Microsoft Excel.

The users who are inventory staffs and sales staffs will use Microsoft Access for daily transaction in which we have designed the interface screen for easy use. And, the user will be trained to use the mentioned program as well.

### 3.2.2 The New System Design

In order to improve the performance of the inventory section, we need to design its logical data flow. We are going to discuss about the context diagram and the logical data flow which are necessary for the new system design.

Figure 3.1 shows the context diagram that is the view of the inventory control system and its relation to other sections. The data flow diagram of process level 0, data flow diagram of process level 1.0, data flow diagram of process level 2.0, data flow diagram of process level 3.0 are shown in Figures 3.2, 3.3, 3.4, 3.5 respectively. As for data dictionary and process specification, they are shown in Appendices A and B respectively.

The whole of the proposed system is divided into 4 processes as stated below:

Process 1.0: Get Order

- To check customer records
- To verify customer orders
- To update customer records

Process 2.0 Create Invoices

- To create customer invoice
- To update customer invoice and vendor invoice
- To check and process product on hand
- To inform sales section for stock available
- To communicate with accounting section with regard to customer invoices and vendor invoices

**Process 3.0 Set Pricing**

- To create price list for sale
- To update product on hand after setting price
- To inquiry vendor order and update vendor records

**Process 4.0 Update Inventory**

- To inform product on hand upon request
- To adjust and update quantity on hand
- To daily update product on hand after sale

The above mentioned 4 processes have been designed to control the inventory system for better performance. This leads to many advantages compared to the existing system as follows:

- To distinguish the function between sales and inventory sections.
- It provides more convenient and accuracy information.
- It reduces disorderly function because the proposed system will specify the function for each staff.
- It helps the prospective view for the management level in case of expansion to meet the company growth.



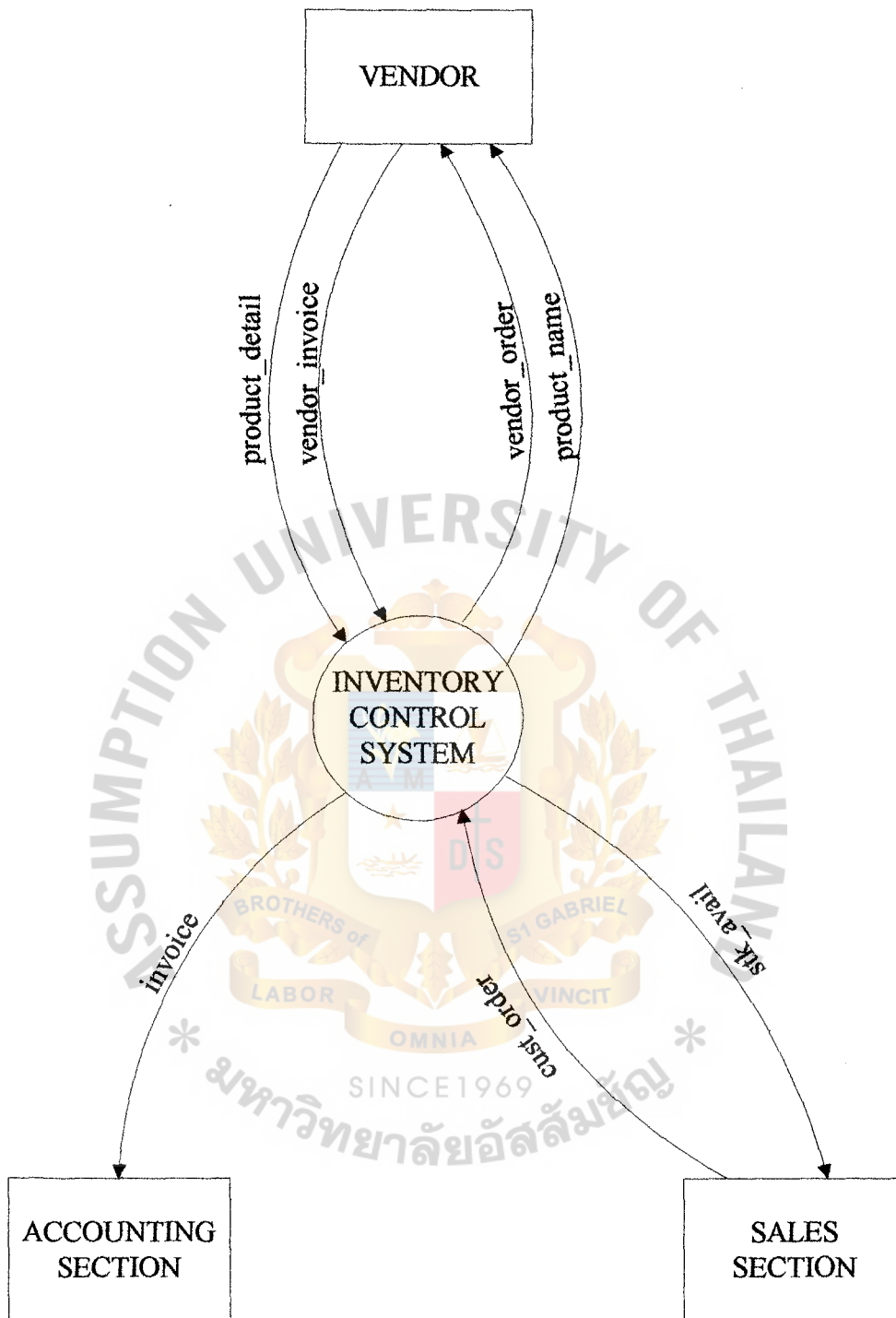


Figure 3.1. Context Diagram of the Proposed System

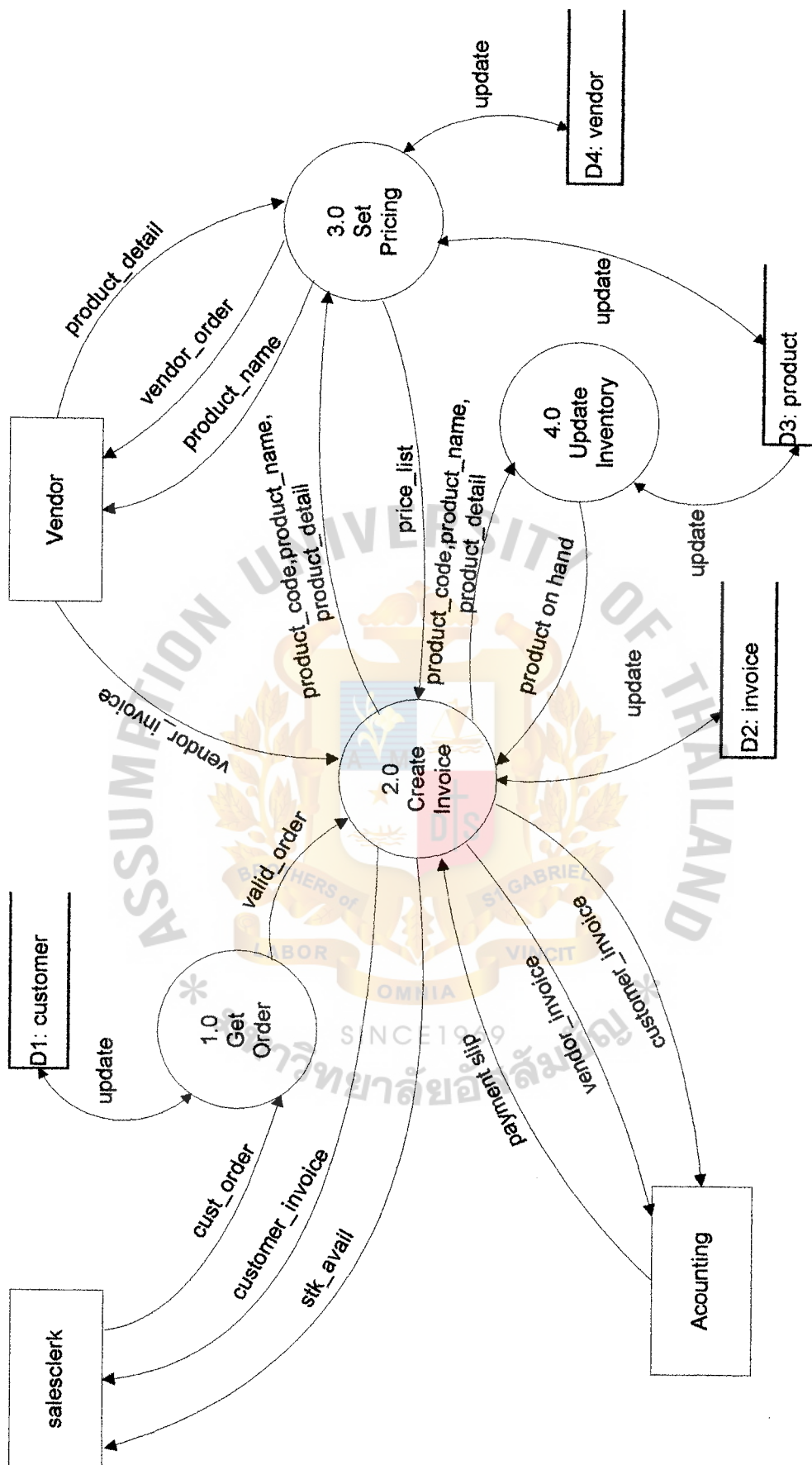


Figure 3.2. Dataflow Diagram Level 0

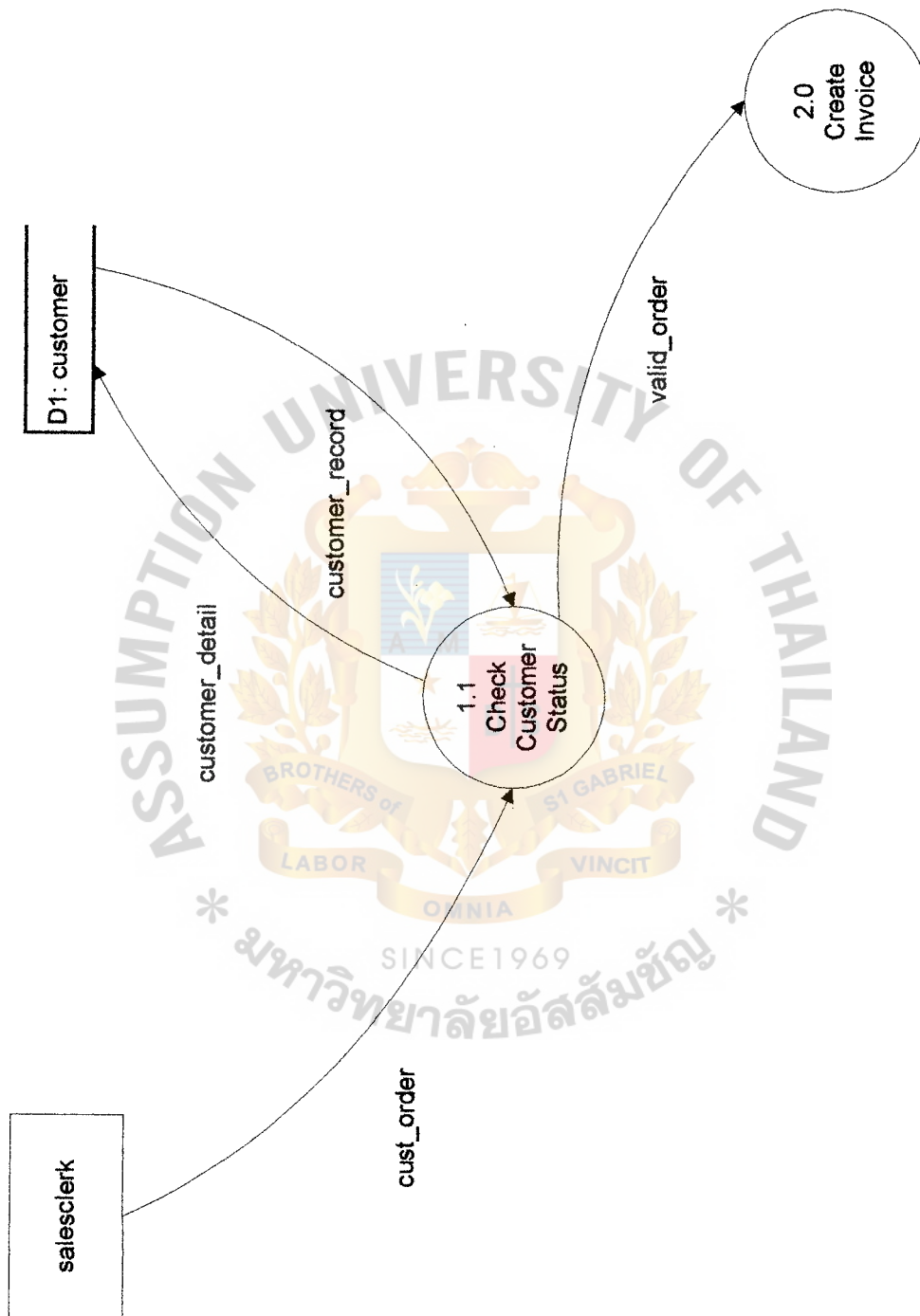


Figure 3.3. Dataflow Diagram Level 1 (1.0 Get Order)

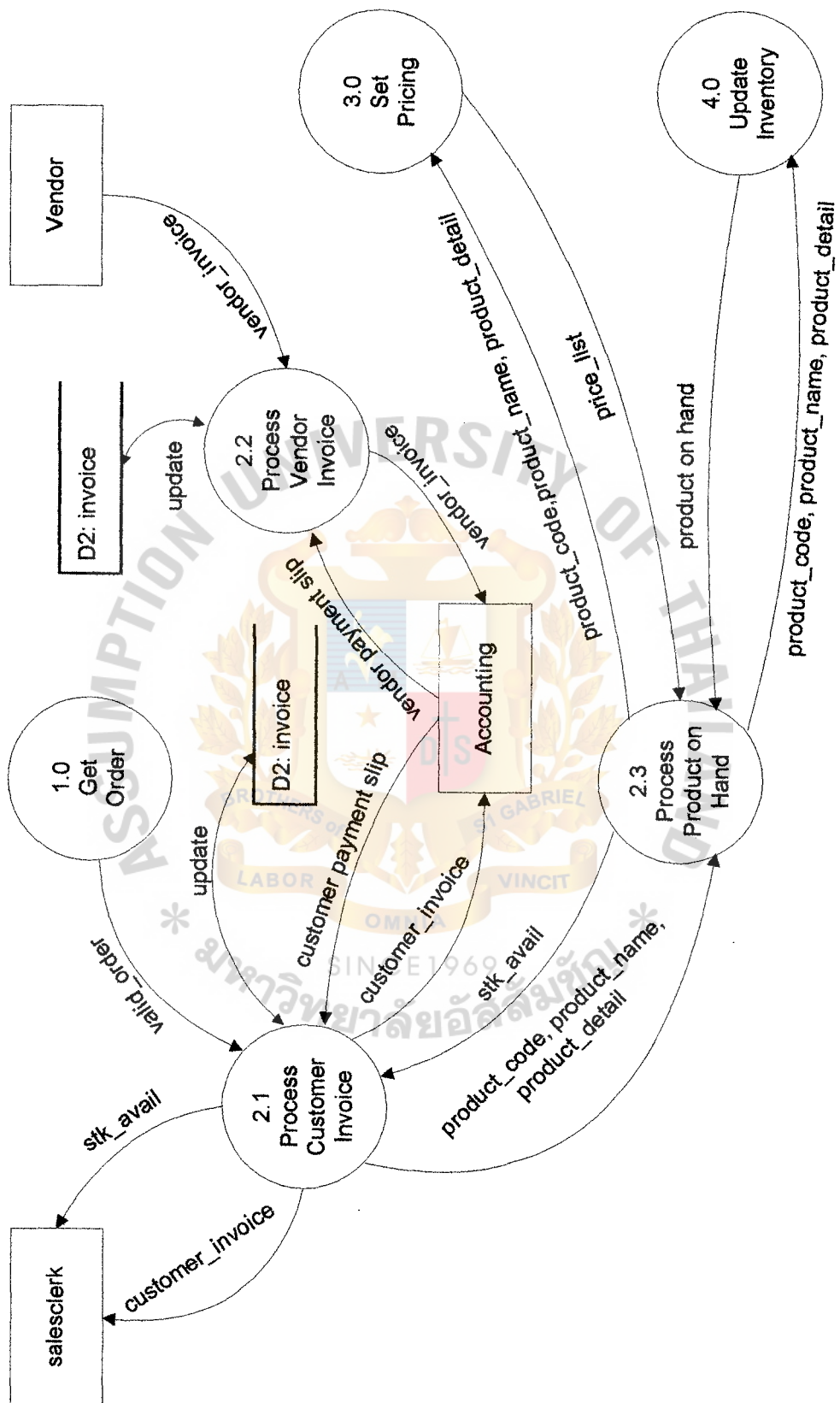


Figure 3.4. Dataflow Diagram Level 1 (2.0 Create Invoice)



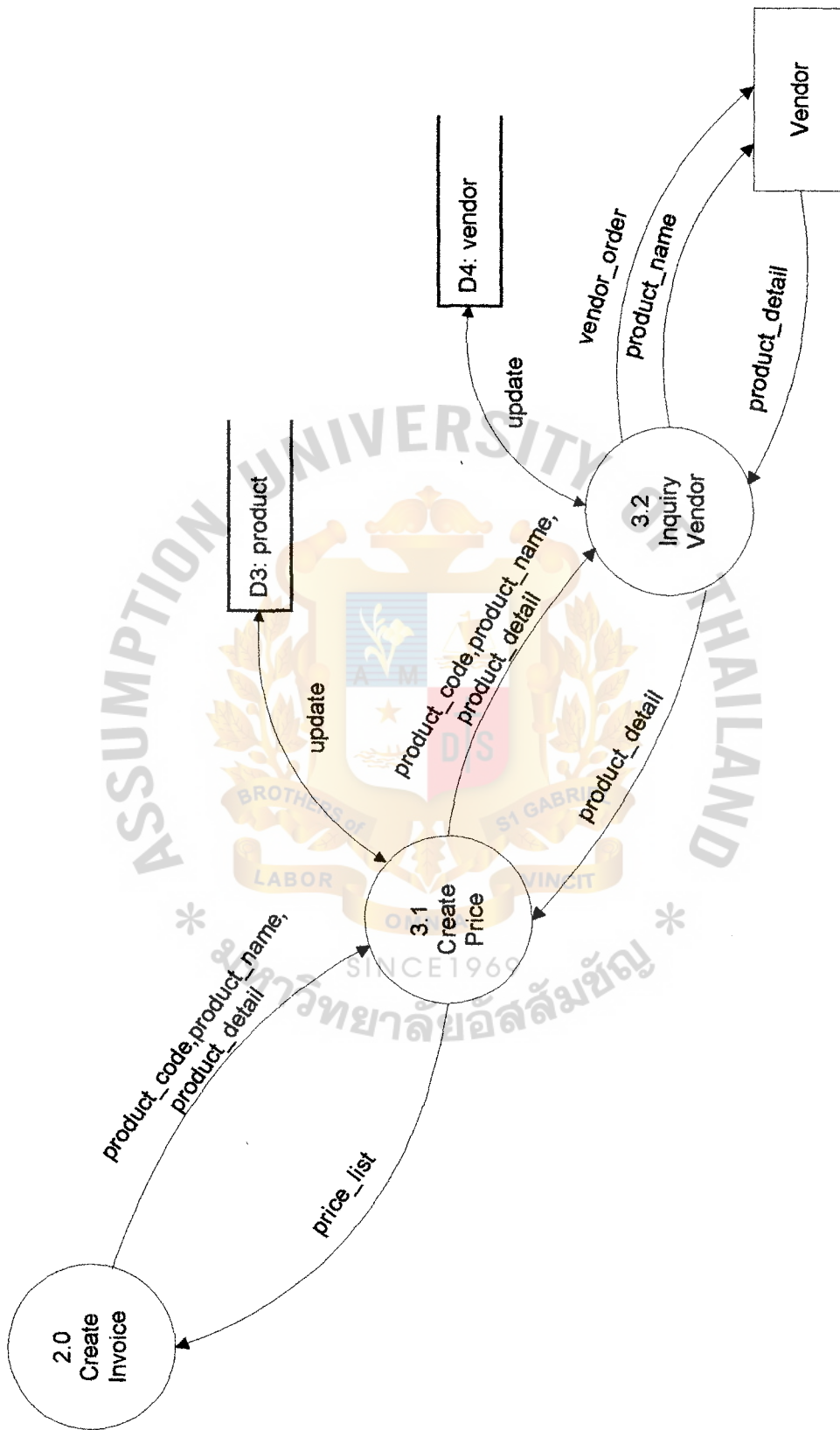


Figure 3.5. Dataflow Diagram Level 1 (3.0 Set Pricing)

### 3.2.3 File Layout

The proposed system stores its database by using Microsoft Access 97. It consists of 3 master files, 4 transaction files and 1 record file. Three master files are mentioned below:

- Customer Master File
- Vendor Master File
- Product Master File

Customer Master File contains customer records that are customer code, customer name, contact name, address, telephone no., fax no., credit term, credit limit, amount owed.

Vendor Master File contains vendor records that are vendor code, vendor name, contact name, address, telephone no., fax no.

Product Master File contains product information that consists of product code, product name, product detail, vendor code, vendor name, unit price, sale price, product on hand, value on hand.

As for transaction file, there are 4 daily transaction files. Besides this, there is one record file that is Vendor Invoice File. Please consider the mentioned files as follows:

-Stock Transaction File contains product code, product name, product detail, vendor name, unit price, sales price and quantity. This file shows the stock available for sales section.

-Customer Order Transaction File contains information of customers and products. This file is designed for sales section when they act as a retailer in front of the store.

-Vendor Order Transaction File contains information of suppliers and products. This file is designed for inventory section in case they order the products from both domestic vendor and foreigner vendor.

-Customer Invoice Transaction File contains information of customers and products. This file is designed for sales section when they act as a wholesaler.

-Vendor Invoice File contains information of vendor and product details that we have purchased from mentioned vendor. The above mentioned file layouts are shown in Appendix C.



### 3.3 Hardware and Software Requirements

#### 3.3.1 Hardware Requirements

The proposed system requires the specification of hardware as follows:

- A) File Server 1 Unit
- POWELL SERVER II 333
  - Harddisk 4.3GB Ultra DMA MODE
  - Intel Pentium II 333 MHz, CD-ROM
  - Keyboard 104 keys
  - POWELL mouse
- B) Workstations 3 Units
- POWELL workstation
  - Intel Pentium II 333 MHz, DVD
  - Harddisk 3.2 GB Ultra DMA MODE
  - Keyboard 104 keys
  - POWELL mouse
- C) Printers 3 Units
- OKI OP4W PLUS
  - 4 SPEED(PPM), 256K BUFFER(MB)
  - PAPER A4, B5, A5, A6, Letter, Executive
- D) LAN accessories
- Hub 8 port 1 Unit
  - LAN Card 16 mbps 4 Cards
  - UTP Cat 5 Cable 40 Metres
  - RJ-15 connector 4 Units

E) UPS

1 Unit

-EGYS-L Line Interactive UPS

### 3.3.2 Software Requirements

A) Network Operating System

-Netware Version 4.1

B) Microsoft Window

-Microsoft Window'95

C) Microsoft Office'97

-Microsoft Access 97

-Microsoft Excel 97

-Microsoft Word 97

-Microsoft Power Point 97

-Microsoft Outlook 97

Figure 3.6 shows hardware configuration of the proposed computerized system



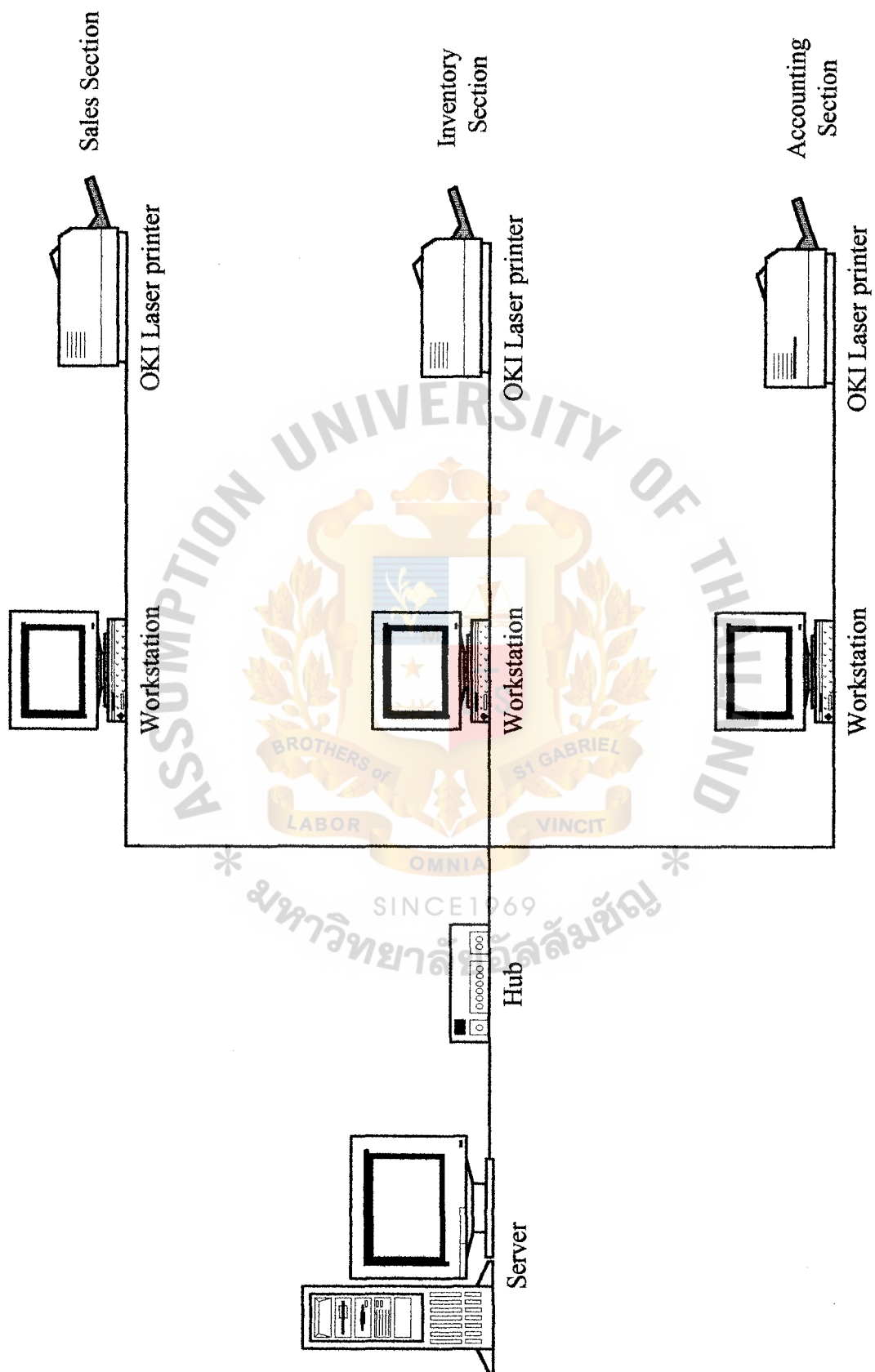


Figure 3.6. Hardware configuration of the proposed computerized system

### 3.4 Cost/Benefit Analysis

#### 3.4.1 Cost Analysis

First, we are going to discuss about cost analysis which consists of **investment cost, implementation cost and annual operating cost**. We should state the cost of the existing system that is the employee costs as follows:

1) Salary of Sales Section

-One supervisor of the section	15,000 Bht/month
- 4 staffs (8,000*4)	32,000 Bht/month
Total	47,000 Bht/month
or	564,000 Bht/year

Salary of Inventory Section

-3 staffs (7,500*3)	22,500 Bht/month
or	270,000 Bht/year

Salary of Accounting Section

-1 staff (9,000)	9,000 Bht/month
or	108,000/year

Salary of General Manager

	20,000 Bht/month
or	240,000 Bht/year

<b>Total employee costs for 10 staffs per month</b>	<b>98,500 Bht/month</b>
<b>or</b>	<b>1,182,000 Baht/year</b>

Now, we are going to discuss the cost analysis of the proposed system as follows:

#### Investment Cost

Investment cost includes hardware cost and software cost as follows:

Hardware Cost Estimate	Unit	Price	Total
POWELL SERVER II 333	1	69,900	69,900
POWELL workstation	3	45,000	135,000
OKI OP4W PLUS printer	3	8,900	26,700
SOCOMECSICON UPS (EGYS-L)	1	3,770	3,770
LAN Accessories	1	14,000	14,000

**Total hardware cost**

**249,370 Bht**

Software Cost Estimate	Unit	Price	Total
Netware Version 4.1	1	30,000	30,000
Microsoft Window 95	1	10,000	10,000
Microsoft Office 97	1	28,000	28,000

**Total software cost**

**68,000 Bht**

Hardware Installation Charge

Consultant Fee *	8,000
Engineer Fee	7,000
Transportation Fee	1,000

**Total charge**

**16,000 Bht**

**Total Investment Cost**

**333,370 Bht**

Implementation Cost

User training and site preparation 20,000 Bht

**Total implement cost**

**20,000 Bht**

### Annual Operation Cost

-Continuous paper	3,000
-A4 paper	4,000
-3.5 Diskette	2,000
-OKI Cartridge	3,000
-Maintenance	20,000

**Total annual operating cost 32,000 Bht**

The formula of annual cost of the proposed system

Annual Cost = Investment Cost + Implementation Cost + Annual Operating Cost  
Estimated System Life Year

$$= \frac{333,370 + 20,000}{5} + 32,000$$

$$= 102,674 \text{ Bht}$$

### **Payback Period**

The payback period is used to judge the profitability of a system. We can calculate it by using the following formula:

$$P = \frac{I}{(1-T) R}$$

where

P = Payback Period

I = Investment Cost

R = Average annual return on investment

T = Corporate tax rate in percentage (30%)

Find the average annual return on investment by

$$\begin{aligned} &= \text{Total saving} - \text{Annual operating cost} \\ &= 282,000 - 102,674 \\ &= \mathbf{179,326 \text{ Bht}} \end{aligned}$$

Reduce 10 staffs to 7 staffs as follows

Sales section reduces 2 staffs (8,000*2)	16,000 Bht
Inventory section reduces 1 staff (7,500*1)	7,500 Bht
Saving for 3 staffs	23,500 Bht
Saving salary per year 23,500 * 12	282,000 Bht

**Total saving 282,000 Bht**

$$\begin{aligned} \text{Payback period} &= \frac{333,370}{(1-0.3) 179,326} \\ &= 2.66 \text{ years} \end{aligned}$$

**Payback period (after taxed) for the proposed system is 2.66 years.**

In addition, we would show the annual cost comparison between the existing system and the proposed system in table 3.1.

#### 3.4.2 Benefit Analysis

After we have applied the proposed computerized system to the company, we can say that the following two benefits are concerned:

1. Tangible benefit:

- Elimination of manual operations.
- Reduction of 2 sales staffs and 1 inventory staff.
- Increased sales due to better responsiveness.
- Faster processing of inventory section.



## 2. Intangible benefit

- Smoothing of operational flow.
- Providing the required document and information with accuracy.
- Providing the customer's satisfaction.
- Improving employee morale.
- Having higher ability in domestic competition.
- Reducing volume of paper produced and handled.

### 3.4.3 Break-Even Analysis

The method of break-even analysis is used to compare the costs of the proposed system and the existing system. At the beginning, the cost of proposed system will be high because of the installation of hardware and software system. But thereafter it is more economical compared to that of the existing system.

Table 3.2 shows a break-even analysis of the existing system whereas a break-even analysis of the proposed system is shown in Table 3.3. From the two tables of break-even analysis, we would use accumulating cost to determine the point at which the proposed system costs the same as that of the existing system. Figure 3.7 shows such a break-even analysis, in which the cost of the proposed system would be higher than that of the existing system. At the estimated year 1.4, the proposed system would have reached the break-even point and thereafter become more economical to operate than the existing system.

Table 3.1. Annual Cost Comparison

	1st Year	2nd Year	3rd Year	4th Year	5th Year	Total
<u>Existing System</u>						
10 staffs (1,182,000 + 10% yearly)	1,182,000	1,300,200	1,430,220	1,573,242	1,730,566.20	7,216,228.20
Utility (25,000 + 10% yearly)	25,000	27,500	30,250	33,275	36,602.50	152,627.50
Other expenses (10,000 + 10% yearly)	10,000	11,000	12,100	13,310	14,641	61,051
Total Existing System	1,217,000	1,338,700	1,472,570	1,619,827	1,781,809.70	7,429,906.70
<u>Proposed System</u>						
7 staffs (900,000 + 10% yearly)	900,000	990,000	1,089,000	1,197,900	1,317,690	5,494,590
Hardware (249,370/5 years)	49,874	49,874	49,874	49,874	49,874	249,370
Software (68,000/5 years)	13,600	13,600	13,600	13,600	13,600	68,000
Hardware Installation Charge (16,000/5 years)	3,200	3,200	3,200	3,200	3,200	16,000
Implementation Cost (20,000/5 years)	4,000	4,000	4,000	4,000	4,000	20,000
Maintenance and Operating Cost	32,000	35,200	38,720	42,592	46,851.20	195,363.20
(32,000 + 10% yearly)						
Utility (40,000 + 10% yearly)	40,000	44,000	48,400	53,240	58,564	244,204
Other expenses (10,000 + 10% yearly)	10,000	11,000	12,100	13,310	14,641	61,051
Total Proposed System	1,052,674	1,150,874	1,258,894	1,377,716.00	1,508,420.20	6,348,578.20

Table 3.2. Break-Even Analysis

	1st Year	2nd Year	3rd Year	4th Year	5th Year
<u>Existing System</u>					
10 staffs (1,182,000 + 10% yearly)	1,182,000	1,300,200	1,430,220	1,573,242	1,730,566.20
Utility (25,000 + 10% yearly)	25,000	27,500	30,250	33,275	36,602.50
Other expenses (10,000 + 10% yearly)	10,000	11,000	12,100	13,310	14,641
Total Existing System	1,217,000	1,338,700	1,472,570	1,619,827	1,781,809.70
Accumulating Cost	1,217,000	2,555,700	4,028,270	5,648,097	7,429,906.70

Table 3.3. Break-Even Analysis

	1st Year	2nd Year	3rd Year	4th Year	5th Year
<u>Proposed System</u>					
7 staffs (900,000 + 10% yearly)	900,000	990,000	1,089,000	1,197,900	1,317,690
Hardware (249,370/5 years)	249,370	-	-	-	-
Software (68,000/5 years)	68,000	-	-	-	-
Hardware Installation Charge (16,000/5 years)	16,000	-	-	-	-
Implementation Cost (20,000/5 years)	20,000	-	-	-	-
Maintenance and Operating Cost (32,000 + 10% yearly)	32,000	35,200	38,720	42,592	46,851.20
Utility (40,000 + 10% yearly)	40,000	44,000	48,400	53,240	58,564
Other expenses (10,000 + 10% yearly)	10,000	11,000	12,100	13,310	14,641
Total Proposed System	1,335,370.00	1,080,200	1,188,220	1,307,042	1,437,746.20
Accumulating Cost	1,335,370.00	2,415,570.00	3,603,790.00	4,910,832.00	6,348,578.20



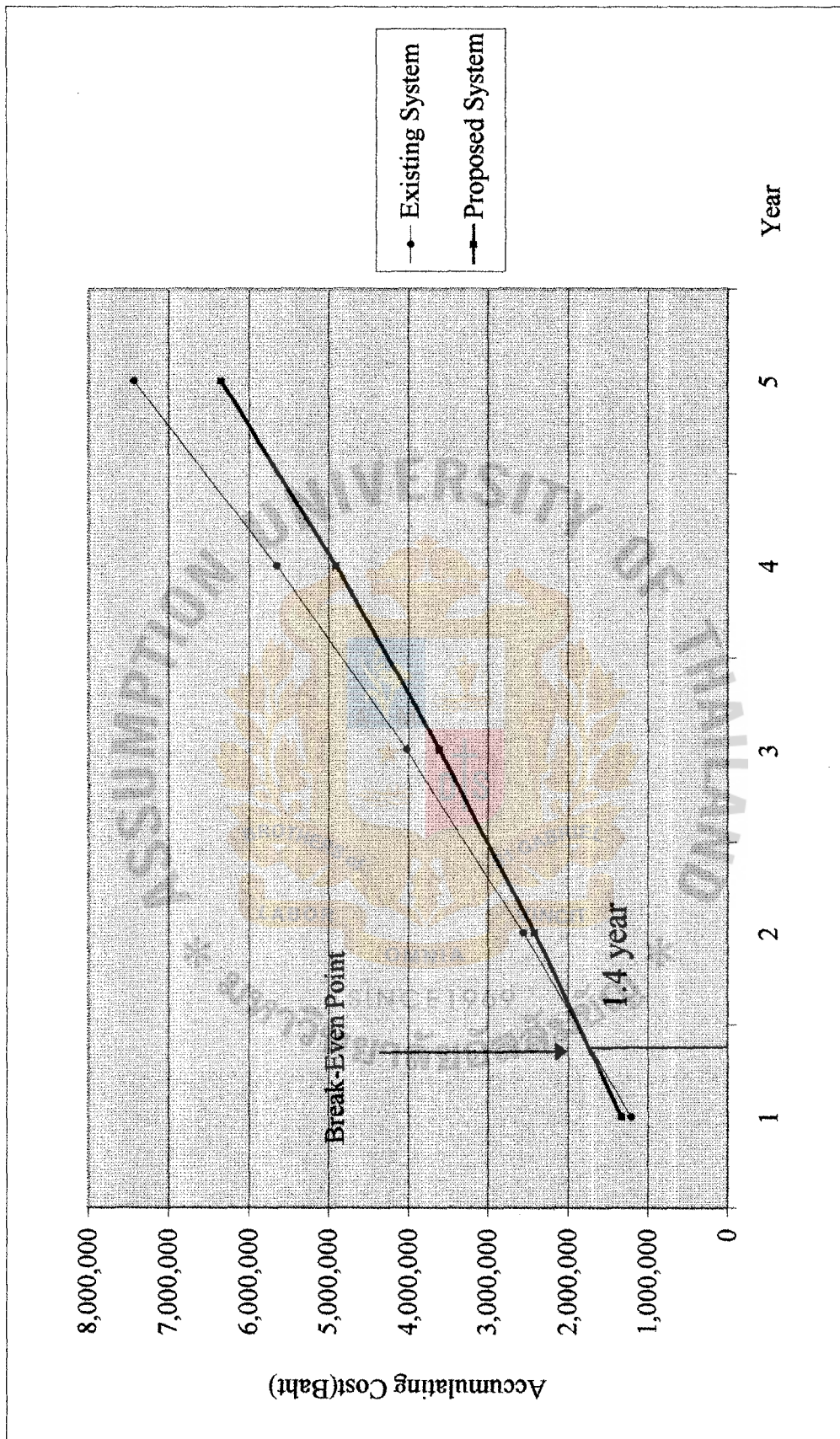


Figure 3.7. Break-Even Analysis Between the existing system VS the proposed system

### 3.5 Security and Control

Security and Control of the proposed computerized system is very important for the company. The following matters should be stated:

- Database control : Database of the inventory system is a critical matter. The users must have well prepared database for end user. The identical staff is specified to update and edit the information. An unauthorized person is prohibited to do the same function.
- Program Security : The information or data that is updated in each daily activity must have a duplicated copy in the secondary storage such as a diskette. The said diskette should also be kept in a safe place.
- Machine Security : The hardware and the printer should be checked periodically so that we can avoid any environmental hazard e.g moisture, fire.
- Function Control : The staffs must be trained to use the program and to do specific function e.g updating inventory and setting pricing.



## **IV. PROJECT IMPLEMENTATION**

A fundamental expectation of the company is that the staffs are ready to use the new computerized system. However, at the first implementation, the staffs or users must operate parallel functions on old the manual system and the new computerized system. In order for the staffs to be familiar with the new system, the following project implementation should be considered:

### **4.1 Programming**

The new computerized system uses Microsoft Access. This program is based on data collection. Therefore, we should study the database of the area under study (inventory section) and normalize it into understandable database.

### **4.2 Testing**

This stage of implementation involves testing the above program (Microsoft Access). Testing whether the prepared database is workable by full system test, individual program testing and backup and restart testing.

### **4.3 Installing**

At this stage, the computerized system has been fully installed for ready use. Therefore, the site preparation should be in a good environment. The link of each workstation should easily communicate with the space requirements.

### **4.4 Training**

This training stage is also an important implementation. The users must be trained to use the application program. They must understand how to use the program effectively. The company would give the opportunity to the staffs to study the program at a Computer School such as ECC, Siam Computer.

#### **4.5 Documentation**

Documentation of the proposed system is separated into 2 types of documents. The first one is the user-guide to operate the program (Microsoft Access User's Manual) and the second one is a data dictionary of the data flow of the system. The staffs should have a fundamental knowledge about the new system. Those user's manual and data dictionary can help the staffs when they have any problem with the program or need information.

#### **4.6 Result of Implementation**

At the first period, the staffs have many problems in using the application since they have not yet been familiar with the new system. Problems occur in both hardware and software system. However, when the staffs have been trained to know how the mistake occurred, they are satisfied with the result and they are happy to work with the new computerized system. We can say that we succeed in moving ahead in future expansion.

## **V. CONCLUSION AND RECOMMENDATION**

### **5.1 Conclusion**

The inventory control system of Thai Audio Co., Ltd. is the area under study and to be improved in order to meet the customer's need. Since the inventory section has controlled all goods in stock and in the past it caused so many problems to the company such as inaccurate information of stock available and redundant reports, it should be the initial section for improvement.

The study of the project firstly concerns the existing problem and then we try to solve the problem by designing a logical data flow of inventory section. This will help the staffs to know their duties and functions. The new proposed system is conducted by using the computer system instead of the manual system. After, we have calculated the cost of the proposed system and the existing system, we concluded that the proposed system would result in better performance even though in the first period the cost of the investment is higher than that of the existing one.

We can conclude that the proposed system gives better performance. We find that the customers are satisfied with the company's service in many areas such as rapid time response and accuracy in good's information. And, we hope that we can meet the competitor and can expand into future business activities.

## 5.2 Recommendation

After improving the inventory control system, in the near future, Thai Audio Co., Ltd. has a plan to improve the overall organization such as the sales section and the accounting section. The study of the proposed system of the inventory system shows that the staff's knowledge in using the application program is very important. Efficient work must be accompanied with efficient staffs. In the near future, the accounting section is the second system that the company would be concerned with in developing and improving

Moreover, the company would need a new technology to accommodate the company's performance. The Internet is the new technology that the management level is interested in. The company may use the internet to contact with the customer and vendor for business transaction. In addition, the company would bring a bar code to identify a particular product. And, it would improve the method of calculating a unit price and sales price. The company would use a percentage formula to calculate the difference between a unit price and sale price. A certain percentage of a well-known product is 100% profitability from a unit price whereas a general product is 50% profitability from a unit price. For example, BUZZER is a well-known product, its unit price is 20 Baht so sale price would be 40 Baht.

Thai Audio Co., Ltd. hopes to be successful in developing its business and the company is ready to meet competition in any way.





## DATA DICTIONARY OF THE PROPOSED SYSTEM

Customer	DATA STORE : D1
cust-order	*customer order form*
	customer code + customer name + date + address + telephone + fax + product code + product name + product detail + quantity + sale price + total
customer code	{legal character}
customer name	{legal character}
date	{legal character}
address	house number + road + district + province + postcode
telephone	{numeric digit}
fax	{numeric digit}
product code	{legal character}
product name	{legal character}
product detail	{legal character}
quantity	{numeric digit}
sale price	{numeric digit}
total	{numeric digit}
customer_record	customer code + customer name + contact name + address + telephone + fax + credit term + credit limit+ amount owned
customer_detail	*the initial checking of customer status whether it is new customer or old customer
valid_order	*to accept the customer's order*
Invoice	DATA STORE : D2
invoices	*the document that used to collect money from the customer and send goods to customer

customer_invoice	<p>*invoice that we send to customer*</p> <p>invoice number + delivery date + customer code + customer name + contact name + address + telephone + fax + payment method + credit term + amount owned + product code + product name + product detail + quantity + sale price + total</p>
invoice number	{numeric digit}
delivery date	{legal character}
contact name	courtesy title + first name + last-name
payment method	*the method that customer pays to company either cash or cheque*
credit term	{legal character}
credit limit	*the amount of credit that offered to customer*
amount owned	*the amount of money that customer owed to company*
vendor_invoice	<p>*invoice that company receives from vendor or supplier*</p> <p>invoice number + date + vendor code + vendor name + address + telephone + fax + received date + product code + product name + product detail + unit price + quantity + total</p>
vendor name	{legal character}
vendor code	{legal character}
received date	*date of receiving invoice from vendor*
unit price	*vendor price per unit in baht*
payment slip	*document that used to be the evidence of payment*
customer payment slip	*the slip that shows payment of customer to company*
vendor payment slip	*the slip that shows payment of company to vendor*

Product	DATA STORE : D3
product	*goods in inventory system for sale* product code + product name + product detail + vendor code + vendor name + unit price + sale price + product on hand + value on hand
product on hand	*total quantity of product in inventory system*
value on hand	quantity of product on hand + sale price
price list	*list of price for sale* product code + product name + product detail + sale price
stock	*goods for sale* product code + product name + product detail + vendor name + quantity + unit price + sale price
stk_avail	*the available goods in stock for sales*
Vendor	DATA STORE : D4
vendor	*the other company who supplies goods for company* vendor code + vendor name + contact name + address + telephone + fax
vendor_order	*the order that company sends to vendor or supplier* vendor code + vendor name + purchase date + purchase order number + delivery number + product code + product name + product detail + unit price + quantity + total
purchase date	{legal character}
purchase order number	{numeric digit}
delivery number	{numeric digit}
legal character	[ A-Z  a-z   0-9   ,   .   /   -   ]
numeric digit	[ 0   1   2   3   4   5   6   7   8   9 ]



## APPENDIX B

### A Process Specification

## PROCESS SPECIFICATION

### Process 1.0 Get Order

```
BEGIN
    ACCEPT    cust_order
    CHECK     cutomer status
END
```

### Process 1.1 Check Customer Status

```
BEGIN
FIND customer_detail from Customer Master File
IF    customer record is not found
    DISPLAY "RECORD NOT FOUND"
    UPDATE new customer_record to Customer Mater File
ELSE
    DISPLAY "VALID_ORDER"
ENDIF
END
```

### Process 2.0 Create Invoice

```
BEGIN
    ACCEPT    valid_order
    CREATE     customer_invoice to Salesclerk
```

```

        GET          vendor_invoice from vendor
        PROVIDE      vendor_invoice and customer_invoice to Accounting
        REVIEW       product on hand
        UPDATE       vendor_invoice and customer_invoice to Invoice File
END

```

#### Process 2.1 Process Customer Invoice

```

BEGIN
ACCEPT    valid_order from process 1.1
REVIEW    customer_order
INFORM    information of product_code, product_name and product_detail to
           process 2.3
        IF    product is available in Stock THEN
           inform salesclerk of stk_avail
        ENDIF
        IF    issue customer_invoice to salesclerk THEN
           update customer_invoice to Invoice File
           *   inform customer_invoice to Accounting
        ENDIF
END

```

#### Process 2.2 Process Vendor Invoice

```

BEGIN
        ACCEPT      vendor_invoice from vendor
        UPDATE      vendor_invoice to Invoice File
        PROVIDE      vendor_invoice to Accounting
END

```



### Process 2.3 Process Product on Hand

```
BEGIN
GET      information of product_code, product_name and product_detail
         from process 2.2
REVIEW   product information + sale price
INFORM   required product information to process 4.0
         IF      product on hand is available THEN
             provide stk_avail to process 2.1
         ENDIF
END
```

### Process 3.0 Set Pricing

```
BEGIN
PERFORM  vendor_order
UPDATE   vendor information
REVIEW   product_code, product_name, product_detail
SET      new price list for product
UPDATE   product information + sale price to Product Master File
END
```

### Process 3.1 Create Price

```
BEGIN
  ACCEPT    product_deatil from process 3.2
    DO WHILE  create price for particular product_code, product_name,
              product_detail
              update product information to Product Master File
    ENDDO
    issue price_list to process 2.3
END
```

### Process 3.2 Inquiry Vendor

```
BEGIN
  RECEIVE    product_code, product_name and product_detail from
              process 3.1
  PERFORM    vendor_order
  INFORM     product_detail to process 3.1
  UPDATE     information of vendor to Vendor Master File
END
```

### Process 4.0 Update Inventory

```
BEGIN
  DISPLAY    product on hand to process 2.3
  UPDATE     product quantity on hand to Product Master File
END
```



## APPENDIX C

### File Layout

Microsoft Access - [Customer : Table]

Field Name	Number	Description
Customer Code	Number	Customer Identification
Customer Name	Text	Customer Name
Contact Name	Text	Contact ame
Address	Text	Customer Address
Telephone	Text	Phone Number
Fax	Text	Fax Number
Credit Term	Text	Term offered to customer for payment
Credit Limit	Text	Maximum credit allowed to customer

Field Properties

General	Lookup
Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

The field is set to be indexed. If you select the Index property, the field will be indexed in the database. You can select the Index property from the Field Properties window.

Design View

Microsoft Access - [Customer : Table]

Figure C.1. Customer Master File



Microsoft Access - [Vendor : Table]

Field Name	Field Type	Field Description
Vendor Code	Text	Supplier Identification
Vendor Name	Text	Supplier Name
Contact Name	Text	Contact Name
Address	Text	Address
Telephone	Number	Phone Number
Fax	Number	Fax Number

Field Properties

Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

Design view    Field Size: 50    Field Name: Vendor Code    Field Type: Text    Field Description: Supplier Identification

Microsoft Access - IV...

Figure C.2. Vendor Master File

Microsoft Access - [Product : Table]

Field Name	Data Type	Description
Product Code	Number	Product Identification
Product Name	Text	Product Name
Product Detail	Text	Product Description
Vendor Code	Number	Vendor Identification
Vendor Name	Text	Supplier Name
Unit Price	Text	Price per unit from vendor
Sale price	Text	Price for sale
Product on Hand	Text	Product on hand

Field Properties

General	Lookup
Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

The field description is optional. It helps you describe the field and it also allows you to add notes and comments. To select the field name, press F1 for help on field names.

Microsoft Access - [P...]

Figure C.3. Product Master File



Microsoft Access - [Stock - Table]

Product Code	Text	Product Identification
Product Name	Text	Product Name
Product Detail	Text	Product Description
Vendor Name	Text	Supplier Name
Unit Price	Number	Price per unit as sold by supplier
Sale Price	Number	Price per unit that sell to customer
Product on Hand	Number	Quantity of product in stock

Field Properties

Field Name	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	0
Validation Rule	
Validation Text	
Indexed	No
Required	No

Microsoft Access - [5]

Figure C.4. Stock Transaction File

Microsoft Access - [Customer order : Table]

Field Name	Field Type	Description
Customer Code	Number	Customer Identification
Customer Name	Text	Customer Name
Date	Date/Time	Date
Address	Text	Customer's address
Telephone	Text	Phone no.
Fax	Text	Fax no.
Product Code	Number	Product Identification
Product Name	Text	Product Name

Design View

Field Name: 50

Field Type: Text

Field Size: 255

Field Properties:

- Indexed: No
- Required: No
- Allow Zero Values: No
- Input Mask: (None)
- Validation Rule: (None)
- Validation Text: (None)
- Default Value: (None)
- Lookup Properties: (None)

Microsoft Access - [Customer order : Table]

Figure C.5. Customer Order Transaction File



Microsoft Access - [Vendor Order : Table]

Vendor Code	Text	Supplier Identification
Purchase Date	Date/Time	Purchase Date
Vendor Name	Text	Supplier Name
Purchase Order Number	Number	No. of purchase order per day
Delivery Number	Number	No. of delivery per day
Product Code	Text	Product Identification
Product Name	Text	Product Name
Product Detail	Text	Product detail

Field Properties

Field Name	Field Type	Field Properties
Vendor Code	Text	
Purchase Date	Date/Time	
Vendor Name	Text	
Purchase Order Number	Number	
Delivery Number	Number	
Product Code	Text	
Product Name	Text	
Product Detail	Text	
Required	No	
Allow Zero Length	No	
Indexed	No	

Microsoft Access - IV...

Figure C.6. Vendor Order Transaction File





Microsoft Access - [Vendor Invoice - Table]

Invoice Number	Number	Invoice number
Date	Date/Time	Date/Month/Year
Vendor Code	Number	Vendor Identification
Vendor Name	Text	Vendor Name
Address	Text	Address
Telephone	Number	Phone No.
Fax	Number	Fax No.
Received Date	Date/Time	Date/Month/Year

Field Properties

Field Name	Field Type	Field Properties
Invoice Number	Number	
Date	Date/Time	
Vendor Code	Number	
Vendor Name	Text	
Address	Text	
Telephone	Number	
Fax	Number	
Received Date	Date/Time	

Microsoft Access - IV

Figure C.8. Vendor Invoice File





## **APPENDIX D**

### **Input/Output Design and Reports**

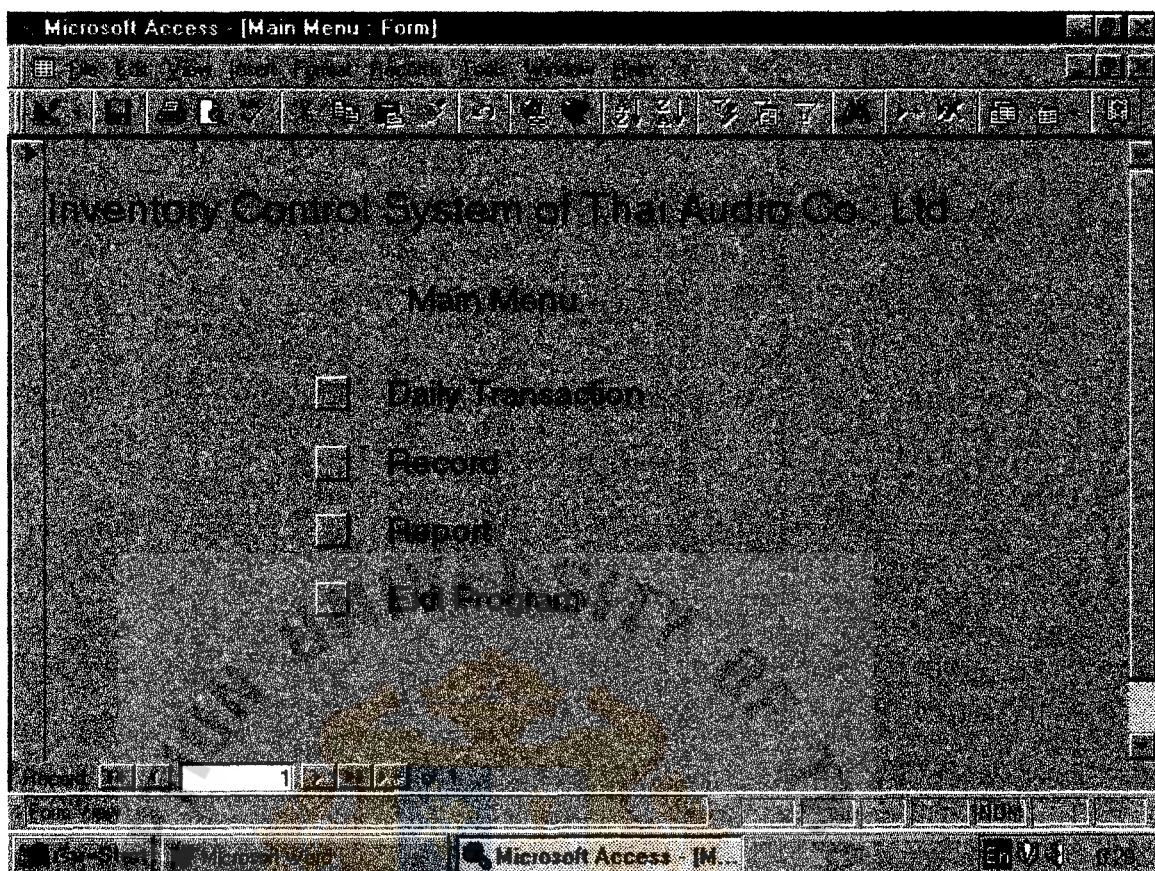


Figure D.1. Main Menu of Inventory Control system



Microsoft Access - [Daily Transaction : Form]

Thel Audio Co., Ltd.

Daily Transaction

- ☐ Stock
- ☐ Customer Order
- ☐ Vendor Order
- ☐ Customer Invoice
- ☐ Exit to Main Menu

Record: 1

Form View

Microsoft Access - [D...]

Figure D.2. Daily Transaction Menu



Microsoft Access - [Stock1]

Thai Audio Co., Ltd.

Stock

Product Code	10	Vendor Name	KAO Co.
Product Name	SWITCH		
Product Detail	DIP SWITCH		
Unit Price	24		
Retail Price	34		
Product Quantity	33		

Records: 1 of 3

Microsoft Access - [5...]

Figure D.3. Stock Form



Microsoft Access - [Customer1]

File Edit View Insert Format Window Help

Thai Audio Co., Ltd.

### Customer Order

Customer Code:  Date:

Customer Name:

Address:

Telephone:  Fax:

Product Code	Product Name	Product detail	Quantity	Sale Price	Total
2	BUZZER	BUZZER 12V	2	50	100
3	CONNECTOR	DIN CONNECTOR	1	50	50

Sub Total:   
 VAT (10%)   
 Total:

Record:

Form View

Microsoft Word Microsoft Access - [C... En 1/3

Figure D.4. Customer Order Form



Microsoft Access - [Vendor Order]

File Edit View Format Window Database Tools Help

Thai Audio Co., Ltd.

### Vendor Order

Vendor Code:  Purchase Date:

Vendor Name:  Delivery Number:

Purchase Order No.:  Expected Date:

Product Code	Product Name	Product Detail	Unit Price	Quantity	Total
12	WIRE	WIRE 12M	12	20	240
5	FILTER	FILTER NV	10	30	300

Total Amount:

Product:  CAPS NUM:

Form View

Microsoft Access - [V...]

Figure D.5. Vendor Order Form





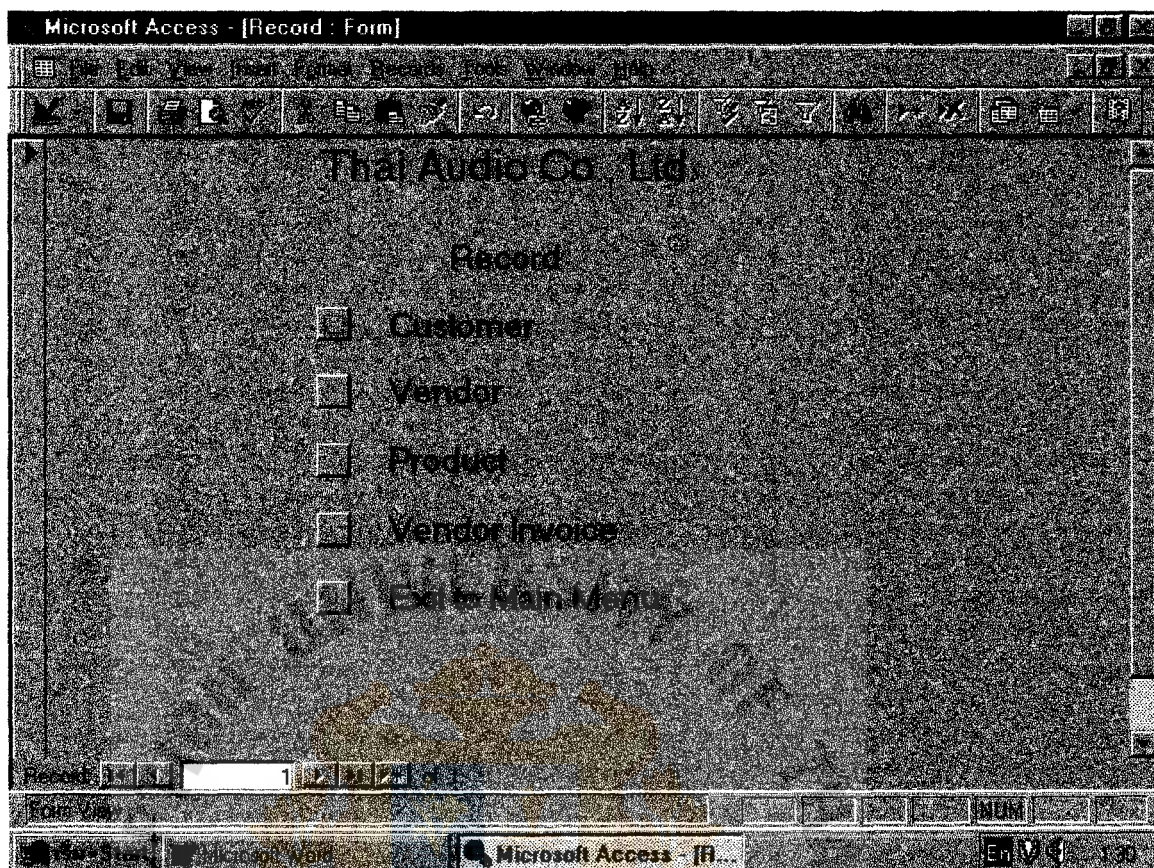


Figure D.7. Record Menu



Microsoft Access - [Customer2]

Thai Audio Co., Ltd.

Customer

Customer Code	8	Contact Name	Khun Ann
Customer Name	R & D Audio Co., Ltd.		
Address	212/4 Sukhumvit 63 Ekamai, Bkk 10110		
Fax	392-9657	Telephone	714-9765
Credit Term	30 days		
Credit Limit	20000		
Amount Owed	0		

Records: 1 | 5 | 8 | 10

Amount in arrears owed to the company

Microsoft Access - [Customer2]

Figure D.8. Customer Record Form



Microsoft Access - [Vendor : Form]

Thai Audio Co., Ltd

Vendor

Vendor Code: 1

Vendor Name: Chitawa Co., Ltd. Contact Name: Mr. Chubuki

Address: 23 Chukuku Tokyo Japan

Telephone: 1939488

Fax: 1920933

Record: 1

Form View

Microsoft Access - IV...

Figure D.9. Vendor Record Form



Microsoft Access - [Product : Form]

Thai Apple Co., Ltd

Product

Product Code	1	Vendor Code	2
Product Name	BATTERY	Vendor Name	Kawasaki CO.
Product Detail	BATTERY GP60BVK 3.6V		
Unit Price	100	Quantity	200
Production Date	4	Value Added	800

Microsoft Access - IP

Figure D.10. Product Record Form



Microsoft Access - [Vendor Invoice : Form]

Thai Audio Co., Ltd.

Vendor Invoice

Invoice no.	20	Date	21/2/99
Vendor Code	4	Vendor Name	KAO Co.
Address	847 Tong New Road, Taiwan		
Telephone	9487492	Fax	3788464
Received Date	22/2/99	Product Code	1.1.0
Product Name	BOTTOM BATTERY	Product Detail	BATTERY CR 1216
Unit Price	35	Quantity	10
Total	350		

Record: 1

Microsoft Access - IV

Figure D.11. Vendor Invoice Form



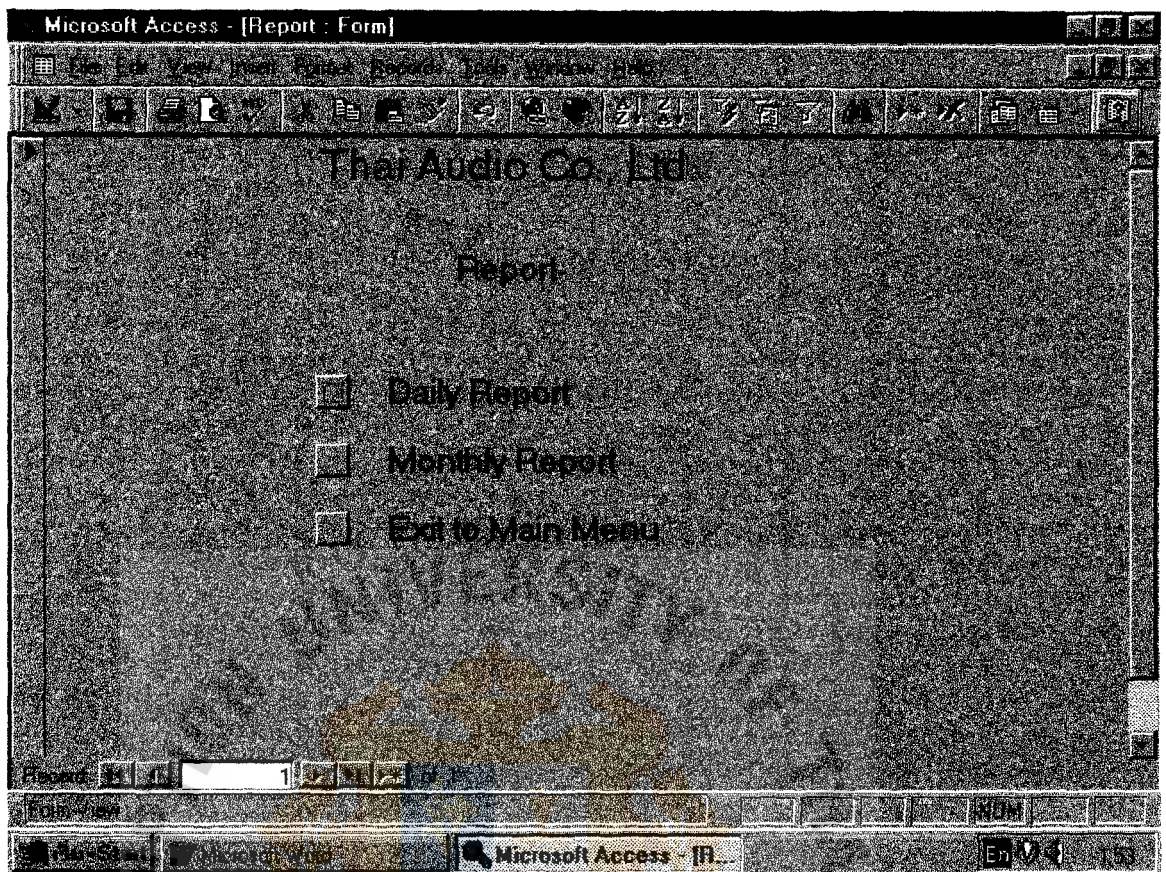


Figure D.12. Report Menu



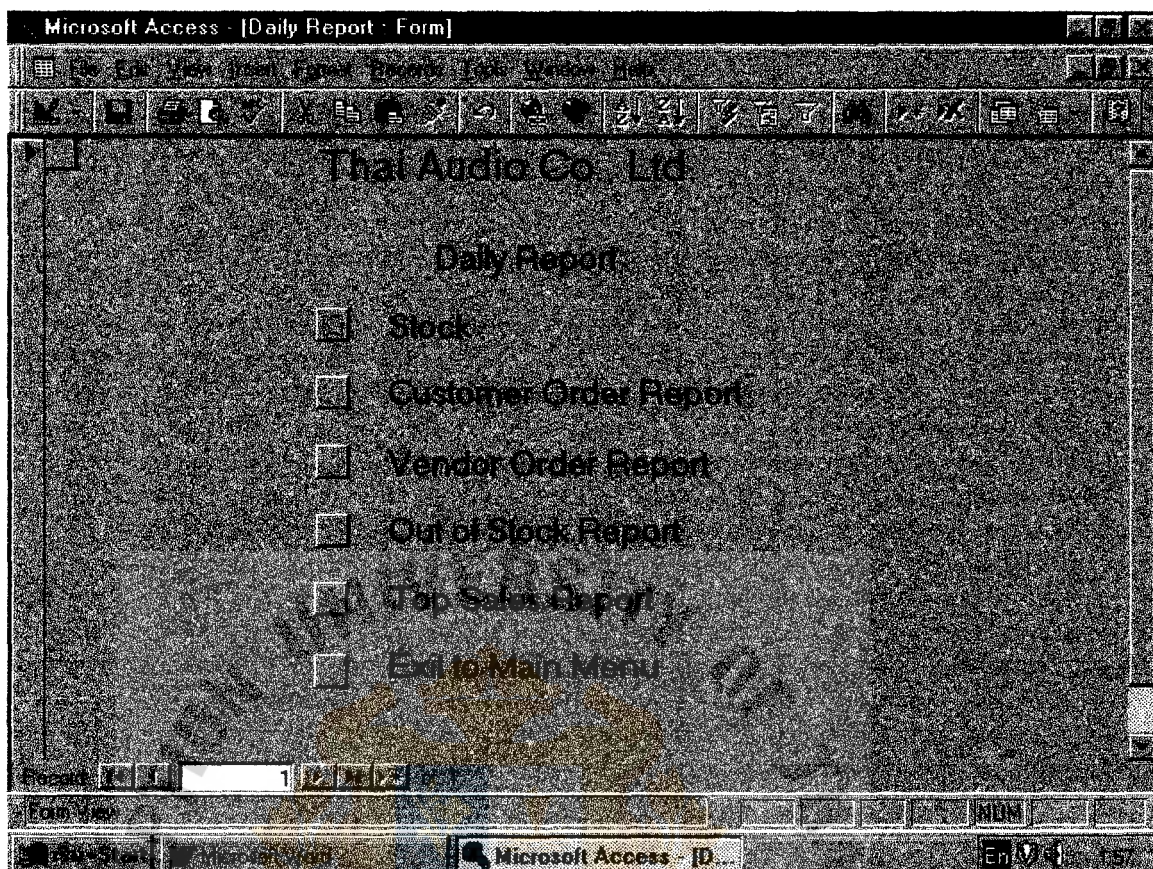


Figure D.13. Daily Report Menu

Table D.14. Stock Daily Report

Stock Daily Report					
Product Code	Product Name	Product Detail	Vendor Name	Unit Price	Sale Price    Quantity
1	BATTERY	BATTERY GPO60BVK 3 6	Kawasaki Co.	20	30    56
1	BATTERY	BATTERY GPO60BVK 3 6	Chitawa Co.	45	50    10
1.1.0	BOTTON BATTERY	BATTERY CR 1216	KAO Co.	50	60    67
1.1.1	BOTTON BATTERY	BATTERY CR 1220	Kawasaki Co.	40	50    50
1.1.1	BOTTON BATTERY	BATTERY CR 1220	KAO Co.	45	55    43
2	BUZZER	BUZZER 12V	Kawasaki Co.	45	50    10
2.1	BUZZER	BUZZER 01 Db	Kawasaki Co.	10	20    23
2.2	BUZZER	BUZZER BFL 01G	Chitawa Co.	35	40    24
3	CONNECTOR	DIN CONNECTOR	KAO Co.	40	45    40
3	CONNECTOR	DIN CONNECTOR	Chitawa Co.	50	55    22



Table D.15. Customer Order Report

Customer Order Report				
Customer Code	Customer Name	Product Code	Quantity	Total Amount
1	Burapa Audio Co., Ltd.	1.1.0	10	200
1	Burapa Audio Co., Ltd.	1.2.0	30	1,350
1	Burapa Audio Co., Ltd.	2	10	500
3	Far East Co., Ltd.	1.1.0	5	200
7	Mr. Surachai Pichit	2	1	45
5	Mr. Manit Boontien	2	1	45
6	Miss Noi Malaniyom	1	2	20

18/2/99

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Table D.16. Vendor Order Report

Vendor Order Report					
PO Number	Vendor Code	Vendor Name	Product Code	Quantity	Unit Price Total Amount
1	1	Chitawa Co.	1.1.0	9	10 90
2	2	Kawasaki Co.	1.2.1	8	20 160
3	3	Kang International	2.2	10	10 100
3	3	Kang International	3	10	10 100
3	3	Kang International	4	2	10 20
4	6	West Tech Co.	1.2.2	15	30 450
4	6	West Tech Co.	3	2	25 50

Table D.17. Out of Stock Daily Report

Out of Stock Report					
Product Code	Product Name	Product Detail	Vendor Name	Required Stock	Product on Hand Out of Stock
1.1.0	BOTTON BATTERY	BATTERY CR 1216	Kawasaki Co.	30	10
1.2.0	BOTTON BATTERY	BATTERY HOLDER 11-1	Kawasaki Co.	10	5
4	DIAC	DIAC DB3	MEC International	40	30
					10

Table D.18. Top Sales Daily Report

Top Sales Daily Report						
Product Code	Product Name	Product Detail	Vendor Name	Sale Qty	Sale price	Total Income
1	BATTERY	BATTERY GPO60BVK	Chitawa Co.	30	100	3,000
1.1.0	BOTTON BATTERY	BATTERY CR 1216	Kawasaki Co.	29	80	2,160
2	BUZZER	BUZZER 12V	West Tech Co.	28	10	280
2.1	BUZZER	BUZZER 01Db	West Tech Co.	26	30	780
2	BUZZER	BUZZER 12V	Chitawa Co.	20	30	600
4	DIAC	DIAC DB3	West Tech Co.	18	10	180
4	DIAC	DIAC	Chitawa Co.	15	20	300
3	CONNECTOR	DIN CONNECTOR	West Tech Co.	14	10	140
3.1	CONNECTOR	D-SUB CONNECTOR	West Tech Co.	13	60	780
2.1	BUZZER	BUZZER 01Db	Chitawa Co.	10	60	600

1/3/99

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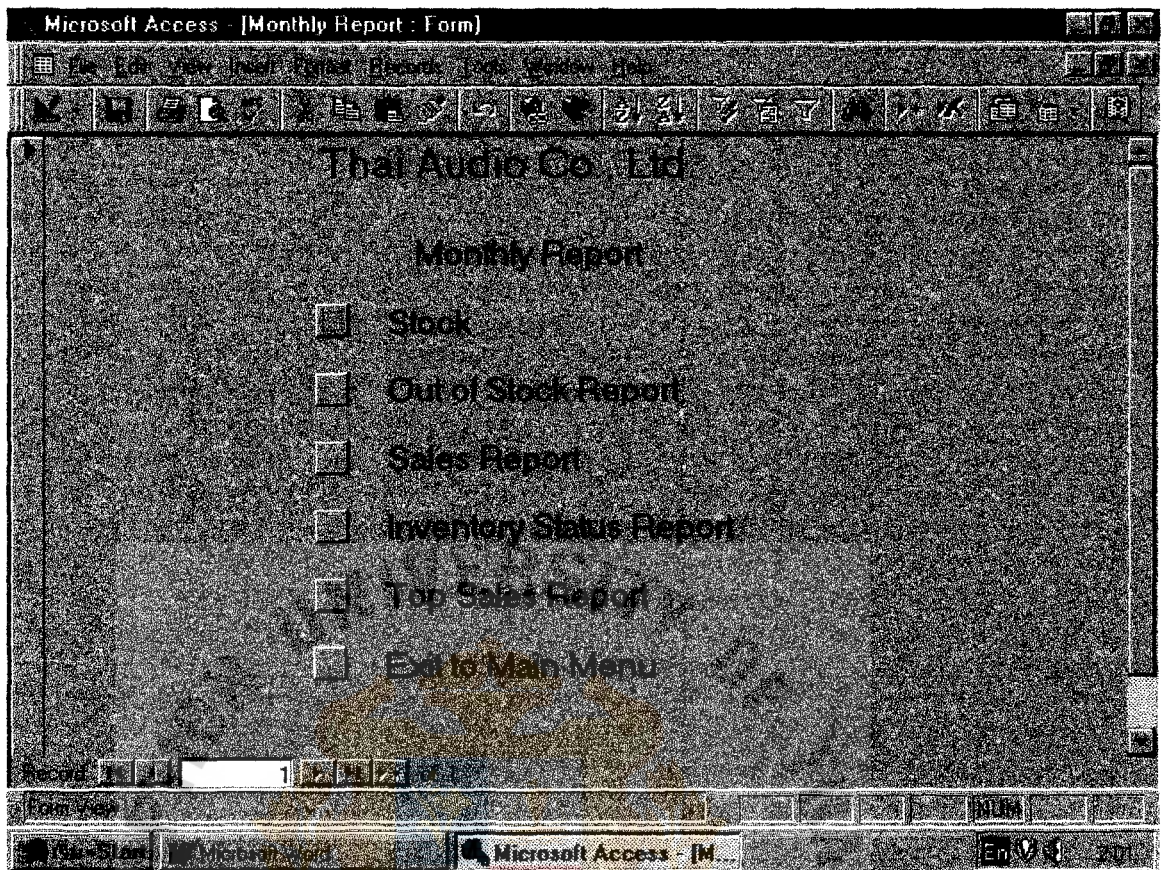


Figure D.19. Monthly Report Menu

Table D.20. Stock Monthly Report

# Stock Report

Product Code	Product Name	Product Detail	Vendor Code	Vendor Name	Unit Price	Sale Price	Product on Hand	Value on Hand
1	BATTERY	BATTERY GPO60BVK	1	Chitawa Co.	20	30	10	300
1	BATTERY	BATTERY GPO60BVK	4	KAO Co.	45	50	10	500
1.1.0	BOTTON BATTERY	BATTERY CR 1216	2	Kawasaki Co.	50	60	20	1200
1.1.1	BOTTON BATTERY	BATTERY CR 1220	2	Kawasaki Co.	40	50	50	2500
1.1.1	BOTTON BATTERY	BATTERY CR 1220	4	KAO Co.	45	55	40	2200
2	BUZZER	BUZZER 12V	1	Chitawa Co.	45	50	10	5000
2.1	BUZZER	BUZZER 01 Db	1	Chitawa Co.	10	20	23	460
2.2	BUZZER	BUZZER BFL 01G	4	KAO Co.	35	40	24	960
3	CONNECTOR	DIN CONNECTOR	2	Kawasaki Co.	40	45	40	1800
3	CONNECTOR	DIN CONNECTOR	4	KAO Co.	50	55	22	1375

28/2/99

Page 1 of 1

Table D.21. Out of Stock Monthly Report

Out of Stock Monthly Report						
Product Code	Product Name	Product Detail	Vendor Name	Required Stock	Product on Hand	Out of Stock Updated
1	BATTERY	BATTERY GPO60	Kawasaki Co.	30	10	20 20/2/99
2	BUZZER	BUZZER 12V	Kawasaki Co.	10	5	5 21/2/99
3	CONNECTOR	DIN-CONNECTOR	MEC International	40	30	10 23/2/99
3.1	CONNECTOR	D-SUB CONNECTOR	KAO Co.	29	20	9 23/2/99
4	DIAC	DIAC DB3	West Tech Co.	30	10	20 28/2/99

1/3/99

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Table D.22. Sales Report

# Sales Report

Product Code	Product Name	Product Detail	Month	Year	Total Income
1	BATTERY	BATTERY GPO60BVK	2	1999	5,900
1.1.0	BOTTOM BATTERY	BATTERY CR 1216	2	1999	10,000
2	BUZZER	BUZZER 12V	2	1999	25,000
2.1	BUZZER	BUZZER 01Db	2	1999	200
2.2	BUZZER	BUZZER BFL 01G	2	1999	350
3	CONNECTOR	DIN CONNECTOR	2	1999	43,089
3.1	CONNECTOR	D-SUB CONNECTOR	2	1999	12,009
4	DIAC	DIAC DB3	2	1999	567
4.1	DIAC	DIAC DB4	2	1999	249

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Table D.23. Inventory Status Report

Inventory Status Report						
Product Code	Product Name	Product Detail	Purchase Qty	Sale Qty	Product on Hand	Value on Hand
1	BATTERY	BATTERY GPO60BVK	100	90	10	200
1.1.0	BOTTON BATTERY	BATTERY CR 1216	80	10	70	210
2	BUZZER	BUZZER 12V	10	-	10	200
2.1	BUZZER	BUZZER 01D6	40	10	30	450
2	BUZZER	BUZZER BFL 01G	30	20	10	150

Table D.24. Top Sales Monthly Report

Top Sales Monthly Report						
Product Code	Product Name	Product Detail	Vendor Name	Sale Qty	Sale price	Total Income Updated
1	BATTERY	BATTERY GPO60BVK	Chitawa Co.	90	100	9,000 31/1/99
1.1.0	BOTTON BATTERY	BATTERY CR 1216	Kawasaki Co.	80	80	6,400 28/2/99
2	BUZZER	BUZZER 12V	West Tech Co.	75	10	750 31/3/99
2.1	BUZZER	BUZZER 01Db	West Tech Co.	70	30	2,100 30/4/99

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