ORDERING INFORMATION SYSTEM FOR FOODS AND BEVERAGES BUSINESS

by

Mr. Kantavee Chaiyasin

A Final Report of the Three-Credit Course
CE 6998 Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer and Engineering Management
Assumption University

November, 2001

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Project Title	Ordering Information System for Foods and Beverages Business
Name	Mr. Kantavee Chaiyasin
Project Advisor	Dr. Ketchayong Skowratananont
Academic Year	November 2001

The Graduate School of Assumption University has approved this final report of the three-credit course CE 6998 PROJECT, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer and Engineering Management.

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ABSTRACT

This project presents the application of IT in order to improve the whole system of the food ordering system for Brew Pavilion pub and restaurant. Since it is a big organization consisting of more than 250 employees most of whom are in the food and beverage department. It can take more than 2500 customers at a time, other than that it also has a big area of exhibition hall. At peak hours with an exhibition hall occupied, this pub and restaurant may have to serve up to 3000 customers at the same time. Hence, it is necessary that such an organization should have a concise and easy to implement system. It must be realized that most of or nearly all of the employees have extremely low skills in IT.

As this pub and restaurant becomes more well - known, it will be faced with increasing numbers of customers. Food ordering system, which is the heart of this business, must be reliable. During peak hours, it is likely that the orders can get mixed up. It is this part that IT should become useful. With its use, the possibility of getting the orders to the right tables should be higher. In other words, the application of IT should at least reduce the numbers of employees and the amount of work individuals must handle.

The proposed system can definitely increase the efficiency and effectiveness of the food and beverage department. At least with this system instead of the manual one, there will be less use of paper and, more importantly, the information will be delivered more accurately. Moreover, the computerized system will aid in storing data and preventing data loss. This new system should reduce most current problems and exceeding lower costs.

ACKNOWLEDGEMENTS

I would like to express my grateful thanks to Assumption Business Administration College Libraries as well as the librarians who have given me advices useful in searching for the information on this topic, without them this research would not have been completed.

I also wish to acknowledge all the researchers who have investigated in the related topics. Much credit should go to my friends and family for their continual support. A special acknowledgement goes to Dr. Ketchayong Skowratananont, my project advisor for his guidelines, expertise, criticisms and suggestions. Most of all I would like to thank my parents for their unfailing supporting.

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SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

TABLE OF CONTENTS

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

LIST OF FIGURES

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

LIST OF TABLES

I. INTRODUCTION

1.1 Background of the Project

Brew Pavilion Microbrewery pub and restaurant is considered to be the biggest brew house in Asia. The ambience is a quarter pub, a quarter restaurant, a quarter beer house and a quarter concert hall, consisting of 2500 seats with nearly 300 employees. There obviously are coordination problems when bookings and orders are handled from one or a few staffs to the others. This project will present the ways in which such problems can be solved. It will present the application of IT to the food ordering system. The main point that will be looked at is the increasing speed of the services.

The menu ranges from Thai, Chinese, Japanese and European, which makes up to more than 400 varieties. In addition not only self-brewed beer is served here, there is also a variety of wine and many other kinds of alcoholic drinks. This tells us that it is extremely difficult for the waiters and waitresses to remember all the drinks and food items. For the service business like this place, the most important thing that must be in everyone's mind is that the customers must be able to obtain the highest level of satisfaction. They will become regular customers only if they do not leave with disappointments. In order to achieve such goal, the organization has to ensure that mistakes should not at all occur. Another point we must look at is that this brew house is such a huge place, it does take a long time for the orders to be handed over from one point to another. Thus time becomes an important issue, the longer the customers have to wait, the more disappointed they become.

1.2 The Objectives of the Project

The objectives of the project are as follows:

(1) To analyze the current problems of the manual system.

(2) To identify the business requirements of the ordering system.

(3) To identify the information system requirements.

(4) To suggest and design computer infonnation system to handle the ordering system at the highest level of effectiveness.

(5) To make the end users aware of the new system.

(6) To increase convenience to the end users.

1.3 The Scope of the Project

This consists of the automation of the following:

(1) Getting rid of the existing problems when using the manual system by designing a computerized system for Brew Pavilion Microbrewery pub and restaurant.

(2) Development of a system, this will keep the organization up to date.

(3) The design of the screen layout for the end users system.

(4) Establishment of the food ordering system in order to give reliable infounation.

(5) The facilitation of the workflow among departments: taking orders, serving, cooking and billing.

(6) To create the systematic reports for all regarding segments, which will help in analyzing problems and making future decisions.

1.4 Deliverables

The deliverables of the new computerized system are as follows:

(1) Reports including daily, weekly, monthly reports, supplier information and customer profiles.

(2) User Interfaces and Screen layouts.

Increase effectiveness in food ordering process.

Reduce energy used by all employees.

Increase effectiveness in decision making by the management team.

Reduce overall costs specifically employees' salary.

1.5 Project Plan

No	Activities	June				July				August				September				October				November			
		1	2	3	4	I	2	3	4	I	2	3	4	I	2	3	4	I	2	3	4	I	2	3	4
.	System Analysis																								
	-Identify existing process & system																								
	-Identify problems																								
	-Documentation or work flows																								
2.	Detailed Analysis and Design																								
	-Gather information about the effective system to find out the candidates					r-																			
	-Analysis and select the candidates																								
	-Develop DFD, Structure chart of the proposed																								
3.	Implementation																								
	Screen Layout																								
	- Report Layout																								
	Programming																								
	Data Conversion																								
	Testing																								
	Documentation Training																								
	Proposed Process and system starts																								

Figure 1.1. Project Plan.

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II. THE EXISTING SYSTEM

2.1 Background of the Organization

Brew Pavilion Microbrewery pub and restaurant is located on one of the busiest areas in Bangkok, it is the area that consists of many types of entertainment places.

On weekdays there are around 2500 to 3000 customers, each person spends about 300 to 600 Bahts on average. On weekends, the number of customers can increase to 5000. Types of customers include students, office workers, families and tourists.

Its purpose is to attract all types of customers and to ensure that most of them will come back and become regular customers. Its marketing team has recently introduced the membership theme, which will bring about higher revenue. It also aims to break even point in two years; that is to earn more than 200 million Bahts within the stated period. Thus, it tries to provide the most satisfactory service along with the best entertainment activities and at reasonable prices in order to be competitive.

Nevertheless, the existing problems of using the manual system are the main point that the company must focus on, since the costs of operating the manual system is too high and too much time is consumed. Hence the management team is considering the computerized system to be applied in to the food ordering system instead of the old system.

The food ordering system consists of 10 sectors as follows:

(1) Waiting staffs:

These people are the first to contact with the customers and must handle the hardest and probably the highest responsibility duties. The most important duty is to take down the right orders and correctly distribute information to the right sectors.

(2) Cashiers:

This is the first point where written orders must be kept in order to print out bills. Waiting staffs must make sure that they do not forget to give any customers' orders to the cashiers. In other words, they must, at all times, hand over correct information to the cashiers because this is the most important part of the process. If the cashiers calculate bills wrongly, customers will, of course be, unsatisfied.

(3) Soft drinks bar:

Waiting staffs will come to this point to drop the orders only when customers order soft drinks and water. As we all know, almost everyone drinks water. And if they drink whisky, they will need to order mixers that are soft drinks. Thus waiting staffs spend a lot of in delivering drink orders to the bar and the cashier.

(4) Beer bar:

It is not surprising if this will be another busy point because most customers may want to try the taste of beer. Since they have picked this Beer house, they might as well try some beers. Hence, waiting staffs will also stop at this point quite often.

(5) Wine bar:

The same process will take place here if the customers order wine. As wine seems to be luxury drinks, it may not be ordered as often as beer. Individuals, however, choose wine for special occasions.

(6) Cocktail bar:

This is another variety that Brew Pavilion offers to its customers especially the ladies. It is common that non-alcoholic drinkers will

pick cocktails as their drinks, thus this point can sometimes be quite busy.

(7) Thai kitchen:

When Thai food is ordered, waiting staffs must first keep one copy at the customers' table and give one copy of the orders to the cashiers. Then another copy must be given to the Thai kitchen section.

(8) Chinese kitchen:

The same process will take place if customers order Chinese food.

(9) Japanese kitchen:

If Japanese food is ordered, orders must be given to this section.

(10) European kitchen:

All European food orders will be given to this kitchen.

As we can see from the above that there are too many sections where waiting staffs must walk to in order to hand over the orders. Keep in mind that this beer house is a massive place, it can take probably an hour for giving out orders to all sections. This is a matter of time resource being wasted as well as human resource. These problems will be looked at in section 2.3.

2.2 Existing Business Function

Brew Pavilion Microbrewery pub and restaurant has been in business for less than a year but it already has a large number of customers. Its current food and ordering system requirements are mainly on a manual basis, meaning that it cannot serve customers at fast pace. The process begins when the customers order food to the waiting staffs who must then distribute this information to all other departments. These include cashiers, bars and kitchens as mentioned before that there are more than one bar and many kinds of food. The last process will be the calculation of bills, cashiers at this point must check that the bills they are given are the same as the bills, which are

left at the customers' table. We will see later that all individuals involved are faced with difficulties when inaccuracy of bills occurs. If they happen to make any mistake, this can bring about customers' disappointments. Not only this can be a problem, cashiers may sometimes calculate bills wrongly due to repetitions of work. Hence, this project will focus on the major problems of the existing business function, which can be solved by applying IT to the system.

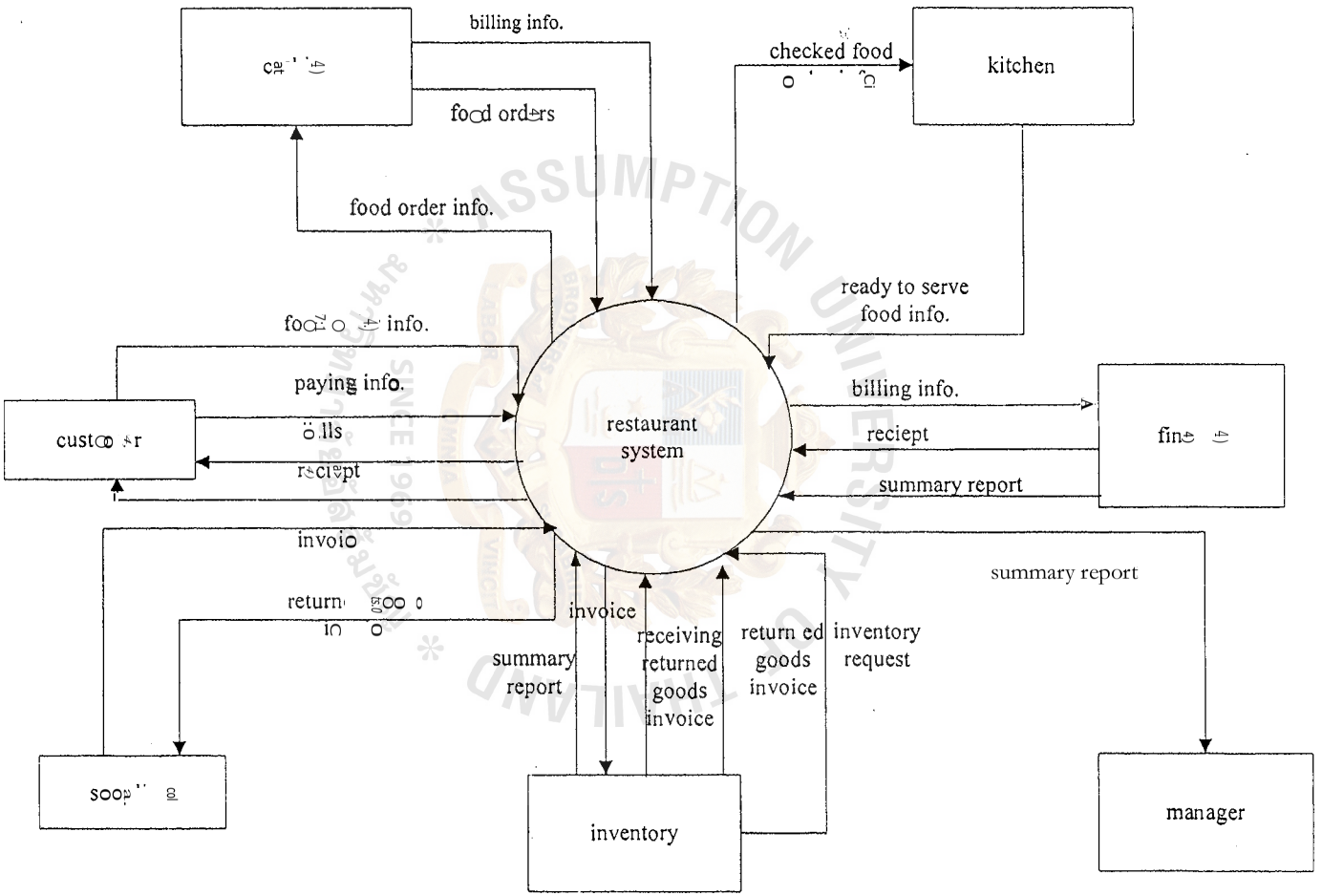

Fig. 1. Context Diagram of the Existing System.

2.3 Current Problems and Areas for Improvement

2.3.1 Current Problems

The existing manual system

(1) Inaccurate information

As we know that in catering business, we must be service minded. That is customers should be served promptly and at the fast pace. The most common problem that we often observe is that waiting staffs cannot deliver the orders correctly all the time. This usually causes frustration and dissatisfaction, meaning that customers may not want to use the service again.

(2) Time consumption

It is obvious that it will take quite a long time for a waiting staff to deliver the order from one end of the restaurant to the other section. The plan of this restaurant may not be shown here but we can imagine how big this place is when we think of how it can fit so many people at one time. First, the order must be sent to the cashiers, then to the other sections relatively. Second, drinks must be served, then food will follow. Third, there usually are additional orders implying that the same process must be repeated. Fourthly, the waiting staffs must take one copy of the bills to the cashiers and must wait until the calculated bill is ready to be given to the customers. Finally, they must bring this bill with the given money to the cashiers and again wait for the change then take back to the customers. These may seem to be a simple process but we can imagine how long it may take and we are only looking at one order at a time here.

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(3) Document problems

In order to obtain the records of each day, individuals may have to spend probably a whole day to do such things. If we are looking at weekly of monthly information we may find that it takes too long to do so or too many staffs will be needed. The main problems of not keeping data systematically are the loss as well as inaccuracy of data. Such problems usually lead to difficulties in closing the accounts.

(4) Exceeding expenses

Let us imagine the amount of paper used and the numbers of staffs running around each day. Then think about how much this organization must pay to the employees each month. Not only the expenses will keep rising, too many resources will also be wasted.

(5) Management problems

The management team will find it extremely difficult to obtain summary reports. It may be due to the incorrect information, making it hard for them to forecast or predict future sales and annual budgets.

2.3.2 Areas for Improvement

If we apply IT to the food and ordering system, we will find that all of the mentioned problems will be solved. Some minute mistakes may still occur but at least the majority of these problems will disappear. The whole service will as well reach higher standard since it will be faster and less mistakes will occur. Customers will gain higher satisfaction, thus, the number of regular customers will keep rising. More importantly, the management team will be able to make better decisions when they can obtain more accurate information.

III. THE PROPOSED SYSTEM

The proposed of the new system is mainly to solve the problems over two areas:

(1) Operational level

(a) Number of errors will decrease.

(b) The amount of workload on each staff will be reduced.

(c) The reduction of time consumption.

(2) Management level

(a) More accurate infoiniation will be produced.

(b) Better decisions will be made.

(c) Higher performance in forecasting future sales and annual budgets.

3.1 User Requirements

In order to develop the system, we need to know the user requirements as a source of the project. We found these by interviewing the waiting staffs and cashiers as well as discussing with the management team. By doing that we then keep records of all the things that they expect this proposed system will serve them. It was found that all of the staffs both at the shop floor level and the management level need the proposed system to increase the speed of the overall services. These include better records of orders, bills and various types of reports both formal and informal. In addition, the owners expect the new system to be an important instrument in bringing success to their business.

The user requirements can be summarized as follows:

(1) Presents information and instructions in an acceptable and effective fashion.

(2) Produces accurate results.

(3) Performs the right procedures properly.

(4) Provides user-friendly interface and method of interaction.

The proposed system should be capable to perform the followings:

(1) Reduce working processes existing in the current system.

(2) Reduce error of working processes.

(3) Reduce the redundancy of the kept data.

(4) Reduce time and unnecessary expenses.

(5) Generate right reports upon the right request.

(6) Provide necessary data to analyze the management report.

3.2 System Design

In this section, the new purposed system is designed with an objective to solve the current problems of the existing system and to meet all user requirements that will be focused on the logical, implementation — independent aspects of a system. It is the evaluation of alternative solutions, which will be our solution.

3.2.1 Candidate Solutions

We should define candidate solutions from our user requirement, not only in hardware but also in software specification or any other related things that must be concerned. Also we should collect any necessary data related in finding the solution, such as interview the experts, gather information to find alternative solution and research technical specification that details the characteristic of each candidate solution. There are many aspects to consider the candidates, all of which are portions of computerized system, software tool requirement, benefits, server and workstation, method of data processing, hardware devices in output, input, and also storage devices. These three alternative candidate solutions are as follows:

(1) Candidate Solution 1

This first solution, the applications will be developed by Microsoft Access 8.0 that allows developers to build — in report function

for any user to design database and display at his/her requirement. It will be connected to the Microsoft Access, which is not the same as average RDBMS and consists not only of the basic data, but also of related items we use to work with the data.

(2) Candidate Solution 2

The second solution, the applications will be developed by' Power Builder 7.0 the software tool that allows developers to build application and use Microsoft SQL server version 7 as database manager which is accessible in native mode and support RDBMS system. This system support user requirements and business processes with easy maintenance and modification. The server will operate on Microsoft NT Server Edition, and the clients on Microsoft Windows 98. The system will be constructed under the multi - user client - server architecture. And it also allows to design and develop the applications in the most efficient and comfortable method, together with Microsoft Office 2000 — the most popular desktop application for generating report. With our own design user interface, we could reduce the complexity of controlling Database Management System. Database Engine enables Power Builder to access the different database platforms.

(3) Candidate Solution 3

The last solution, the applications will be developed by Microsoft Visual Fox Pro 6.0. It is appropriate for building the multi — tier application and 32- bit database application. The database is connected through Jet Database Engine 3.5. The platform is Microsoft Windows NT 4.0. The client's Operating system is Windows 98.

3.2.2 Candidate System Matrix

The matrix allows us to compare and evaluate candidate system on the basis of several characteristics. Each solution has both advantages and disadvantages. This must be shown in the foini of table that the columns represent candidate solution whereas the rows represent characteristic (see in Table 3.1). All solutions are analyzed, compared and evaluated in the portion of system computerized, benefits, hardware, software specification, method of data processing, input and output devices and storage devices. The best solution will be selected to be implemented in the proposed system.

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3.2.3 Feasibility Analysis Matrix

After we identified the alternative candidate solutions, we must then analyze each solution for feasibility. In order to determine whether our solution is feasible and achievable, the organization's resources and constraints must be given. Feasibility analysis consists of four major criteria that are operational feasibility, technical feasibility, schedule feasibility and economic feasibility. Each candidate is analyzed and given scores in all criteria. The highest total score determines the best solutions for implementing the proposed system.

(1) Operational feasibility: this is used for measuring the acceptability of the end user and how well such solution meets the user requirements.

(2) Technical feasibility: this is to measure how practical such solution is and whether the proposed system can be implemented with the available hardware, software and technical resources.

(3) Schedule feasibility: this is to measure how long each candidate will take in developing such system. The proposed system must be implemented within an accepted time period.

(4) Economic feasibility: this is to measure whether the benefits of the proposed solution will outweigh costs. This is the most important measure.

Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility	30%	Only supports food ordering system and current business will have to be modified in order to take advantage of the computerized system. Score: 90	Fully supports user required functionality. Score: 100	Support food ordering system but current business processes have to be modified in order to take advantage of software functionality. Score: 80
Technical Feasibility - Technology - Experts	30%	Microsoft Access is highly user-friendly tool that provides the integrated report designer. Required to hire or train Microsoft Access experts to perform modification for integration requirements. Score: 85	Power Builder can respond to different queries with different views of database. Supported database management system and is easy to connect other programs. Score: 95	MS Visual FoxPro is user-friendly software tool, which has efficient built-in database management system. It also provides integrated report design as well as serving fast development. Adequate available in Thailand. Score: 90
Economic Feasibility - Cost of development - Payback Period (Discounted) - Return on Investment	30%	Approximately 1,695,500 Bahts 5 months 53.4% Score: 85	Approximately 1,676,500 Bahts 5 months 53.6% Score: 90	Approximately 1,816,500 Bahts 5 months 53% Score: 80
Schedule Feasibility	10%	6 months Score: 85	6 months Score: 85	7 months Score: 70
Ranking	100%	88%	94%	82%

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3.2.4 Data Flow Diagram

DFD illustrates all the working process graphically and is used as a first tool for designing the proposed system. The proposed system consists of seven branches of working process, the center is the restaurant system: it is designed to control major activities of food ordering system. The whole process consists of the followings:

(1) Customer

All of the information that comes from the customers will go to the center that is the restaurant system. Order information is delivered to the center first, then it will be distributed to other sections as necessary. The first section that will receive this information will be the cashier.

(2) Cashier

This section keeps order information, then distributes food orders to the kitchen, drink orders to bars and gathers all that in the billing information.

(3) Kitchen

As stated in 2) cashier has the duty to check all food orders before it delivers such information to this section. The Kitchen's duty is to receive that order, complete it and deliver information of food that is ready to serve.

(4) Finance

This section keeps billing information, calculates them correctly and distributes receipts to cashier. It will handle all the money matters.

(5) Manager

The restaurant system will distribute daily, monthly and yearly reports to manager. Each report will tell him all detailed information about what sells best, how much revenue it has received per day and who served

best as well. With these information, the manager will be able to improve the overall services effectively.

(6) Inventory

This section keeps tracks of all information on stocks including all kinds of drinks and food. It will record all goods returned and requested.

(7) Suppliers

This will not be looked at at this project since it is not in its scope.

3.2.5 Software Design and Structure Chart

The final step involves software design. In this step, we are concerned with how programming specification is presented to the computer program for implementing. The technique involved is structure design. The concept of structured design is the software design discipline, encompassing a set of design rules and techniques for designing a system from the top down in a hierarchical fashion and refined to greater levels of detail. As the design is formulated, it is documented in a structure chart. The structure is a top-down chart, showing each level of design, its relationship to other levels, and its place in the overall design structure, it can document one program, one system, or part of one program.

3.2.6 Process Specification

Process specifications describe the transformations occurring within the lowest level processes of the data flow diagrams. They express the logic for each process. (Process Specifications are shown in Appendix B)

3.2.7 Output Design and Prototyping

Database is a collection of data organized to serve or service many applications efficiently at the same time by storing and managing data so that they appear to be in one location and also by centralizing the data and minimizing redundant data. It

is a very important issue in designing the database. We should perform data analysis first, that is the process which prepares a data model for implementation as a simple, non-redundant, flexible and adaptable database.

The process of creating small stable data structures from complex groups of data when designing a relational database is called "Normalization". If a database has been carefully thought out, with a clear understanding of business information needs and usage, the database model will most likely be in some normalized form. An entity is in the first normal only in the condition when it contains no repeated attributes. An entity is in the second normal if it contains no partial dependencies and in the third form if it contains no derived attribute. (See Database schema and Normalization in Appendix C)

3.2.8 Data Dictionary

This is an automated or manual file that stores definitions of data elements and data characteristics such as usage, physical representation, ownership (who in the organization is responsible for maintaining the data), authorization, and security. This data is maintained in a database. (The data dictionary is shown in Appendix D)

3.2.9 User Interface Design and Prototyping

The users and management team has to make important business decision based on system output. However, there will be a lot of mistakes if they worry only about output, input design is also important because you will waste time if your input has some mistakes. So the input should be easy — to — use and user — friendly to the end users. Good input design prevents users from keying the wrong input and then good output design will come up. The managers and users will not waste time interpreting or trying to understand the output result when they need urgent decision — making.

In the system development, we have to be careful about the necessity of input information. We are designing the input & prototype to test according to the user

requirement. See Appendix G.

3.2.10 Output Design and Prototyping

Basically, output can be divided into two types:

(1) External Output: System output that is generated for External Party. The examples for this are Purchase order and Performa invoice.

(2) Internal Output: The company uses internal output for operation, control, it can also be classified into two types:

(a) Detailed Report: Shows all data about each transaction and can provide backup for future reference. The report will show the details of product purchased within a month or year.

(b) Summary Report: This report is for Management to overview the performance of each department.

Output Design in Appendix E.

3.2.11Application Architecture

At this time, we come to system design, which is the requirement of detail design. During general design, we identify the application or information system architecture. Four major aspects to be considered are network architecture, data architecture, interface architecture and process architecture.

(1) Network Architecture: Two-tiered client / server

The company will apply the local area network (LAN). One server will connect clients by two — tiered client / server architecture. Under the architecture, all four machines are interconnected by unshielded twisted pair cable. All business data, mainly about Product information, will be stored on a data server and the business logic and user interface on three clients.

When the clients run their own application and need data, they will send the server requests for the data. As soon as the server gets them, it will retrieve the data from the database and send them back to these clients. Such a translation will take place back and forth between the clients and their server. Data can be shared among the clients and that can be executed separately.

(2) Data Architecture: Relational Database

The company prefers the relational database technology. In a relational system, the user sees the data as tables and the operators available to the user for dealing with the data by the user as tables, and the operators available to the, user for dealing with the data are operators who manipulate tables.

With relational database, we can assign some sort of account number for each raw material record. A database of product record would have a field for these accounts. That is easy for us to relate each product to the appropriate raw materials the production requires.

The company chooses SQL Server as a database management system. SQL Server will give the benefit in terms of storing data, entering data, searching and easily managing data and so on. Since most databases are stored away from the application, it is self-documenting, which is easy to change and manage.

(3) Interface architecture: Online processing

We choose Power Builder to develop our own application because it has GUI technology, which can be used to create interface. The procedures are simple to use; we can drag and drop any controls onto the template

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and can change the style by setting new properties as we wish. Its simplicity enables us to change output and input interface at any time to the extent that we are satisfied and sure that such interface is user-friendly to all individuals.

A new system should provide up-to-date information to all users, thus online processing needs to be applied to this system. So all inquiries and reports can be processed instantly, meaning that decision-makers can obtain any updated information at any point in time.

(4) Process architecture: Power Builder

Power Builder is used to develop the application, it has a predefined set of user actions, called events that it can recognize. Program codes are written in order to command Power Builder what we want in response to these events. Thus we only need to write the codes that are for the events that have meanings to this program. For instance, if we want it to recognize when users double click on one of the keys, we will write the code for that event. On the other hand, we will not write any code for a single click if this does not have any meaning in our program. We can obtain these special features from Power Builder.

3.3 Hardware and Software Requirements

The proposed system requires the following hardware components:

(1) Server 1 set

(a) Pentium III 800 MHz

(b) Motherboard Support SCSSII Hard Disk

(c) SD Ram 128 MB

(d) Hard Disk SCSSII 20 GB

(e) 1.44 MB 3.5" Floppy Disk Drive

(0 CD-ROM Creative 52 x

(g) Logitech Mouse and Keyboard

(h) Monitor 15" Non Radiation

(2) PC Clients 16 sets

(a) Intel Pentium III 600 MHz

(b) SD Ram 64 MB

(c) Hard Disk 15 GB XTE 66

(d) 1.44 MB 3.5" Floppy Disk Drive

(e) Mouse and Keyboard

(f) Monitor 15" Non Radiation

(3) Printer

(a) TMU 210 Printer 10 sets

(b) TMU 950 printer 3 sets

(4) Ethernet LAN card 10 sets

(5) Network Peripheral

(a) 10/100 Mbps Speed HUB (8 ports)

(b) UTP Cable

(6) UPS 200 VA Power 1 set

Software requirements needed are as follows:

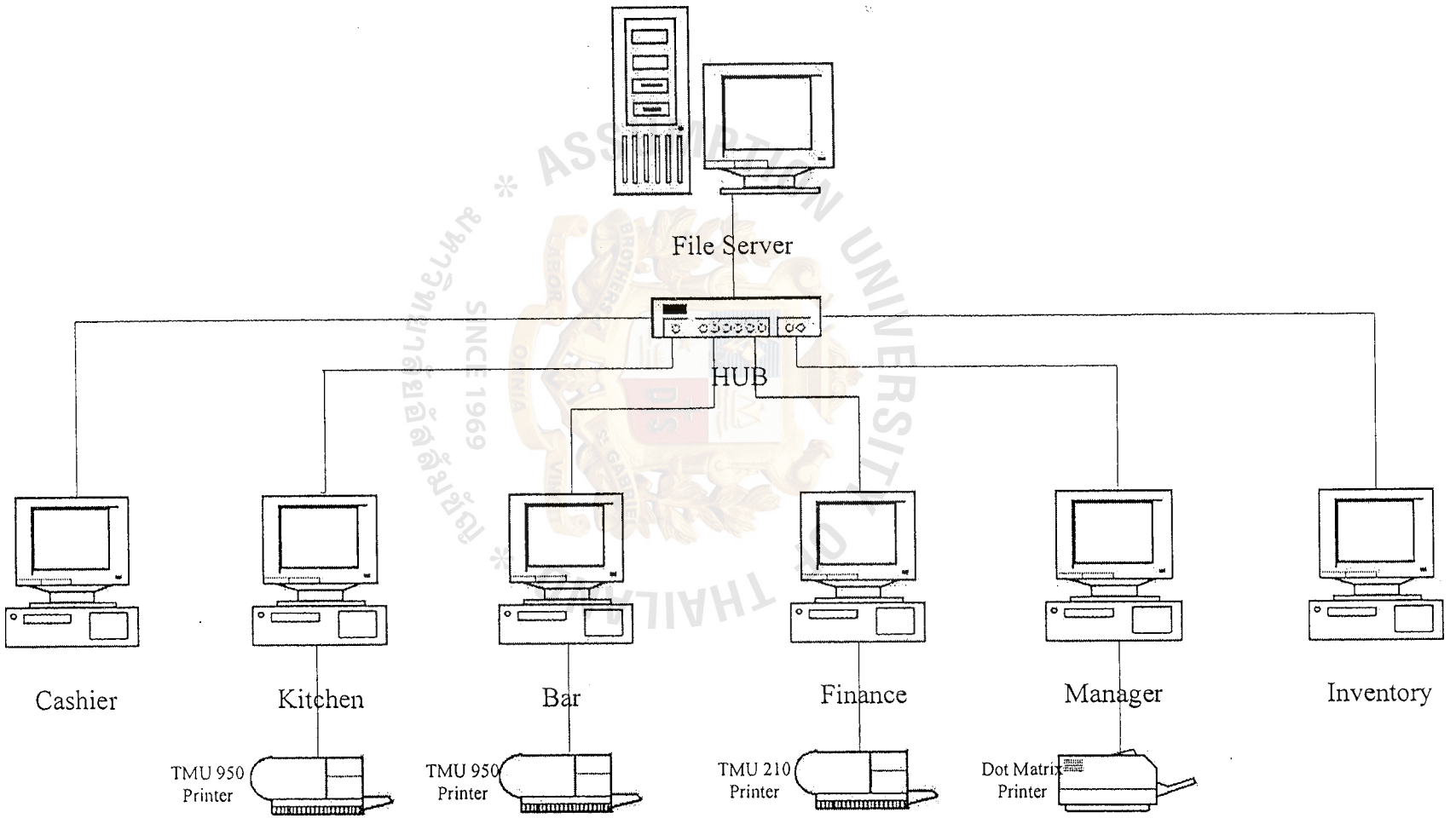
(1) Microsoft Office 2000

(2) Microsoft Windows 98

(3) Microsoft Windows NT

(4) Power Builder 7.0

(5) Microsoft SQL Database Server.



Hardware Configuration of the Proposed System.

3.4 Security and Controls

3.4.1 Security

Measurement, procedure and control methods are required to protect the system from the followings:

(1) Viruses

(2) Electronic failure

(3) Hardware and software failure

(4) Intrusion and unauthorized access from unauthorized individuals

The following protections and control methods are to be implemented:

(1) Virus detection program must be installed and run at least weekly and the diskettes from all unknown users must not be used.

(2) Install UPS to prevent data loss from electronic failure.

(3) Install back up data to prevent data loss from hardware and software failure.

(4) Use software detection algorithm to verify the data in order to prevent the data from redundancy and inaccuracy.

(5) User authentication should be applied to the whole system, implying that all users must have either password or username to prove their authentication.

(6) Provide system usage training session to all end-users regularly.

3.4.2 Control

(1) Input control: use built in algorithm software to check for the validity and accuracy of the data as well as to prevent the data from redundancy.

(2) Output control: set and customize the application software to produce the standardized outputs and reports.

(3) Human control: there should be regulations such as no drinks or food,

no smoking, do not enter without permission and one specific person should be assigned to lock the server room.

(4) System maintenance: hardware should be checked on regular basis in order to prevent the system from unexpected failures.

3.5 Cost and Benefit Analysis

3.5.1 Cost Analysis

We must analyze whether the costs of the new system will be worthwhile that is in a long term it should save costs for the business. We may start the analysis by comparing the old system to the new one.

(1) Cost of the existing system consists of the followings:

(a) Annual operating cost: this includes salary of managers, cashiers, finance and waiting staffs.

(2) Cost of the proposed system includes:

(a) Hardware and software

(b) Set up costs

(c) Office supplies and utilities

(d) Personnel: staffs should be trained specifically for IT use, they should be given more knowledge in computer use.

(e) Training costs: this includes end-user training cost and other education programs or seminars regarding their fields.

(f) Depreciation costs

(g) Miscellaneous

Estimated cost of the Existing system

Fixed cost	Baht
Typewriter	10,000
Copier Machine	40,000
Total fixed cost	50,000
Operation cost	
Personnel cost:	
Manager 6 @ 8,000 @ 12 months	576,000
Waiting staffs 200 @ 3,500 @ 12 months	8,400,000
Cashiers 9 @ 6,000 @ 12 months	648,000
Total	9,624,000
Office supplies & Miscellaneous cost:	
Office supply cost	25,000
Utility cost	30,000
Miscellaneous (5,000 @ 12 months)	60,000
Total	115,000
Depreciation cost	10,000
Total Operation cost	9,749,000
Total annual existing cost	**9,799,000**

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Estimated cost of proposed system:

(1) Development cost

New Hardware:	Baht
File Server 1 @ 60,000	60,000
Clients 16 @ 28,000	448,000
TMU 210 printers 10 @ 21,000	210,000
TMU 950 printers 3 @ 36,000	108,000
Network (LAN) 10 @ 3,300	33,000
Back up Hard Disk 1 @ 15,000	15,000
UPS 1 @ 3,500	3,500
Compaq Proliant 350 CPU PII Server 1 @ 160,000	160,000
Total	1,037,500
New Software:	
Microsoft Office 2000 1 @ 12,000	12,000
Microsoft Window NT 1 @ 42,000	42,000
Power Builder @ 150,000	150,000
Microsoft SQL Server 1 @ 65,000	65,000
Total	269,000
Implementation cost:	
Software development	200,000
Set up cost	80,000
Training cost	90,000
Total	370,000
Total Development cost	**1,676,500**

(2) Operation cost

Personnel cost:	Baht
Manager 4 @ 8,000 @ 12 months	384,000
Waiting staffs 150 @ 3,500 @ 12 months	6,300,000
Cashiers 3 @ 6,000 @ 12 months	216,000
Total	6,900,000
Office supplies & Miscellaneous cost:	
Office supply cost	22,500
Utility cost	35,000
Maintenance cost	50,000
Miscellaneous 5,000 @ 12 months	60,000
Total	167,500
Depreciation cost	90,000
Total operation cost	7,157,500
Total proposed system costs	8,834,000

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3.5.2 Differential Cost Analysis

Differential Cost point shows that the level of the accumulative cost of the existing system will be equal to the accumulative cost of the proposed system. At the beginning, the cost of the existing system will be higher than the proposed cost due to the company's heavy investment on personnel cost e.g. manager, waiting staff, and cashier. However, we will see the benefits of using proposed system because cost of proposed system will be decreased rapidly if we compared with cost of existing system. In the long run, we can see that the proposed system will be more effective in reducing annual operating cost respectively. After we compare both systems, in the near future, the cost of the existing system will be higher than the proposed system.

Differential Cost point is the period that the cost of both systems is different at zero. The Differential Cost can be calculated from the interpolation technique by the method of summing the number of years where the cost difference between both systems is still positive and the fraction of year where the cost difference is still positive.

$$1 \text{ year} + \frac{-965{,}000}{-965{,}000 - (-3{,}815{,}650)} \qquad 1 \text{ year} - 0.34 \text{ year}$$

8 months

Table 3.3 shows the cost comparison between the existing system and the proposed system. Figure 3.2 shows the Differential Cost point.

Table 3.3. Cost comparison between Existing and Proposed System.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Costs of Manual system						
Fixed cost:	50,000					
Operating cost:						
Personnel:						
Manager		576,000	633,600	696,960	766,656	843,322
Waiting staffs		8,400,000	9,240,000	10,164,000	11,180,400	12,298,440
Cashiers		648,000	712,800	784,080	862,488	948,737
Office supplies costs:						
Office supply cost		25,000	27,500	30,250	33,275	36,603
Utility cost		30,000	33,000	36,300	39,930	43,923
Miscellaneous		60,000	66,000	72,600	79,860	87,846
Depreciation cost		10,000	11,000	12,100	13,310	14,641
Total	50,000	9,749,000	10,723,900	11,796,290	12 975,919	14,273,511
Accumulated cost of existing system		9,799,000	20,522,900	32,319,190	45,295,109	59,568,620
Cost of computerized system						
Development cost:	1,676,500					
Operating cost:						
Personnel:						
Manager		384,000	422,400	464,640	511,104	562,214
Waiting staffs		6,300,000	6,930,000	7,623,000	8,385,300	9,223,830
Cashiers		216,000	237,600	261,360	287,496	316,246
Office supplies & Miscellaneous cost:						
Office supply cost		22,500	24,750	27,225	29,948	32,942
Maintenance cost		35,000	38,500	42,350	46,585	51,244
Utility cost		50,000	55,000	60,500	66,550	73,205
Miscellaneous		60,000	66,000	72,600	79,860	87,846
Depreciation cost		90,000	99,000	108,900	119,790	131,769
Total	1,676,500	7,157,500	7,873,250	8,660,575	9,526,633	10,479,296
Accumulated cost of proposed system		8,834,000	16,707,250	25,367,825	34,894,458	45,373,753
Cost difference		-965,000	-3,815,650	-6,951,365	-10,400,652	-14,194,867

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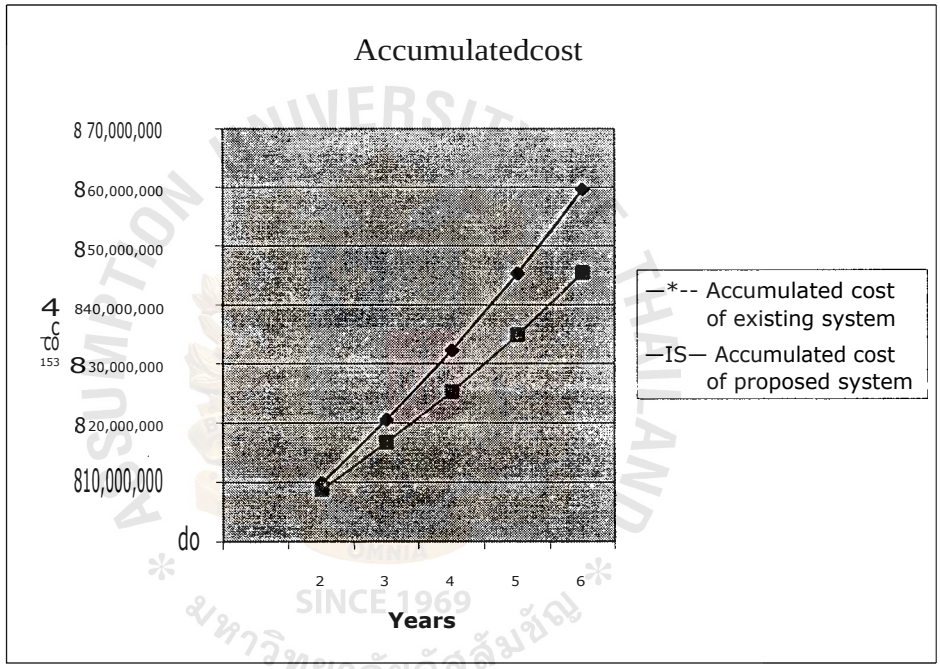

Figure 3.2. Differential Cost Analysis.

3.5.3 Benefit Analysis

The benefit of the proposed system can be divided into two categories, which are tangible benefit and intangible benefit.

Tangible Benefit

The major meaning of tangible benefit is the cost reduction of all occurred expenses.

(1) Personal cost reduced because the computerized system can replace the staff.

Reduce from 6 to 4 managers (2 @ 8,000 @ 12)	192,000 Bahts
Reduce from 200 to 150 waiting staffs (50 @ 3,500 @ 12)	2,100,000 Bahts
Reduce from 9 to 3 cashiers (6 @ 6,000 @ 12)	432,000 Bahts

(2) Sales volume is increased by 5%

or 750,000 Bahts / month	9,000,000 Bahts
Estimated sale volume/month derived from operating the proposed system	15,750,000 Bahts
Less Average sales volume per month derived from operating the existing system	15,000,000 Bahts
Increased sales volume/month (5%)	750,000 Bahts
Total estimated tangible benefit derived from reduced operating cost (9,749,000 — 7,157,500)	2,591,500 Bahts
Total estimated tangible benefit derived from increased sale volume is	9,000,000 Bahts
Total estimated tangible benefit derived from operating the proposed system is	11,591,500 Bahts

Intangible Benefit

(1) Increase in data accuracy and quality of data, report and document.

(2) More timely and beneficial information.

(3) Updated information.

(4) No data redundancy.

(5) Retrieve information faster.

(6) Reduce the volume of paperwork.

(7) More efficient of working processes and working time.

(8) Reduction of workload of employees.

(9) Other departments have more guideline to develop their own new system.

(10) Provides efficient reports to manager.

(11) Improves decision-making.

(12) Better service and response time to the customers.

(13) Increase customer satisfaction.

It can be described that the new system can increase efficiency and effectiveness of the operation. With all benefits occurred, it is estimated that the sales volume will increase and cost of operation will decrease. The total benefit derived from operating the new system is estimated to be 11,591,500 Bahts for the first year and will increase at 10% annually.

3.5.4 Payback Period Analysis

Payback period is mostly used as a criterion in evaluating the proposed investment. Payback period analysis is to determine the exact period that the investor gets the initial investment back derived from the cash inflows. In term of annuity, divide cash in flows each year in equal amount. Payback period is found by dividing the initial investment by annual cash inflow. Yearly cash inflows will be accumulated

until we get the initial payment back or it means that payback period will show how long the project takes in return on initial investment. It mostly deals with cash inflows more than accounting profits and it will ignore the time value of money too. The investor will accept or reject this project including the determination of maximum desired payback period.

Payback Period Analysis is shown in Table 3.4. The payback period is calculated from interpolation techniques to find the exact date by summing the number of years where the cost difference still is positive plus the fraction of year of such cost difference.

$$1 \text{ year} + \frac{2{,}283{,}062 - 0}{2{,}283{,}062 - 6{,}170{,}350} \quad 1 \text{ year} - 0.59 \text{ year}$$

$$= 5 \text{ months}$$

The desired payback period is 1 years or less is preferred. So our project is acceptable since it takes only a year to get our investment back. The project with such a short payback is liquid and less risky. We can invest money left elsewhere. Moreover, the short payback period will give more chance in marketing condition, interest rate, or another factors that effect the hazard changing.

Table 3.4. Payback Period Analysis.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,676,500					
Annual operating cost		-7,157,500	-7,873,250	-8,660,575	-9,526,633	-10,479,296
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value)	-1,676,500	-6,391,648	-6,274,980	-6,166,329	-6,058,938	-5,941,761
Cumulative time-adjusted costs over lifetime:	-1,676,500	-8,068,148	-14,343,128	-20,509,457	-26,568,395	-32,510,156
Benefits derived from operating new system:	0	11,591,500	12,750,650	14,025,715	15,428,287	16,971,116
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (adjusted to present value):	0	10,351,210	10,162,268	9,986,309	9,812,391	9,622,623
Cumulative time-adjusted benefits over lifetime:	0	10,351,210	20,513,478	30,499,787	40,312,178	49,934,801
Cumulative time-adjusted costs + benefits	-1,676,500	2,283,062	6,170,350	9,990,330	13,743,783	17,424,645

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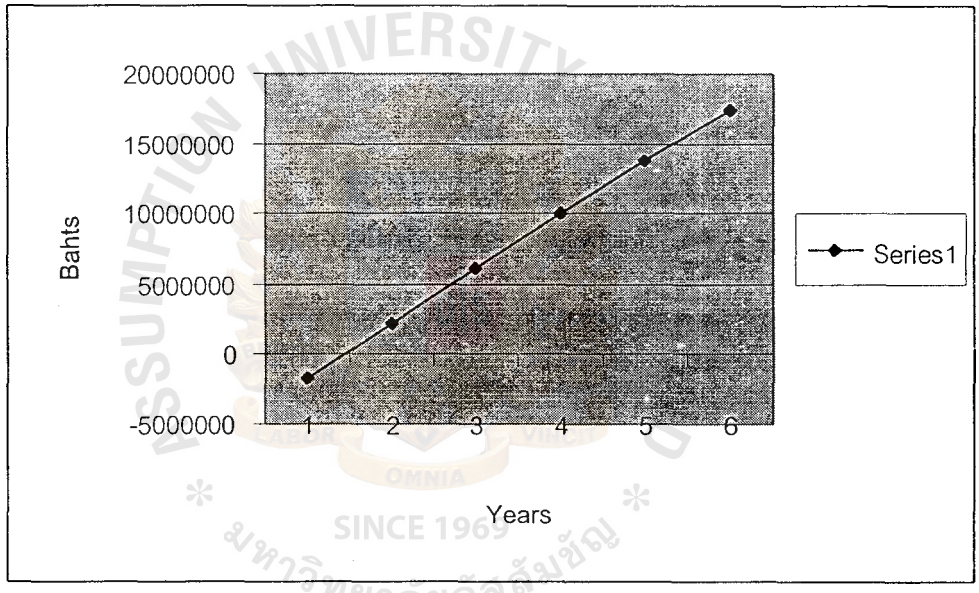

Figure 3.3. Payback Period.

3.5.5 Return of Investment Analysis

The return-on-investment (ROI) analysis technique compares the lifetime profitability of alternative solution or project. The return-on-investment is the percentage rate that measures the relationship between the amounts the business gets back from an investment and the amount invested. The return-on-investment lifetime for the project is calculated as follows:

$$ROI = \frac{\text{(Estimated lifetime benefits — Estimated lifetime costs)}}{\text{Estimated lifetime costs}}$$

$$= \frac{(49{,}934.801 - 32{,}510{,}156)}{32{,}510{,}156}$$

$$53.6\%$$

The ROI is usually accepted at 20% for all investment; in this case the ROI is extremely high. We can, however, see from the payback period table that the computerized system can save costs in human resources, which is the main cost of the existing system. It may seem impossible that ROI can be that high but we must realize that human resources' costs are fixed and will not disappear. On the other hand, investing in technology may seem to be high at first. It will nevertheless give back returns after some period. With the proposed system, we can observe that the payback period is extremely short.

IV. SYSTEM IMPLEMENTATION

There are four stages in implementing the system:

4.1 Building the New System

This stage includes programming all required modules, then integrate them into the application program that meets all user requirements. The programming language chosen is Power Builder 7.0, which is used to handle the database. Whereas Power Builder is event-driven programming language that is controlled by the objects drawn on the screen. The major concern of the development during programming is hardware compatibility. Then both hardware and software must be integrated at the same time in order to build the complete system. Hardware and software applications will be integrated by the operating system that is Microsoft Windows 2000.

4.2 Testing

This is the most important stage for the development of the new system. At this stage the programmer can find the errors, hidden failures, bugs and possibly further requirements. The programmer will also find modification requirements of the process design or even the new process requirements of the system. This is the last step for the programmer to do before converting the current system to the proposed one.

The testing stage consists of the followings:

(1) Unit testing or program testing

The programmer will test each module and source all of the codes in order to find out the system failures.

(2) System testing

This is testing of all hardware and software, system failure such as storage device capability, recovery and restart capability will be corrected.

(3) Acceptance testing

This test is for the end users and the management team, they will find out whether this proposed system is appropriate. If all of the objectives and user requirements are met, they will agree to certify such system.

4.3 Conversion

After all the testing steps are approved, the proposed system will replace the old one. The pilot study will then be selected in order to introduce the new system onto one of the departments or operating units of the organization. The program will be installed to all departments of the organization after the pilot version is completed.

4.4 Production and Maintenance

When the conversion is completed and the proposed system is properly installed, the system is in production. End users will review the system whereas the tectinical specialists will find out whether any reversions or modifications are necessary. Then throughout the usage of such program, maintenance will become an important stage. That includes renewing any hardware and software, meeting new requirements and keeping improving processing efficiency.

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V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This project has presented the weak points of the existing system that is inefficient and is exposed to various errors. Individual staffs find it extremely difficult to serve all customers promptly. Management team cannot obtain reliable information instantly, leading to inefficient decision-makings. The repeated mistakes keep occurring; thus we have proposed a new system that is more productive and less time consuming.

We have suggested the application of IT into the food ordering system. Starting from taking the orders, recording the orders, calculating bills and keeping records daily, weekly, monthly and annually. It is important to keep these records safely and to ensure that only the right information is kept so that it can be delivered to the management team. This computerized system offers various advantages to the business; it will enable the staffs to serve the customers faster, reducing the number of mistakes, increasing the level of satisfaction and possibly eliminating most of the problems that are being encountered.

It may seem that the proposed system has extremely high costs, however, in the long term we will see that it will save the business from spending too much on hiring too many staffs. Since several steps that are being repeated and consume too much time will be no longer necessary. Hence the number of waiting staffs and cashiers will be reduced, implying that the costs of human resource will decrease. The management team will as well be faced with less problems in managing staffs.

Having compared the two systems, we can obviously see why we should replace the existing system with the new one.

Table 5.1. Degree of Achievement of Proposed System.

Process	Existing System	Proposed System
Taking Orders	3 minutes	3 minutes
Delivering Orders	5 minutes	2 minutes
Serving Food	10 minutes	5 minutes
Distributing Bills & Receipts	10 minutes	3 minutes
Printing Reports	360 minutes	15 minutes
Total	388 minutes	33 minutes

5.2 Recommendations

The proposed system may be more effective than the current one but the management team should regularly look for any problem that may occur. If any problem is found, they should call in technical specialists to solve it. Other than ensuring that the system is working properly, they should keep improving it. We should be reminded that staffs should also be highly trained because there will be massive costs for recovering the lost data.

Since this beer house is such a big organization, we should realize that it is not only the food and ordering system, which needs to be improved. Other departments should also be looked at and analyzed. In order to keep pace with its competitors, it must have all operational units working efficiently.

In the service business, staffs should be service minded and in order to ensure that the management team must have some kind of tools that can stimulate them.

APPENDIX A

DATA FLOW DIAGRAM

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Context Diagram of the Proposed System.

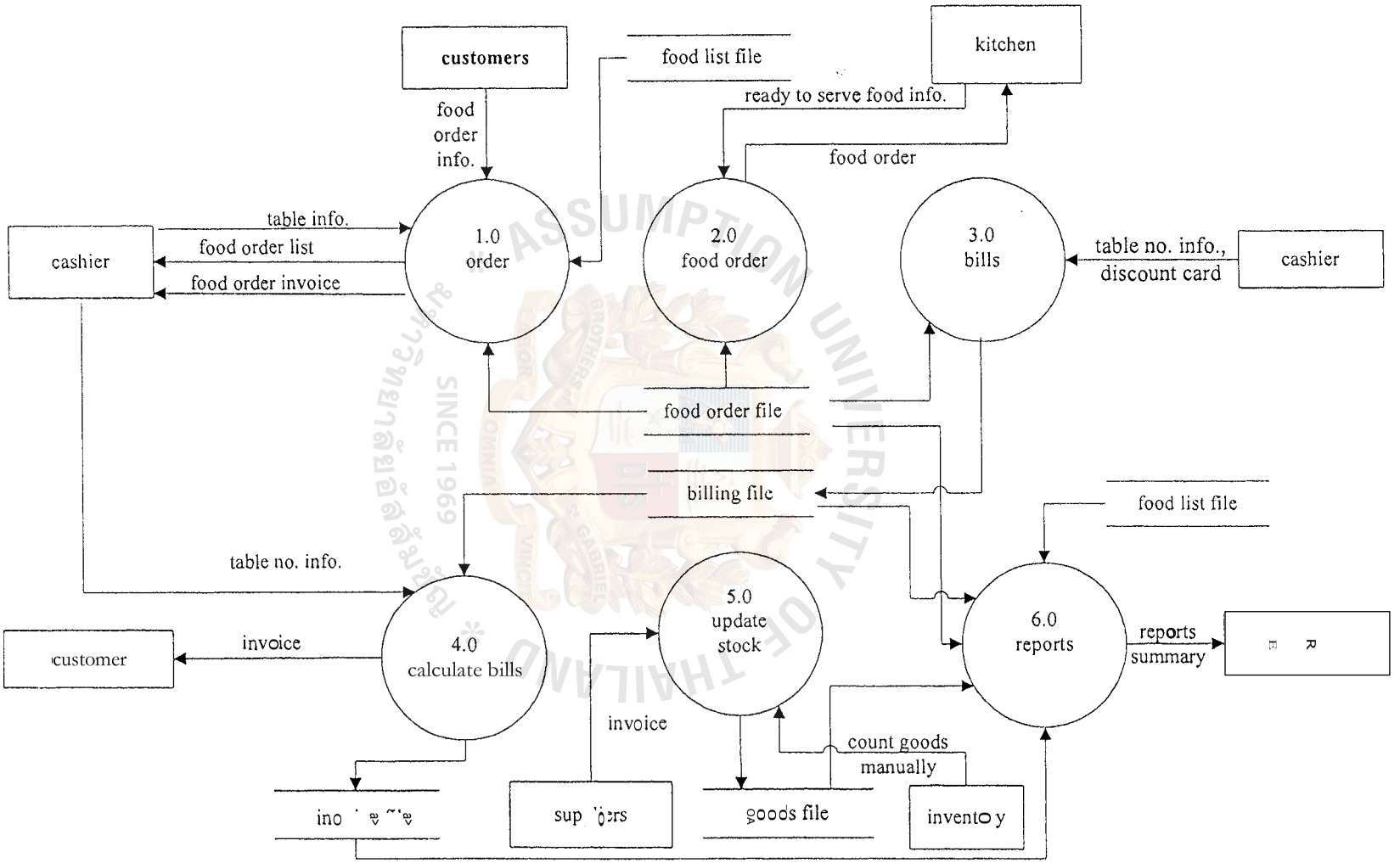
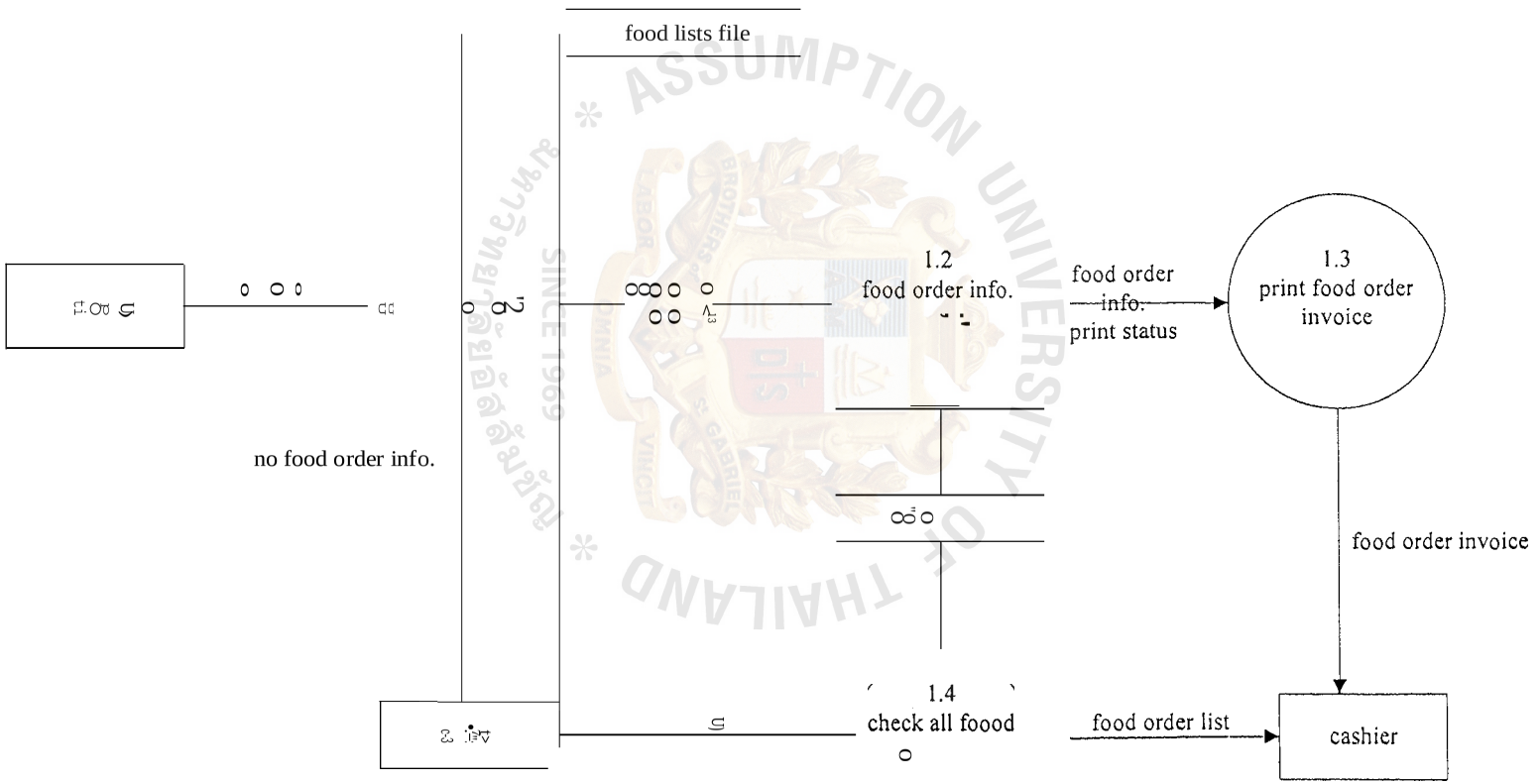
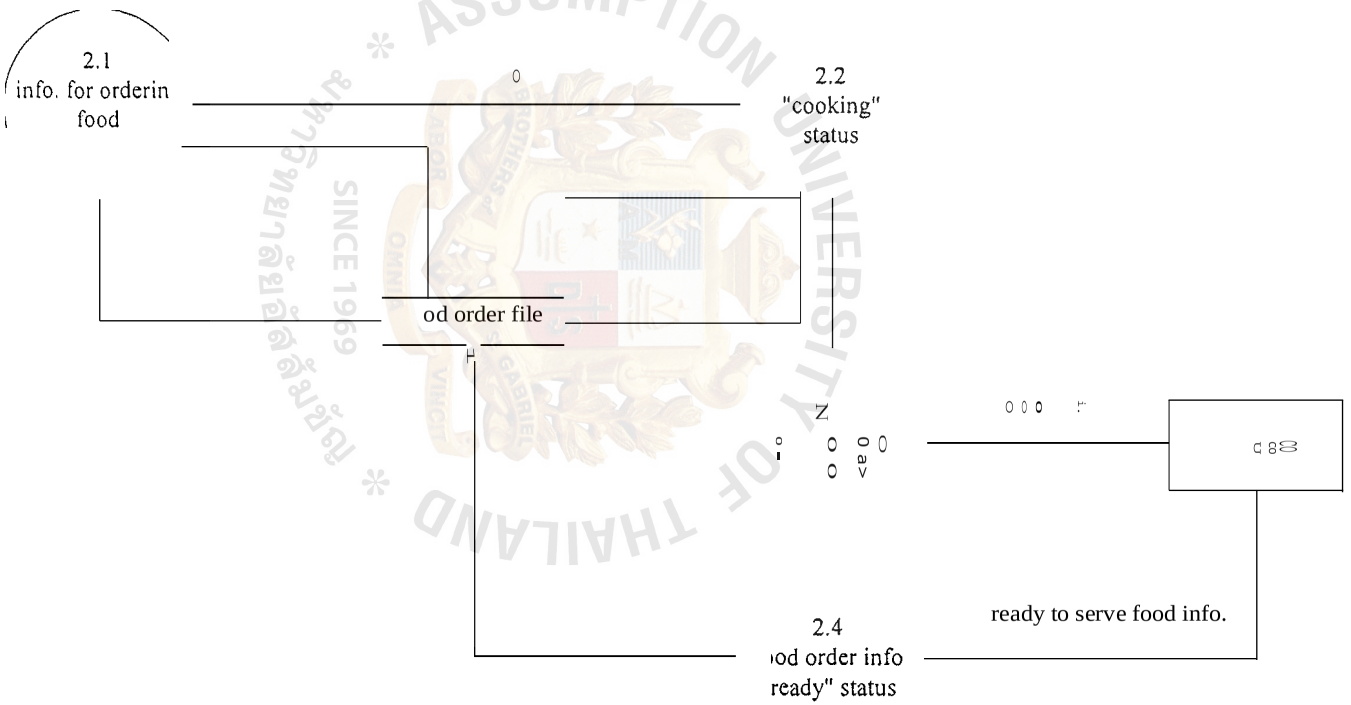


Figure A.2. DFD Level 0 of the Purposed System.



DFD Level 1 Process 1 (Taking Order).


2.1
info. for orderin
food
2.2
"cooking"
status
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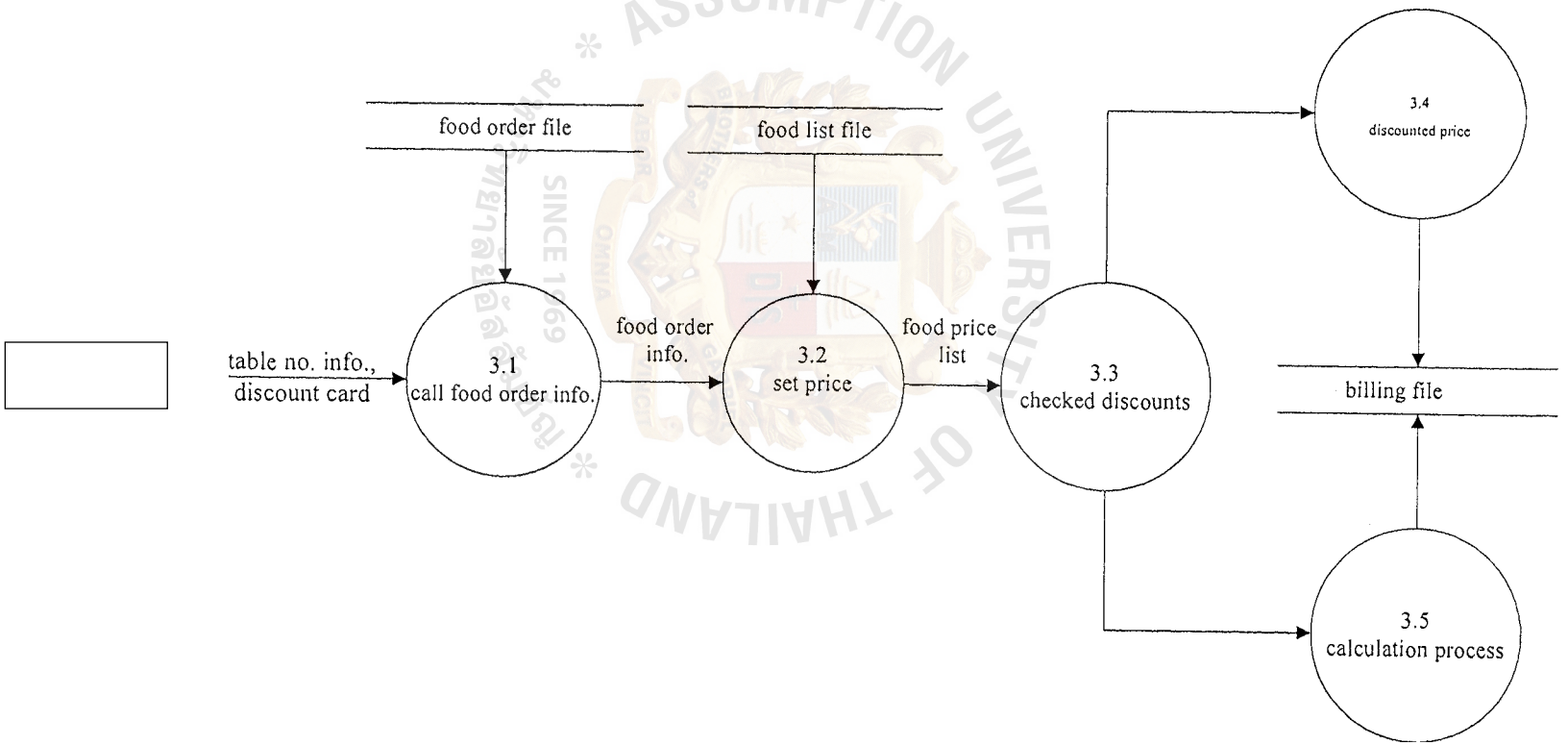
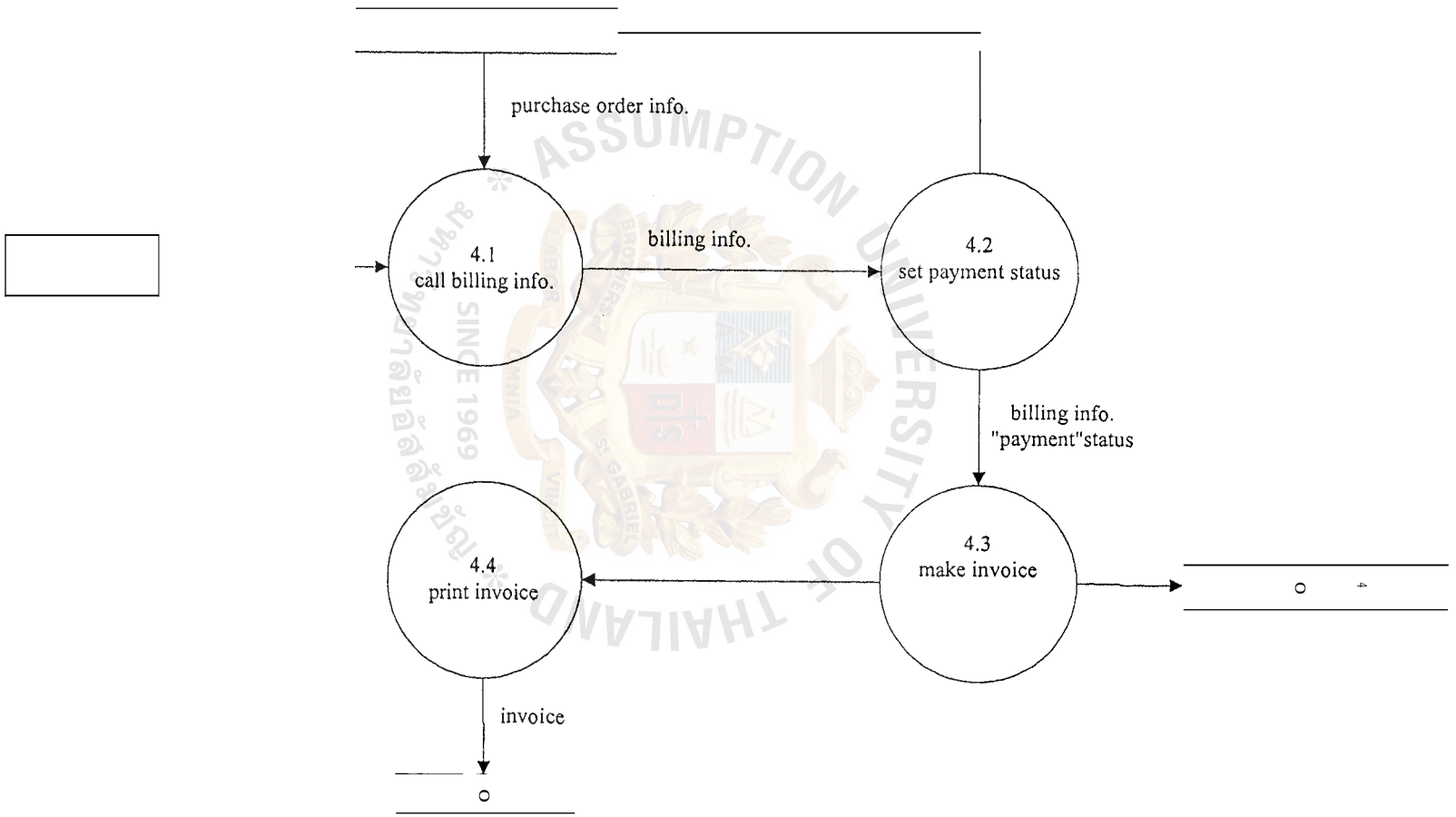
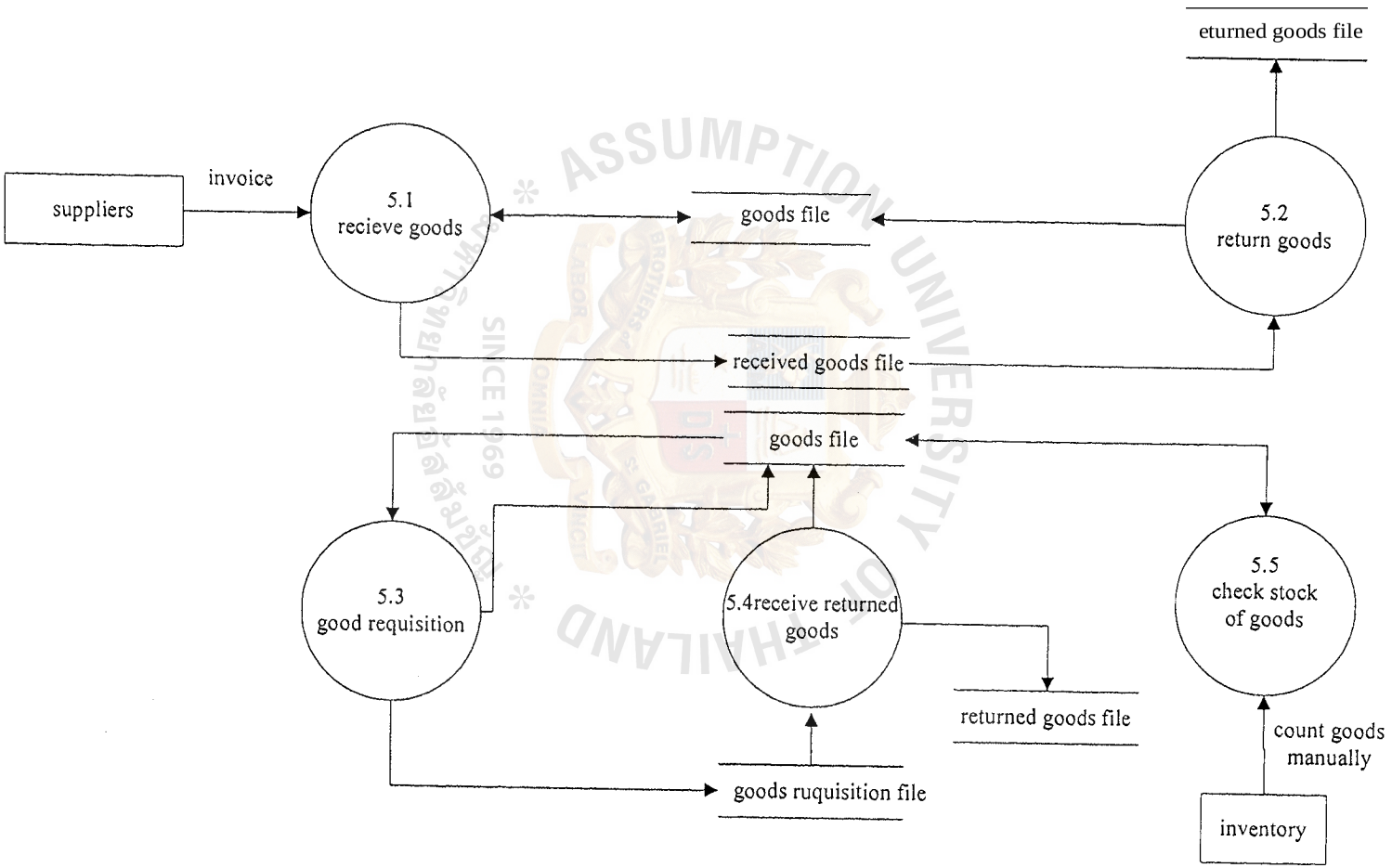
ready to serve food info.
2.4
od order info
ready" status



DFD Level 1 Process3.0 (Ordering Process).



DFD Level 1 Process 4 (Calculation Process).



DFD Level 1 Process5 (Update Stock).

APPENDIX B

PROCESS SPECIFICATION

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Table BA. Process Specification of Process 1.1.

Process Name	Record Product Order
Input:	Food Order Information
Output:	Checked Food Order Information
Process:	1. Take Orders Information from Customers 2. Compare the Orders to Food Lists File
Attachment	• Waiting Staff • Cashier • Customers

Table B.2. Process Specification of Process 1.2.

Process Name	Record Product Order
Input:	Checked Food Order Information
Output:	Food Order Bill/Invoice
Process:	1. Set "Food Order" Status 2. Record Food Order Information 3. Print Out Food Order Bill
Attachment	• Cashiers • Food Order File

Table B.3. Process Specification of Process 1.3.

Process Name	Record Product Order
Input:	Table Information
Output:	Food Order Information
Process:	1. Receive Table Information from Waiting Staff 2. Compare Table Information to Food Order Information
Attachment	• Waiting Staff • Cashiers

Table B.4. Process Specification of Process 1.4.

Process Name	Record Product Order
Input:	Table Information
Output:	Food Order Information
Process:	1. Call Food Order Information 2. Check Table Number Information
Attachment	• Waiting Staff • Food Order File

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Table B.5. Process Specification of Process 2.1.

Process Name	Record Product Order
Input:	Food Order Information
Output:	Food Lists
Process:	1. Call Food Order Information 2. Check Printing Status of Order Paper 3. Call Food Lists
Attachment	• Food Order File • Kitchen

Table B.6. Process Specification of Process 2.2.

Process Name	Record Product Order
Input:	Food Lists
Output:	Order Paper
Process:	1. Set Food Lists Status "In Process" 2. Record Information in Food Order File
Attachment	• Food Order File • Kitchen

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Table B.7. Process Specification of Process 2.3.

Process Name	Record Product Order
Input:	Food Lists
Output:	Order Paper
Process:	1. Call Order Paper 2. Print Order Paper
Attachment	• Kitchen • Order Paper

Table B.8. Process Specification of Process 2.4.

Process Name	Record Product Order
Input:	Ready to Serve Information
Output:	Food Order Information
Process:	1. Ready Food Acknowledged 2. Call Food Order Information 3. Set Ready Food Status 4. Record Food Order File
Attachment	• Kitchen • Order Paper

Table B.9. Process Specification of Process 3.1.

Process Name	Record Product Order
Input:	Table Information
Output:	Food Order Information
Process:	1. Call Food Order Information 2. Check Table Number
Attachment	• Food Order File • Waiting Staffs • Cashiers

Table B.10. Process Specification of Process 3.2.

Process Name	Record Product Order
Input:	Food Order Information
Output:	Specified Prices Food Order Information
Process:	1. Check Food Order from Food Order List File 2. Specified Prices
Attachment	• Food Order List File • Cashiers

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Table B.11. Process Specification of Process 3.3.

Process Name	Record Product Order
Input:	Specified Prices Food Order Information, Discount
Output:	Food Order Information with Discount
Process:	1. Receive Discount Card 2. Check Discount
Attachment	• Customers • Cashiers • Waiting Staffs

Table B.12. Process Specification of Process 3.4.

Process Name	Record Product Order
Input:	Food Order Information with Discount
Output:	Payment Information
Process:	1. Calculate Discount 2. Calculate Food Prices 3. Calculate Discounted Amount 4. Record on Billing File
Attachment	• Cashiers • Waiting Staffs

Table B.13. Process Specification of Process 3.5.

Process Name	Record Product Order
Input:	Food Order Information without Discount
Output:	Billing Information
Process:	1. Calculate Food Prices 2. Record on Billing File
Attachment	• Billing File • Cashiers

Table B.14. Process Specification of Process 4.1.

Process Name	Record Product Order
Input:	Table Number Information
Output:	Billing File Information
Process:	1. Call Purchase Order Information 2. Call Billing Information
Attachment	• Billing File

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Table B.15. Process Specification of Process 4.2.

Process Name	Record Product Order
Input:	Billing Information
Output:	Payment Status Billing Information
Process:	1. Set Payment Status 2. Record on Receipt File
Attachment	• Billing File

Table B.16. Process Specification of Process 4.3.

Process Name	Record Product Order
Input:	Payment Status Receipt Information
Output:	Receipt
Process:	1. Make the Receipt
Attachment	• Receipt File

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Table B.17. Process Specification of Process 4.4.

Process Name	Record Product Order
Input:	Payment Status Receipt Information
Output:	Receipt
Process:	1. Print Receipt Out
Attachment	• Receipt File

Table B.18. Process Specification of Process 5.1.

Process Name	Record Product Order
Input:	Invoice
Output:	Goods Information
Process:	1. Receive Invoice 2. Check Goods Items 3. Record on Goods File, Received Goods File
Attachment	• Goods File • Supplier • Received Goods File

St. Gabi: 21 Library, Au

Table B.19. Process Specification of Process 5.2.

Process Name	Record Product Order
Input:	Received Goods Information
Output:	Returned Goods Information
Process:	1. Call Received Goods Bill Information 2. Check Received Goods Bill Information 3. Record on Received Goods File
Attachment	• Received Goods File • Returned Goods File • Goods File

Table B.20. Process Specification of Process 5.3.

Process Name	Record Product Order
Input:	Goods Requisition Information
Output:	Requisited Goods Information
Process:	1. Call Information from Goods File 2. Check Goods Lists 3. Record on Goods File
Attachment	• Goods File • Goods Requisition File

Table B.21. Process Specification of Process 5.4.

Process Name	Record Product Order
Input:	Goods Information
Output:	Received Return Goods Information
Process:	1. Received Information of Received Return Goods 2. Check Goods Information from Goods Requisition File 3. Increase Number of Goods 4. Record on Received Return Goods File
Attachment	• Goods File • Goods Requisition File • Received Return Goods File

Table B.22. Process Specification of Process 5.5

Process Name	Record Product Order
Input:	Number of Goods Counted Manually
Output:	Adjusted Goods' Number Information
Process:	1. Received Goods Counted Manually Information 2. Check and Compare Number of Goods 3. Record on Goods File
Attachment	• Goods File • Stock Checking Staffs

APPENDIX C

DATABASE DESIGN

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PHYSICAL SCHEMA

RB M FOODTYPE	
Type_id	Item

RB M INVOICE				
Bill_no	Bill_date	Table no	Name	Address
Total_amount	Discount	Vat status	Total_vat	Entry_date
Entry name	Entry machine	Status	Section_id	Discount code
Discountcard no	Payment_type	Paymentcard_no	Net_amount	Pay_status
Rpay_name	Checkout_status	Vat rate	Marketing_name	Server_id
Bikkendtime	Receive_amt	Change_amt	Voucher amt	Tip_amt

RB M RECEIVEITEM				
Sequence_no	Bill_no	Food id	Item	Quantity
Unit_price	Discount			

RB M ORDERFOOD				
Trans_no	Foods id	Table no	Quantity	Server_id
Entry_machine	Entry_name	Enter date	Ref table no	status
Section_id	Checkbill status	Checkin_id	Bill no	Send machine
Send_section_id	Busboy	pcode	item	transfer name
Tranfer_date	Cancle_name	Cancle_date		

Figure C.1. Physical Schema.

Table C.1. File Structure of RB M FOODSTYPE.

FILE STRUCTURE			
FILE NAME: RB_MFOODSTYPE			
FILE NAME	TYPE	LENGTH	DEC
TYPE ID	FLOAT		
ITEM	DATETIME		

Table C.2. File Structure of RB M INVOICE.

FILE STRUCTURE			
FILE NAME: RB_MINVOICE			
FILE NAME	TYPE	LENGTH	DEC
BILL_NO	CHAR	2	
BILL_DATE	VARCHAR	6	
TABLE NO	CHAR	2	
NAME	VARCHAR	100	
ADDRESS	CHAR	10	
TOTAL AMOUNT	INT		
DISCOUNT	INT		
VAT_STATUS	FLOAT		
TOTAL VAT	INT		
ENTRY DATE	VARCHAR	6	
ENTRY_NAME	DATETIME		
ENTRY_MACHINE	DATETIME		
STATUS	CHAR	8	
SECTION_ID	CHAR	2	
DISCOUNT CODE	CHAR	2	
DISCOUNTCARD_NO	CHAR	20	
PAYMENT_TYPE	CHAR	2	
PAYMENTCARD NO	CHAR	20	
NET_AMOUNT	VARCHAR	40	
PAY_STATUS	LONG VARCHAR		
RPAY_NAME	DATETIME		
CHECKOUT STATUS	LONG VARCHAR		
VAT_RATE	NUMERIC	7	4
MARKETING NAME	VARCHAR	100	
SERVER_ID	CHAR	2	
BILLENDTIME	VARCHAR	6	
RECEIVE_AMT	VARCHAR	40	
CHANGEAMT	DECIMAL	10	2
VOUCHER AMT	VARCHAR	40	

Table C.3. File Structure of RB M RECEIPTITEM.

FILE STRUCTURE			
FILE NAME: RB_M RECEIPTITEM			
FILE NAME	TYPE	LENGTH	DEC
SEQUENCE NO	NUMERIC	10	2
RECEIPT_NO	CHAR	2	
FOODSJD	CHAR	2	
ITEM	VARCHAR	60	
QUANTITY	VARCHAR	50	
UNIT_PRICE	INT		
DISCOUNT	INTEGER		

Table C.4. File Structure of RB M ORDERFOODS.

FILE STRUCTURE			
FILE NAME: RB_M_ORDERFOODS			
FILE NAME	TYPE	LENGTH	DEC
TRANS_NO	CHAR	2	
FOODSJD	CHAR	2	
TABLE_NO	CHAR	2	
QUANTITY	VARCHAR	50	
SERVER ID	CHAR	2	
ENTRY_MACHINE	DATETIME		
ENTRY_NAME	DATETIME		
ENTRY_DATE	VARCHAR	6	
REF_TABLE NO	CHAR	2	
STATUS	FLOAT		
SECTION ID	CHAR	2	
CHECKBILL_STATUS	VARCHAR	60	
CHECKING _ID	FLOAT		
BILL NO	CHAR	20	
SEND_MACHINE	DATETIME		
SEND_SECTION ID	CHAR	4	
BUSBOY	DATETIME		
PCODE	VARCHAR	50	
ITEM	VARCHAR	250	
TRANSFER NAME	DATETIME		
TRANSFER_DATE	VARCHAR	6	
CANCEL_NAME	DATETIME		
CANCEL DATE	VARCHAR	6	

APPENDIX D

DATA DICTIONARY

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Table D.1. Data Dictionary of RB_M_ FOODTYPE.

FILE NAME: RB_M_FOODSTYPE	DEFINITION
TYPE _ID	Code of Foods
ITEM	List of Foods

Table D.2. Data Dictionary of RB_M_INVOICE.

FILE NAME: RB_M_INVOICE	DEFINITION
BILL_NO	Number of Bill
BILL_DATE	Date of Bill
TABLE_NO	Number of Table
NAME	Name of Customer
ADDRESS	Address of Customer
TOTAL_AMOUNT	Total Amount Spending of that Table
DISCOUNT	Discounted Amount
VAT_STATUS	Percentage of Tax Charged on Each Item
TOTAL VAT	Total Amount of Value Added Tax
ENTRY_DATE	Date of Recording
ENTRY_NAME	Name of Recorder
ENTRY_MACHINE	Series of Machine
STATUS	Status of Invoice
SECTION JD	Number of Section
DISCOUNT_CODE	Type of Discount
DISCOUNTCARD NO	Number of Discount Card
PAYMENT_TYPE¯	Method of Payment
PAYMENTCARD_NO	Number of Discount Card
NET_AMOUNT	Net Amount After Deduct Discount
PAY_STATUS	Period of Time of Collecting Payment
RPAY_NAME	
CHECKOUT_STATUS	Status of Bill Checked Out
VAT_RATE	Rate of Value Added Tax
MARKETING_NAME	Name of Person who Persuades Customers
SERVER JD	Code of Waiting Staffs
BILLENDTIME	Receiving Payment Time
RECEIVE_AMT	Amount of Payment Received
CHANGE AMT	Amount of Changes
VOUCHER AMT	Amount of Voucher

Table D.3. Data Dictionary of RB_M_RECEIPTITEM.

FILE NAME: RB_M_RECEIPTITEM	DEFINITION
SEQUENCE_NO	Sequence of List
RECEIPT_NO	Number of Receipt
FOODS_ID	Code of Foods
ITEM	List of Foods
QUANTITY	Quantity of Foods
UNIT PRICE	Price of Food per Unit
DISCOUNT	Discounted Amount

Table D.4. Data Dictionary of RB_M_ORDERFOODS.

FILE NAME: RB_M_ORDERFOODS	DEFINITION
TRANS_NO	Sequence of List
FOODS_ID	Code of Foods
TABLE_NO	Number of Table
QUANTITY	Quantity of Foods Ordered
SERVER ID	Code of Waiting Staffs
ENTRY MACHINE	Series of Machine
ENTRY_NAME	Name of Recorder
ENTRY_DATE	Date of Recording
REF_TABLE_NO	Number of Referenced Table
STATUS	Status of Order Paper
SECTION ID	Code of Section
CHECKBILL_STATUS	Status of Bill Checked
CHECKING _ID	Code of Checking Bill
BILL_NO	Number of Bill
SEND_MACHINE	Series of Machine which Order Paper is sent to
SEND_SECTION _ID	Section Where Foods is Served
BUSBOY	The Person who Serves the Foods
PCODE	
ITEM	List of Foods Ordered
TRANSFER_NAME	Name of Waiting Staffs who Transfer the Table
TRANSFER_DATE	Date of Table be Transferred
CANCEL_NAME	Name of Waiting Staff who Cancels
CANCEL DATE	Date of Cancellation

APPENDIX E

REPORT

ASSUMPTION UNIVERSITY OF THAILAND
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LABOR OMNIA VINCIT
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Figure E.1. Report of Ranking Best Selling Beverages.

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Figure E.2. Report of Ranking Best Selling Foods.

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Figure E.3. Report of Sales and Separated Bill.

APPENDIX F

ECONOMIC FEASIBILITY ANALYSIS

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Estimated Project Cost for Candidate 1

I. Development cost

New Hardware:	Baht
File Server 1 @ 60,000	60,000
Clients 16 @ 28,000	448,000
TMU 210 printers 10 @ 21,000	210,000
TMU 950 printers 3 @ 40,000	120,000
Network (LAN) 10 @ 4,000	40,000
Back up Hard Disk 1 @ 15,000	15,000
UPS 1 @ 3,500	3,500
Compaq Proliant 350 CPU PII Server 1 @ 160,000	160,000
Total	1,056,500
New Software:	
Microsoft Office 2000 1 @ 12,000	12,000
Microsoft Window NT 1 @ 42,000	42,000
Microsoft Access 8.0 @ 35,000	35,000
Microsoft SQL Server 1 @ 65,000	65,000
Total	154,000

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Implementation cost:	Baht
Software development	275,000
Set up cost	50,000
Training cost	120,000
Total	445,000
Total Development cost	**1,655,500**

II. Operation cost

Personnel cost:	
Manager 4 @ 8,000 @ 12 mths	384,000
Waiting staffs 150 @ 3,500 @ 12 mths	6,300,000
Cashiers 3 @ 6,000 @ 12 mths	216,000
Total	6,900,000
Office supplies & Miscellaneous cost:	
Office supply cost	22,500
Utility cost	35,000
Maintenance cost	50,000
Miscellaneous 5,000 @ 12 mths	60,000
Total	167,500
Depreciation cost	130,000
Total operation cost	**7,197,500**
Total proposed system costs	**8,853,000**

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Estimated Project Cost for Candidate 3

I. Development cost

New Hardware:	Baht
File Server 1 @ 60,000	60,000
Clients 16 @ 28,000	448,000
TMU 210 printers 10 @ 21,000	210,000
TMU 950 printers 3 @ 36,000	108,000
Network (LAN) 10 @ 3,300	33,000
Back up Hard Disk 1 @ 15,000	15,000
UPS 1 @ 3,500	3,500
Compaq Proliant 350 CPU PII Server 1 @ 160,000	160,000
Total	1,037,500
New Software:	
Microsoft Office 2000 1 @ 12,000	12,000
Microsoft Window NT 1 @ 42,000	42,000
Microsoft Visual Fox Pro 6.0 @ 25,000	25,000
Microsoft SQL Server 1 @ 65,000	65,000
Total	144,000

Implementation cost:	Baht
Software development	330,000
Set up cost	115,000
Training cost	150,000
Total	595,000
Total Development cost	**1,776,500**

II. Operation cost

Personnel cost:	
Manager 4 @ 8,000 @ 12 months	384,000
Waiting staffs 150 @ 3,500 @ 12 months	6,300,000
Cashiers 3 @ 6,000 @ 12 months	216,000
Total	6,900,000
Office supplies & Miscellaneous cost:	
Office supply cost	22,500
Utility cost	35,000
Maintenance cost	50,000
Miscellaneous 5,000 @ 12 months	60,000
Total	167,500
Depreciation cost	130,000
Total operation cost	**7,157,500**
Total proposed system costs	**8,974,000**

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Table F.1. Cost Comparison between the Existing and Proposed Systems for Candidate 1.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Costs of Manual system						
Fixed cost:	50,000					
Operating cost:						
Personnel:						
Manager		576,000	633,600	696,960	766,656	843,322
Waiting staffs		8,400,000	9,240,000	10,164,000	11,180,400	12,298,440
Cashiers		648,000	712,800	784,080	862,488	948,737
Office supplies costs:						
Office supply cost		25,000	27,500	30,250	33,275	36,603
Utility cost		30,000	33,000	36,300	39,930	43,923
Miscellaneous		60,000	66,000	72,600	79,860	87,846
Depreciation cost		10,000	11,000	12,100	13,310	14,641
Total	50,000	9,749,000	10,723,900	11,796,290	12,975,919	14,273,511
Accumulated cost of existing system		9,799,000	20,522,900	32,319,190	45,295,109	59,568,621
Cost of computerized system						
Development cost:	1,695,500					
Operating cost:						
Personnel:						
Manager		384,000	422,400	464,640	511,104	562,214
Waiting staffs		6,300,000	6,930,000	7,623,000	8,385,300	9,223,830
Cashiers		216,000	237,600	261,360	287,496	316,246
Office supplies & Miscellaneous cost:						
Office supply cost		22,500	24,750	27,225	29,948	32,942
Maintenance cost		35,000	38,500	42,350	46,585	51,244
Utility cost		50,000	55,000	60,500	66,550	73,205
Miscellaneous		60,000	66,000	72,600	79,860	87,846
Depreciation cost		90,000	99,000	108,900	119,790	131,769
Total	1,695,500	7,157,500	7,873,250	8,660,575	9,526,633	10,479,296
Accumulated cost of proposed system		8,853,000	16,726,250	25,386,825	34,913,458	45,392,753
Cost difference		-946,000	-3,796,650	-6,932,365	-10,381,652	-14,175,868

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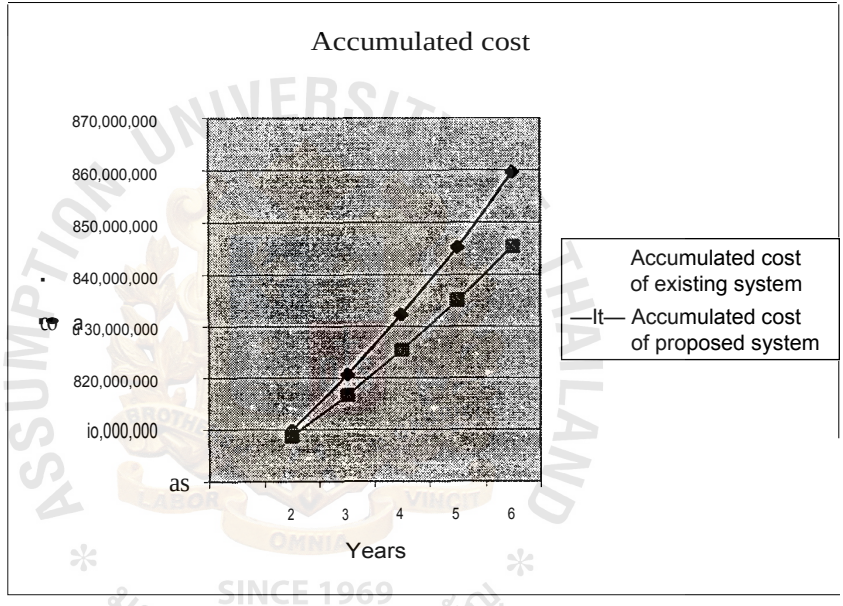

Figure F.1. Differential Cost Analysis for Candidate 1.

Table F.2. Cost Comparison between the Existing and Proposed Systems for Candidate 3.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Costs of Manual system						
Fixed cost:	50,000					
Operating cost:						
Personnel:						
Manager		576,000	633,600	696,960	766,656	843,322
Waiting staffs		8,400,000	9,240,000	10,164,000	11,180,400	12,298,440
Cashiers		648,000	712,800	784,080	862,488	948,737
Office supplies costs:						
Office supply cost		25,000	27,500	30,250	33,275	36,603
Utility cost		30,000	33,000	36,300	39,930	43,923
Miscellaneous		60,000	66,000	72,600	79,860	87,846
Depreciation cost		10,000	11,000	12,100	13,310	14,641
Total	50,000	9,749,000	10,723 900	11,796,290	12,975,919	14,273,511
Accumulated cost of existing system		9,799,000	20,522,900	32,319,190	45,295,109	59,568,620
Cost of computerized system						
Development cost:	1,816,500					
Operating cost:						
Personnel:						
Manager		384,000	422,400	464,640	511,104	562,214
Waiting staffs		6,300,000	6,930,000	7,623,000	8,385,300	9,223,830
Cashiers		216,000	237,600	261,360	287,496	316,246
Office supplies & Miscellaneous cost:						
Office supply cost		22,500	24,750	27,225	29,948	32,942
Maintenance cost		35,000	38,500	42,350	46,585	51,244
Utility cost		50,000	55,000	60,500	66,550	73,205
Miscellaneous		60,000	66,000	72,600	79,860	87,846
Depreciation cost		90,000	99,000	108,900	119,790	131,769
Total	1,816,500	7,157,500	7,873,250	8,660,575	9,526,633	10,479,296
Accumulated cost of proposed system		8,974,000	16,847,250	25,507,825	35,034,458	45,513,753
Cost difference		-825,000	-3,675,650	-6,811,365	-10,260,652	-14,054,867

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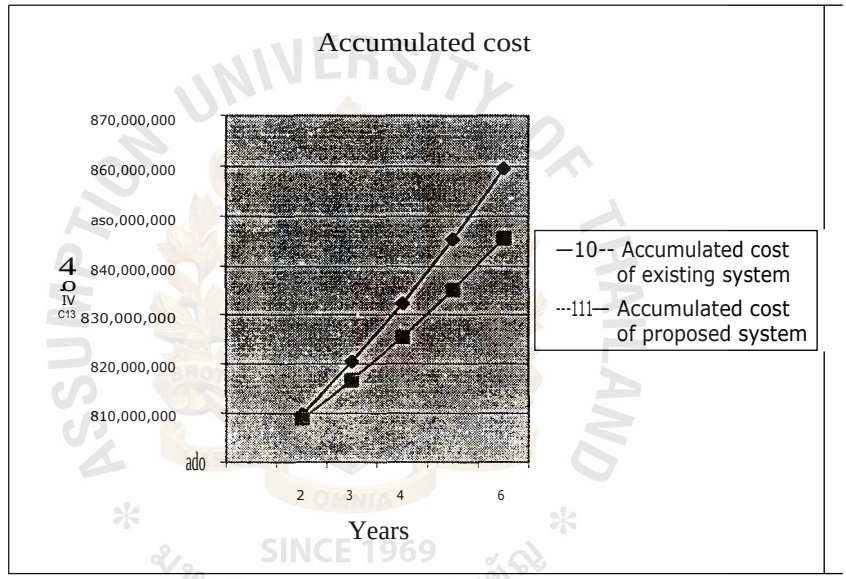

Figure F.2. Differential Cost Analysis for Candidate 3.

Table F.3. Payback Period Analysis of Candidate 1.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,695,500					
Annual operating cost		-7,157,500	-7,873,250	-8,660,575	-9,526,633	-10,479,296
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs {adjusted to present value)	-1,695,500	-6,391,648	-6,274,980	-6,166,329	-6,058,938	-5,941,761
Cumulative time-adjusted costs over lifetime:	-1,695,500	-8,087,148	-14,362,128	-20,528,457	-26,587,395	-32,529,156
Benefits derived from operating new system:	0	11,591,500	12,750,650	14,025,715	15,428,287	16,971,116
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits {adjusted to present value):	0	10,351,210	10,162,268	9,986,309	9,812,391	9,622,623
Cumulative time-adjusted benefits over lifetime:	0	10,351,210	20,513,478	30,499,787	40,312,178	49,934,801
Cumulative time-adjusted costs + benefits	-1,695,500	2,264,062	6,151,350	9,971,330	13,724,783	17,405,645

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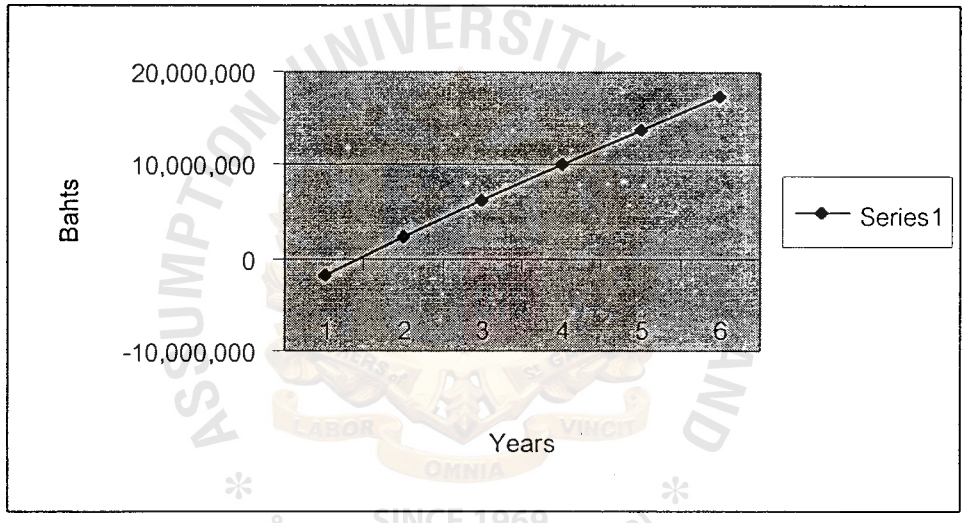

Figure F.3. Payback Period for Candidate 1.

Table F.4. Payback Period Analysis of Candidate 3.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	-1,816,500					
Annual operating cost		-7,157,500	-7,873,250	-8,660,575	-9,526,633	-10,479,296
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted costs (adjusted to present value)	-1,816,500	-6,391,648	-6,274,980	-6,166,329	-6,058,938	-5,941,761
Cumulative time-adjusted costs over lifetime:	-1,816,500	-8,208,148	-14483128	-20649457	-26708395	-32650156
Benefits derived from operating new system:	0	11,591,500	12,750,650	14,025,715	15,428,287	16,971,116
Discount factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (adjusted to present value):	0	10,351,210	10,162,268	9,986,309	9,812,391	9,622,623
Cumulative time-adjusted benefits over lifetime:	0	10,351,210	20,513,478	30,499,787	40,312,178	49,934,801
Cumulative time-adjusted costs + benefits	-1,816,500	2,143,062	6,030,350	9,850,330	13,603,783	17,284,645

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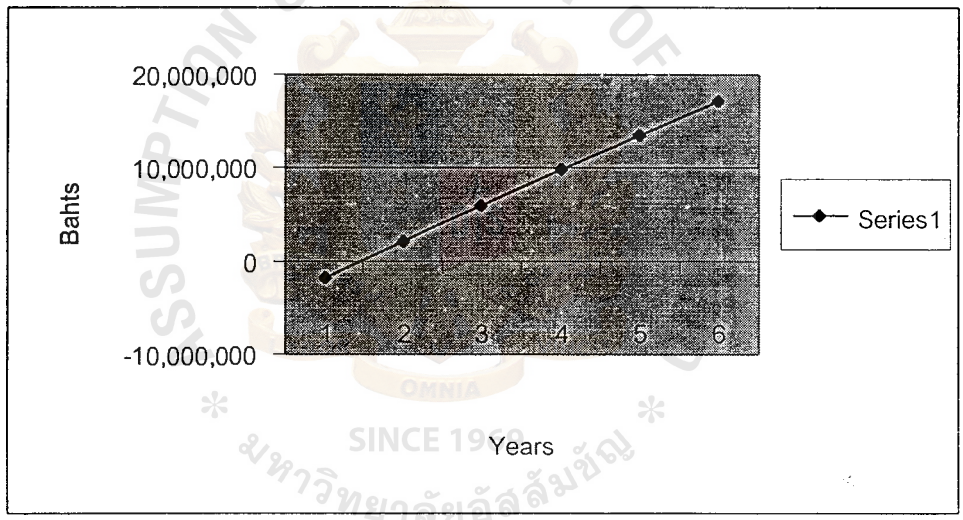

Figure F.4. Payback Period for Candidate 3.

APPENDIX G

USER INTERFACE

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Figure G.1. Financial Interface.

Figure G.2. Kitchen Interface.

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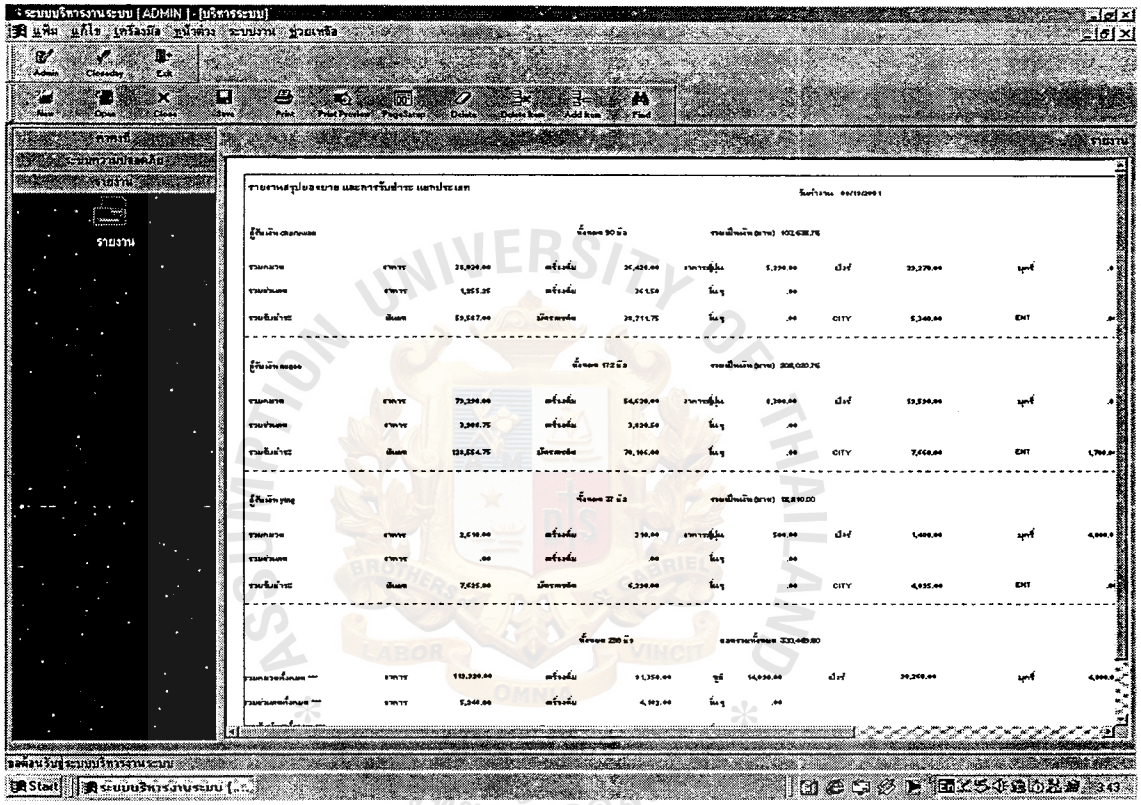

Figure G.3. Sales Interface.

Figure G.4. Cashier Interface.

Figure G.5. Bar Interface.

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