



Food and Beverage Information System
of P. S. Bowling (Pattaya)

by

Ms. Krittaya Pichitnapakul

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

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

November, 2001

MS (CIS)
St. Gabriel Library, Au

Food and Beverage Information System of P.S.Bowling (Pattaya)

by
Ms. Krittaya Pichitnapakul

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

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

November 2001

Project Title Food and Beverage Information System of P.S.Bowling
(Pattaya)

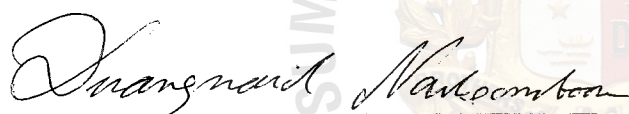
Name Ms. Krittaya Pichitnapakul

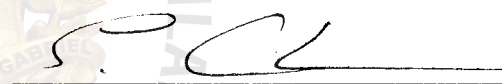
Project Advisor Dr. Duangnaid Narksomboon

Academic Year November 18, 2001

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

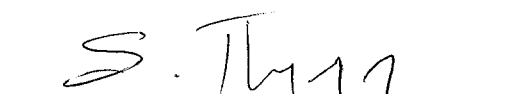
Approval Committee:


(Dr. Duangnaid Narksomboon)
Advisor


(Prof. Dr. Srisakdi Charmonman)
Chairman


(Air Marshal Dr. Chulit Meesajjee)
Dean and Co-advisor


(Asst. Prof. Dr. Vichit Avatchanakorn)
Member


(Assoc. Prof. Somchai Thayarnyong)
MUA Representative

November 18, 2001

ABSTRACT

Nowadays, most food chains and restaurants are quite competitive in terms of services. The computerized system is one of the high technology tools to be used as a strategic asset to increase speed and customer satisfaction. Restaurant businesses are not only one of the main industry to use computerized system to support their operations, but also entertainment businesses want to use this kind of technology to replace its manual system.

This project is a study about using computerized system in the entertainment business for improving its Food and Beverage service. Especially, the new proposed system in this system development project will be developed to replace the existing system by eliminating all manual problems such as duplicating works and human errors.

In the service industry, rapid speed and reliability are the main factors in running the business. Therefore, being able to share and send information to the right person at the right time will make the Food and Beverage department save some times, cost, paper, and as well as enhance the communication.

By running Information system, the company can manage and control the whole functions more easily. Depending on the business requirement, the new system can provide more accurate information to customers, track all functions, and increase communication among staff.

With the Client/Server and the software package specializing in Food and Beverage business, the system can use these tools to support all transactions and any relevant activities among the organization. Furthermore, the new computerized system is developed to be friendly and easy to use. So, the organization does not need to train people or prepare the conversion for a long time. The new system can be ready to replace the manual system immediately.

ACKNOWLEDGEMENTS

First of all, the writer would like to take this opportunity to express her thanks for the cooperation of several persons in helping this Food and Beverage Information system project.

She is indebted to Dr. Duangnaid Narksomboon, the advisor of this project, for giving me some advise and support for completing this project.

Also, she would like to thank Mr. Chawalit Poopaijitkul, the executive committee of P.S.Bowling (Pattaya) for giving information about Food and Beverage services in bowling industry, and others who have sacrificed their valuable time in order to provide the information needed for the system and gave me instructions. Furthermore, she would like to acknowledge the contribution of everybody else who were involved in this project.

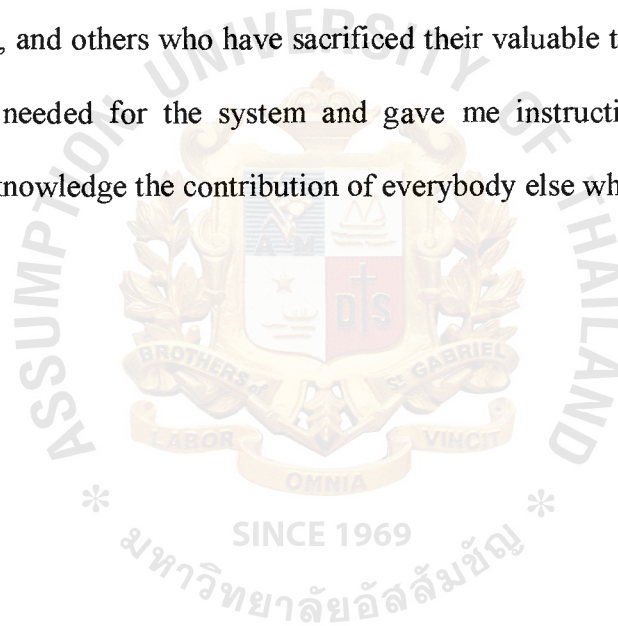


TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF FIGURES	v
LIST OF TABLES	vii
I. INTRODUCTION	1
1.1 Background of the Project	1
1.2 Objectives of the Project	6
1.3 Importance of the Project	6
1.4 Scope of the Project	7
1.5 Deliverables	7
II. THE EXISTING SYSTEM	10
2.1 Background of the Organization	10
2.2 Existing Business Function	11
2.3 Current Problems and Areas for Improvement	14
III. THE PROPOSED SYSTEM	17
3.1 System Specification	17
3.2 System Design	18
3.3 Hardware and Software Requirement	36
3.4 Security and Control	38
3.5 Cost and Benefit Analysis	39
IV. PROJECT IMPLEMENTATION	51
4.1 Overview of Project Implementation	51
4.2 Testing	51

<u>Chapter</u>	<u>Page</u>
4.3 Training and Conversion	54
V. CONCLUSIONS AND RECOMMENDATIONS	56
5.1 Conclusions	56
5.2 Recommendations	57
APPENDIX A LOGICAL DATA FLOW DIAGRAM	60
APPENDIX B DATABASE DESIGN	67
APPENDIX C PHYSICAL DATA FLOW DIAGRAM	70
APPENDIX D SOFTWARE DESIGN	75
APPENDIX E PROCESS SPECIFICATION	78
APPENDIX F DATA DICTIONARY	88
APPENDIX G INTERFACE DESIGN	90
BIBLIOGRAPHY	100

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Organization Chart of P.S.Bowling (Pattaya)	5
1.2 Project Plan of Food and Beverage Information System	9
2.1 Context Diagram of Existing System in Food and Beverage Department	11
2.2 Diagram of Existing System	13
3.1 Entity Relationship Diagram of the Proposed System	20
3.2 Context Diagram of the Proposed System	22
3.3 Decomposition Diagram of the Proposed System	25
3.4 DFD Level 0	26
3.5 Network Configuration of the Proposed System	32
3.6 Cost Comparison between Existing and Proposed System	46
3.7 Payback Analysis of the Proposed System	50
A.1 Logical Data Flow Context Diagram of the Proposed System	60
A.2 Logical DFD Level 0	61
A.3 Logical DFD Process 1.0 Level 1	62
A.4 Logical DFD Process 2.0 Level 1	63
A.5 Logical DFD Process 3.0 Level 1	64
A.6 Logical DFD Process 2.1 Level 2	65
A.7 Logical DFD Process 2.2 Level 1	66
B.1 ERD Context Level Data Model	67
B.2 ERD Key Based Data Model	68
B.3 ERD Fully Attributed Data Model	69
C.1 Physical DFD Process 1.0 Level 1	70
C.2 Physical DFD Process 2.0 Level 1	71

<u>Figure</u>	<u>Page</u>
C.3 Physical DFD Process 3.0 Level 1	72
C.4 Physical DFD Process 2.1 Level 2	73
C.5 Physical DFD Process 2.2 Level 2	74
D.1 Structure Chart of Process 1.0	75
D.2 Structure Chart of Process 2.0	76
D.3 Structure Chart of Process 3.0	77
G.1 Authorization Input Screen	90
G.2 Food and Beverage List Screen	91
G.3 Order Input Screen	92
G.4 Cashier Input Screen	93
G.5 Bar Controller Input Screen	94
G.6 Manager Input Screen	95
G.7 Sale Report	96
G.8 Order Report	97
G.9 Payment Report	98
G.10 Inventory Report	99

LIST OF TABLES

<u>Table</u>	<u>Page</u>
3.1 The Hardware Specification for the Server Computer	37
3.2 The Software Specification for the Server Computer	37
3.3 The Hardware Specification for Each Client Machine	38
3.4 The Software Specification for Each Client Machine	38
3.5 Estimated Projected Cost	40
3.6 Tangible Benefits of the Proposed System	42
3.7 Manual System Cost Analysis	43
3.8 Five Years Accumulated Manual System Cost	43
3.9 Computerized System Cost Analysis	44
3.10 Five Years Accumulated Computerized Cost	45
3.11 The Comparison of the System Cost	45
3.12 Payback Analysis of the Proposed System	48
3.13 Net Present Value of the Proposed System	49
4.1 System Testing of the Proposed System	53
5.1 The Degree of Achievement of the Proposed System	61
E.1 Process Specification of Process 1.1.1	78
E.2 Process Specification of Process 1.1.2	78
E.3 Process Specification of Process 1.1.3	79
E.4 Process Specification of Process 1.1.4	79
E.5 Process Specification of Process 2.1.1	80
E.6 Process Specification of Process 2.1.2	80
E.7 Process Specification of Process 2.1.3	81
E.8 Process Specification of Process 2.1.4	81

<u>Table</u>	<u>Page</u>
E.9 Process Specification of Process 2.1.5	82
E.10 Process Specification of Process 2.1.6	82
E.11 Process Specification of Process 2.1.7	83
E.12 Process Specification of Process 2.1.8	83
E.13 Process Specification of Process 2.1.9	84
E.14 Process Specification of Process 3.1.1	84
E.15 Process Specification of Process 3.1.2	85
E.16 Process Specification of Process 3.1.3	85
E.17 Process Specification of Process 3.1.4	86
E.18 Process Specification of Process 3.1.5	86
E.19 Process Specification of Process 3.1.6	87
F.1 Data Dictionary of Customer Table	88

I. INTRODUCTION

The bowling industry is considered to be one of the successful and competitive businesses. Especially, bowling becomes a popular sport for everyone. So, many groups of investors both locally and internationally want to operate their own bowling center in Thailand. As entertainment complex, each bowling center provides various services for serving the customers such as Food and Beverage service.

Along with bowling activity, Food and Beverage service is other main service that most bowling centers offer. However, most bowling centers have to compete their own food and beverage service against other direct competitors or any restaurants nearby. Because of this, most bowling centers should have a good Food and Beverage Information System to control service quality and achieving customer satisfaction.

1.1 Background of the Project

A good food and beverage (F & B) Information system is needed not only for restaurants, but also for entertainment businesses because it can help them to save time as well as operating cost. Besides, the effective food and beverage Information system can provide more benefits for the businesses. For instance, the system owners can increase more sales and reputation. The customers enjoy rapid services. The end users can easily use the system to retain accurate data and information. Because of this, most food chain stores use the computerized system for improving its controls and services such as Sizzler and Pizza Hut.

Similar to the service industry, the effective Food and Beverage system used in any famous restaurants can be applied to Food and Beverage service in entertainment businesses. In particular, the Food and Beverage Information system can be adopted to use in bowling centers where Food and Beverage service is considered as the secondary

activity. At this point, P.S.Bowling (Pattaya) is chosen to study how to develop and implement an Food and Beverage Information System in the bowling business.

P.S.Bowling (Pattaya) is the latest franchise of P.S.Bowling Group, which is the largest bowling chain in Thailand. It is a 32 lane state-of-the-art bowling center located on the 3rd floor in the shopping center at Central Pattaya. Besides operating with the latest computerized system and equipment from the United States, P.S.Bowling (Pattaya) also provides Food and Beverage services for both of their local and international customers during their visit.

P.S.Bowling (Pattaya) has organized the company into main three main departments: Bowling, Food and Beverage, and service & support department. (Figure 1.1)

(1) Bowling Department

This department focuses on mostly serving customers on the bowling lanes from checking-in until finishing bowling games. The staffs in this department consist of a bowling manager, cashiers, instructors, and shoes rental staffs. The main task of this department is to assist customers starting from providing bowling shoes to arranging lanes.

(2) Food and Beverage Department

Food and Beverage department focuses on serving food and beverages to customers in the bowling center. The main tasks of this department include from taking orders, serving, and collecting the payment. So, the key employees of this department are Food and Beverage manager, Food and Beverage cashier, waiters, bar staffs, kitchen staffs, and busboys.

(3) Service & Support Department

To maintain business, P.S.Bowling (Pattaya) needs to maintain the bowling lanes and as well as all facilities ensuring that everything in the center operating well. The key employees are mechanics, cleaners, and inventory controllers.

By operating the bowling center, P.S.Bowling (Pattaya) has imported the latest computerized system to control all activities called BOSS system. Since American Food and Beverage service is different from that in Thailand, the BOSS system cannot support the Food and Beverage department effectively. Because of this, P.S.Bowling (Pattaya) has to manage Food and Beverage service mostly through manual work for controlling Food and Beverage processes in the bowling center separately.

The whole department uses order forms with several copies as the main document for distributing the orders. There are two main order forms: Food and Beverages Forms. When the customers order food and drinks, the waiters will write their names, orders and its price on the order forms. Then, the first copy is distributed to either the bar or the kitchen. The second copy is kept with the cashier for payment calculation. The last one is kept in the book as a hardcopy for checking against the inventory stock.

By using only the order forms, it is difficult to control the process and track down the orders whether it has been processed and served to the customers. Moreover, there are several problems caused by human errors. For instance, the order forms are lost or misplaced. At the same times, there are more communication problems among the staffs in the department such as the unreadable handwritten of the waiters.

Besides using the manual order forms, there is another problem with distance which causes order delays as there is only one bar and kitchen in the bowling center. The waiters have to walk from lanes or the customer's tables to the bar for ordering and

picking up the food and beverages. At this point, it shows clearly that the distance becomes a major problem to slow down the business cycle. In terms of service, longer time taken will make P.S.Bowling (Pattaya) lose their customers because waiting time and cold food will influence them to have meals outside the bowling center.

To solve these problems and improve the service quality of Food and Beverage services, P.S. Bowling (Pattaya) needs to implement the Food and Beverage Information system for managing the services of this department. Therefore, this project will focus on the details and problems of the existing system in order to enhance the workflow of the department and fulfill the business requirements.



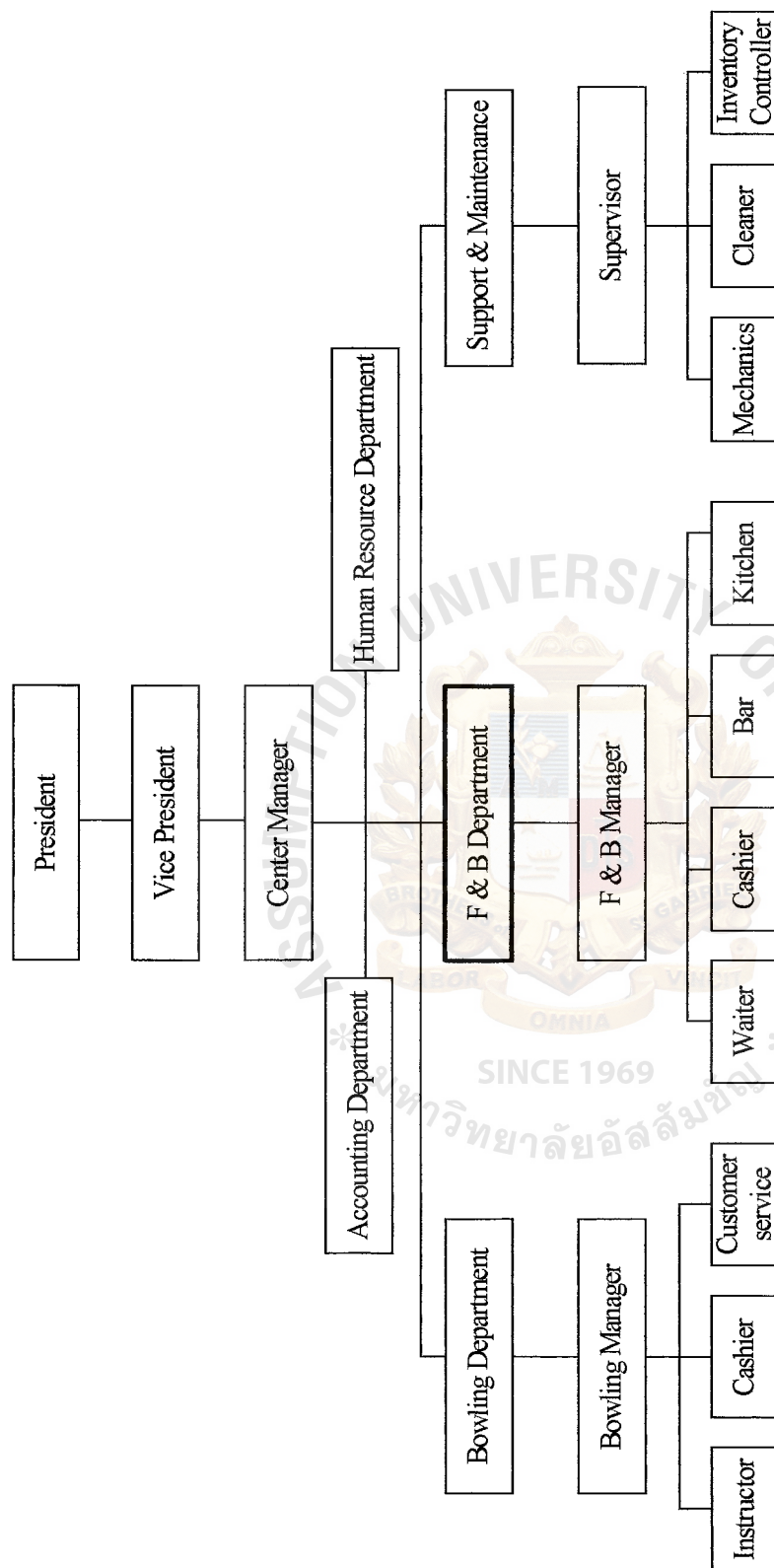


Figure 1.1. Organization Chart of Food and Beverage Information System for P.S.Bowling (Pattaya).

1.2 Objectives of the Project

Since most processes in Food and Beverage department at P.S.Bowling (Pattaya) are based on manual works in the existing system, order tracking, delays, and no standard information stored are needed to improve for increasing service quality. Thus, this project will focus on solving these problems by proposing the new system for this department. The objectives of project work developing are as follows:

- (1) To analyze the existing system and observe business, users, and other requirements. The existing system must to be observed and studied for collecting the facts as well as understanding the business processes and other business needs.
- (2) To implement the computerized system for controlling the work flow and managing the processes of Food and Beverage department, the new computerized system must be designed for order tracking and monitoring the whole process.
- (3) To enhance the communication between users among the department by introducing the interface technology in order to reduce business cycle and improve service quality.
- (4) To improve data management and data storage by storing data in a database, which will be shared among the department and other relevant staffs in the bowling center such as creating the report for manager.
- (5) To set standard data entry format to facilitate data storage in order to reduce human errors and mistakes. Data will be recorded in the same format for both retrieving and entering.

1.3 Importance of the Project

The importance of the project is to study how to develop a good Food and Beverage Information system in bowling business. By coming up with the great system design and implementation, studying the existing system and collecting business requirement for each bowling center and environment are required. In other words, Food and Beverage department of each bowling center is quite different from each other. So, system planning is quite unique from one to other due to its goal and scope.

1.4 Scope of the Project

The primary scope of this project is to develop a Food and Beverage Information system replacing the manual process for supporting and improving its performance. The scope of the project is as follows:

- (1) To analyze the business requirement for the new Food and Beverage Information system and select the proper business applications.
- (2) To design a new computerized system and develop related programs for supporting the Food and Beverage processes.
- (3) To develop a new database system which will fulfill the data requirement and be shared among the Food and Beverage department.
- (4) To design the input or output screen for distributing data to other areas or working stations properly.
- (5) To test programs and system for ensuring operating efficiency and performance.

1.5 Deliverables

Throughout this project, the project deliverables primarily emphasize on three main areas: system analysis, system design, and system implementation.

System analysis is the main study from the existing system for finding the business requirements. By collecting necessary information, system owner and end users interview are required to identify problems and understand the system clearly. So, the deliverables for this part include Data model such as Entity Relationship diagram (ERD) and Process Model which combines of Functional Decomposition and Data Flow diagram.

After finding the business requirements, the logical data model from previous section are continuously expanded to more technical ready for implementation. The deliverable for the system design part are Data Analysis, Physical Data Flow Diagram, Input/output design as well as software program.

The third section is the new system implementation, which serve to construct and deliver the new system into operation. The deliverables of the new system operation are described as follows:

- (1) Hardware and Software requirement
- (2) Test Plans
- (3) Training and Conversion

In order to prepare these mentioned deliverables, the project plans are represented below: (See Figure 1.2)

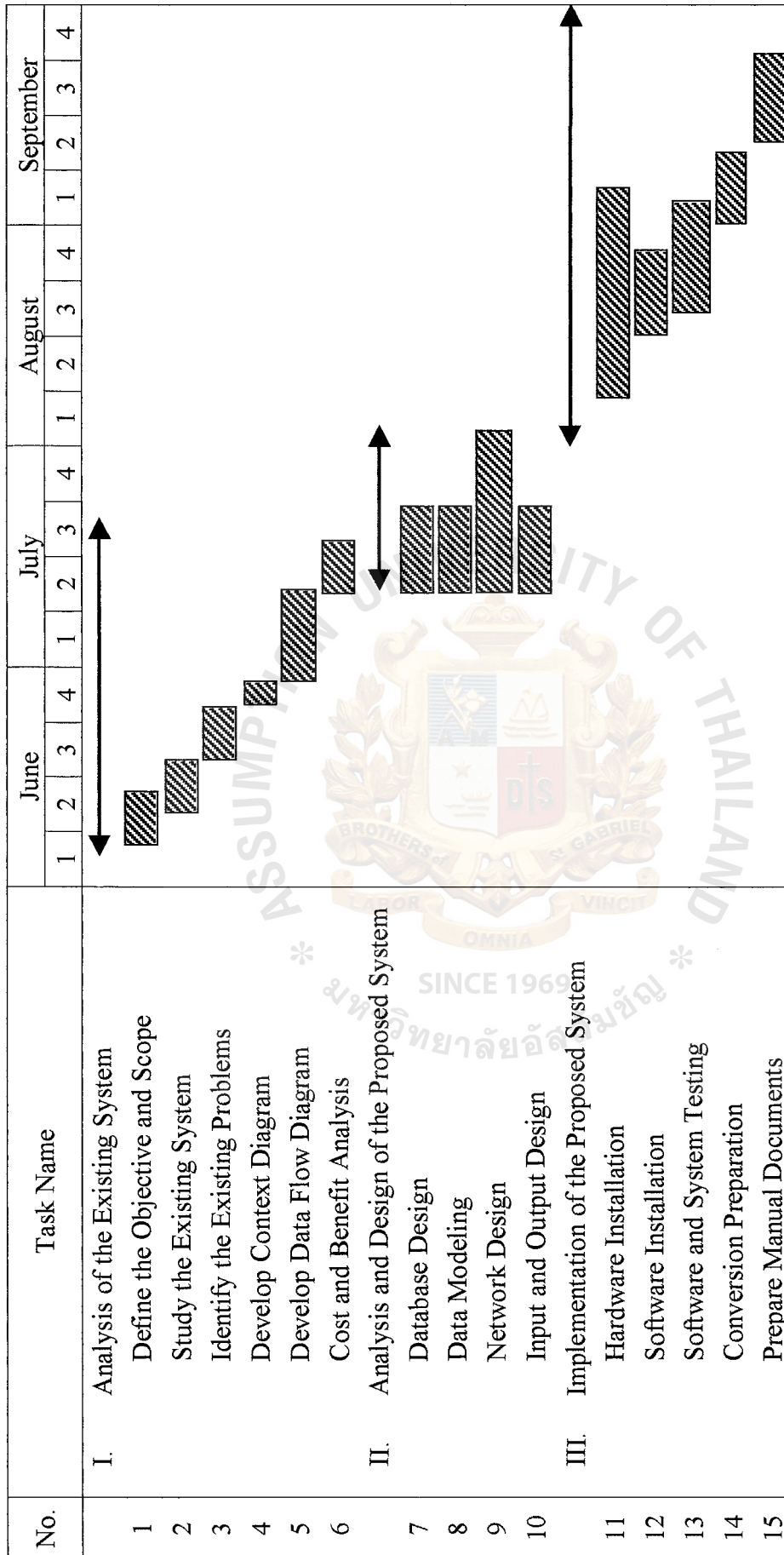


Figure 1.2. Project Plan of Food and Beverage Information System.

II. THE EXISTING SYSTEM

2.1 Background of the Existing System

The main responsibility of Food and Beverage department at P.S.Bowling (Pattaya) is to serve food and beverage to customers in the bowling center. The service cycle of this department start from taking order from customers, writing orders on order forms, and distributing the order forms to the bar or kitchen for processing the orders. After serving the orders, the waiters will hand the bills to the cashier for calculating the payment. Then, the waiters will collect the payment from customers and hand to the cashier for making reports.

Later, all transactions that are recorded on the manual process will be handed to checkers for checking the balanced stocks for each day. In other words, all of order copies will be collected from the cashier, the bartender, and the kitchen staff for tracking to check whether all orders are processed and paid. Also, the amount of orders will be checked against the inventory stocks for left over. If some items are sold out, the inventory controller cannot refill and order suppliers immediately.

Throughout this routine, there are many mistakes and errors such as tracking the orders, checking the transactions, and distributing the orders. Especially, the Food and Beverage manager cannot monitor and control whether the orders are completed and delivered to customers. In some case, the order forms are misplaced and lost. The orders are delivered to wrong tables or lanes. When customers complain about their orders, it is difficult to track down and solve those problems right away.

In addition, re-checking the order transaction takes a long time to process because the inventory controller and checker have to go through each order and record manually

for the sold items number. Usually, the inventory controller and checker find out the mistakes a day later, which cannot solve problems and is late to do anything.

Overall, the processes of the existing system that is described above is summarized into the context diagram shown on Figure 2.1.

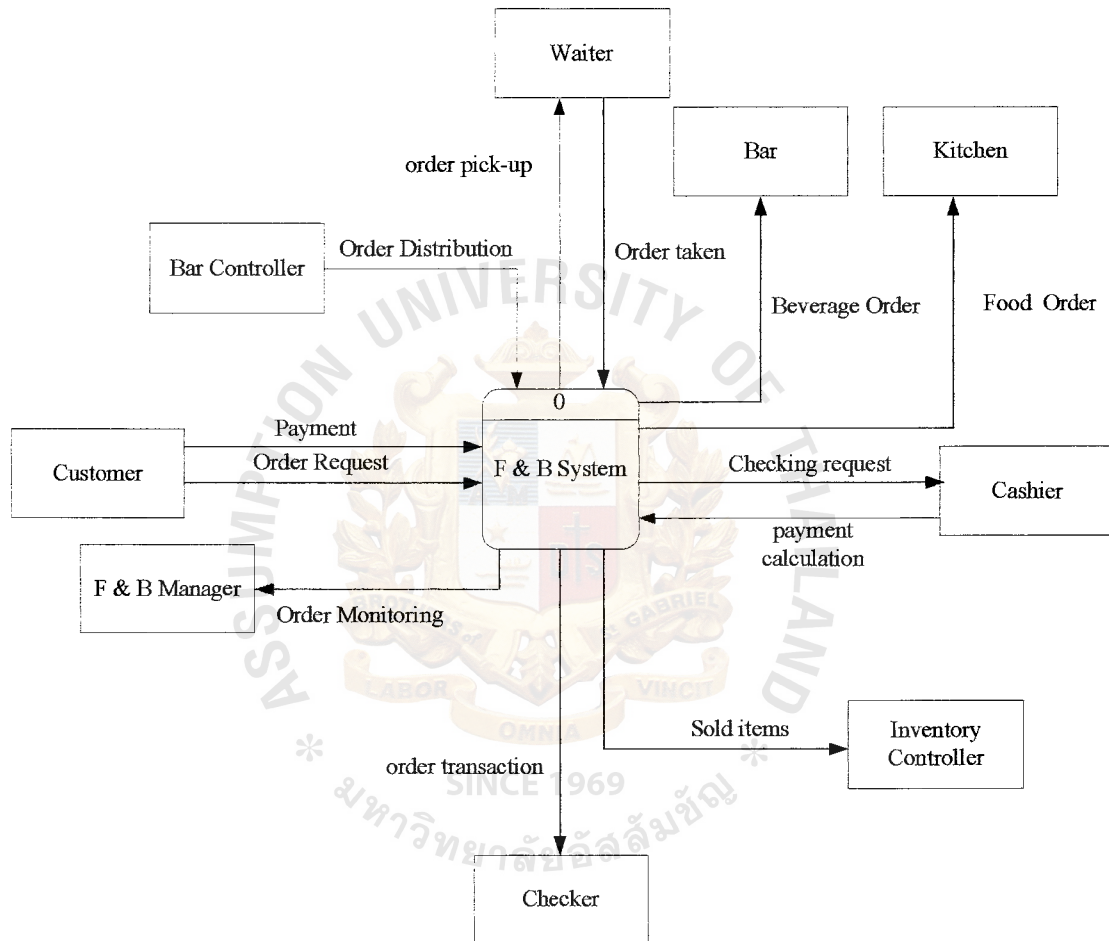


Figure 2.1. Context Diagram of Existing System in Food and Beverage Department.

2.2 Existing Business Functions

Similar to any restaurant business, F & B processes in the bowling center can be divided into four main tasks: order taking, order distribution, order delivery, and payment. Order taking is a task that customers place the order. Order distribution is

taken when the orders are submitted and handed through the bar controller for separating food and beverage orders. Then, the orders are passed to either the bar or the kitchen for further processing. Order delivery is a task when the orders are completed finished and taken to customers. Finally, the cashiers collect and control the payment transactions. All of these four main tasks are summarized into the diagram shown in Figure 2.2.

(a) Order Taking Task

After taking orders from customers, the waiters will go to the working station or the bar for filling the order forms separately for Food and Beverage including table number, quantity, and price. Then, the waiters have to calculate the price manually on the order forms. Next, they submit the first copy to the bar controller and the second copy to the cashier for payment handling.

(b) Order Distributing task

When the waiters hand the order forms to the bar controller, the orders are distributed separately. For food orders, those order forms are passed to the kitchen. The beverage orders are passed directly to the bar for further processing. If those order forms are unreadable, the bar controller has to check with the waiters. In case of unavailable stock for some orders, the bar controller has to wait for refilling or contact the waiters/the waitresses for revising the orders.

(c) Order Delivery Task

As soon as the orders are completed, the kitchen staff and the bar controller will bring those finished orders to the bar controller. Then, the bar

controller informs the waiters/the waitresses for picking up and delivering to customers.

(d) Payment Task

When the customers request bills, the waiters ask the cashier at the counter for the second copies and total payment. The waiters present the bills and collect the payment. Then, they bring this payment back to the cashier and complete the transactions.

At the end of the shift, these transactions are reported to the Food and Beverage manager. Also, all copies of order forms are returned to the checker for checking the sale amount, stocks, and payment.

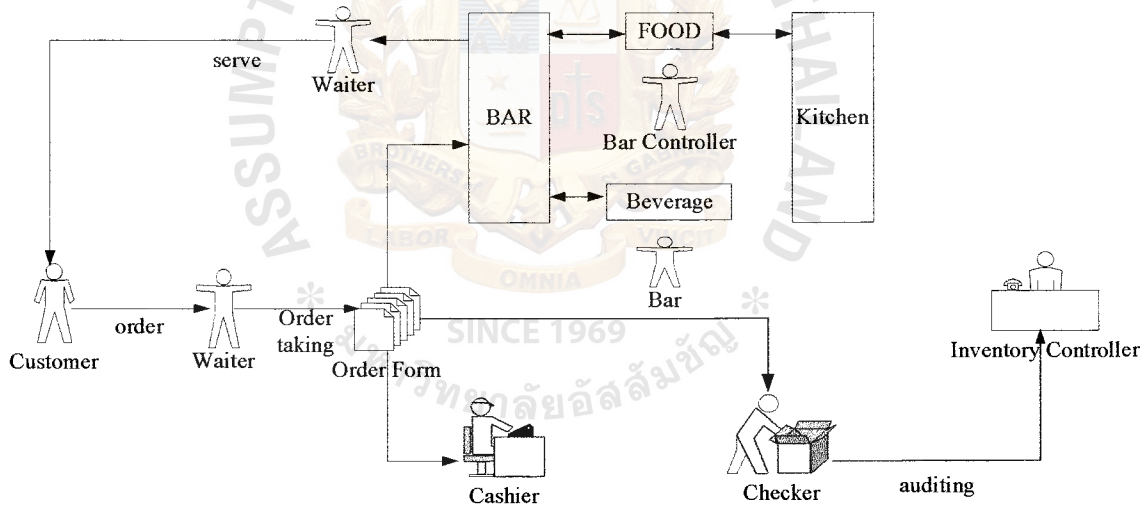


Figure 2.2. Diagram of the Existing System.

2.3 Current Problems and Areas for Improvement

2.3.1 Current Problems

By relying on manual procedure, there are several problems affecting their services. By analyzing the existing system, the Food and Beverage department at P.S.Bowling (Pattaya) has four major problems as follows:

(1) Centralized working station

Since most orders have to be processed at the bar counter, the waiters have to write the order forms at the bar counter. For instance, the waiter has to walk about 20 meters from lane 32 or the customer's table in the back area picking up the orders. The waiters waste their time to walk back and forth when they want to submit the orders. They have to go back to serve the other customers at the lane area while they are waiting for order processing. When the orders are completed, they have to walk to the work station for pick-up.

(2) Multitasks Performing

For servicing customers, the waiters have to perform multiple tasks at the same time such as checking the bills, cleaning the tables, and taking new coming customers to the seats. Especially during the peak hours, the waiters and the waitresses are likely to forget to write down the orders and leave the order forms to the bar controller. As the result, the orders are not processed properly.

(3) Orders Tracking

When the orders are finished, the kitchen and bar controller will place those in front of the bar waiting for pick-up. Without any specific table and

other information, the waiters and the waitresses do not know where they should deliver. So, the repetitive orders and mistakes often occur.

(4) Inventory Control

Besides servicing, the Food and Beverage department also needs to control inventory. Since all the existing system is based on manual order forms, the bar controller and the checker have to count those order forms and record on the piece of paper for finding the balance stock. At the same time, the inventory controller needs to report the inventory status to F & B manager at the end of each day. Thus, the Food and Beverage manager cannot forecast what to order because he cannot find out how much the materials remain in the stock.

2.3.2 Areas for Improvement

Throughout the F & B department, its service quality should consist of rapid speed, efficient workflow, food tracking, and data accuracy. In order to improve the existing system, it is necessary to emphasize these following requirements:

- (1) Eliminate manual data entry by designing the standard data entry format. The format should be easy to use and understand among the whole department for better communication. With the same format, it is easy to store, retrieve, and produce the report under the same platform.
- (2) Improve data management by organizing and grouping data according to its usage and task such as order taking and payment. All data are kept on the database for direct access and distribution to the whole department immediately. In this case, these data help to decrease delay time and redundant work. Especially, work efficiency will be improved for order tracking and controlling because the manager and staffs can use the database

as reference. When there are any errors, the staffs can check from the database promptly.

- (3) Increase speed of working process by distributing orders electronically. The waiters do not need to pass the order to the bar controller. Instead, they can key the order to the bar and kitchen through kiosks which will automatically distribute orders to the bar and kitchen respectively.
- (4) Enhance workflow and increase response time by accessing the database directly for monitoring process. If there is any problem, most staffs in the department can check for errors and respond immediately.
- (5) Provide both routine transaction and MIS reports for users. The report will be used for daily operations and decision-making purposes. This will reduce the time for preparing reports manually and repetitively in case of submitting to other department. The users can retrieve data from the system accurately and immediately.

III. THE PROPOSED SYSTEM

3.1 System Specification (User Requirement)

In order to improve the problems from the existing system, there are several criteria that the users require for operating efficiency as follows:

- (1) Order Information must be collected and input through any kind of computerized device. By replacing the manual system, all information must be changed into computerized format for retrieving and processing the orders. This increases the speed of the response time for order processing and tracking. At the same time, security control should authorize data access to only valid users by defining user names and passwords.
- (2) Store the price list, inventory stock, and all transactions in to the data store as reference for gaining more control and auditing.
- (3) Standard data format is required in order to enhance communication and control. The information should be easy to use and understand for both data entry and report generating.
- (4) All data must be linked together and shared throughout the department. Especially, data should be interfaced via real time online processing. In order to increase the speed of service, all information and transaction must be accessed quickly by several people such as cashier, waiter, and bar controller.
- (5) The system should be feasible to adjust, improve, or correct for any wrong orders and insufficient stocks, for instance, the cashier can correct the detail of orders before processing payment.

- (6) The system can control the inventory more efficiently by checking the sufficient stock automatically. Instead of counting the stock manually, the system should provide the inventory control automatically. This reduces working time for checkers and auditors to check the inventory.
- (7) The system needs to have more than one working stations for placing the orders.

3.2 System Design

The system design of this project primarily focuses to fulfill the business requirement of the Food and Beverage department as well as users friendliness. Especially, the project uses the most popular technique of data and process modeling to organize and document the business data requirement controlling all functions of the system. After the data model is completed, the data analysis and normalization technique will be applied in this project for designing database to be non-redundant, flexible, and adaptable. At the same time, the project will use the process modeling to organize the flow of data through processes in which it will be divided into levels covering both logical and physical data flows for system design.

(1) Data Modeling

For designing a new system, the data modeling is sometimes called Entity Relationship Diagram (ERD). It is used for developing the database ensuring how the information has been processed and stored in the system. Because most information is needed to share among the whole department, the new system focuses on efficient storage, retrieving, and update data. In this case, the project needs to manage data with rational database, especially with Microsoft SQL server. Thus, ERD technique represents the logical structure of the database in a pictorial manner.

In the data model, the fundamental entities in this system are Customer, Waiter, Bar Controller, Bar, Kitchen, Bus Boy Staff, Food and Beverage Order, Food and Beverage list, and Food and Beverage price. These nine entities can be described their relationship as follows: (See Figure 3.1.).

The ERD of the new system is also illustrated clearly in Appendix B.



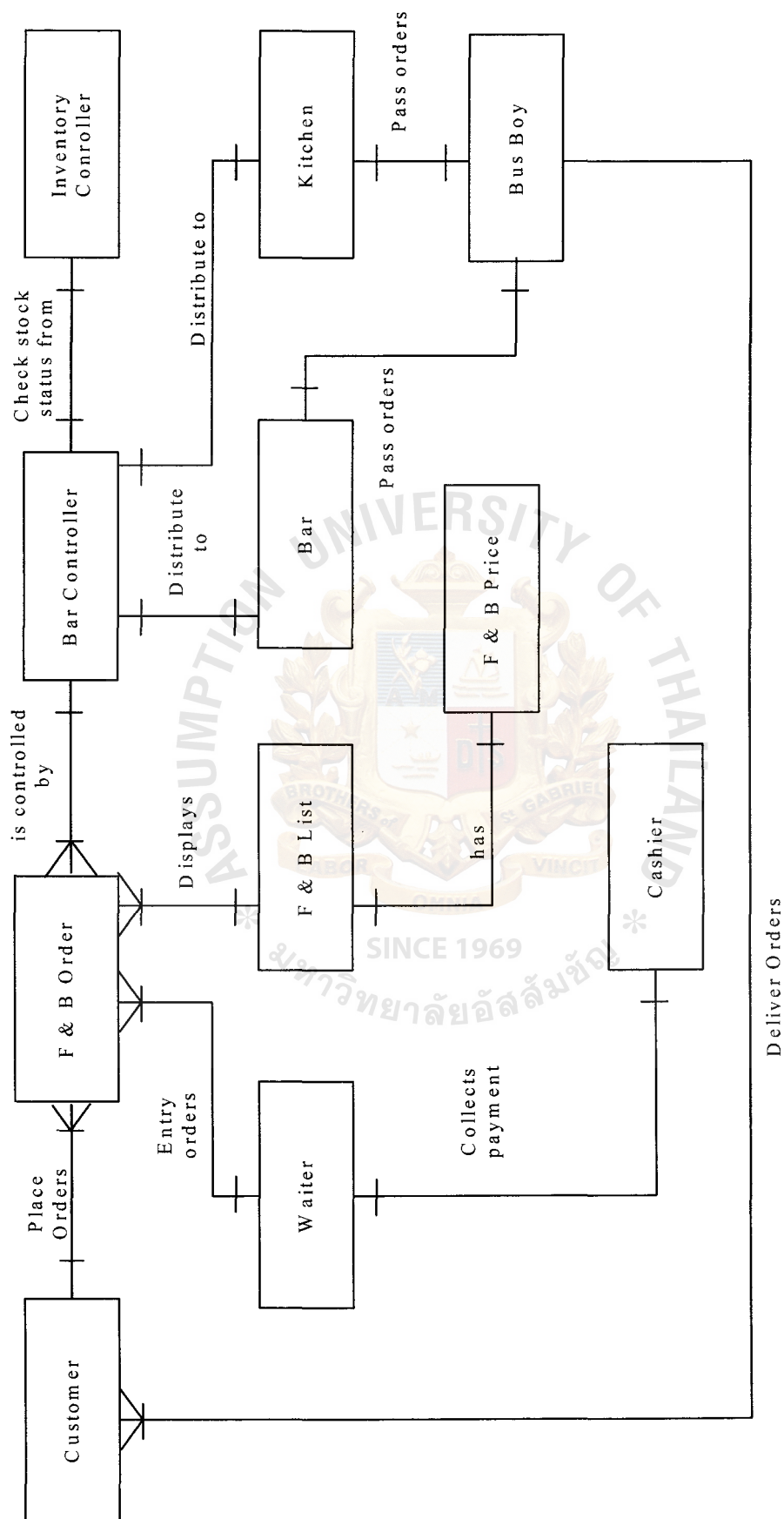


Figure 3.1. ERD of the Proposed System.

(c) Process Modeling

Process Modeling is a technique for organizing and documenting the structure and flow of data through a process system. One of the most popular techniques that has been used for analysis the process of the F & B system is called Data Flow Diagram (DFD). This is a tool that illustrates the flow of data through a system and the work or processing performed by that system. To understand the movement and flow of the data through the system, Data Flow Diagrams or DFDs are shown in Appendix A.

The Data Flow Diagram of the proposed system are represented into both logical and physical data flows. The logical data flow is a non-technical business requirement for understanding how the system works and designing the new system.

The process modeling of the proposed system focuses on the computerized distribution of information. It especially stores the relevant data in a centralized database for eliminating the data redundancy and increasing data consistency. Because of this, the relevant information can be sent to the right people and the right time among the Food and Beverage department. (See Figure 3.2)

The details of system analysis and design of Food and Beverage system have been presented in the form of graphical presentation, which includes:

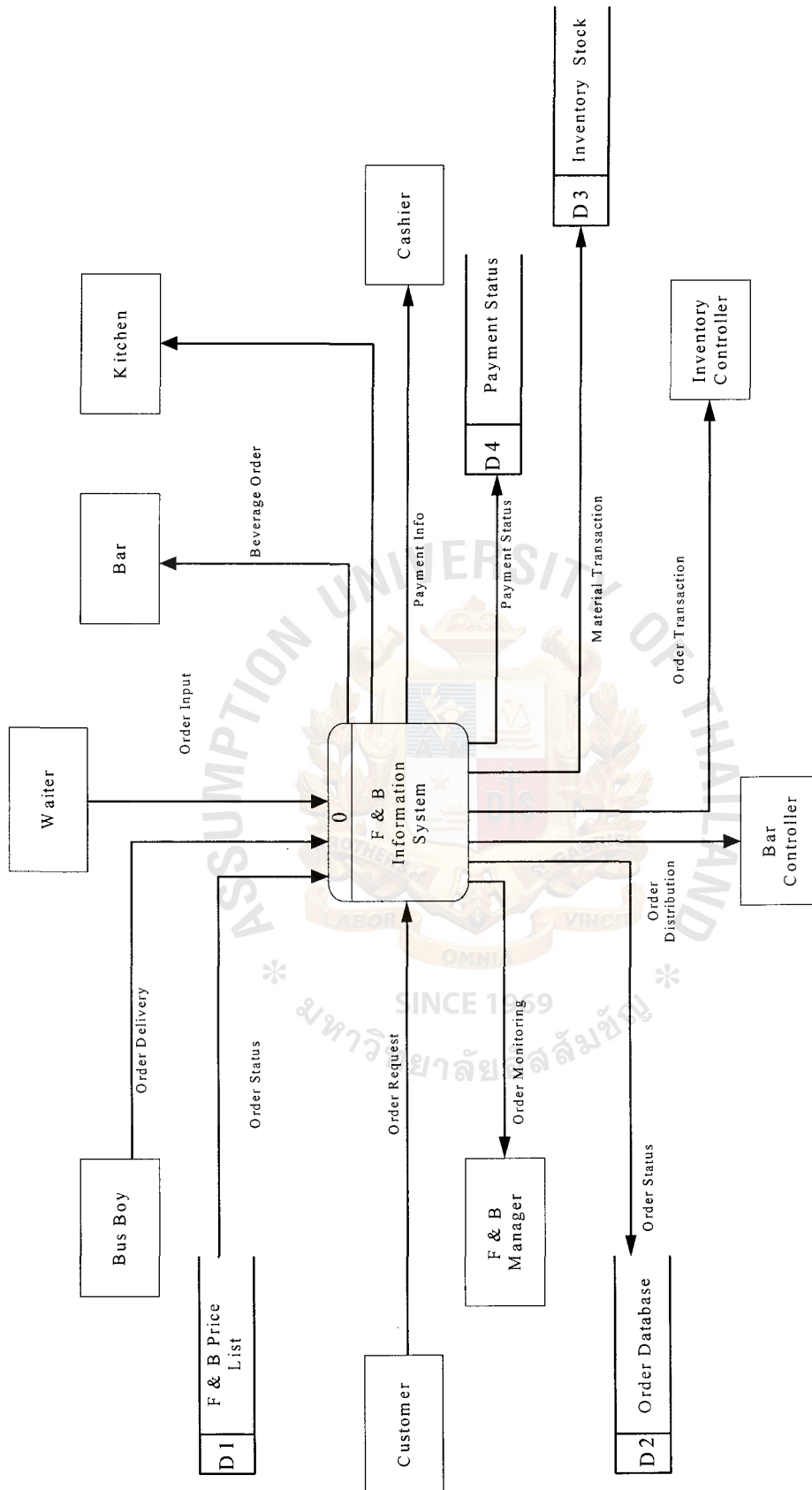


Figure 3.2. Context Diagram of the Proposed System.

(a) Decomposition Diagram

For breaking the system into its subsystems, processes, and sub-processes, the decomposition diagram is applied here for better understanding of the system. The hierarchy chart of the decomposition diagram shows the top-down functional decomposition and structure of a system. (See Figure 3.3.)

(b) Logical Data Modeling

Logical data model illustrates the essence of the system. According to the business requirement, the core Food and Beverage system consists of three main subsystems categorizing by its functions as follows: (See Figure 3.4.)

Order Taking subsystem: This subsystem is considered as the earliest process in the F & B department. This function refers to data keying the orders into the system. By keying the food and beverage codes, the orders will be routed to the bar and the kitchen automatically for further processing. At this point, the system will generate the order number and order table for reference.

Inventory subsystem: This process focuses the sufficient stock checking and the number of the items that have been sold. Based on the F & B code and the order number, the system can check for the stock balance immediately. Also, the inventory subsystem can generate the report for F & B manager for the number of sold items periodically. So, the manager can use this report to predict the number of inventory that F & B department should carry.

Payment Subsystem: This subsystem is mainly about collecting the payment. When the customers request a check, the cashier can access the information of that particular transaction and adjust the right information into printed receipt. Also, the payment record is stored into the system which can generate a report to the F & B manager for periodical transactions.

The details of these subsystems are presented graphically in the context data flow diagram and the processes of level 0 and level 1 data flow diagram. (See Appendix A).



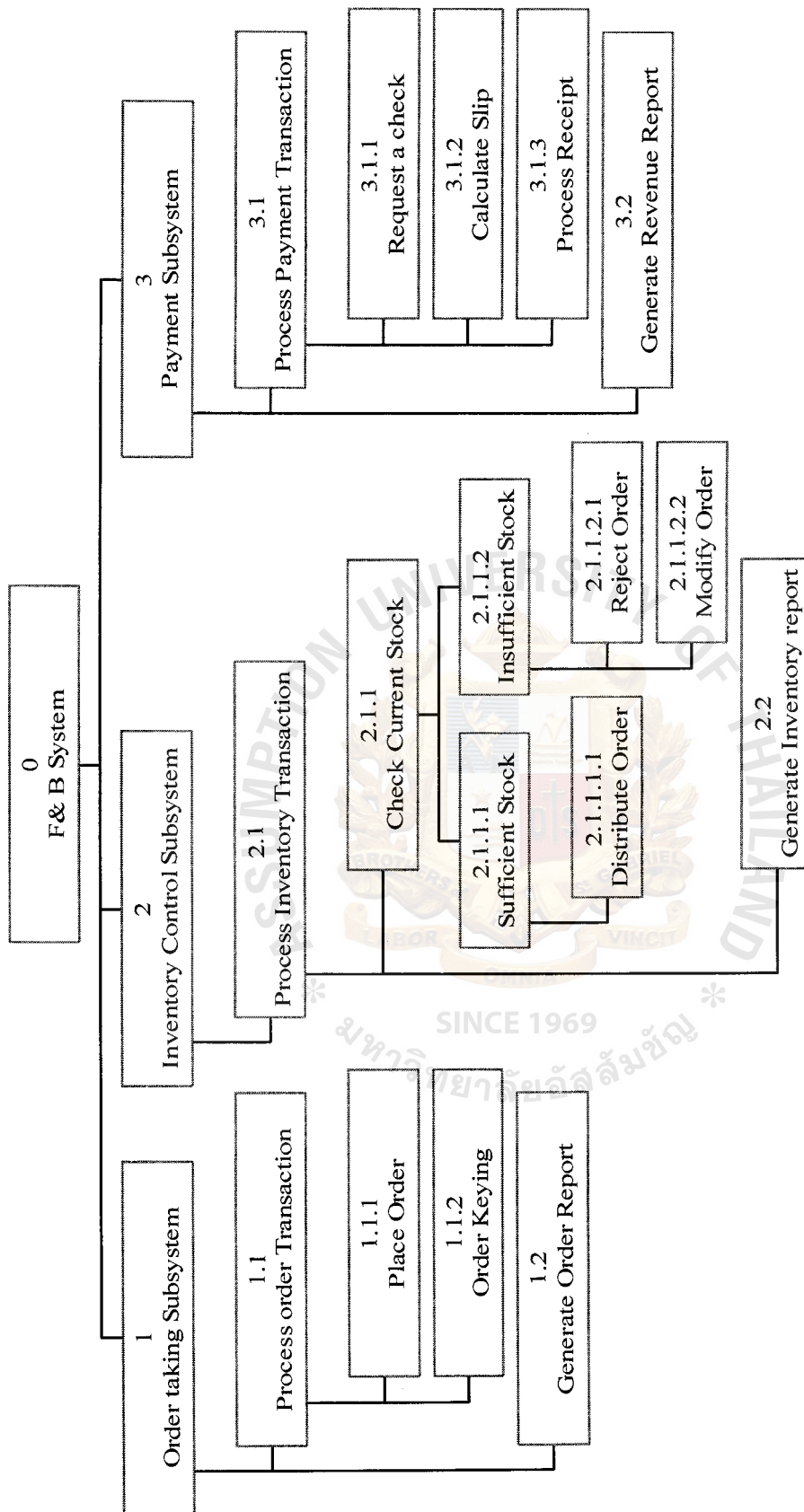


Figure 3.3. Decomposition Diagram of the Proposed Diagram.

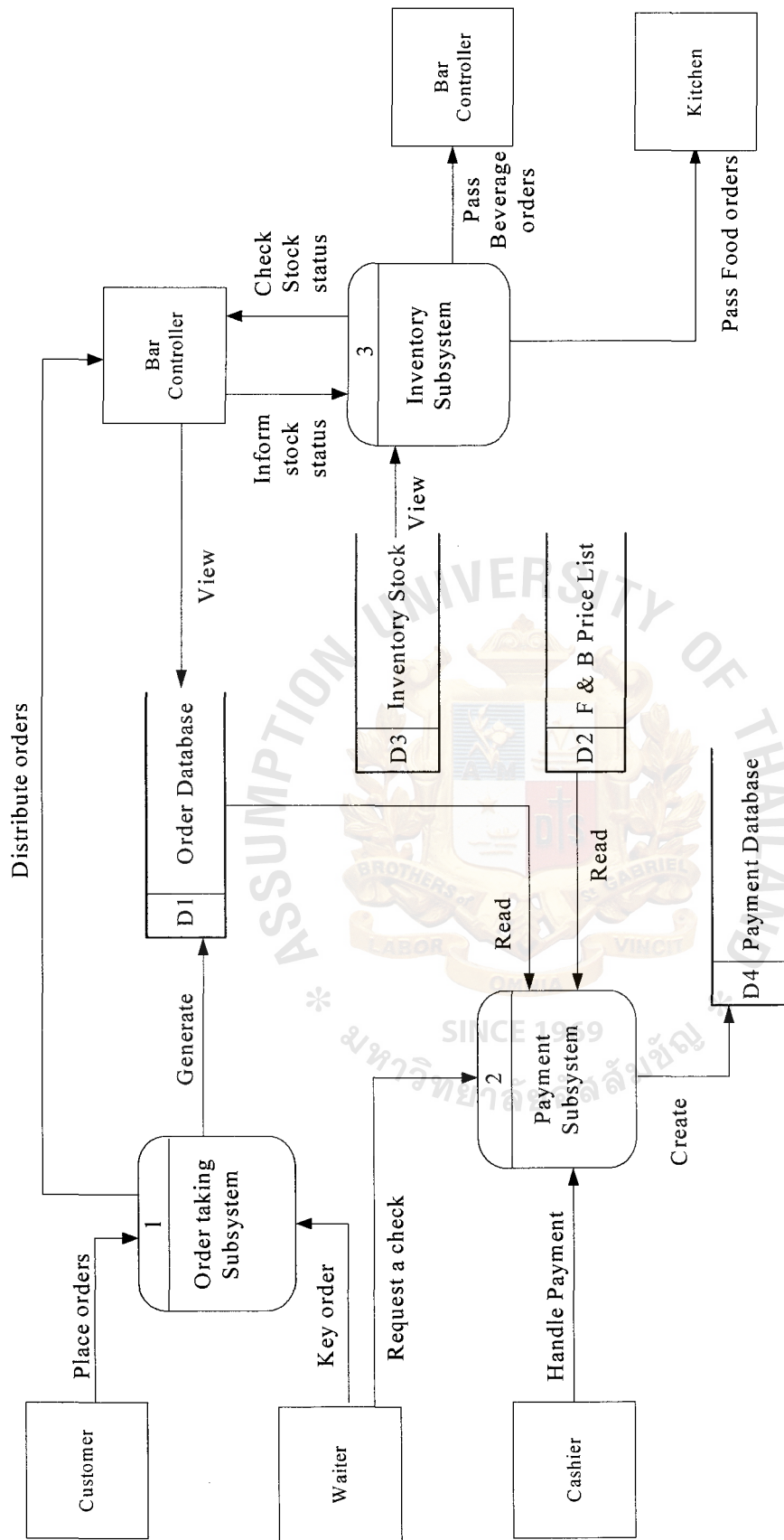


Figure 3.4. Logical Data Flow Diagram of the Proposed Diagram.

(c) Physical Data Flow Diagram

To apply the technique into the system, the logical data flow diagram has to be converted from non-technical to technical model by changing into Physical Data Flow Diagram. In the Physical Data flow (PDFD) model, the technical and human design decisions are implemented as part of an information system. They communicate technical and other design constraints to those who will actually implement the system. In other words, the physical Data flow diagrams serve as the technical blue prints for the implementation.

There are four subsystems as shown in Appendix C and the process specification in Appendix E. Each subsystem can be subdivided into several processes.

Subsystem 1: Order taking. The main process of this subsystem is taking customer orders and input them into the system for further process. It can be subdivided into three processes: Placing Order, Order Keying, and Generating Order Report. (See Figure C.1).

Process 1.1: Placing Order. This process is used when the customers place their orders with the waiters. Later, these customer orders are ready to be entered into the system.

Process 1.2: Order Keying. This process is used when the waiters are keying the orders into the system. The customer orders will be converted into F & B code by looking at the F & B price list for detail. After the data are entered, the system will keep the order information in the order database for further distribution.

Process 1.3: Generating the order report. This process will create information from order database periodically or based on request. Then, the information will be sent to the F & B manager.

Subsystem 2: Inventory control. This subsystem focuses checking inventory and controlling inventory status. This subsystem can be subdivided into four processes: checking stock, distributing the order, delivering order, and generating inventory report. (See Figure C.2)

Process 2.1: Checking stock. This process is used for checking the countable beverage stock such as cans or bottle products. At this stage, the process helps to control the stock and speed up the inventory checking by recording the inventory information. Also, it can speed up processing order by showing the inventory status. If it shows the insufficient stock, it will alert the waiters for revising the orders. This process can be subdivided into two additional processes.

Process 2.1.1: Sufficient Stock. After the orders are entered, the system checks for available beverage stock by looking at the inventory database. If there is sufficient stock, the order information will automatically distribute it to the bar controller. (See Figure C.4).

Process 2.1.2: Insufficient Stock. This process is used when the system shows that the orders are not available. This will alert the waiter for asking the customers to revise the order. At the same time, the system will alert the inventory controller to refill the stock.

Process 2.2: Distributing orders. When the system shows the

inventory status as available stock, the order information will automatically pass to the bar controller for processing orders.

Process 2.3: Delivering orders. After the orders are completely processed, both the bar and the kitchen will inform the system. Then, this process is used for the bar controller to call the bus boy for delivering orders to the customers.

Process 2.4: Generating Inventory report. This process will gather details of inventory transaction and information. Then, it will be sent to the inventory controller.

Subsystem 3: Payment control. This subsystem mainly focuses collecting the payment by calculating the price and printing the receipt. This subsystem can be divided into five processes: Billing request, Calculating price, Printing receipt, Collecting payment, and Generating the revenue report. (See Figure C.3).

Process 3.1: Billing Request. This process is used for informing the system when the customers request a bill; the waiter just key only the lane or table number into the system for recalling the order information.

Process 3.2: Calculating price. By viewing the order information of the particular lane or table, this process will calculate the total sales amount. At the same time, it will check with the order information to see whether all orders are correct.

Process 3.3: Printing the receipt. This process is used to print all the order information and the amount of sales for customers.

Process 3.4: Collecting the payment: This process is used to record the payment by keying the actual received amount into the system.

Process 3.5: Generating the revenue report. This process will gather all sales transactions and information for creating a revenue report.

(d) Application Architecture

By preparing system implementation, the F & B system needs to define the technologies used in terms of its network, data, process, and interface components for a general design. This application architecture is served as the blueprints for system design.

Network Architecture: The F & B department has several groups of staffs who need to use and share information from the system to serve the customer. For effective information storing and distributing, it requires the database server to accumulate all of information for performing the job.

The most suitable network architecture is Distributed Data (two-tier client/server) for applying to the F & B system. All terminals of the system will be connected via Local Area Network (LAN). LAN is a set of client computers connected to one or more server computers through cable over relatively short distances. This architecture stores data at the server. The business logic and user interface on the clients. Since the data is stored at server side, the other division can access and share information in the same database server across LAN. This

LAN is connected by using Star Network Topology which installed hub to distribute the line to clients. (See Figure 3.5)



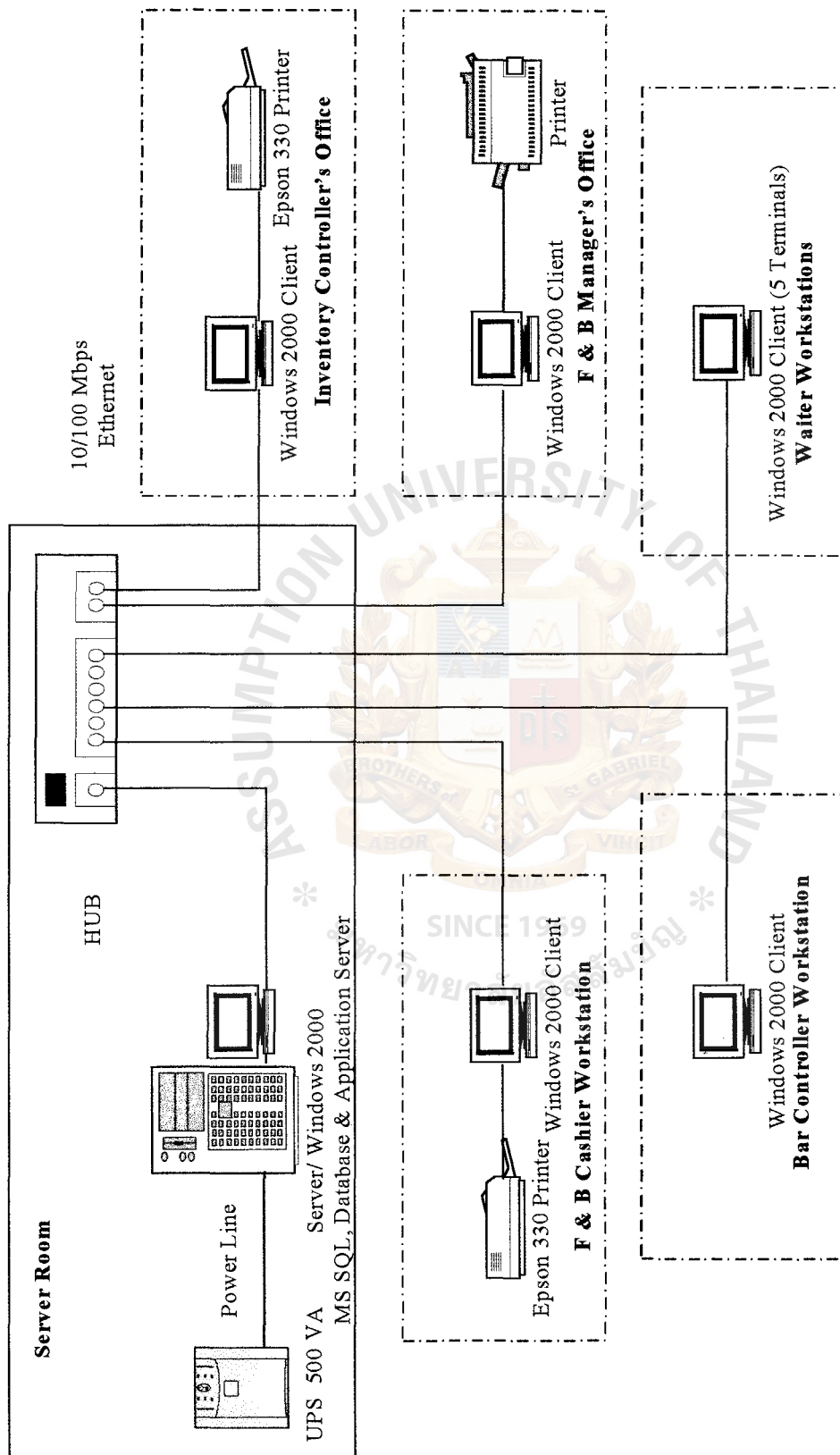


Figure 3.5. Network Configuration of the Proposed System.

Data Architecture: As mentioned before, each subsystem needs to store its own data and information for sharing among the Food and Beverage department. Thus, all data have to be consistent with another subsystem and behave less redundant information for maintaining it efficiently and accessing easily.

In order to make data storing efficiently, data architecture of the Food and Beverage system needs to be “rational database.” This kind of architecture stores data in tabular form called table. Each row in a table is called record. Large amount of data can be kept separately as many tables and all of them can join together by using Primary Key, Foreign Key Property. This distributed RDBMS which is used to manage data is Microsoft SQL server.

Interface Architecture: In the Food and Beverage system, most data is required to check and access immediately. For example, the bar controller must see the orders that are placed by customer and check for sufficient stock in order to distribute orders. For corresponding instantly, the F & B system must be on-line processing. All data and queries can be process on real time basis. Information inquires and business reports can be processed immediately. This type of interface architecture is consistent with client/server architecture.

Process Architecture: The Food and Beverage system selects Software Development Environment (SDE) for Two-Tier Client/Server to develop process throughout the system. This process architecture consists of client based programming language. The Food and Beverage system application will be developed using Microsoft

Visual Basic 6, which is easy to develop the application in the short time. Moreover, the applications that are developed by Visual Basic are very friendly to use. All data manipulation language such as create, read, delete, and update are sent for execution at server computer. Coding, debugging, and testing can be done at client computer.

(e) Input Design

In order to ensure data consistency and accuracy, the system design needs to focus on input design. Especially, the user interface design must be considered. It must be friendly to use and easy to understand for capturing inputs and sending these information across the workstations in the Food and Beverage department under the same format.

By previewing the context data flow diagram on Figure 3.2, it shows that there are five major computer input screens for capturing data into the system. They are Authorization input, F & B list, Order Input, Cashier input, Food status, and manager input screen. (See Appendix G)

Authorization Input Screen. By accessing the data from the system, the validated usernames and passwords are required to verify for protection. Also, these valid passwords will lead the users to appropriate screens which they have access to. Because of this, the authorization-input screen is considered as the first important input screen.

F & B List Input Screen. This input screen contains the master data source for F & B sale items, which will be used as reference throughout other input screens. Each food and beverage item will be assigned as numeric code and price. The food item code will begin with 101-200. The beverage item will use 201-300. This F & B list input screen will normally be input by F & B manager or IT employee to build up the database of F & B List price.

Order Input Screen. This input screen is used to enter the orders by keying their code, table number, and quantity through kiosk terminal. As soon as the waiters enter the orders, their record will be stored and further routed to bar controller and cashier respectively.

Bar Controller Input screen. This screen is designed for the bar controller to inform the system back for the order status by checking on the box indicating finished orders.

Cashier Input screen. This input screen will be used to monitor the payment. Especially, it will be used when the customers request a check. The cashier will input the table number for previewing all of the transactions and status. Then, the cashier can request the system to print the receipt.

Managerial Input screen. This screen serves the F & B manager for requesting all reports. The screen will give the option to the manager for choosing the type of reports such as summary and detail reports of each category.

(f) Output design

According to six major input screen, the data will be recorded and categorized for generating the three main outputs: sales report, inventory report, and payment report. However, these reports have been classified to two types of reports: Detail Reports and Summary Reports.

Detail report is information presented with little or no filtering or restrictions. In other words, this type of report includes all information in details. The other report is a summary report, which categorizes information for managers who do not want to wade through the details. This report will mostly highlight the information periodically, but will not show details.

The major outputs for the F & B system are the results of input selection on cashier input screen and manager input screen. For cashier input screen, all information is generated and printed for the manager. The manager input screen will generate the output regarding to the selection of criteria and type of report. (See Appendix G).

3.3 Hardware and Software Requirement

The proposed system emphasizes the use of computerized system controlling the workflow of the F & B department of P.S.Bowling (Pattaya). Since the existing system is based on the manual process, all new hardware and software requirement are needed to introduce to the organization.

From the requirements and application architecture, the best system configuration should base on client/server system connecting the main server with the workstations. In particular, we have decided to use Windows 2000 server as the major software for the

proposed system. The hardware & software specifications for the proposed Food and Beverage Information system are shown in the Tables 3.1 and 3.2 respectively.

Table 3.1. The Hardware Specification for the Server Computer.

Hardware	Specification
CPU	Pentium III 1 Ghz.
Memory	128 MB or higher
Hard Disk	18.2GB or higher
CD-Rom Drive	50X
Floppy Drive	1.44 MB
Display Adapter	SVGA card
Display	Compaq 15"
UPS	500 VA
Printer	HP Laser Printer

Table 3.2. The Software Specification for the Computer Server.

Software	Specification
Operating System	Microsoft Windows 2000 for Server
Database Server	Microsoft SQL

By using Microsoft Windows 2000 as the main software for server, the client machines should have higher capacity to be able to support Windows 2000. The hardware & software specifications for each client machine are shown in the Tables 3.3 and 3.4 respectively.

Table 3.3. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Pentium Celeron 800 MHz
Memory	64 MB or higher
Hard Disk	20 GB or higher
CD-Rom Drive	48X or higher
Floppy Drive	1.44 MB
Display Adapter	SVGA card
Display	MAG 15"
Printer	Epson LX-330

Table 3.4. The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 2000 for Client
Application Software	Microsoft Visual 6.0
Food & Beverage Software	Computer Plus 6.0
Database Software	Microsoft Access 2000

3.4 Security and Control

In order to protect and control data, the system has set up system controls maintaining data security. Security and controls of the F & B system are listed as follows:

3.4.1 System Security

- (1) Identification and Authentication: The valid usernames and passwords are required to access the system. If user name or password are incorrect, login fails.
- (2) Password: The system has set up the passwords into two main levels. The first level will be given to the end-users such as waiters, bar controllers, and cashiers. The second level will be given to the managers for accessing all data. By entering the passwords, the system will allow users to access data depending on the security level.
- (3) Security control log: the system support and the F & B manager can connect to preview the detail of every logins. Any invalid using will be recorded on the log with a report.

3.4.2 Data Security

- (1) Daily Backup: The regular backup will be activated at the end of the day. The data files and system files will be backed up daily. Throughout this backup, the data file will be kept in the diskette in case of file loss or corruption.
- (2) Uninterruptible Power Supply (UPS): In case of electronic outage, UPS system will supply the power to the system controller for continuing some processing jobs for a short period of time.

3.4 Cost/Benefit Analysis

3.5.1 Cost Analysis

The cost estimation will be categorized into two main parts: development costs and operating costs. Development costs will include the cost of hiring personnel to develop the new system, acquiring new hardware and software, and training the existing

employees. For operating costs, the expense will be included mainly for implementing the system. Some main costs are the personnel cost and other maintenance costs.

This Proposed system needs more people to be recruited such as system analysts and database specialists. Moreover, some of the operating costs are involved for getting required hardware and software such as software packages. (See Table 3.5)

Table 3.5. Estimated Projected Cost, Baht.

Cost Items	Description	Amount	Unit Price	Price
1. Development Cost:	1.1 Personnel Cost:			
	System Analyst (3 months/ea)	2	60,000.00	120,000.00
	Database Specialist (3 months/ea)	1	40,000.00	40,000.00
	Network Specialist (3 months/ea)	1	40,000.00	40,000.00
	Subtotal 1:			200,000.00
	1.2 New Hardware:			
	Compaq Proliant 3300 Server	1	120,000.00	120,000.00
	Compaq Deskpro SP Clients	10	30,000.00	300,000.00
	Network Equipment		34,000.00	34,000.00
	HP Laser Printer	2	50,000.00	50,000.00
	UPS	10	35,000.00	35,000.00
	Subtotal 2:			539,000.00
	1.3 New Software:			
	MS Windows 2000 for server	1	105,250.00	105,250.00
2. Operating Cost	MS SQL for Sever	1	75,000.00	75,000.00
	MS Visual Basic 6.0	1	20,000.00	20,000.00
	Subtotal 3:			200,250.00
	1.4 Expenses:			
	Computer Plus Software Training			100,000.00
	Windows 2000 for Server Training			20,000.00
	Subtotal 4:			120,000.00
	Total Development Cost			1,099,250.00
2. Operating Cost	2.1 Maintenance:			
	Hardware Maintenance			35,000.00
	Software Maintenance			10,000.00
	Subtotal 1:			45,000.00
	Total Operating Cost			45,000.00
	Total Project Annual Cost			1,144,250.00

3.5.2 Benefit Analysis

By implementing the new computerized system, benefit analysis can be categorized into two kinds: tangible and intangible benefits. Mainly, the tangible benefits include requiring fewer staffs and reducing paper or other tools for controlling the process.

From the Food and Beverage Information system introduction, the F & B department can reduce the number of staffs for some positions as followings:

- | | | |
|-----|----------------------------------|----------|
| (1) | 2 inventory controllers @ 10,000 | = 20,000 |
| (2) | 2 auditors @ 12,000 | = 24,000 |
| (3) | 2 cashiers @ 8,000 | = 16,000 |

Besides salary, the F & B department also reduces the bonus for these positions as well office supplies cost. (See Table 3.6.)

At the same time, the new computerized system also provides several intangible benefits. Especially, it improves the response times and enhances workflow among the Food and Beverage department. Furthermore, it increases service quality and performance for processing orders. By doing so, the usage of Food and Beverage Information system indirectly increases the revenue because the Food and Beverage department can manage the customer traffic with the good system.

3.5.3 Break-even Analysis

To be clear, the cost of the manual and the proposed system are needed to be compared and analyzed whether the proposed system is worthy of investment or not. The cost of manual system and the cost of proposed system are shown in Table 3.7 and Table 3.9 respectively. For this project, the cost of the proposed system will be higher than the cost of the existing system in the first period. Then, it will decrease later the time passes by. In the other words, system development costs are heavily to invest for

the first year. After that, the company will earn some benefits from the proposed system usage.

In contrast, the break-even point for the manual and proposed system is about 1 operation year. (Note: year one is starting point.) Indeed, it states that the proposed system is overall in a good shape to invest and enjoy the benefits in return. (See Figure 3.6).

Table 3.6. Tangible Benefits of the Proposed System, Baht.

Cost Items:	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Salary for 2 Inventory Controllers (12,000 Baht/ Month)	288,000	316,800	348,480	383,328	421,660	463,826
Salary for 2 auditors (12,000 Baht/ Month)	288,000	316,800	348,480	383,328	421,660	463,826
Salary for 2 cashiers (8,000 Baht/Month)	192,000	211,200	232,320	255,552	281,108	309,219
Bonus for 2 controllers, 2 cashiers and 2 auditors (3 Months)	192,000	211,200	232,320	255,552	281,108	309,219
Office Supplies expense reduction (20,000 baht/month)	240,000	264,000	290,400	319,440	351,384	386,522
Total	1,200,000	1,320,000	1,452,000	1,597,200	1,756,920	1,932,612

Table 3.7. Manual System Cost Analysis, Baht.

Cost items		Years				
		1	2	3	4	5
<u>Fixed Cost:</u>						
Calculator	15 units @ 2,100	31,500.00	-	-	-	-
Copy machine	2 units @ 25,000	50,000.00	-	-	-	-
Total Fixed Cost		81,500.00	-	-	-	-
<u>Operating Cost:</u>						
<u>Salary Cost:</u>						
F & B Manager	1 person @ 20,000	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Supervisor	2 persons @ 12,000	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Waiters	12 persons @ 6,000	72,000.00	79,200.00	87,120.00	95,832.00	105,415.20
Bar	6 persons @ 6,000	36,000.00	39,600.00	43,560.00	47,916.00	52,707.60
Chef	2 persons @ 12,000	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Kitchen Staffs	3 persons @ 5,000	15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Cashiers	5 persons @ 6,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Inventory Controller	3 persons @ 8,000	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Auditor	2 persons @ 8,000	16,000.00	17,600.00	19,360.00	21,296.00	23,425.60
Total monthly Salary Cost		261,000.00	287,100.00	315,810.00	347,391.00	382,130.10
Total Annual Salary Cost		3,132,000.00	3,445,200.00	3,789,720.00	4,168,692.00	4,585,561.20
<u>Office Supplies & Miscellaneous Cost:</u>						
Stationery	Per Annum	18,000.00	19,800.00	21,780.00	23,958.00	26,353.80
Paper	Per Annum	50,000.00	55,000.00	60,500.00	66,550.00	73,205.00
Utility	Per Annum	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Miscellaneous	Per Annum	36,000.00	39,600.00	43,560.00	47,916.00	52,707.60
Total Annual Office Supplies & Miscellaneous Cost		134,000.00	147,400.00	162,140.00	178,354.00	196,189.40
Total Annual Operating Cost		3,266,000.00	3,592,600.00	3,951,860.00	4,347,046.00	4,781,750.60
Total Manual System Cost		3,347,500.00	3,682,250.00	4,050,475.00	4,455,522.50	4,901,074.75

Table 3.8. Five Years Accumulated Manual System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	3,347,500.00	3,347,500.00
2	3,628,250.00	6,975,750.00
3	4,050,475.00	11,026,225.00
4	4,455,522.50	15,481,747.50
5	4,901,074.75	20,382,822.25
Total	20,382,822.25	—

Table 3.9. Computerized System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
<u>Fixed Cost</u>					
Hardware Cost:					
Computer Server Cost	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00
Workstation Cost	60,000.00	60,000.00	60,000.00	60,000.00	60,000.00
Printing Device Cost	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
UPS Cost	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
Total Hardware Cost	105,110.00	105,110.00	105,110.00	105,110.00	105,110.00
Maintenance Cost:					
Maintenance Cost	–	45,000.00	45,000.00	45,000.00	45,000.00
Total Maintenance Cost	–	45,000.00	45,000.00	45,000.00	45,000.00
Software Cost:					
Computer Server Cost	40,050.00	40,050.00	40,050.00	40,050.00	40,050.00
Computer Plus Software Packages	8,000.00	8,000.00	8,000.00	8,000.00	8,000.00
Network Cost	6,800.00	6,800.00	6,800.00	6,800.00	6,800.00
Total Software Cost	58,450.00	58,450.00	58,450.00	58,450.00	58,450.00
Implementation Cost					
Training Cost	100,000.00	–	–	–	–
System Development Cost	200,000.00	–	–	–	–
Set up cost	30,000.00	–	–	–	–
Total Implementation Cost	300,000.00	–	–	–	–
Total Fixed Cost	455,850.00	200,850.00	200,850.00	200,850.00	200,850.00
<u>Operating Cost</u>					
People-Ware Cost:					
F & B Manager 1 person @ 20,000	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
IT Specialist 1 person @ 35,000	35,000.00	38,500.00	42,350.00	46,585.00	51,243.50
Supervisor 1 persons @ 12,000	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Waiters 12 persons @ 6,000	72,000.00	79,200.00	87,120.00	95,832.00	29,282.60
Bar 6 persons @ 6,000	36,000.00	39,600.00	43,560.00	47,916.00	105,415.20
Chefs 2 persons @ 12,000	24,000.00	26,400.00	29,040.00	31,944.00	35,138.40
Bar 3 persons @ 3,000	15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Cashiers 6 persons @ 6,000	18,000.00	19,800.00	21,780.00	23,958.00	26,353.80
Inventory Controller 1 person @ 8,000	8,000.00	8,800.00	9,680.00	10,648.00	11,712.80
Total Monthly Salary Cost	240,000.00	225,500.00	248,050.00	272,855.00	300,140.50
Total Annual Salary Cost	2,880,000.00	2,864,400.00	3,484,800.00	3,833,280.00	4,216,608.00
Office Supplies & Miscellaneous Cost:					
Stationary 1,500 per month	14,400.00	15,840.00	17,424.00	19,166.40	21,083.04
Paper 600 per month	14,400.00	15,840.00	17,424.00	19,166.40	21,083.04
Utility 3,000 per month	60,000.00	66,600.00	72,600.00	79,860.00	87,846.00
Miscellaneous 1,000 per month	48,000.00	52,800.00	58,080.00	63,888.00	70,276.80
Annual Office Supplies & Miscellaneous Cost	168,400.00	185,240.00	203,764.00	224,140.00	246,554.44
Total Operating Cost	3,048,400.00	3,353,240.00	3,688,564.00	4,057,420.40	4,463,162.44
Total Computerized System Cost	3,504,250.00	3,554,090.00	3,889,414.00	4,258,270.40	4,662,012.44

Table 3.10. Five Years Accumulated Computerized Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	3,504,250.00	3,504,250.00
2	3,554,090.00	7,058,340.00
3	3,889,414.00	10,947,754.00
4	4,258,270.40	15,206,024.40
5	4,662,012.44	19,868,036.84
Total	19,868,036.84	—

Table 3.11. The Comparison of the System Costs, Baht.

Year	Accumulated Manual Cost	Accumulated Computerized Cost
1	3,347,500.00	3,504,250.00
2	6,975,575.00	7,058,340.00
3	11,026,225.00	10,947,754.00
4	15,481,747.50	15,206,024.40
5	20,382,822.25	19,868,036.84

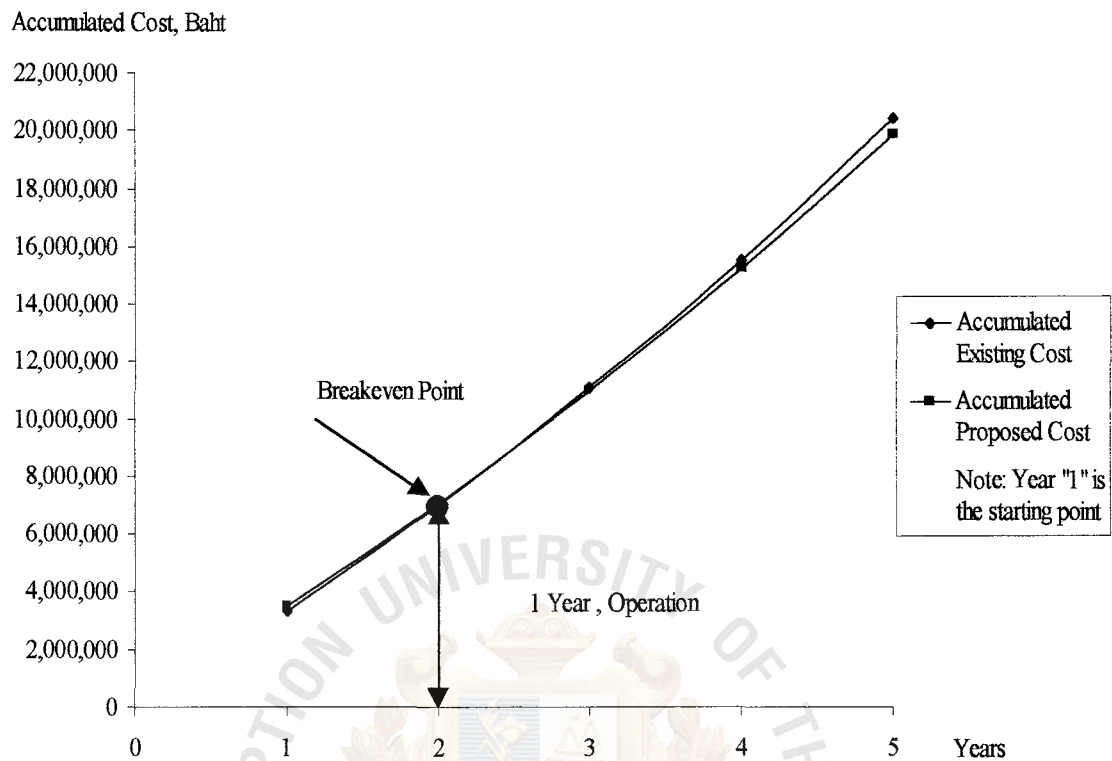


Figure 3.6. Cost Comparison between Existing System and Proposed System.

3.4.1 Cost-Benefit Analysis

The Food and Beverage Information system is strongly recommended for implementation by the Food and Beverage department at P.S.Bowling (Pattaya) because it supports all user requirements and the technology used supports the future expansion of the organization. By performing the cost-benefit analysis, the study also shows that the proposed system is worth to invest. Especially, the project has also used payback analysis and net present value for reviewing the project implementation.

Payback analysis technique is used in this project for determining if and when an investment will pay for itself. The net present value is used to find out the amount of money an investment is worth, taking into account its cost, earnings, and the time value

of money. These two cost-effective techniques for the proposed system are illustrated on Table 3.12 and 3.13 respectively.

An analysis of the payback period shows that the investment of the proposed system will pay back approximately in 1 year operation. (See Figure 3.7). Moreover, the net present value is about 3.8 million baht in six years.



Table 3.12. Payback Analysis of the Proposed System, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development cost:	1,099,250					
Operation & Maintenance cost:		45,000	47,250	49,500	51,750	54,000
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted cost (adjust to present value):	1,099,250	40,185	37,658	35,244	32,913	30,618
Cumulative time-adjusted costs over life time:	1,099,250	1,139,435	1,177,093	1,212,337	1,245,250	1,275,868
Benefits derived from operation of new system:	0	1,200,000	1,320,000	1,452,000	1,597,200	1,756,920
Discount Factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567
Time-adjusted benefits (adjust to present value):	0	1,071,600	1,052,040	1,033,824	1,015,819	996,174
Cumulative time-adjusted benefits over life time:	0	1,071,600	2,123,640	3,157,464	4,173,283	5,169,457
Cumulative lifetime time-adjusted cost + benefits:	- 1,099,250	- 67,835	946,547	1,945,127	2,928,033	3,893,589

Table 3.13. Net Present Value of the Proposed System, Baht.

Cost Items	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development cost:	1,099,250						
Operation & Maintenance cost:		45,000	47,250	49,500	51,750	54,000	
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual costs:	1,099,250	40,185	37,658	35,244	32,913	30,618	
Total present value of lifetime costs:							1,275,868
Benefits derived from operation of new system:	0	1,200,000	1,320,000	1,452,000	1,597,200	1,756,920	
Discount Factors for 12%:	1.000	0.893	0.797	0.712	0.636	0.567	
Present value of annual benefits:	0	1,071,600	1,052,040	1,033,824	1,015,819	996,174	
Total present value of lifetime benefits:							5,169,457
Net Present Value of this alternative							3,893,589

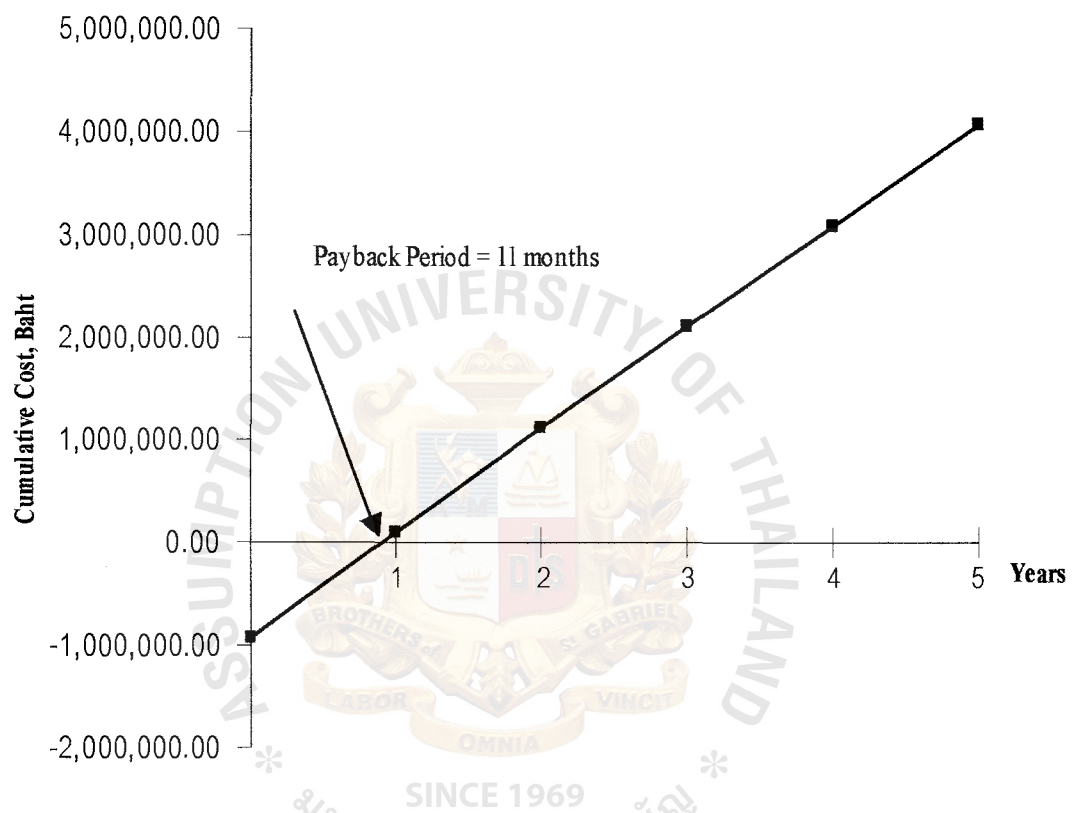


Figure 3.7. Payback Analysis of the Proposed System.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

After system analysis and design, the next phrase that the project should focus is system implementation. System implementation phrase is the construction of the new system and the delivery of that system into operation. By implementing the proposed system of the Food and Beverage department, both hardware and software are needed to be installed as their requirements. After the hardware and software installation period, the system will be tested for ensuring its performance and accuracy. Finally, after testing the proposed system for a week, the new system conversion and evaluation is the final stage of this project.

4.2 Testing

Project Implementation is to assure that the new system can work properly and fulfills the project objectives. The test plan can be categorized into main tests: network, database, and program testing.

For network testing, the network administrator has to first review the network design outline. Then, the network configuration is constructed and tested for communication and accuracy.

After the network testing has been tested properly, the database specialist should review the database design and manage a centralized database. Next, the database specialist should work on SQL program and test it whether each piece of information is recorded and stored accurately or not.

After the system configuration is constructed and tested, each individual software modules will be tested. All correct modules will be integrated to test for each program. Lastly, all the programs will be tested together as a whole system for ensuring all of them work effectively.

In other words, the project will be performed by system testing or a test that ensures that application programs written in isolation work properly when they are integrated into the total system. In particular, the project will be performed by using the system acceptance test by using real data over an extended time period to ensure data input and correct the error.

The test data and current performance are used here. For Food and Beverage Information system, the combination of data testing for each module and system testing have been combined together. Some examples of the tested plans are shown in Table 4.1.



Table 4.1. System Testing of the Proposed System.

[illegible]

Table 4.1. System Testing of the Proposed System (Continued).

Test subject	Test data	Result	Accept (Y/N)
<u>Inventory sub module</u> 4. Update the status of the finished food.	Item No. : 18 Then click "Complete" button.	The status changes from incomplete to complete and update the stock database.	Y
<u>Payment sub module</u> 5. Calculate the receipt by receiving 100 Baht in cash.	Table No. : 1 Paid : 100	Receipt No. : 188 Table No. : 1 Order No. : 125 F/B Code : 101 F/B Name : Chicken Soup Remark : Blank Status : Complete Quan. : 1 Price : 25 Total amount : 25 Paid : 100 Changes : 75	Y
6. Calculate the receipt when there are still have incomplete status transaction.	Table No: 4 Paid : 500	The system displays windows dialogue box "Cannot calculate the bill, still have incomplete transaction	Y

4.3 Training and Conversion

Parallel conversion is used for the conversion stage. For Parallel conversion, both the old and new systems are operated for some time period. This is done to ensure that all major problems in the new system have been solved before the old system is discarded. This strategy minimizes the risk of major flaws in the new system causing irreparable harm to the business.

Meanwhile, the end-users and other relevant staff must be trained to use computerized system. Especially, computer training course from the software company and other computer skills are required. Since the existing system is based on manual work, it needs to make sure that all the end-users and most staff in the organization

believe in IT. In order to do so, the organization should provide some seminar to staffs to learn some IT and practice using computers.

So when the end users are familiar to use the computer, the existing system should slowly be terminated. The system analysts should work closely with the end-users at this time for helping them solve some problems. Besides, the F & B department should organize some manual books for the end-users to self-study or teach someone else to use the computerized system effectively.



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Most restaurants and entertainment businesses face many challenges to operate their own Food and Beverage Service. They especially need to ensure their service quality for maintaining customer satisfactions. Nowadays, most of these businesses have adopted Food and Beverage Information system for three main reasons: speed up time, gain more control, and ensure good services.

Similar to a bowling center, the Food and Beverage department can apply the usage of Information system for handling and controlling their services. P.S.Bowling (Pattaya) is especially needed the Food and Beverage Information system to replace manual system for improving its services.

By developing and implementing Information system for the Food and Beverage department, the new system must fulfill the business requirements and resolves problems such as centralized control management, information management, and service quality management. Moreover, the system should cost reasonably and has less negative impacts on regular business operation. That means the system should be implemented in the short time and be ready to replace the manual system.

In terms of performance parameter, Table 5.1 shows the time performance on each process of the proposed system compared with the existing system. It shows that the whole process of the proposed system performs less than thirty minutes, instead of taking more than one day for checking and monitoring all activities.

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

Process	Existing System	Proposed System	Difference (%)
Order Taking Process	15 mins	3 mins	80
Order Distributing Process	10 mins	3 mins	70
Order Tracking Process	30 mins	5 mins	83.3
Payment Process	15 mins	5 mins	66.6
Inventory Control Process	12 hours	5 mins	98.56
Generate Report Process	24 hours	2 mins	97
Total	1 day 13 hour 16 mins	23 mins	95

From Table 5.1, the proposed system can save times more than existing system about thirty six hours. Order taking process in the Food and Beverage Information system consumes time less than the existing system because waiters can access information right away from database and enter the orders into the system. Furthermore, order distribution process saves more time since all orders are automatically routed to the bar and kitchen. As same as order tracking and payment process, it takes only few minutes for cashiers to handle transactions. Lastly, inventory control process under the computerized system takes only few minutes to prepare the inventory and provide the inventory reports. Overall, the computerized system is able to save more than 90% of time throughout the whole process.

5.2 Recommendations

The proposed system of the Food and Beverage Information system is strongly recommended for P.S.Bowling (Pattaya) to use for gaining more controls and improving its service. Since most staffs in the Food and Beverage department are familiar with their routine manual work, it is quite challenge for converting from manual to

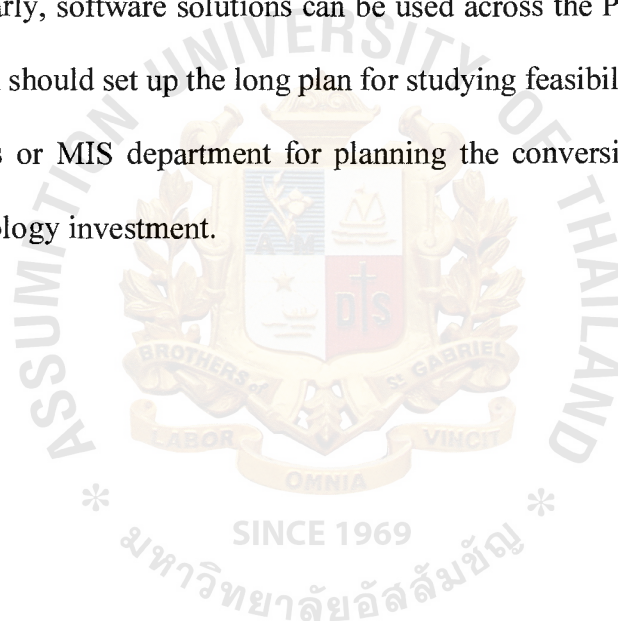
computerized based system. It definitely takes time for all staff to get familiar for using computer and believing in Information Technology (IT). Most of them may neither understand nor appreciate the conversion. The change of system will have some impact on all the users and system support in the organization. The system development team has to create positive attitude of users toward the new system. For instance, the system developers and implementers should open some training sessions for computer knowledge and basic computer skills. Instead of teaching the users press the certain command or buttons on the keyboard, most users will at least have some skills and feel comfortable to use or work under the new system.

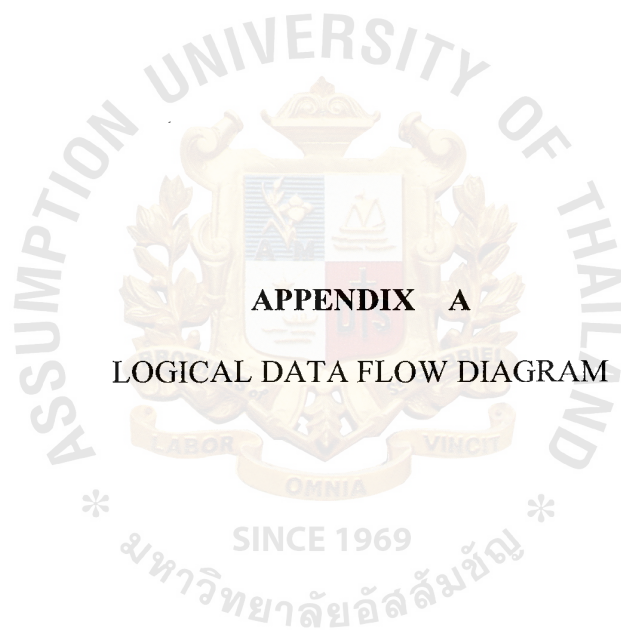
After being familiar with information technology, P.S.Bowling (Pattaya) can develop software program for another Food and Beverage activities such as menu costing for controlling raw materials and another processes. Meanwhile, the system should continuously be developed further with inventory control. For instance, the inventory database should contain information of suppliers. When the alert message has sent to the inventory controller for refilling stocks, the orders can be distributed automatically to the suppliers. As the results, the inventory controller can control inventory stocks economically.

Under the new information system, the organization can also improve its service by adopting other type of technology for improving its service. Especially, the organization should use wireless technology for order taking. Instead of sharing the terminals, the waiters can hold the wireless handheld or personal digital assistant (PDAs) computers for data keying while taking orders. Through the use of PDAs, the system should develop some software program that can share data and connect to the main system.

Even though the F & B computerized system provides more control on the whole Food and Beverage process, the bowling center should also be aware of the data entry. Most Food and Beverage functions, especially inventory control and payment handling, are required for the users to input information such as the number of items. The organization should come up with policy and control the input data carefully. If the staffs forget to entry some data, the system does not work properly and accurately.

If P.S.Bowling (Pattaya) is successful in using this Food and Beverage system for its F & B service, the organization can propose this kind of software to any bowling center. Particularly, software solutions can be used across the P.S.Bowling chain. If so, the organization should set up the long plan for studying feasibility and appointing some system supports or MIS department for planning the conversion and achieving rapid return on technology investment.





APPENDIX A

LOGICAL DATA FLOW DIAGRAM

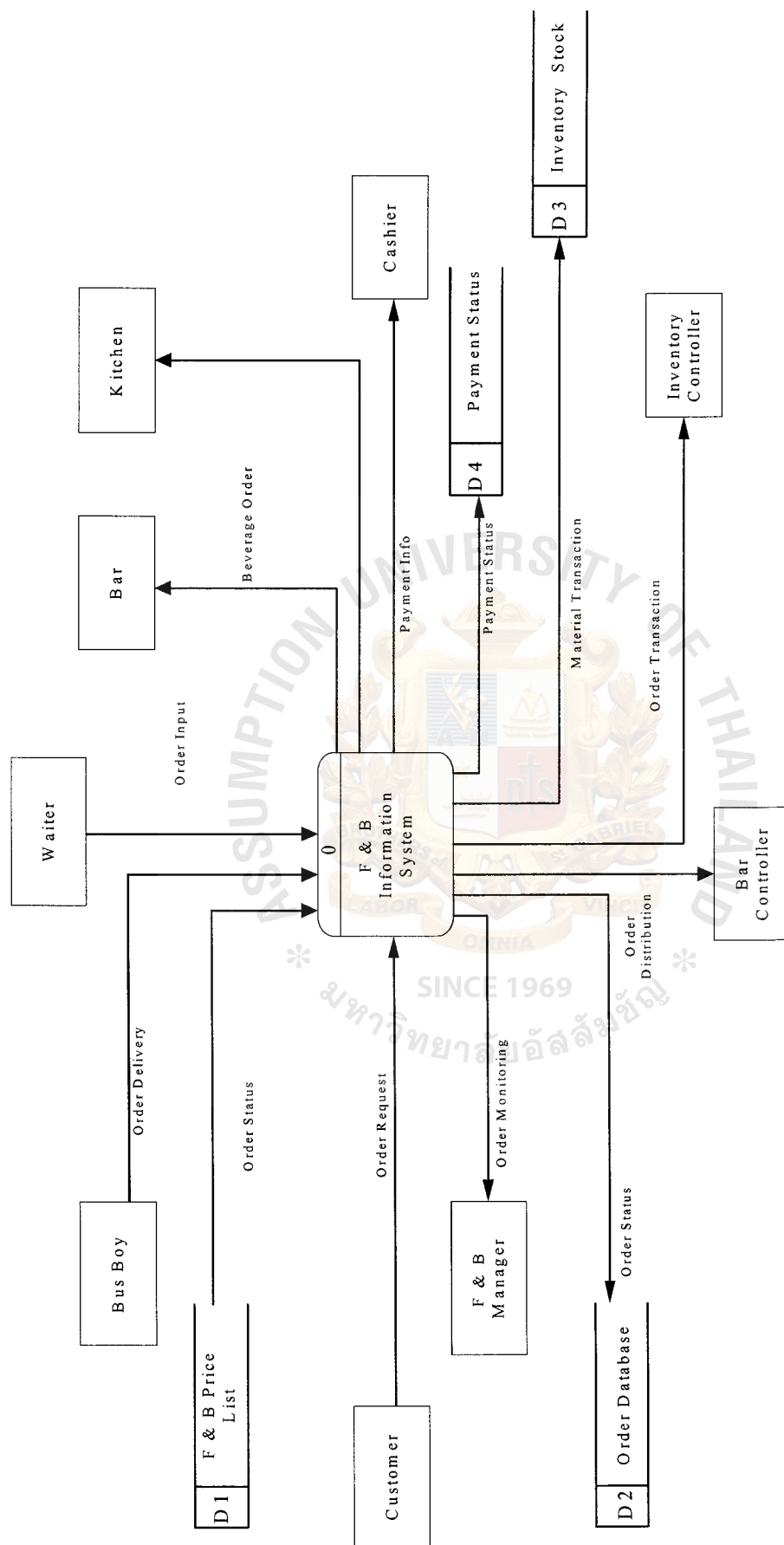


Figure A.1. Context Diagram of the Proposed System.

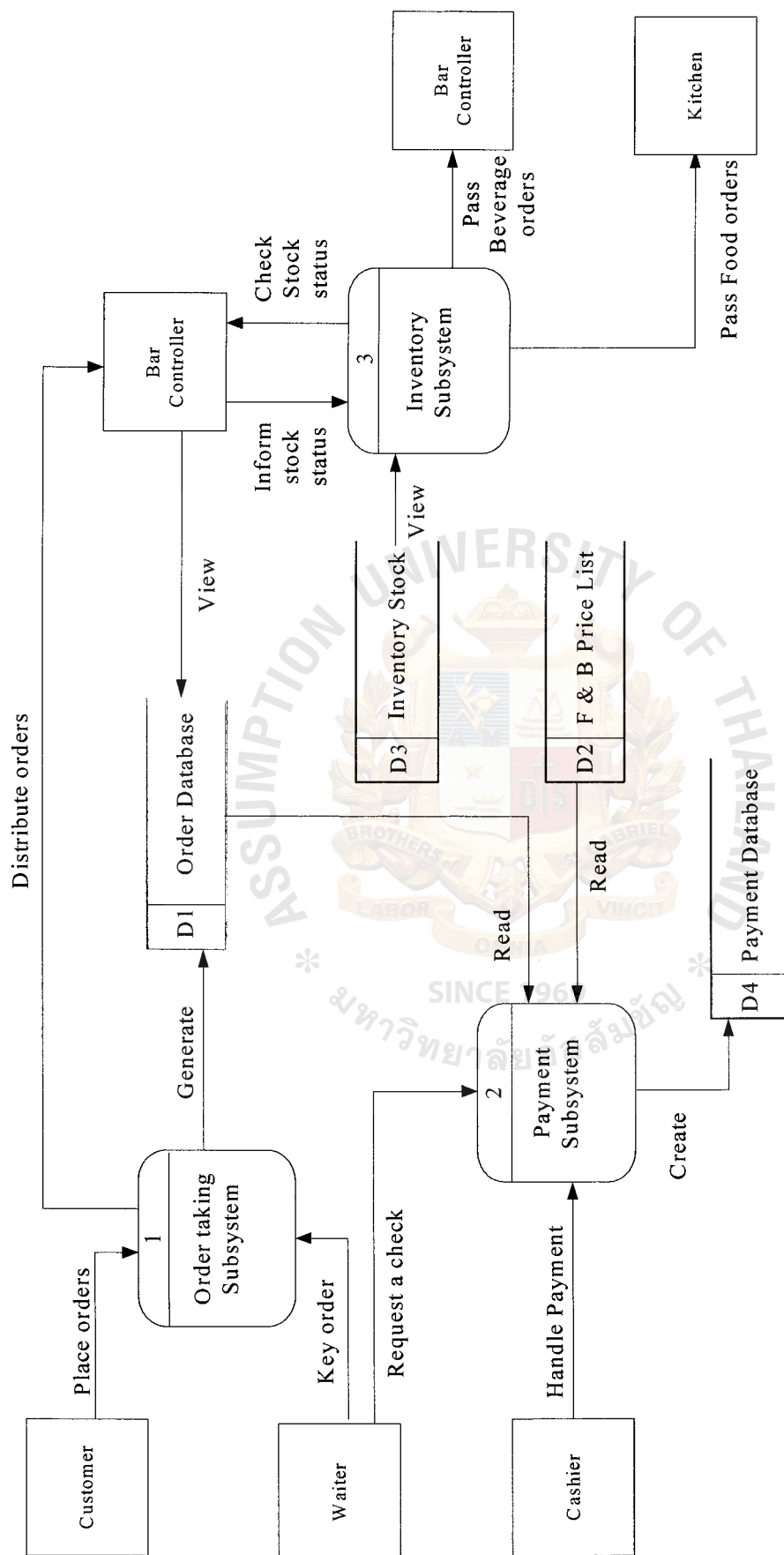


Figure A.2. Logical DFD Level 0 of the Proposed System.

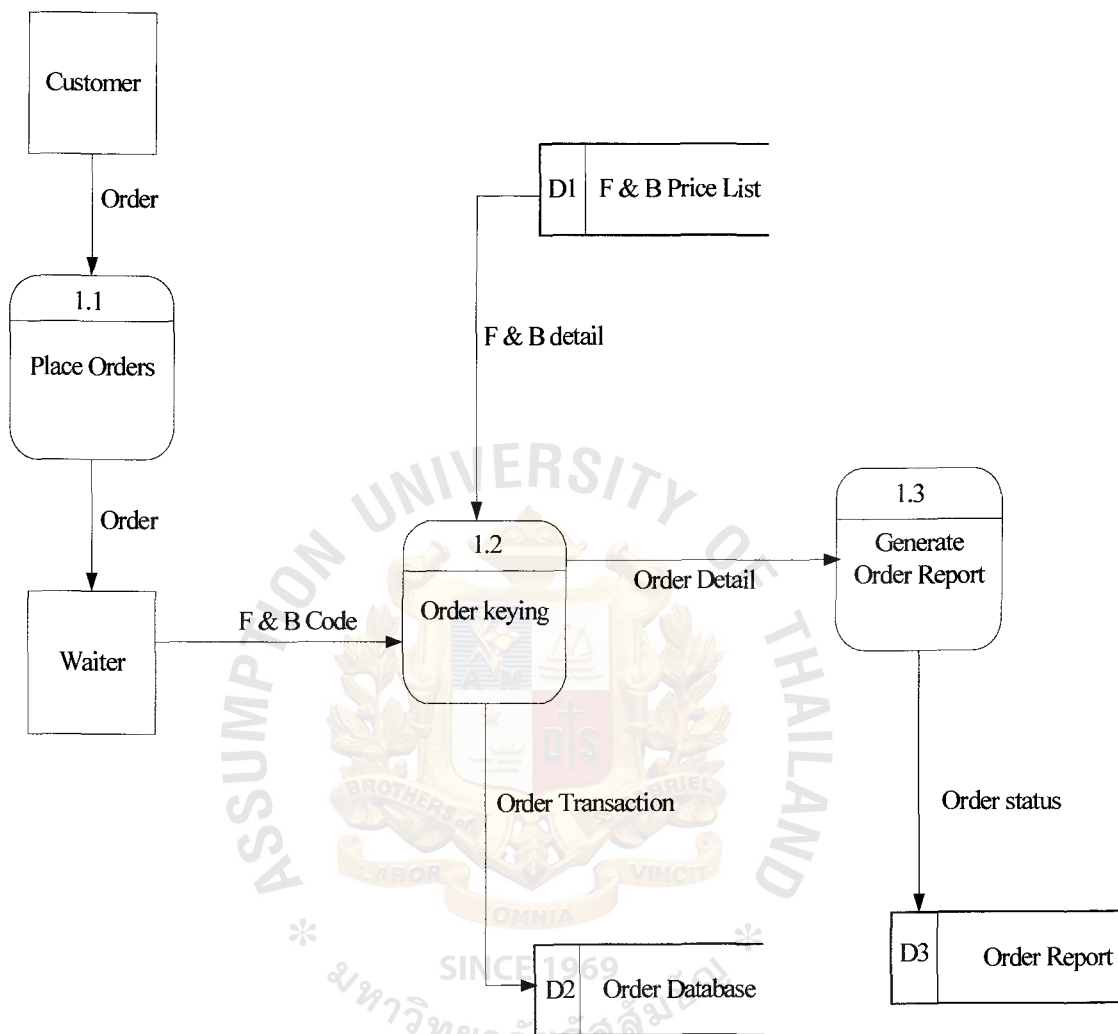


Figure A.3. Logical DFD - Level 1 of Order Taking Process.

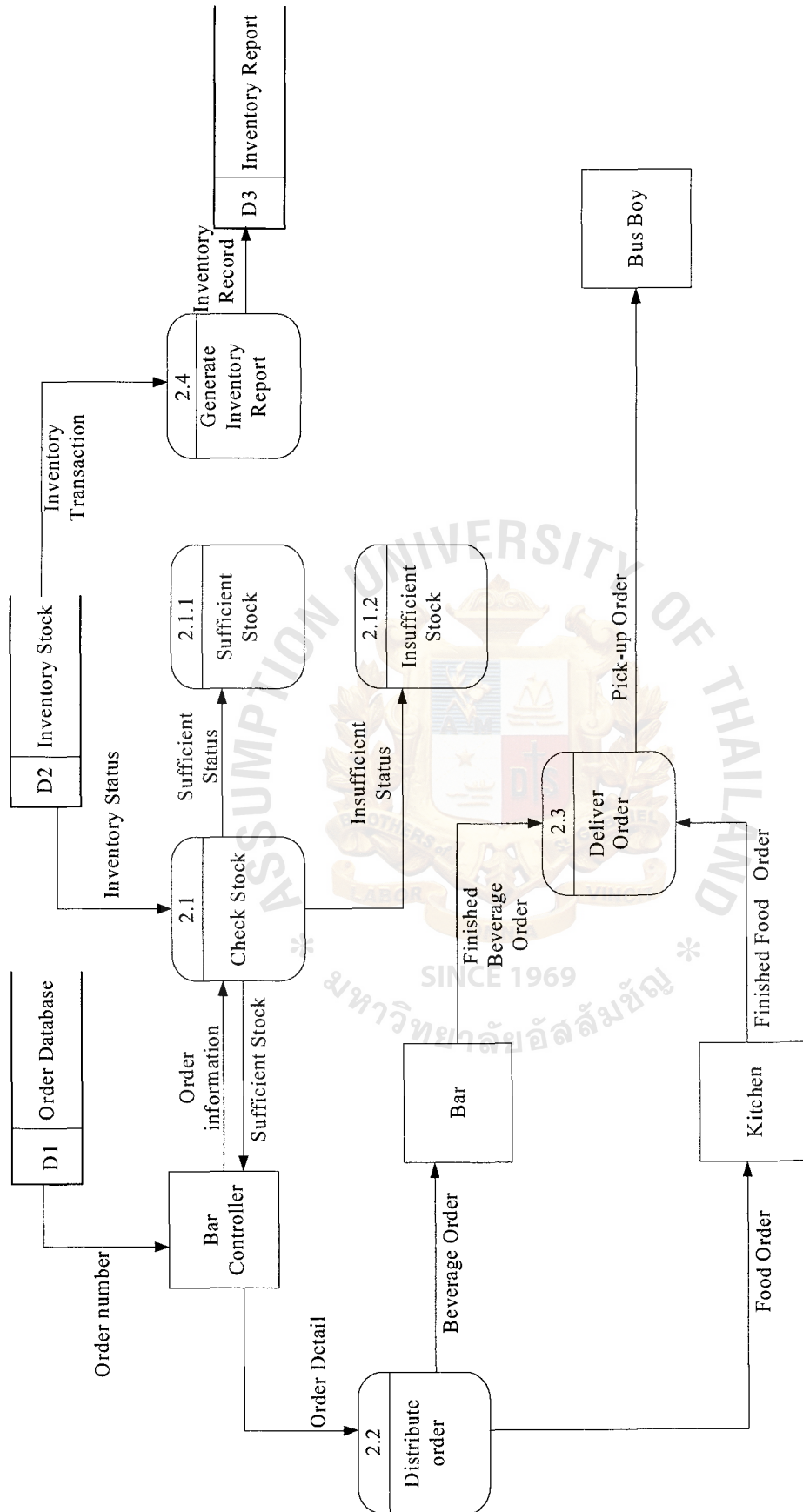


Figure A.4. Logical DFD- Level 1 of Inventory Process.

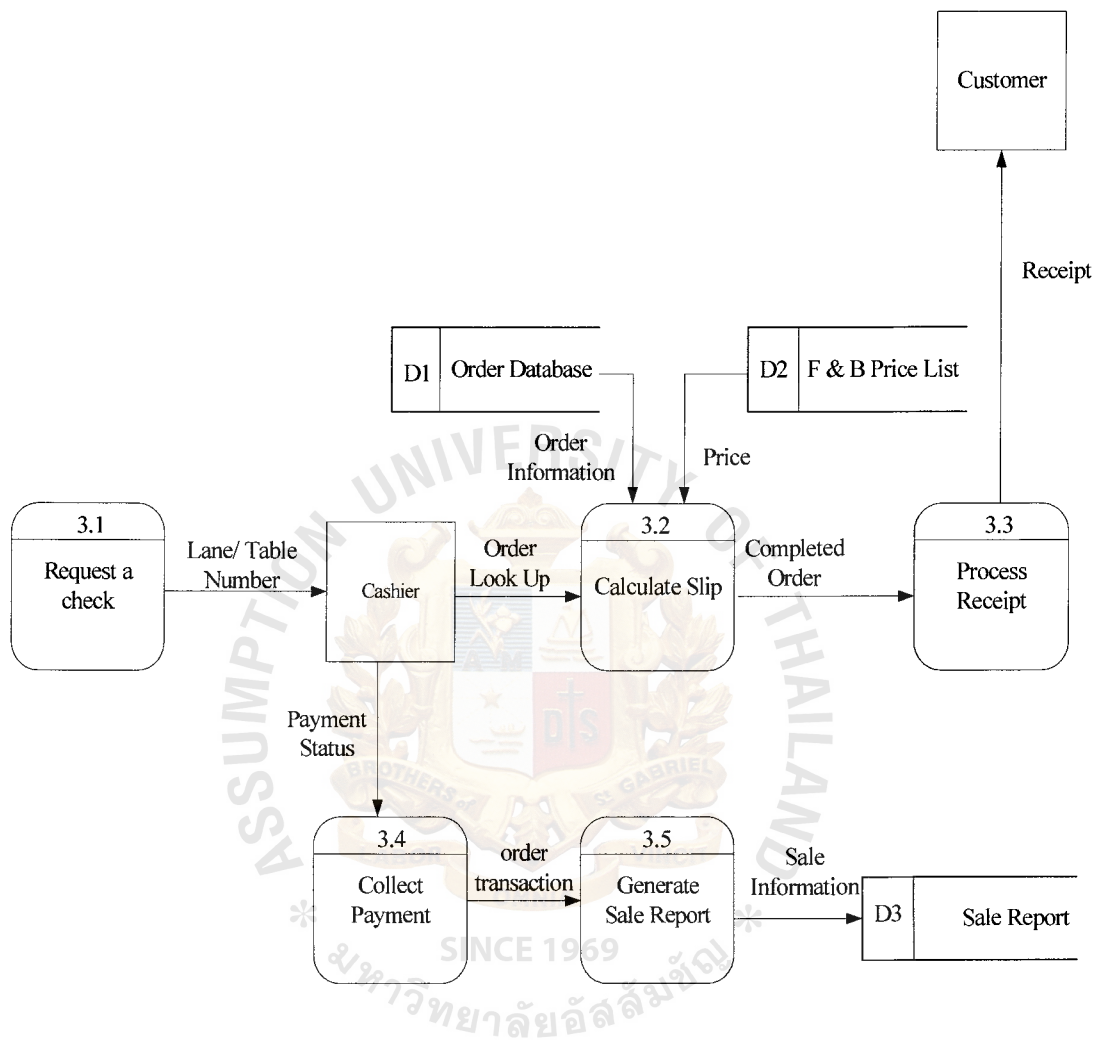


Figure A.5. Logical DFD- Level 1 for Payment Control Process.

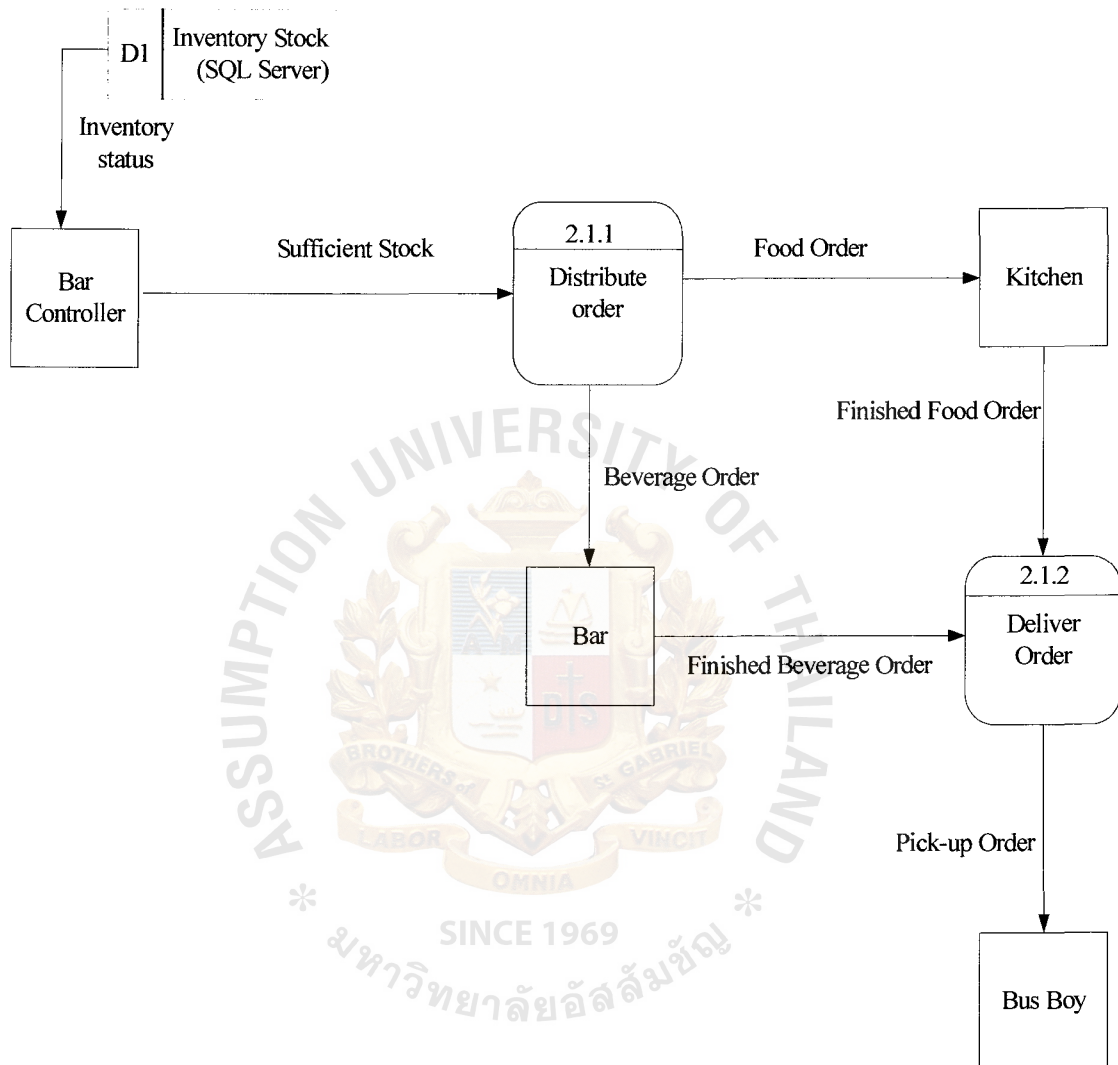


Figure A.6. Logical DFD –Level 2 for Order Distributing Process.

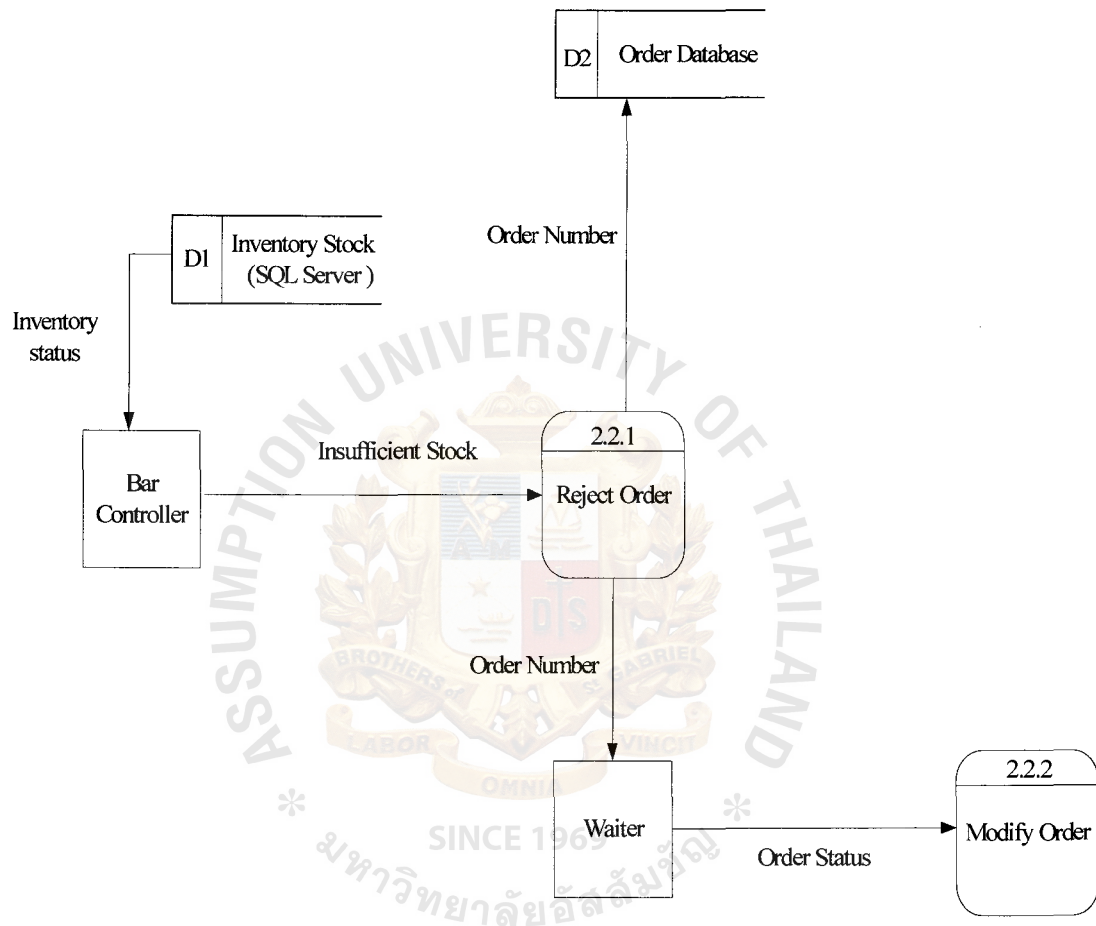


Figure A.7. Logical DFD – Level 2 for Insufficient Inventory Process.



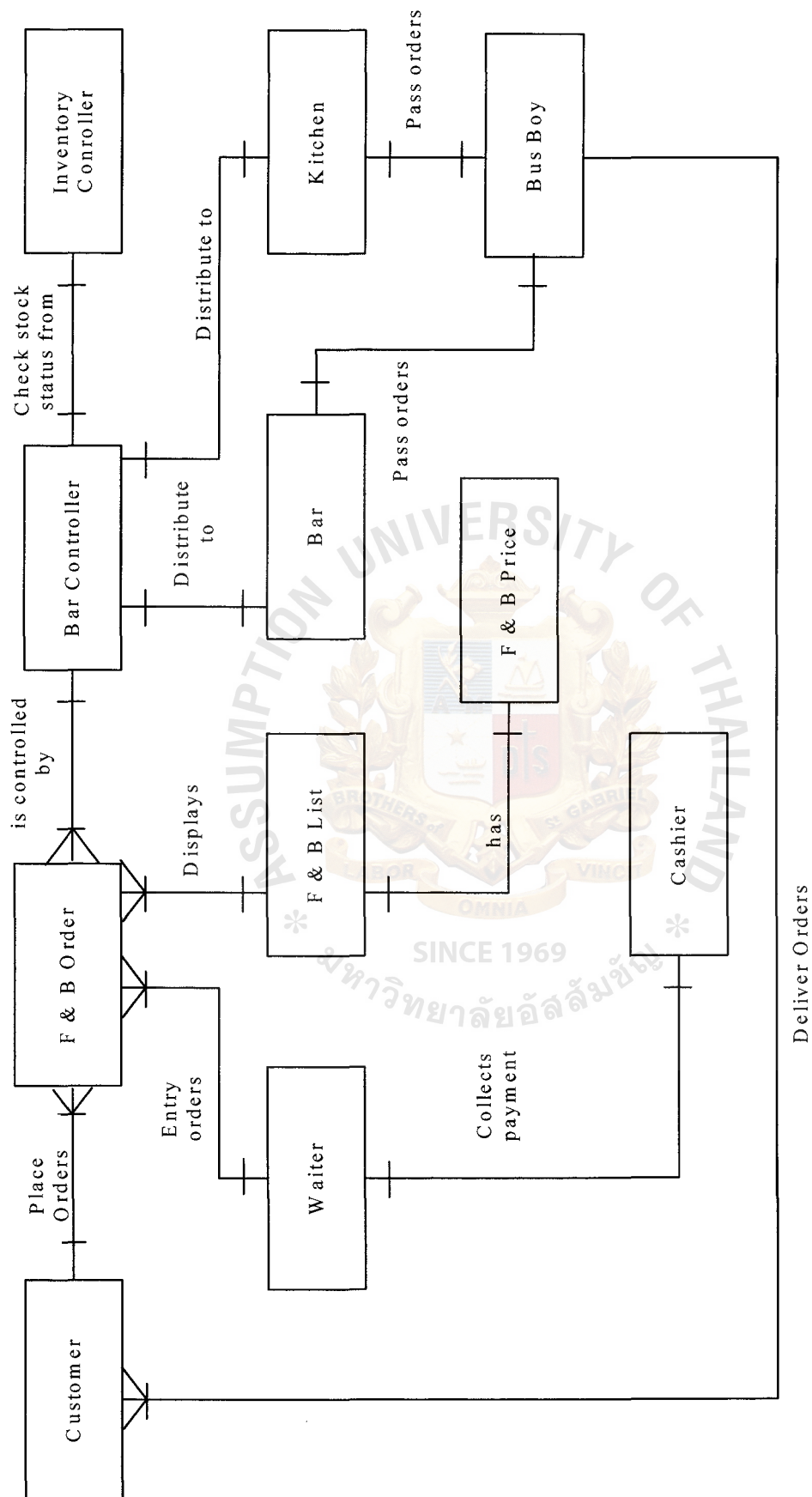


Figure B.1. ERD – Context Data Model of the Proposed System.

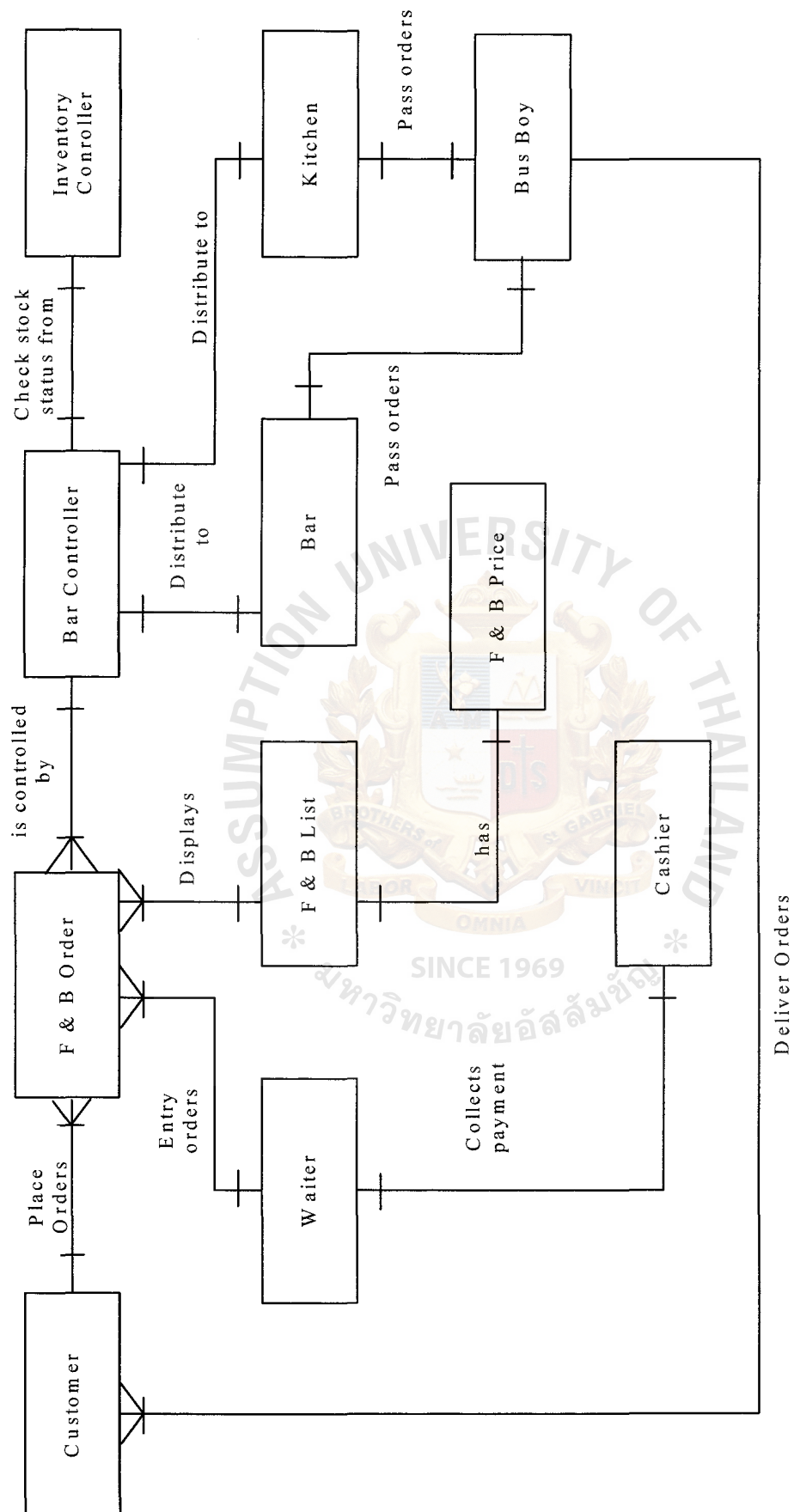


Figure B.2. ERD – Key Based Data Model of the Proposed System.

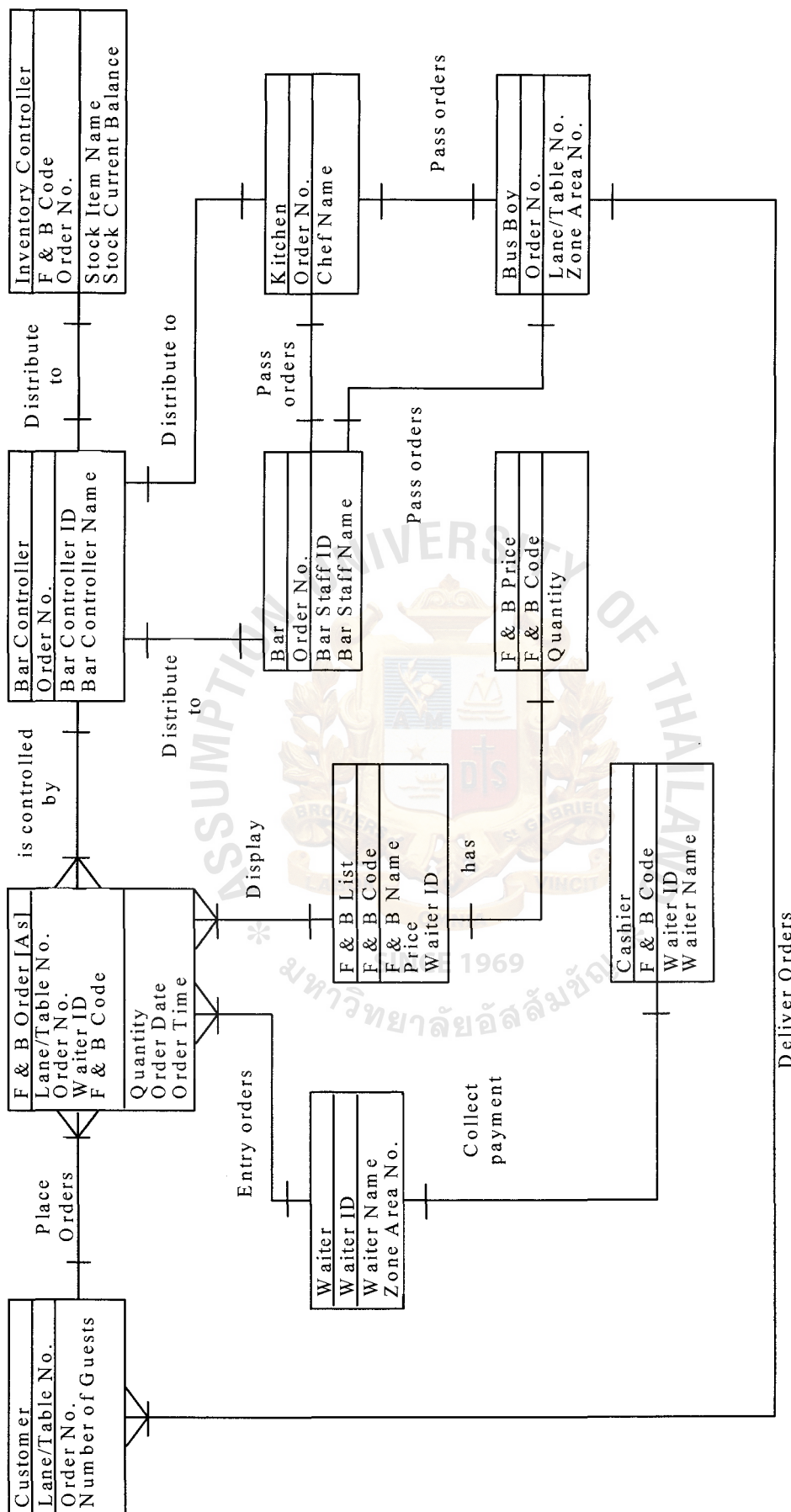
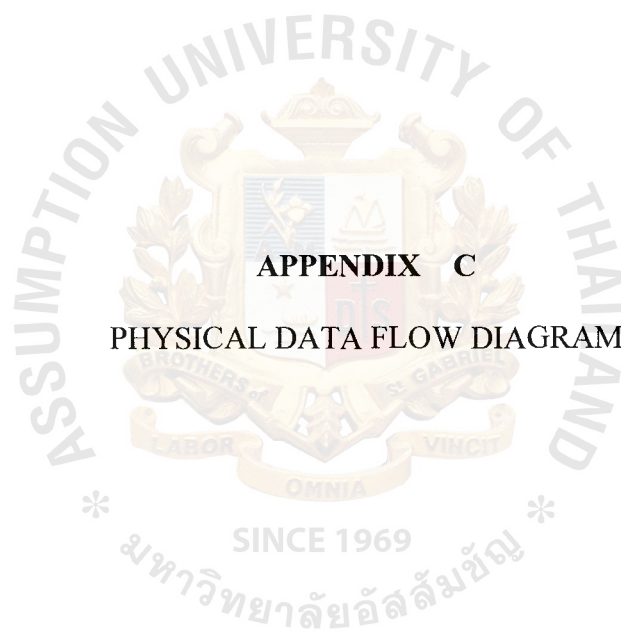


Figure B.3: ERD – Fully Attributed Data Model of the Proposed System.



APPENDIX C

PHYSICAL DATA FLOW DIAGRAM

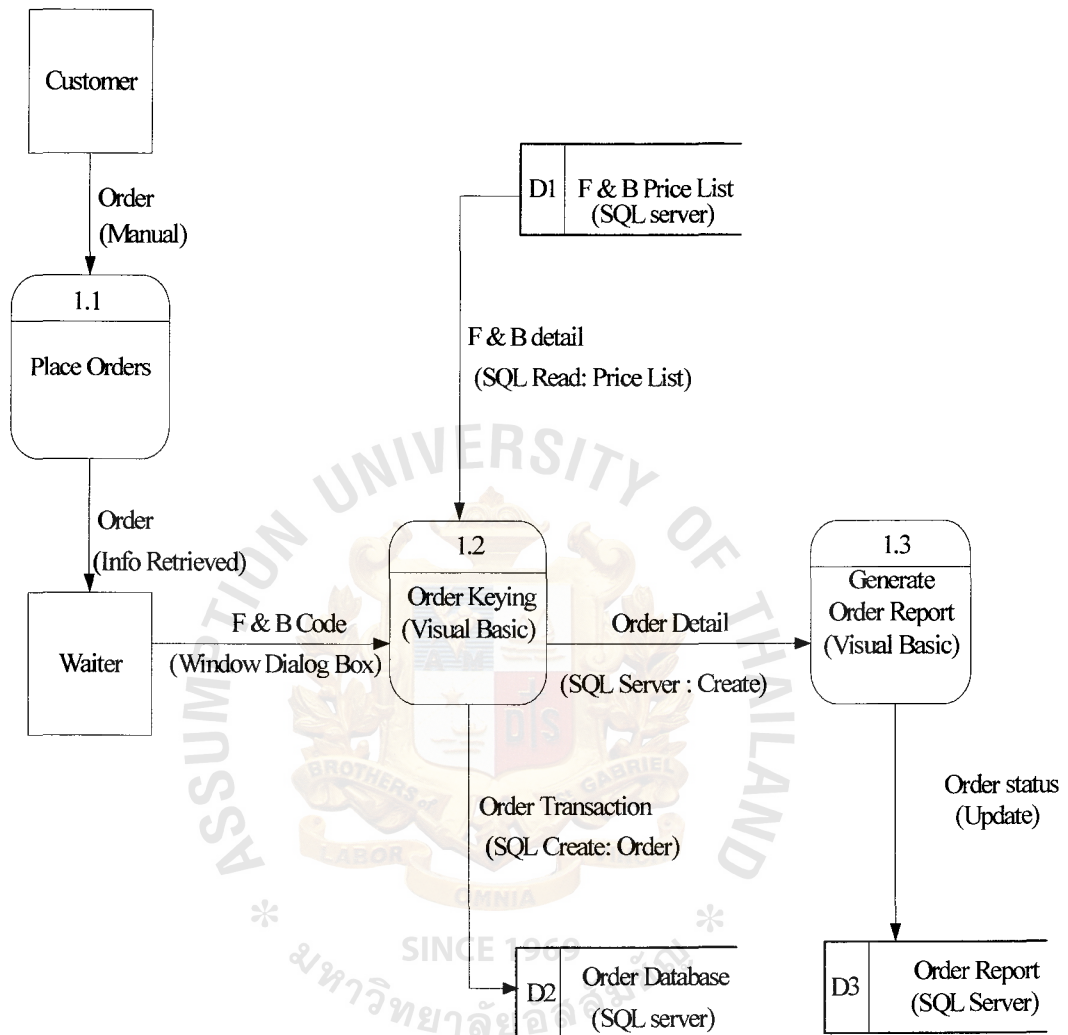


Figure C.1. Physical DFD –Level 1 of the Order Taking Process.

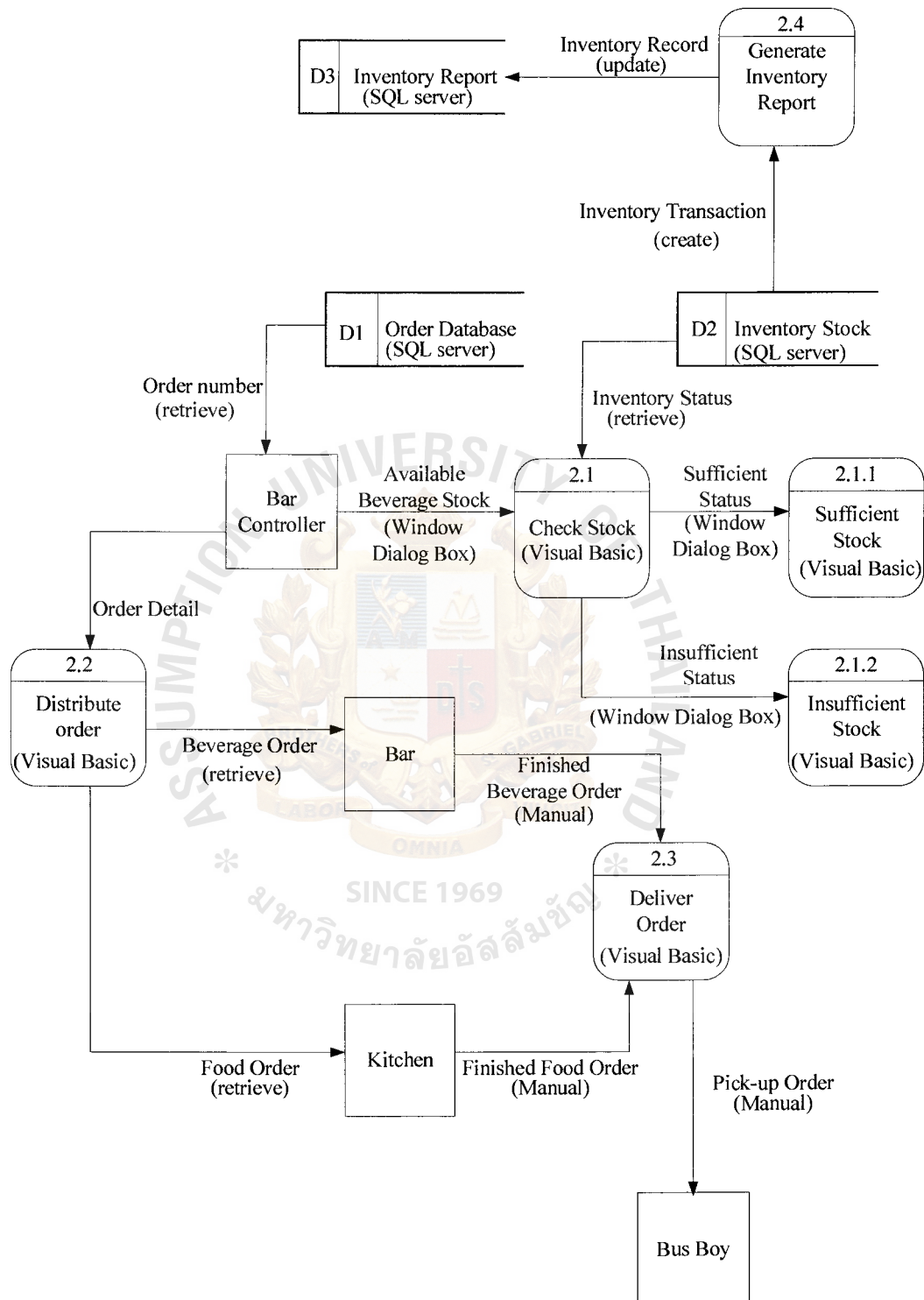


Figure C.2. Physical DFD –Level 1 of Inventory Control Process.

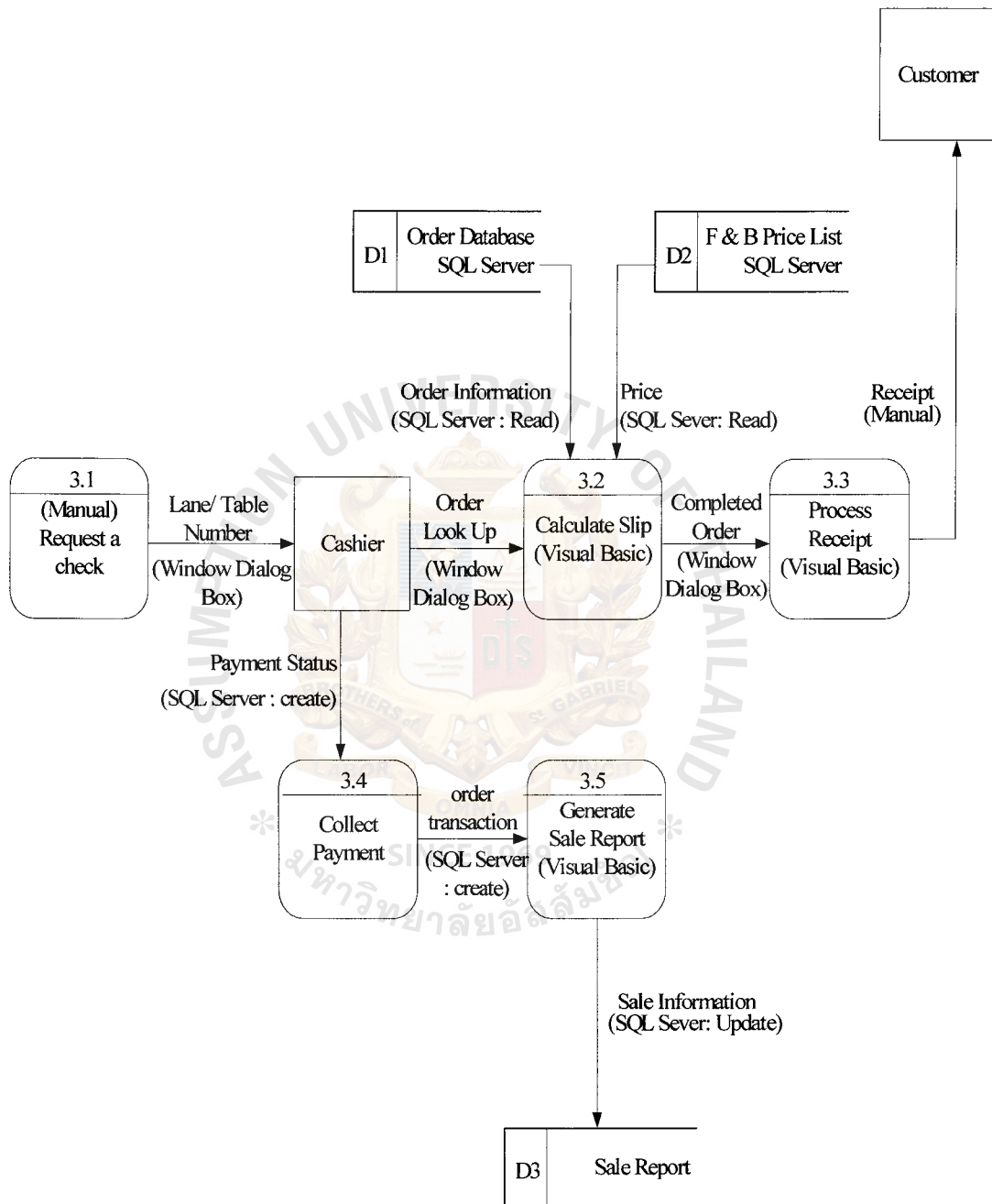


Figure C.3. Physical DFD –Level 1 of Payment Control Process.

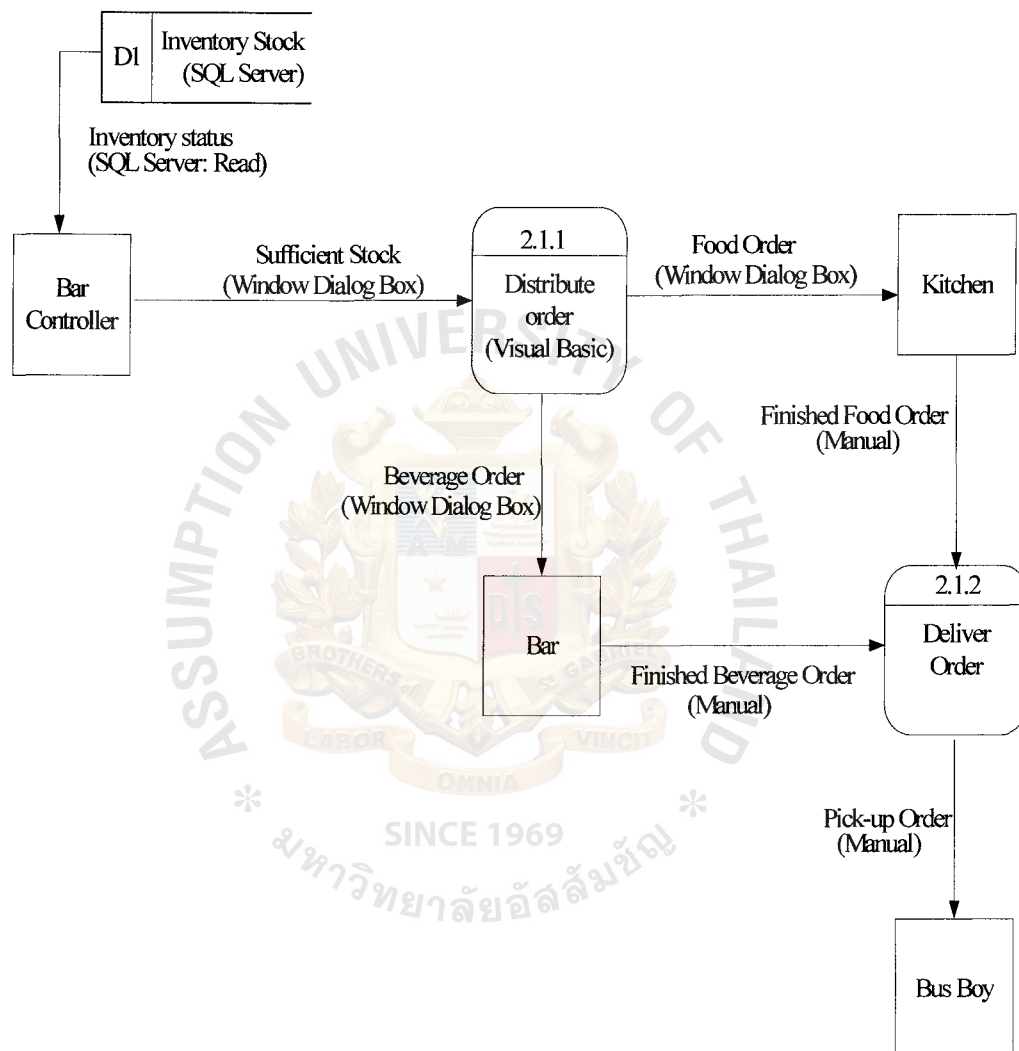


Figure C.4. Physical DFD –Level 2 of Order Distribution Process.

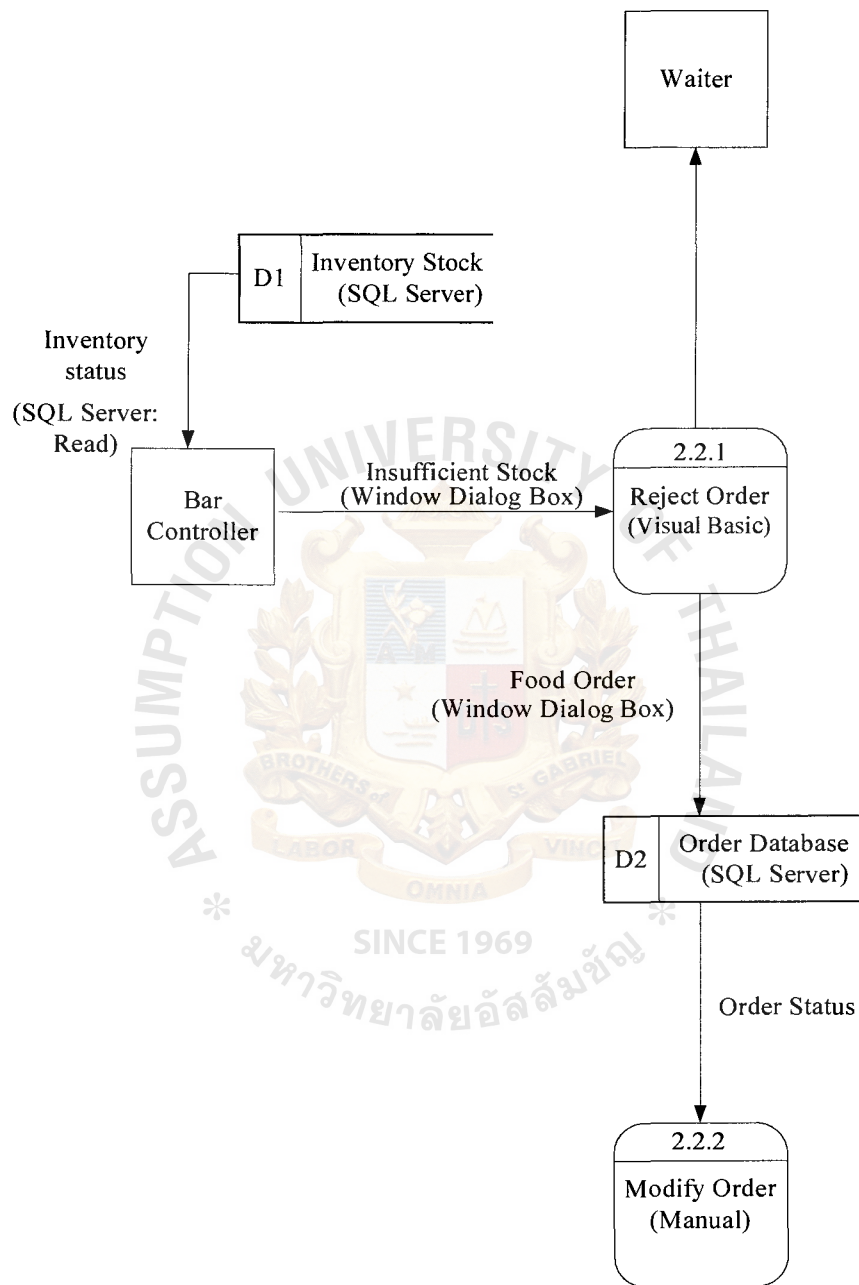
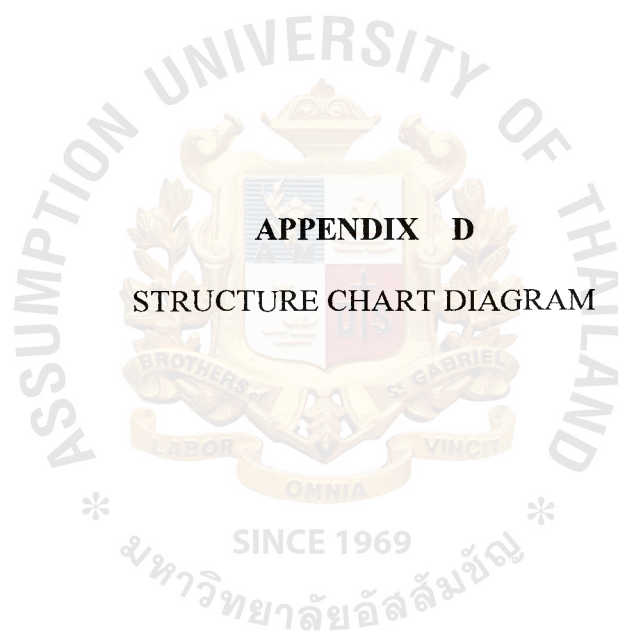


Figure C.5. Physical DFD –Level 2 of Insufficient Control Process.



APPENDIX D

STRUCTURE CHART DIAGRAM

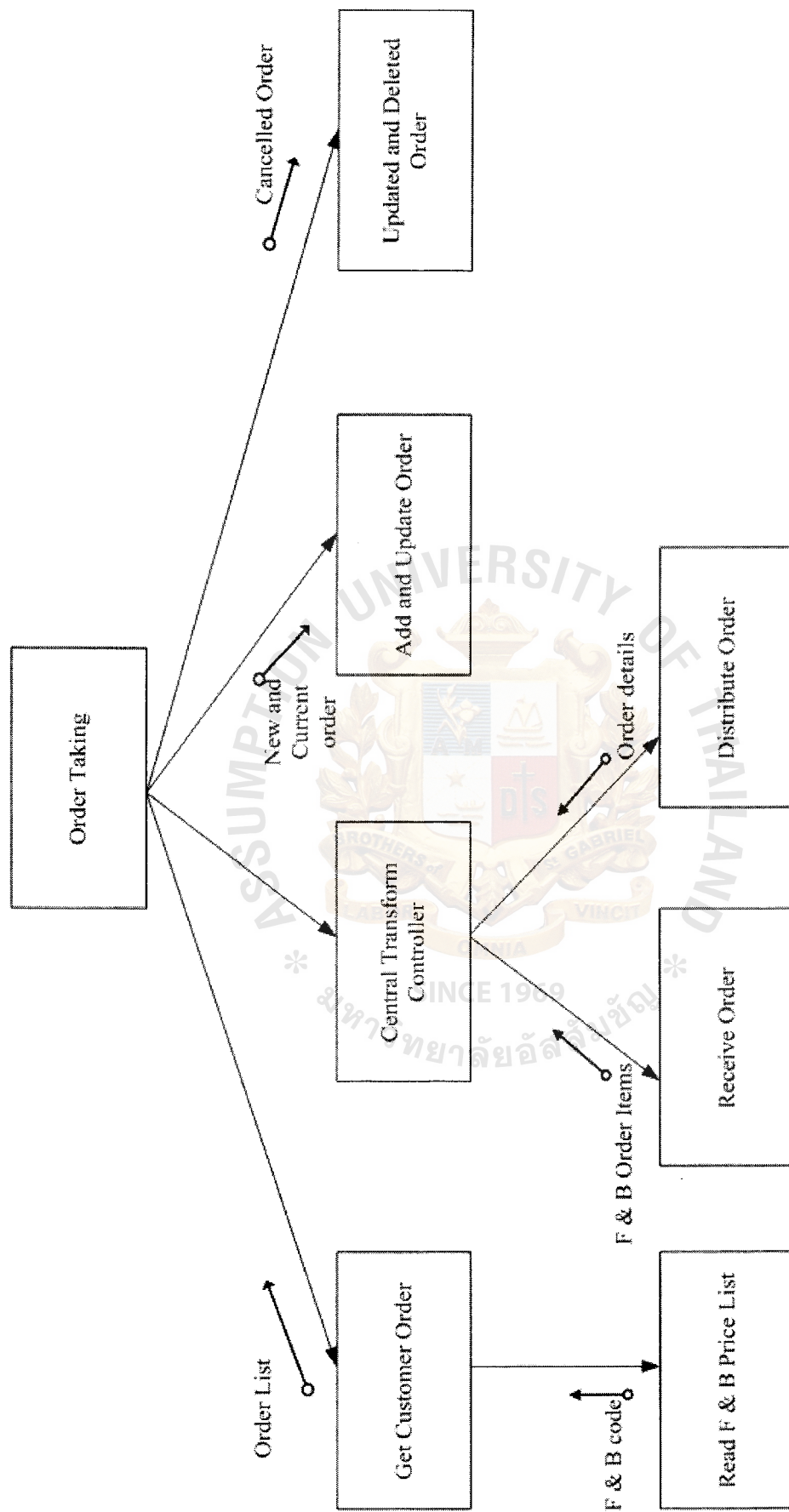


Figure D.1. Structure Chart of Order Taking Process.

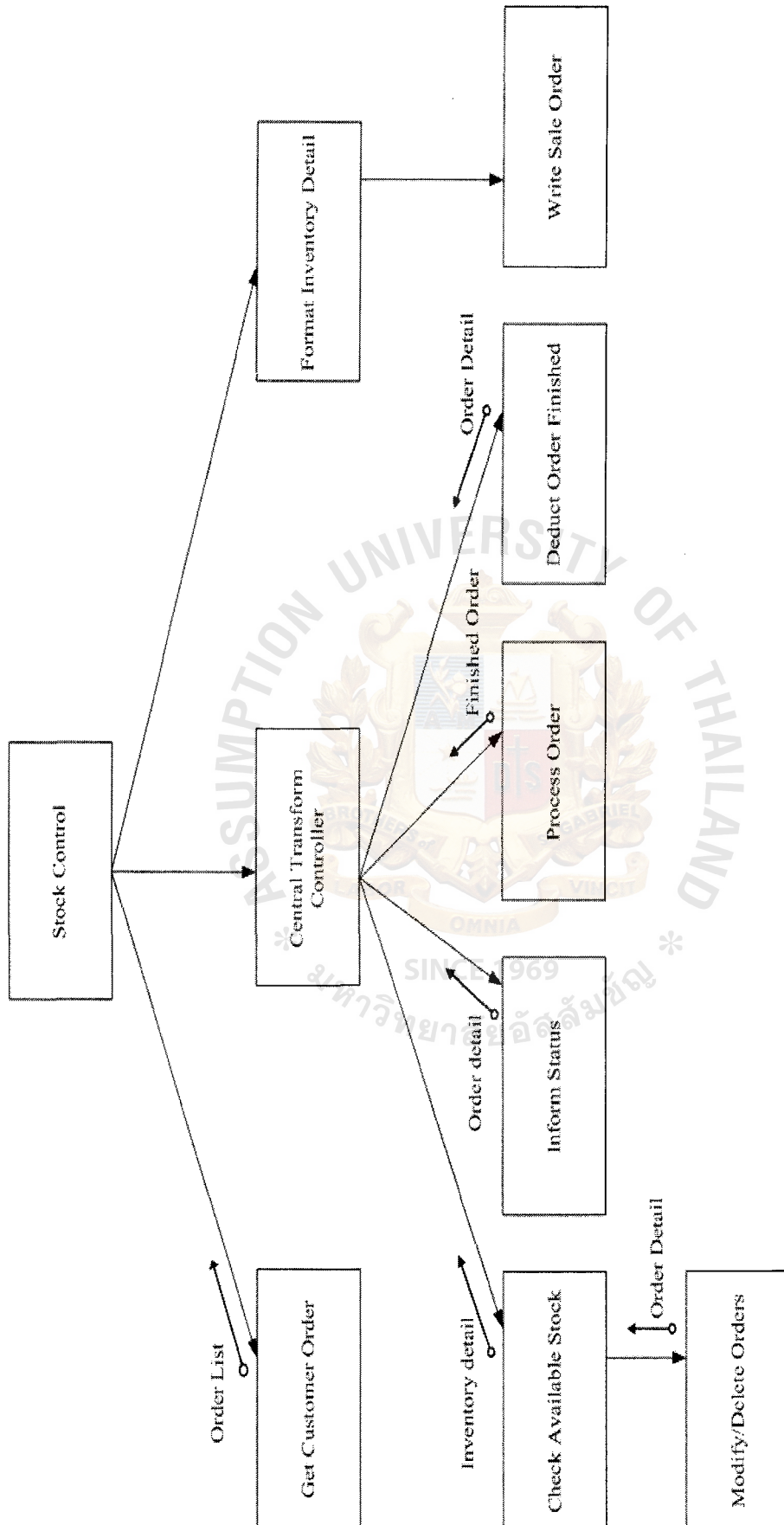


Figure D.2. Structure Chart of Inventory Control Process.

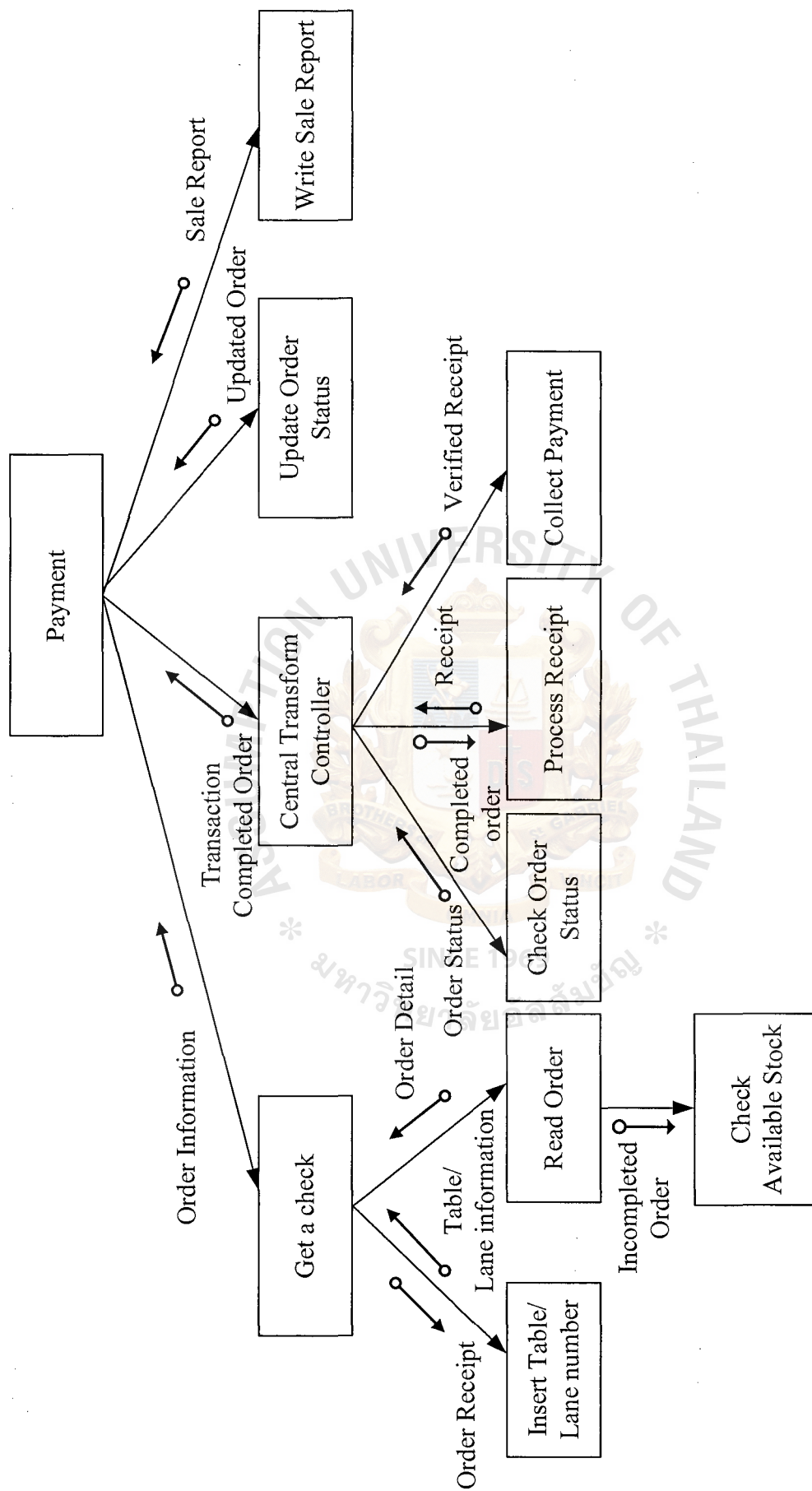


Figure D.3. Structure Chart of Payment Control Process.



APPENDIX E

PROCESS SPECIFICATION

PROCESS SPECIFICATION

Table E.1. Process Specification of Process 1.1.1.

Items	Descriptions
Process Name:	Read F & B Price List
Data In:	Customer Order
Data Out:	Order Database
Process:	(1) Receive customer orders (2) Look up F & B Price
Attachment:	(1) Customer (2) Waiter (3) F & B Price List Store D1

Table E.2. Process Specification of Process 1.1.2.

Items	Descriptions
Process Name:	Order Keying
Data In:	Customer Order
Data Out:	Order Database
Process:	(1) Look up for F & B code from F & B price list (2) Enter F & B code (3) Enter Quantity (4) Repeat step 1 for the rest of orders (5) Order are routed to store in the order database
Attachment:	(1) F & B Price List Store D1 (2) Order Database Store D2

Table E.3. Process Specification of Process 1.1.3.

Items	Descriptions
Process Name:	Update Order Database
Data In:	Order Details
Data Out:	Order Database
Process:	(1) Receive order details (2) Update order status
Attachment:	(1) Order Database Store D2 (2) Order Report Store D3

Table E.4. Process Specification of Process 1.1.4.

Items	Descriptions
Process Name:	Generate Order Report
Data In:	Order Details
Data Out:	Order Report
Process:	(1) Receive order detail (2) Generate order transaction (3) Display order status
Attachment:	(1) Order Database Store D2 (2) Order Database Store D3

Table E.5. Process Specification of Process 2.1.1.

Items	Descriptions
Process Name:	Check Stock
Data In:	Order Details
Data Out:	Order Database
Process:	(1) Receive order details (2) Update order status
Attachment:	(1) Order Database Store D2 (2) Order Report Store D3

Table E.6. Process Specification of Process 2.1.2.

Items	Descriptions
Process Name:	Sufficient Stock
Data In:	Order Details Available Beverage Stock
Data Out:	Sufficient Status
Process:	(1) Look up inventory stock for particular orders (2) Check against the available stock (3) Show the sufficient status (4) Inform bar controller
Attachment:	(1) Order Database Store D2 (2) Inventory Database Store D4

Table E.7. Process Specification of Process 2.1.3.

Items	Descriptions
Process Name:	Insufficient Stock
Data In:	Order Detail Available Beverage Stock
Data Out:	Insufficient Stock
Process:	(1) Receive order number including order details (2) Look up inventory stock for particular order (3) Display the order status (4) Message alert to waiter for revising the orders
Attachment:	(1) Order Database Store D2 (2) Inventory Stock Store D4 (3) Waiter

Table E.8. Process Specification of Process 2.1.4.

Items	Descriptions
Process Name:	Modify Order
Data In:	Insufficient Status
Data Out:	Order Details
Process:	(1) Receive insufficient status (2) Message alert to waiter for revising orders (3) Get new orders and enter the new F & B code (4) Modify the order
Attachment:	(1) Order Database Store D2 (2) Inventory Stock Store D4 (3) Waiter

Table E.9. Process Specification of Process 2.1.5.

Items	Descriptions
Process Name:	Update Inventory Stock
Data In:	Inventory Transaction
Data Out:	Inventory Status
Process:	(1) Receive new inventory transaction (2) Add the new number (3) Display the current balance (4) Deduct the amount of new order status (5) Display the balance of inventory stock
Attachment:	(1) Order Database Store D2 (2) Inventory Stock Store D4

Table E.10. Process Specification of Process 2.1.6.

Items	Descriptions
Process Name:	Distribute Order
Data In:	Sufficient Status
Data Out:	Beverage Order
Process:	(1) Receive Order Number (2) Display Sufficient Status (3) Route beverage orders to bar controller (4) Route food orders to kitchen
Attachment:	(1) Order Database Store D2 (2) Bar Controller (3) Bar (4) Kitchen

Table E.11. Process Specification of Process 2.1.7.

Items	Descriptions
Process Name:	Process Order
Data In:	Order Detail
Data Out:	Finished Orders
Process:	(1) Receive order detail (2) Prepare order (3) Deliver finished order
Attachment:	(1) Order Database Store D2 (2) Bar (3) Kitchen

Table E.12. Process Specification of Process 2.1.8.

Items	Descriptions
Process Name:	Deliver Finished Order
Data In:	Finished Beverage Order Finished Food Order
Data Out:	Pick-up Order
Process:	(1) Inform the bar controller for finished orders (2) Look up order numbers and table (3) Check for finished order status (4) Call bus boy for pick up
Attachment:	(1) Order Database Store D2 (2) Bar Controller (3) Bar (4) Kitchen (5) Bus Boy

Table E.13. Process Specification of Process 2.1.9.

Items	Descriptions
Process Name:	Generate Inventory Report
Data In:	Inventory Transaction
Data Out:	Inventory Report
Process:	(1) Look up for the current stock balance (2) Summarize the inventory transaction (3) Print the inventory report
Attachment:	(1) Inventory Controller (2) Inventory Stock Store D4

Table E.14. Process Specification of Process 3.1.1.

Items	Descriptions
Process Name:	Request a check
Data In:	Requested the lane and table number
Data Out:	Order Details
Process:	(1) Enter the lane and table number (2) Look up for order details
Attachment:	(1) Order Database D2 (2) Customer (3) Waiter

Table E.15. Process Specification of Process 3.1.2.

Items	Descriptions
Process Name:	Check Order Status
Data In:	Order Details Order Status
Data Out:	Finished Order Status
Process:	(1) Look up the order details (2) Check for order status (3) Display the finished order status
Attachment:	(1) Order Database Store D2 (2) F & B Price List Store D1 (3) Cashier

Table E.16. Process Specification of Process 3.1.3.

Items	Descriptions
Process Name:	Process Receipt
Data In:	Finished Order Status
Data Out:	Receipt Number
Process:	(1) Receive orders display as finished order status (2) Generate the receipt (3) Print the receipt to waiters
Attachment:	(1) Order Database Store D2 (2) Cashier (3) Waiter

Table E.17. Process Specification of Process 3.1.4.

Items	Descriptions
Process Name:	Order Tracking
Data In:	Order Detail
Data Out:	Finished Status
Process:	(1) Enter the order number (2) Look up for incomplete orders (3) Track the order name
Attachment:	(1) Order Database Store D2 (2) Cashier (3) Bar Controller

Table E.18. Process Specification of Process 3.1.5.

Items	Descriptions
Process Name:	Collect Payment
Data In:	Receipt Number
Data Out:	Payment Record
Process:	(1) Insert lane or table number (2) Enter the received amount (3) Provide the change (4) Record the data into the payment database
Attachment:	(1) Cashier (2) Waiter (3) Order Database Store D2 (4) Payment Database D5

Table E.19. Process Specification of Process 3.1.6.

Items	Descriptions
Process Name:	Generate Sales Report
Data In:	Payment Record
Data Out:	Sales Report
Process:	(1) Receive payment record (2) Summarize the payment transaction (3) Print the sales report
Attachment:	(1) Customer (2) Data Store D2





APPENDIX F
DATA DICTIONARY

DATA DICTIONARY

Table F.1. Data Dictionary of the Proposed System.

Field Name	Meaning
Bar Controller ID	Bar Controller Identification Number
Bar Controller Name	The name of the bar controller
Bar Staff ID	Bar Staff Identification Number
Bar Staff Name	The name of bar staff
F & B Cashier ID	Food and Beverage cashier Identification Number
F & B Code	Food and Beverage code that identifies the number of the order name
F & B Name	Food and Beverage name
Lane / Table Number	The number of lane or table that customers have placed the order
Number of Guests	The number of customers on the particular lane or table
Order Date	The date that identifies when the orders have been placed
Order Number	The number is generated when the new orders are placed and used for reference
Order time	The time that is recorded when the orders have been placed
Price	The price of particular orders in the Food and Beverage List
Quantity	The quantity identifies the number of items of each order
Stock Current Balance	The number of particular stock items that remains in the stock
Stock Item Name	The name of stock items
Waiter ID	The waiter identification number

Table F.1. Data Dictionary of the Proposed System (Continued).

Field Name	Meaning
Waiter Name	The name of the waiter
Zone Area No.	The specific area number that a waiter and a busboy are responsible for.





APPENDIX G

INTERFACE DESIGN

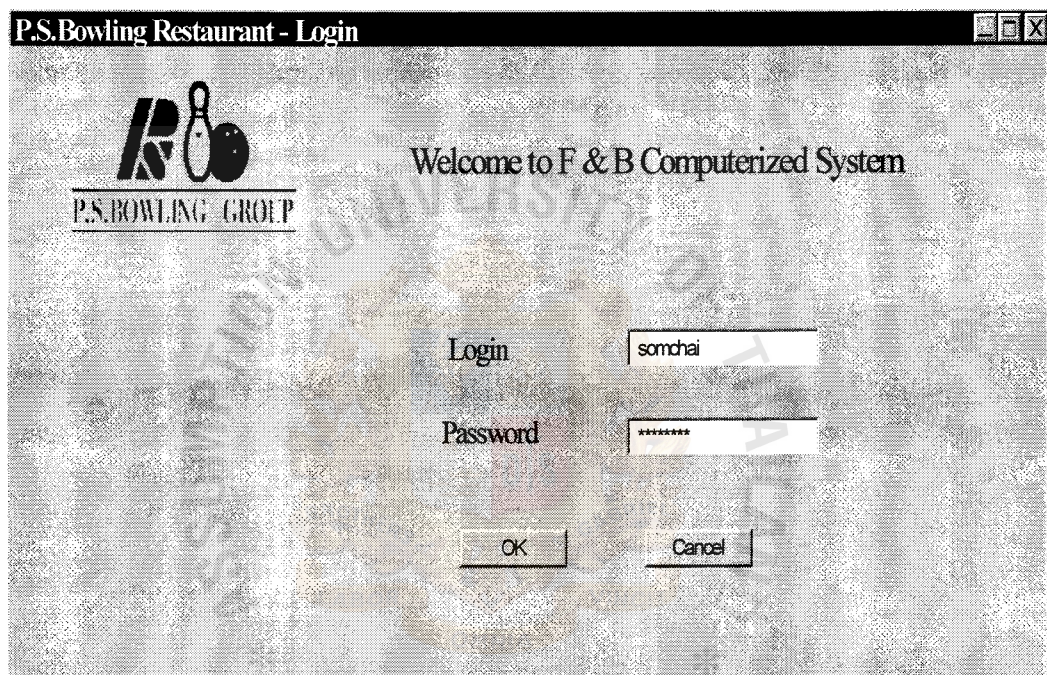
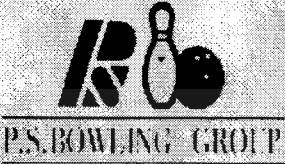


Figure G.1. Authorization Input Screen.

P.S.Bowling Restaurant - F & B List



F & B List
P.S.Bowling (Pattaya)

F & B Assigned Code	102
F & B Name	Fried Sausages
Prices (Baht)	40.00

Figure G.2. Food and Beverage List Input Screen.

P.S.Bowling Restaurant - Order Screen

Order Screen
P.S.Bowling (Pattaya) **30/10/01 17:11:58**

P.S.BOWLING GROUP Waiter ID Waiter Name

Order Number
 Table

F/B Code	F & B Name	Quan.	Prices	Remarks	Status
102	Fried Sausages	1	40.00		☐
208	Coke (Pitcher)	1	50.00		☐
125	Shrimp Fried Rice	1	45.00		☐
					☐
					☐
					☐

< Back OK Next > Cancel

Figure G.3. Order Input Screen.

P.S.Bowling Restaurant - Cashier Screen 30/10/01 17:11:58



Cashier Screen
P.S.Bowling (Pattaya)

P.S.BOWLING GROUP

Cashier ID

Cashier Name

Order Number

Waiter Name

Table

F/B Code	F & B Name	Quan.	Price	Remarks	Status
102	Fried Sausages	1	40.00		☐
208	Coke (Pitcher)	1	50.00		☐
125	Shrimp Fried Rice	1	45.00		☐

Total Price
Cash Receive
Change Due

Figure G.4. Cashier Input Screen.

P.S.Bowling Restaurant - Bar Controller Screen



Bar Controller Screen
P.S.Bowling (Pattaya) 30/10/01 17:40:03

P.S.BOWLING GROUP

Bar Controller ID

Bar Controller Name

Order Number

Table

F/B Code	F & B Name	Quan.	Prices	Remarks	Status
102	Fried Sausages	1	40.00		☒
208	Coke (Pitcher)	1	50.00		☒
125	Shrimp Fried Rice	1	45.00		☒

Figure G.5. Bar Controller Input Screen.

P.S.Bowling (Pattaya) Sales Report --Detail Journal

From 01/10/01 to 01/10/01 : Page 1

Date	Time	Table No.	Employee ID	Order No.	F/B Code	F/B Name	Remark	Quan.	Price	Receipt No.	Amount
01/10/01	11:31 AM	07	117	00290	125	Shrimp Fried Rice	06--No MSG	1	45.00	1001	45.00
01/10/01	11:31 AM	07	117	00290	214	Thai Iced Coffee		1	25.00	1001	25.00
01/10/01	11:31 AM	07	117	00290	215	Thai Iced Tea		1	25.00	1001	25.00
01/10/01	11:31 AM	07	117	00290	210	Water (Bottle)		1	15.00	1001	15.00
01/10/01	11:31 AM	05	103	00291	210	Water (Bottle)		1	15.00	1002	15.00
01/10/01	11:31 AM	05	103	00291	215	Coke (Can)		1	20.00	1002	20.00
01/10/01	11:32 AM	14	121	00292	127	Pork Fried Rice	06--No MSG	1	45.00	1003	45.00
01/10/01	11:32 AM	14	121	00292	215	Coke (Can)		1	20.00	1003	20.00
01/10/01	11:33 AM	14	121	00292	213	Hot Coffee		1	25.00	1003	25.00
01/10/01	11:38 AM	08	117	00293	120	American Fried Rice		1	70.00	1004	70.00
01/10/01	11:38 AM	01	117	00294	210	Water (Bottle)		1	15.00	1005	15.00
01/10/01	11:38 AM	11	117	00295	210	Water (Bottle)		1	15.00	1006	15.00
01/10/01	11:38 AM	12	117	00296	210	Water (Bottle)		1	15.00	1007	15.00
01/10/01	11:41 AM	22	110	00297	210	Water (Bottle)		2	30.00	1008	60.00
01/10/01	11:41 AM	22	110	00297	215	Coke (Can)		1	20.00	1008	20.00
Total											690.00

Figure G.7. Sales Report.

P.S.Bowling (Pattaya) Order Report—Detailed Report										
From 01/10/01 to 02/10/01 Page 1										
Order No.	Time	Table No.	Employee ID	F/B Code	F/B Name	Quan	Price	Order No.	Receipt No.	Amount
00290	11:31 AM	07	117	125	Shrimp Fried Rice	1	45.00	00290	1001	45.00
00290	11:31 AM	07	117	214	Thai Iced Coffee	1	25.00	00290	1001	25.00
00290	11:31 AM	07	117	215	Thai Iced Tea	1	25.00	00290	1001	25.00
00290	11:31 AM	07	117	210	Water (Bottle)	1	15.00	00290	1001	15.00
00291	11:31 AM	05	103	210	Water (Bottle)	1	15.00	00291	1002	15.00
00291	11:31 AM	05	103	215	Coke (Can)	1	20.00	00291	1002	20.00
00292	11:32 AM	14	121	127	Pork Fried Rice	1	45.00	00292	1003	45.00
00292	11:32 AM	14	121	215	Coke (Can)	1	20.00	00292	1003	20.00
00292	11:33 AM	14	121	213	Hot Coffee	1	25.00	00292	1003	25.00
00293	11:38 AM	08	117	120	American Fried Rice	1	70.00	00293	1004	70.00
00294	11:38 AM	08	117	210	Water (Bottle)	1	15.00	00294	1004	15.00
00295	11:38 AM	08	117	210	Water (Bottle)	1	15.00	00295	1004	15.00
00296	11:38 AM	08	117	210	Water (Bottle)	1	15.00	00296	1004	15.00
00297	11:41 AM	22	110	210	Water (Bottle)	2	30.00	00297	1005	60.00
00297	11:41 AM	22	110	215	Coke (Can)	1	20.00	00297	1005	20.00
00297	11:41 AM	22	110	120	American Fried Rice	1	70.00	00297	1005	70.00
00297	11:42 AM	22	110	165	Spicy Noodle Salad	1	70.00	00297	1005	70.00
00297	11:42 AM	22	110	145	Pad Thai Noodle	1	60.00	00297	1005	60.00
Total per page										690.00

Figure G.8. Order Report.

P.S.Bowling (Pattaya) Payment Report--Detail Report							
From 01/10/01 to 02/10/01 Group by table Page 1							
Date	Time	Employee ID	F/B Code	F/B Name	Quan.	Price	Order No. Receipt No. Amount
Table 05							
01/10/01	11:31 AM	103	210	Water (Bottle)	1	15.00	00291 1002 15.00
01/10/01	11:31 AM	103	215	Coke (Can)	1	20.00	00291 1002 20.00
							SubTotal 35.00
Table 07							
01/10/01	11:31 AM	117	125	Shrimp Fried Rice	1	45.00	00290 1001 45.00
01/10/01	11:31 AM	117	214	Thai Iced Coffee	1	25.00	00290 1001 25.00
01/10/01	11:31 AM	117	215	Thai Iced Tea	1	25.00	00290 1001 25.00
01/10/01	11:31 AM	117	210	Water (Bottle)	1	15.00	00290 1001 15.00
							SubTotal 110.00
Table 08							
01/10/01	11:38 AM	117	120	American Fried Rice	1	70.00	00293 1003 70.00
01/10/01	11:38 AM	117	210	Water (Bottle)	1	15.00	00294 1003 15.00
01/10/01	11:38 AM	117	210	Water (Bottle)	1	15.00	00295 1003 15.00
01/10/01	11:38 AM	117	210	Water (Bottle)	1	15.00	00296 1003 15.00
							SubTotal 115.00
Table 10							
01/10/01	11:42 AM	118	210	Water (Bottle)	1	15.00	00298 1005 15.00
01/10/01	11:42 AM	118	146	Pork Fried Rice	1	45.00	00298 1005 45.00
							SubTotal 60.00

Figure G.9. Payment Report.

P.S.Bowling (Pattaya) Inventory Report--Detail Report					
From 01/10/01 to 02/10/01 Page 1					
Date	F/B Code	F/B Name	Stock Quan.	Sold Quan.	Balance
01/10/01	201	Hot Coffee	30	15	15
01/10/01	202	Iced Coffee	30	8	22
01/10/01	203	Coke (Can)	60	45	15
01/10/01	204	Sprite (Can)	60	23	37
01/10/01	205	Fanta (Can)	60	5	55
01/10/01	206	Schwepp (Can)	60	4	56
01/10/01	207	Minere (Bottle)	60	19	41
01/10/01	208	Cold Tissue	60	39	21
01/10/01	209	Water (Bottle)	40	34	6
01/10/01	210	Singha Beer (Large Bottle)	60	56	4
01/10/01	211	Singha Gold	40	30	10
01/10/01	212	Mittweida (Large Bottle)	40	6	34
01/10/01	213	Mittweida (Small Bottle)	40	20	20
01/10/01	214	Barcardi Breezer	40	10	30
01/10/01	215	Singha Soda	40	30	10
					Refill Needed
					Refill Needed

Figure G.10. Inventory Report.

BIBLIOGRAPHY

1. Bennett, Simon. Object-Oriented Systems Analysis and Design Using UML, International Edition. London: The McGraw-Hill Companies, 1999.
2. Date, C. J. An Introduction to Database Systems. MA: Addison-Wesley, 1995.
3. Gibson, Michael L. and Cary T. Hughes. Systems Analysis and Design: A Comprehensive Methodology with Case. MA: Boyd & Fraser, 1994.
4. Gray, Clifford F. and Erik W. Larson. Project Management: The Managerial Process, International Edition. Singapore: McGraw Hill, 2000.
5. Greer, Tyson. Understanding Intranets. Redmond, WA: Microsoft Press, 1998.
6. Kendall, Kenneth E. and Julie E. Kendall. System Analysis and Design, Third Edition. NJ: Prentice-Hall, 1995.
7. Kosiur, David. Understand Electronic Commerce. WA: Microsoft Press, 1997.
8. Laudon, Kenneth C. and Jane P. Laudon. Management Information Systems: New Approaches to Organization and Technology, Fifth Edition. NJ: Prentice Hall, 1998.
9. Loomis, Mary E. S. Data Management and File Structures, Second Edition. London: Prentice-Hall International, 1989.
10. Post, Gerald V. and David L. Anderson. Management Information Systems: Solving Business Problems with Information Technology, Second Edition. USA: McGraw Hill, 2000.
11. Pressman, Roger S. Software Engineering: A Practitioner's Approach, Fourth Edition. Singapore: McGraw Hill, 1997.
12. Ramakrishnan, Raghu and Johannes Gehrke. Database Management Systems, Second Edition. Singapore: McGraw Hill, 2000.
13. Trepper, Charles. E-Commerce Strategies. USA: Microsoft Press, 2000.
14. Whitten, Jeffrey L. and Lonnie D. Bentley. Systems Analysis and Design Methods, Fourth Edition. Taipei: McGraw-Hill, 1998.

