



**SHIPPING SERVICE SYSTEM OF  
RIVER TRANSPORTATION COMPANY**

by

**Ms. Fah Mahanavanont**

**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, 2000**



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Project Title                      Shipping Service System of River Transportation Company

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Academic Year                  November 2000

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

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## ABSTRACT

This project is a system development project of the Shipping Service System. The objective of the project is to improve the system efficiency. In order to achieve this objective, System Analysis and Design Methodology are to be used as the tools to develop the most suitable system for the company.

This methodology involves the study of the existing system, analysis of the current problems, selection of the best alternative to be used, development of the new proposed system, estimation of the budget and schedule for the whole project and the plan for the system implementation.

From the study of the existing system, the major problem of the existing system is the use of the manual system. Manual process is simple but it cannot support the increase in the number of transactions and the complexity of the report required by the users. Moreover, the manual process cannot produce the required information in time.

This project recommends the use of computerized system to increase the system efficiency. The interview is conducted to collect the requirements of the users and the company's management. The new computerized system is designed to fulfill all of these requirements. The cost and benefit analysis is also presented in this project to show the project feasibility, payback period and the return on investment.

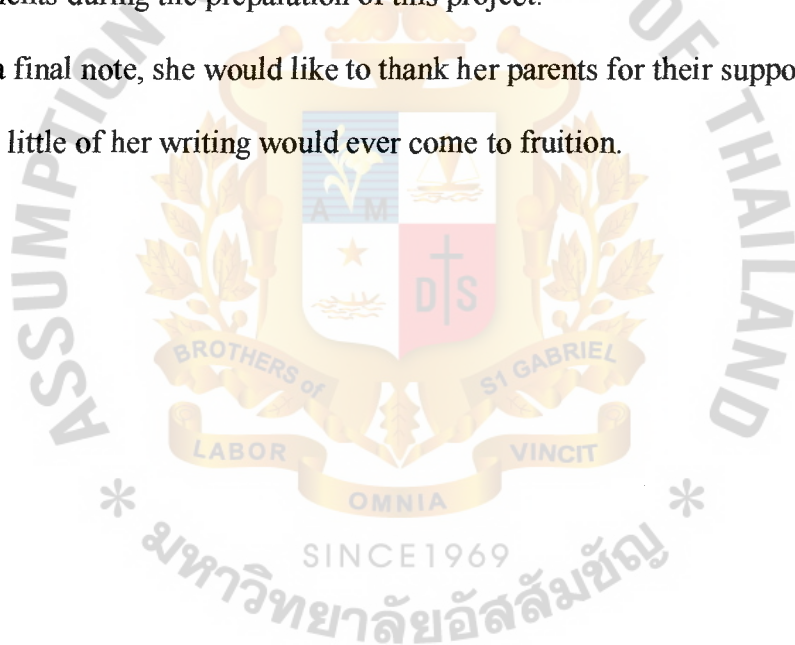
The project does not require huge initial investment and the payback period of the project is not very long so it will be very useful for the company to change its system to be a computerized system. The expected advantages from the system are to reduce the errors generated from the system and accelerate its work process. Finally, the company can compete with others and can increase the level of customers' satisfaction at the same time.

## ACKNOWLEDGEMENTS

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# **I. INTRODUCTION**

## **1.1 Background of the Project**

Nowadays, transportation along the Chaopraya River is one of the distribution channels of many companies especially for the distribution of mass products with huge weight such as cement, sand, powder, etc.

Many companies choose river transportation as their major channel of distribution because of lower cost of transportation and less traffic problem. As we know, the traffic problem in Bangkok is very serious. Consequently the use of trucks to convey the goods from the suburb to the city will be more time consuming, and certainly more costly. However, the companies can deliver more products in one trip with the use of shiploads.

The business environment is changing rapidly. The number of competitors in all types of business is also increasing everyday. Currently there are many new competitors entering into the shipping business. In order to compete with others, the company should not only use the pricing strategies but also the system analysis and design.

One of the major problems that cause inefficiency in the company's operation is the weakness in its workflow and process. Some processes may cause redundancy of work or it may be too complicated to be performed by the company's staff. Some processes may overlap the others. Some processes may be overlooked. To solve this problem, the company has to study its workflow, identify weak points in each particular process, and design the process that is most suitable for the company's environment.

Many old style companies that depend mostly on the manual processing may face problems of human errors and inaccurate data. Sometimes those companies have to spend a lot of time producing various reports and paper works manually. This also



increases the operating cost of the company. Using the information technology is considered to be one of the best solutions for the small and medium businesses that would like to survive in the current business environment.

The advanced information technology, which is the computer-based technology, can accelerate the company's workflow, promote the efficiency in each process, reduce the redundancy and finally can increase the company's profit. It needs quite high investment in developing the computerized system to be used in the company and in developing its people to be able to use the system efficiently.

The company needs to conduct a research and study hard about its current workflow and process in order to be able to identify specific problems incurred within its whole process. Then the analysis and design of a new proposed system have to be conducted carefully in order to have the most suitable computer system that best suits the current business condition.

## **1.2 Objectives of the Project**

The objectives of “Effective Shipping Service System of River Transportation Company” are listed as follows:

- (1) To study the current existing system.
- (2) To evaluate the current existing system, identify the problems and find out the possible solutions to solve those problems.
- (3) To perform user requirement analysis and identify the specifications for new proposed system.
- (4) To design new proposed computerized system that can facilitate the sales system on the basis of time and cost effectiveness.
- (5) To accelerate the invoicing process so that the company can manage its working capital efficiently.

- (6) To minimize the paper work and administration cost through the use of new proposed computerized system.

### **1.3 Scope of the Project**

This project emphasizes on the shipping service system in shipping administration department. It does not include the software program development but gives the information about the logical and technical design including design of system output and input. The shipping service system comprises the major activities as follows:

- (1) Shipping fee calculation

This module will cover the process of calculating the shipping fee in order to issue the invoice for charging customers. This module is designed to support the fee calculation for both one way trip and round trip. The standard fee will be set into the system as the base for calculation for each customer. This system will accelerate the billing process and will enable the management to have effective and efficient control of the company's working capital.

- (2) The wages to be paid to sailors

This process will facilitate the shipping administration and finance departments in preparing the payment to be paid to sailor after finishing each trip. The system will generate the amount to be paid and relevant withholding tax deduction. Accordingly, it can provide the accounting department with the details of withholding tax deducted at source in order to enclose the tax return form at the beginning of each month.

#### 1.4 Deliverables

The deliverables for the shipping service system are as follows:

- (1) Relational Database, which is developed using Microsoft Access. The Database comprises 10 tables. These tables are as follows:
  - (a) Customer Database Table
  - (b) Sailors Database Table
  - (c) Standard Wages Database Table
  - (d) Standard Fee Database Table
  - (e) W/H Tax Rate Database Table
  - (f) Job Order Database Table
  - (g) Delivery Database Table
  - (h) Wages Payment Database Table
  - (i) Withholding Tax Deduction Database Table
  - (j) Invoice Billing Database Table
- (3) Input User Interface, which is developed using Microsoft Access.
- (4) Report Design, which is developed using Microsoft Access. List of reports are summarized as follows:
  - (a) Report of Customer Detail
  - (b) Report of Sailors Information
  - (c) Report of Invoice Billing
  - (d) Report of Job Order Detail
  - (e) Report of Delivery Details
  - (f) Report of Wages Payment
  - (g) Report of Withholding Tax Deduction



## 1.5 Project Plan

The schedule of the whole project is about 6 months. The project is divided into 3 phases: analysis of the existing system, analysis and design of the proposed system and implementation of the proposed system. The estimated time used in the analysis of the existing system phase is about 2 months. Then the system analyst can start the system design of the proposed system, which will take about one and a half months to finish system design.

Finally, the system implementation phase will take about two and a half months to complete. Please see Figure 1.1 for the project planning of the system.



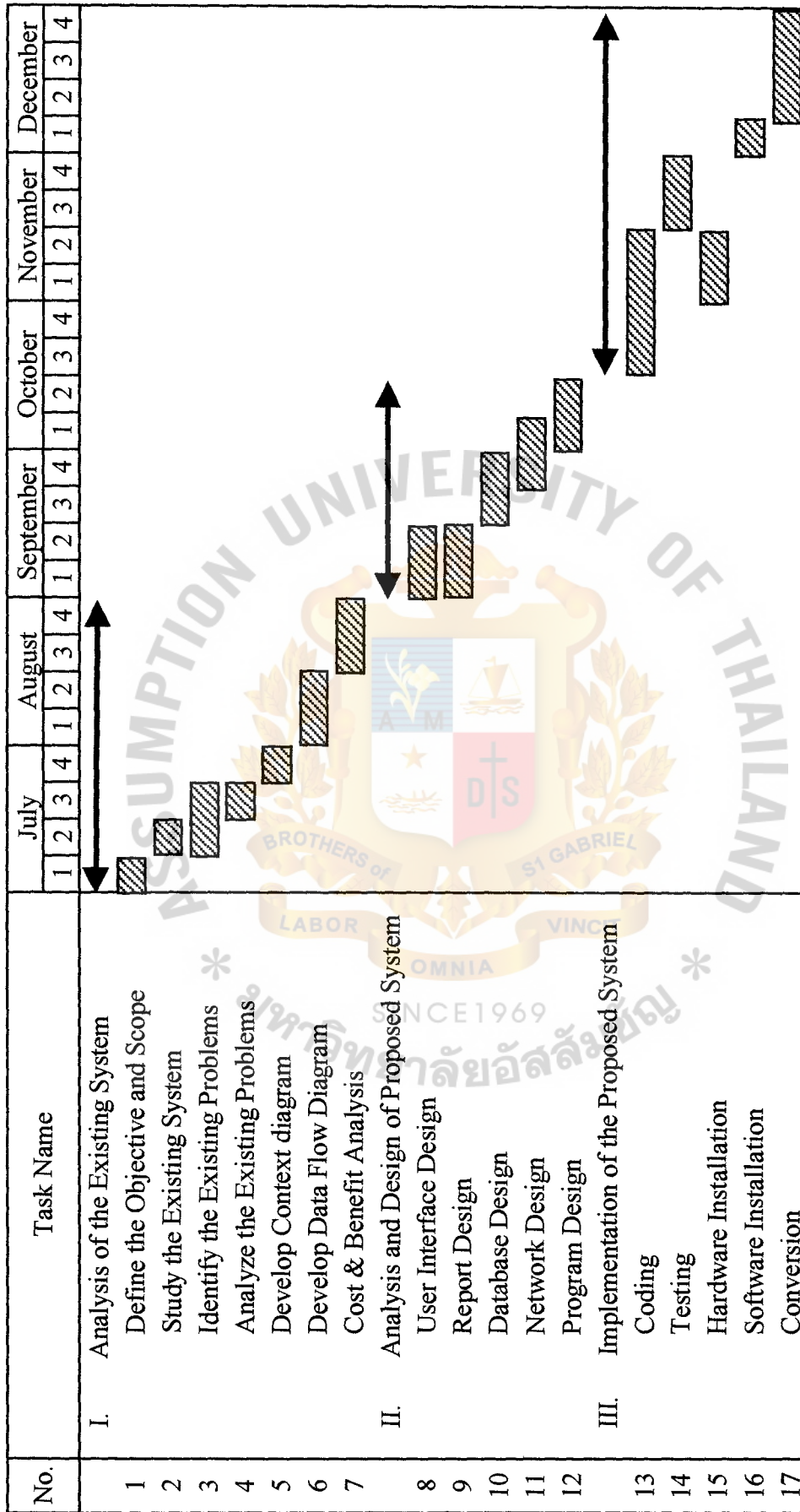


Figure 1.1. Project Planning of Shipping Service System of River Transportation Company.

## **II. THE EXISTING SYSTEM**

### **2.1 Background of the Organization**

River Transportation Company was established in 1976 and now has about 10 staff working in its head office and 60 sailors working on the ships. It provides the transportation service to customers for both bulk loads such as sand, powder, etc. and packing load such as sacks of cement, sacks of grains, etc. Since River Transportation Company is a service rendering company, there was no product to be sold but the income will come from the service rendered to customers by its staff and vessels. So staff utilization and billing system is the key issue of the company. Shipping Service System is the system used in preparation of invoice and wages calculation to sailors.

At present, the company uses the manual system in preparing all documents. The sailors have to come to the office twice in order to get their wages. Firstly they come to send the job order sheet along with their time sheet to the Shipping Administrative officer. Then they have to come again on the following day to get cash from the Finance Department. So the company faces the problem of productivity since the sailors have to stop sailing in order to settle their wages for at least 2 times within a month.

The billing system is even worse. The billing staff has to wait for the approved order sheet before she can prepare the invoice. Normally, the billing process has to take nearly 1 week after finishing the work until the invoice reaches the client's office. It is very time consuming before the company can get the money from the client. So the company cannot manage the use of its working capital effectively.

Therefore, River Transportation Company wants to develop an effective shipping service system that can save time and minimize the cash collection period. The system will engage the use of computer in order to facilitate the work of all staff and accelerate the work flow of all relevant departments.



This project will provide the information of the current existing system, problems occurred from the existing system and weakness of the whole system. Furthermore, this project will present the possible solutions to solve the existing problems and propose the new shipping service system and all of its benefits and advantages.



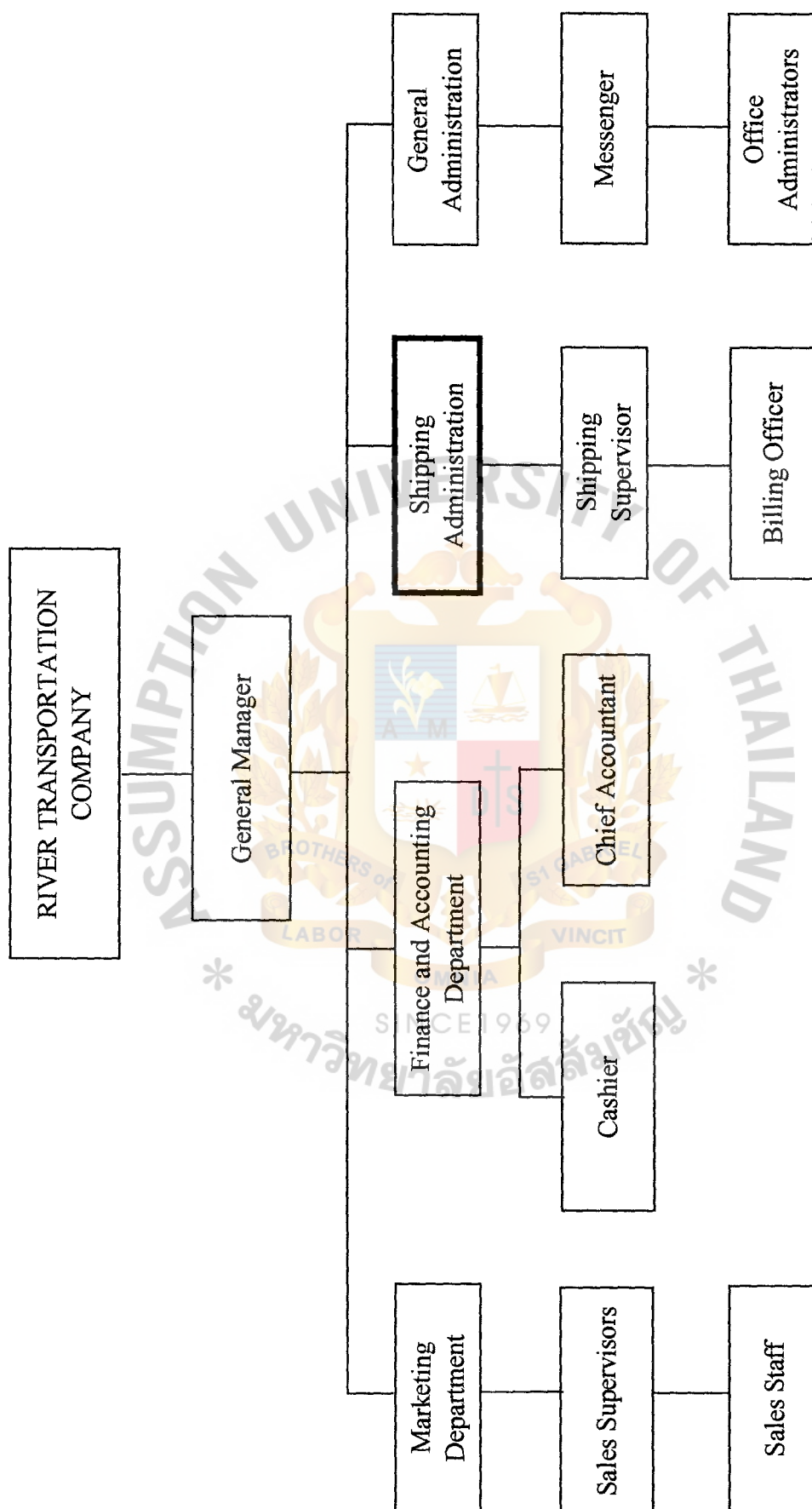


Figure 2.1. Organisation Chart of River Transportation Company.

## **2.2 Evaluation of Problems**

There are many problems that the company currently faces from the use of manual system. The problems that are identified during the evaluation of current data flow diagram are as follows:

### **2.2.1 Problem of Economy**

The current existing system of the company depends wholly on the manual process. The cost of handling paperwork, cost of transportation of sailors from the ship to the office, and opportunity loss from late billing to customers are the major problems of the company during this economic turmoil period. During the busy season, the company has to hire temporary staff to prepare the withholding tax return form unless the company has to pay the penalty and surcharge for paying tax late. So the company has to pay for the wages of temporary staff and for the tax penalty.

### **2.2.2 Problem of Timeliness**

The wages paid to sailors have to be calculated by shipping administrative officer manually before sending to the Finance Department to get the approval for payment. So currently this process takes at least 1 day before the sailors can get their wages.

The sailors' wages are subjected to withholding tax deductible at source at the payment date. The company has to remit the withholding tax to the Revenue Department within the 7<sup>th</sup> day of the following month. Some months the accounting staff cannot complete the Tax Return Form and cannot submit the tax to the Revenue Department on time. So the company has to pay the tax penalty and surcharge to the Revenue Department.

The billing staff has to wait for the approved job order sheet from the shipping administrative officer. Then she gathers the information about the type of commodity being conveyed by the company's ship, number of trips and destination. She has to



prepare invoices manually using the typewriter to fill in the details of trips and amount to be charged for each customer. The current invoicing process takes at least 1 week and about 2 weeks at most. Some customers may have payment schedule only one time at the beginning of the month. If the company misses the client's schedule, it has to wait for another one month for the settlement of that invoice. So the company faces the opportunity loss from late payment from customers.

### 2.2.3 Problem of Accuracy

The billing staff has to gather the information of the shipments being conveyed in each month in order to prepare the customer invoices. The customer's name, the destination of the shipment, type of products, weight, and the name of the ship are presented in the invoices.

There are several customers' complaints about the typographical errors and mathematical errors incurred in the invoices sent to them. These errors occurred because the billing staff has to issue the invoices and key in all details manually using the typewriter. Moreover, there are huge numbers of invoices to be issued in each month so the billing staff may have less time to review for any typographical errors. At present there are many complaints about this matter from many customers. Normally, it takes a couple of days to correct the invoices and send them to the customers. This causes a delay in settlement of the invoices and reduces the degree of customers' satisfaction.

## 2.3 Analysis and Selection of Alternative

From the evaluation of the current existing problems, we can see that the manual system is the major cause of most of the problems. It creates a lot of human errors and delay in the work process. In this case, the use of computer-based system is the best solution to solve these problems. Before selection of any new design system, the following factors will be considered:

### 2.3.1 Computer-Based Versus Manual System

There are several good reasons for building a computer-based system. The advantages of computer-based system over the manual system are summarized as follows:

- (1) Improve the invoice processing speed.
- (2) Produce accurate and consistent data in shipping fee calculation and invoice processing.
- (3) Reduce the redundancy in paper work.
- (4) Accelerate the wages calculation process.
- (5) Improve the speed of preparing the withholding tax deduction report.
- (6) Support the increase in number of transactions in the future with less cost and space.

Although there are many advantages of the computer-based system, it also has some constraints as follows:

- (1) High investment cost at an early stage and usually involves lump-sum payment.
- (2) High training cost during the transitional period.
- (3) High maintenance cost.

After comparing both advantages and constraints, we can see that the computer-based system has many advantages over the manual system. The only major constraint is the capital investment, which is not the problem of the system itself. So the computer-based system is recommended in this project. The next step is to define whether to build or buy a new system.

### 2.3.2 Build Versus Buy

Should the company build a new system or buy software packages and implement it directly? There are many factors to be considered. The most important factors are functionality, availability, ease of understanding, performance, and initial and recurring costs.

Currently, there are a large number of software products available for sale in the market. The company can buy the general purposes software such as word processing, electronic spreadsheets and other office packages from the market. This can reduce the cost of developing the new system.

Although the company can buy some application software from the vendor, there are still some systems such as shipping service and wages calculation system that have to be developed especially for the company. There are many specific conditions for the invoicing and wages calculation processes, which are totally different from any other businesses.

To avoid a lot of modification cost, which will be incurred in order to modify the software packages to fit the company's requirement, the author of this project chooses to develop the shipping service and wages calculation system. However, for other general purposed systems, it is cheaper for the company to buy from the vendors instead of developing itself.

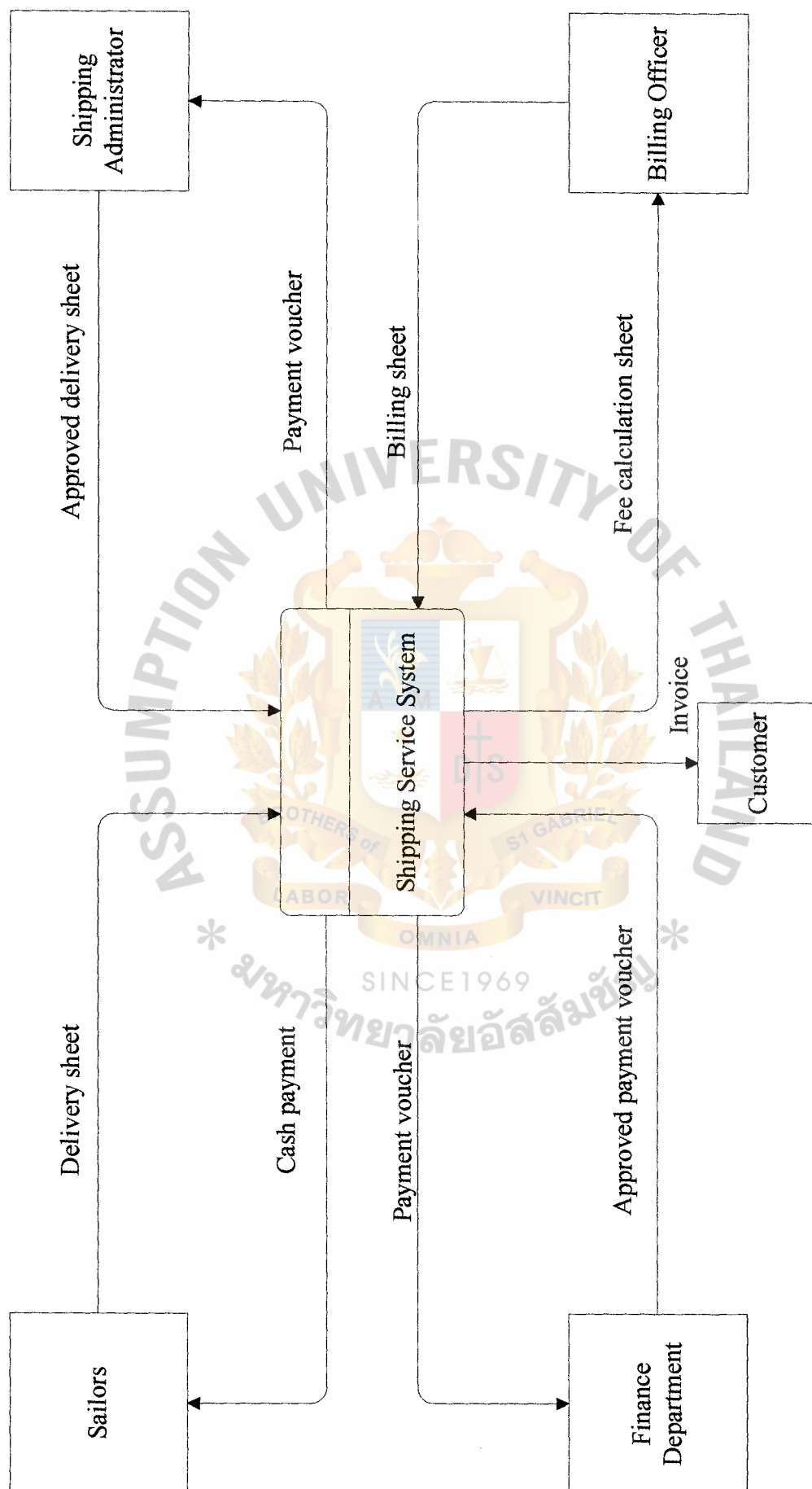


Figure 2.2. Context Diagram of the Existing Shipping Service System.



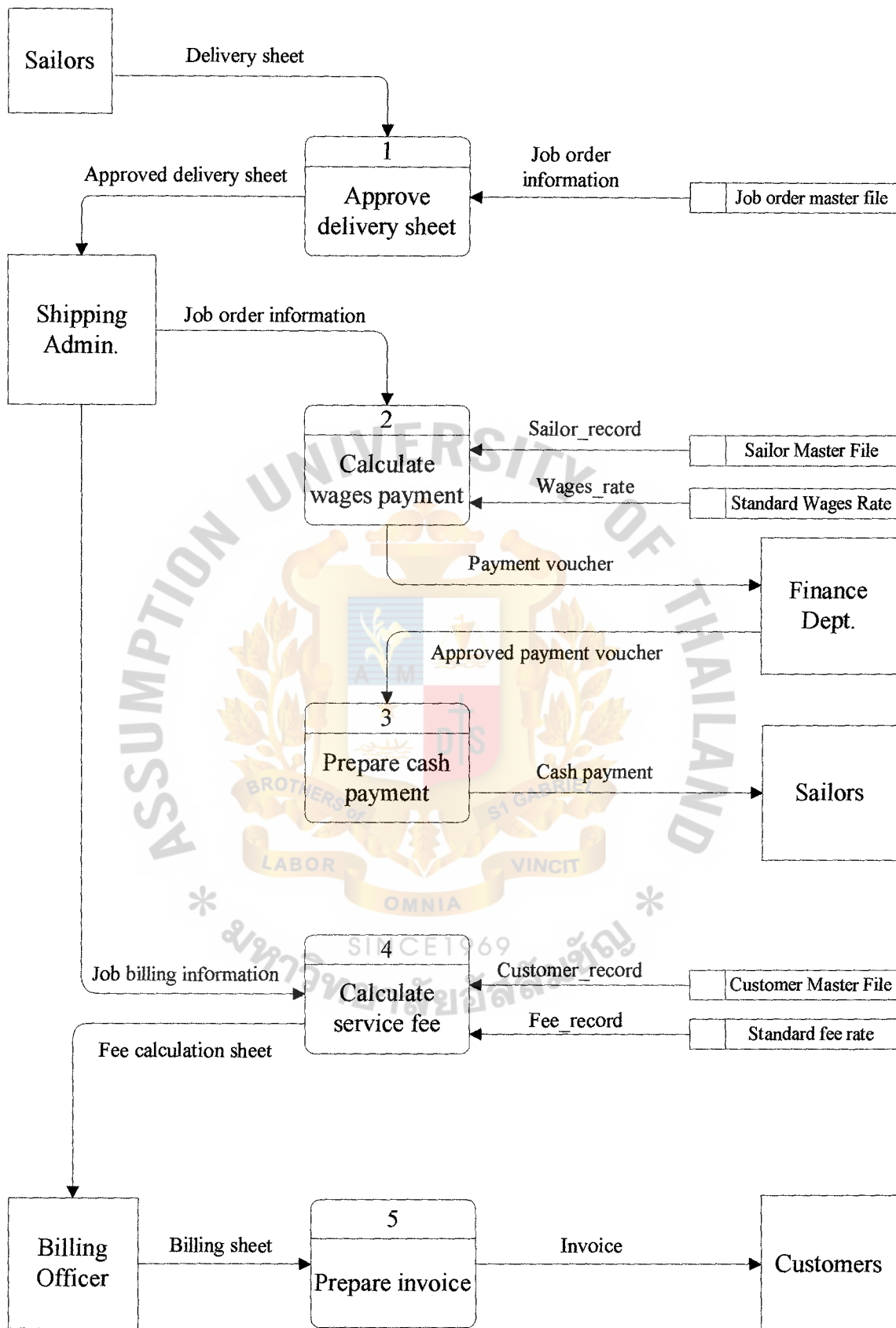


Figure 2.3. Level 0 Data Flow Diagram of the Existing Shipping Service System.

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

#### **3.1 System Specification**

In this stage, various techniques are used in the analysis of user requirements. Firstly, the formal interview of the company's management is conducted to gather the information about the need of the company to improve its system and the attitude of the management. From the interview, I know that the company's management has the positive attitude towards the system change and is willing to pay for the development cost if it can improve the efficiency of the system.

Secondly, the billing staff and the shipping administrative officer were interviewed in order to gather the detail information about the system flow. The requirement of the staffs and their expectation from the new proposed system are also derived from that interview session.

From the interview and the discussion with the company's management and its staff, the requirements to be system output and input requirement are summarized:

##### **3.1.1 System Output Requirement**

There are many reports required by both the management and the staff. Some of them are required by the government authority and some are used internally by the management for monitoring the business. The important things are that the report should be accurate, up to date, and created in appropriate format to be used instantly with minimum modification. The required reports are as follows:

- (a) Customer Report
- (b) Sailors Information Report
- (c) Invoice Billing Report
- (d) Job Order Report
- (e) Delivery Details Report

- (f) Wages Payment Report
- (g) Withholding Tax Deduction Report

### 3.1.2 System Input Requirement

Apart from the output requirement, the users also need to have the following input requirements:

- (a) The input screen should be user friendly and easy to use.
- (b) The system should require minimum manual key-in to prevent the human errors.
- (c) It should have adequate system security such as user name and password.
- (d) The system should have controls over the input process.

The context diagram and data flow diagram decomposition is shown in the attached figures.

## 3.2 System Design

After completing the users' requirement process, the next step is to design the system according to those requirements. The system flexibility is one of the major concerns during this phase to support the change in users' requirement and expansion of the business in the future.

There will be many changes to the company system especially for physical change. To be change from the manual process to computerized process, the company has to install new computer hardware and software. The working environment may be changed from the existing system.

The data flow diagram of the new proposed system is designed to support this change. The workflow of some processes may be changed a little bit to reflect the use of computerized system.

The input and output are designed to respond to the management and users' requirements. Various reports are created automatically by the system with only one time input. This will reduce the chance of human errors and mistakes in preparing the reports for the management. The input screens are designed to be most user-friendly and various controls are put into the system to protect any human errors that may be occurred during the input process.





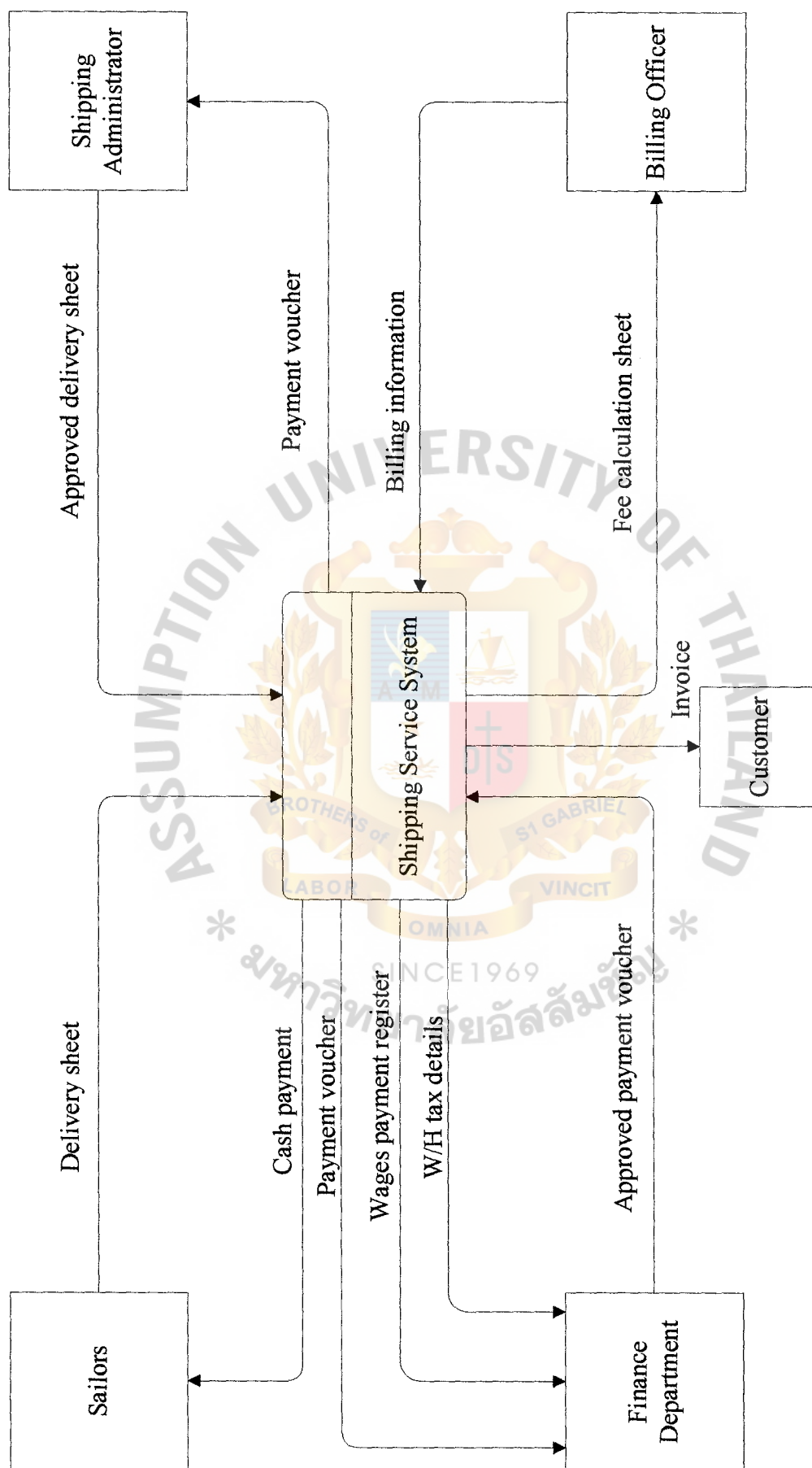


Figure 3.1. Context Diagram of the Proposed Shipping Service System.

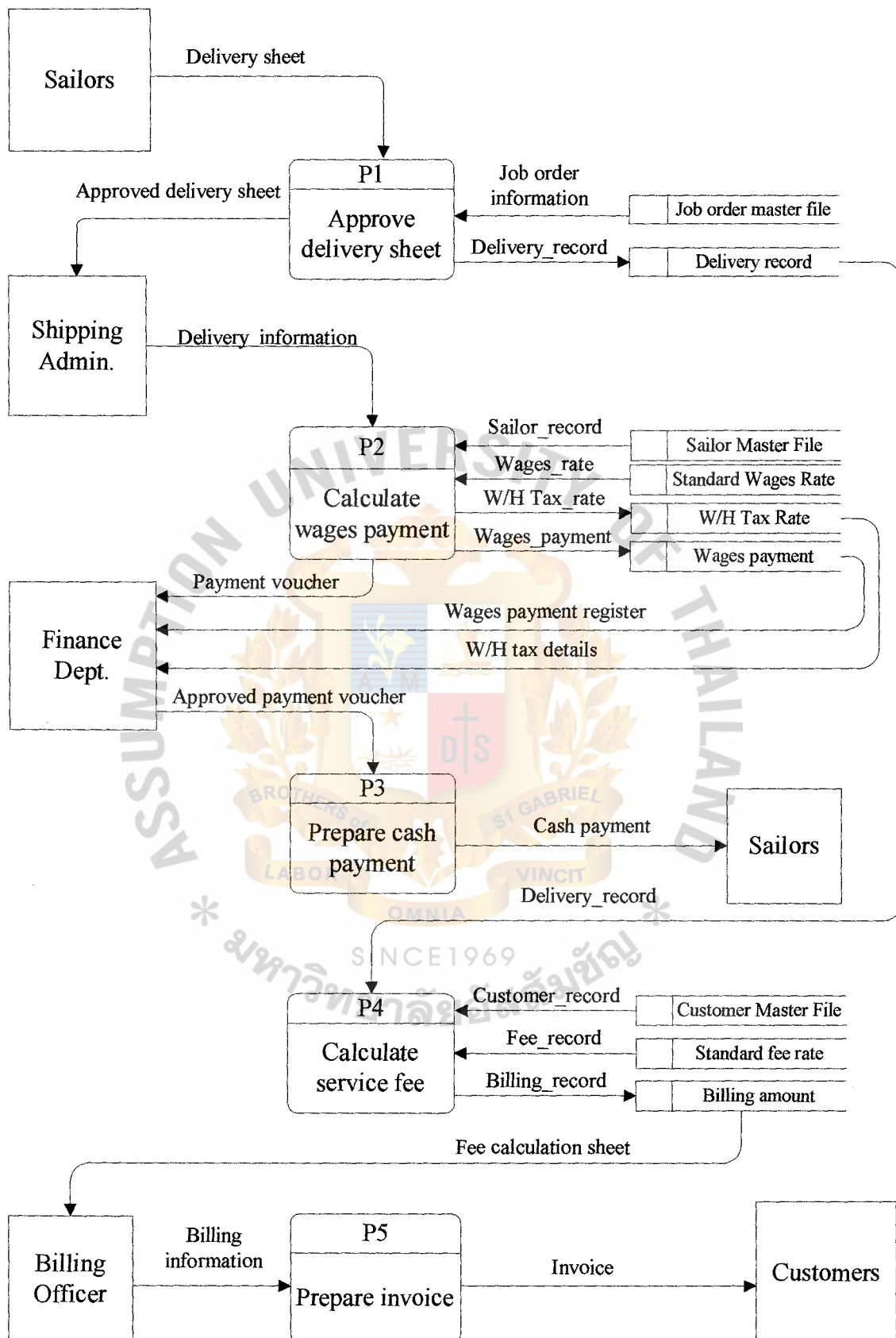


Figure 3.2. Level 0 Data Flow Diagram of the Proposed Shipping Service System.

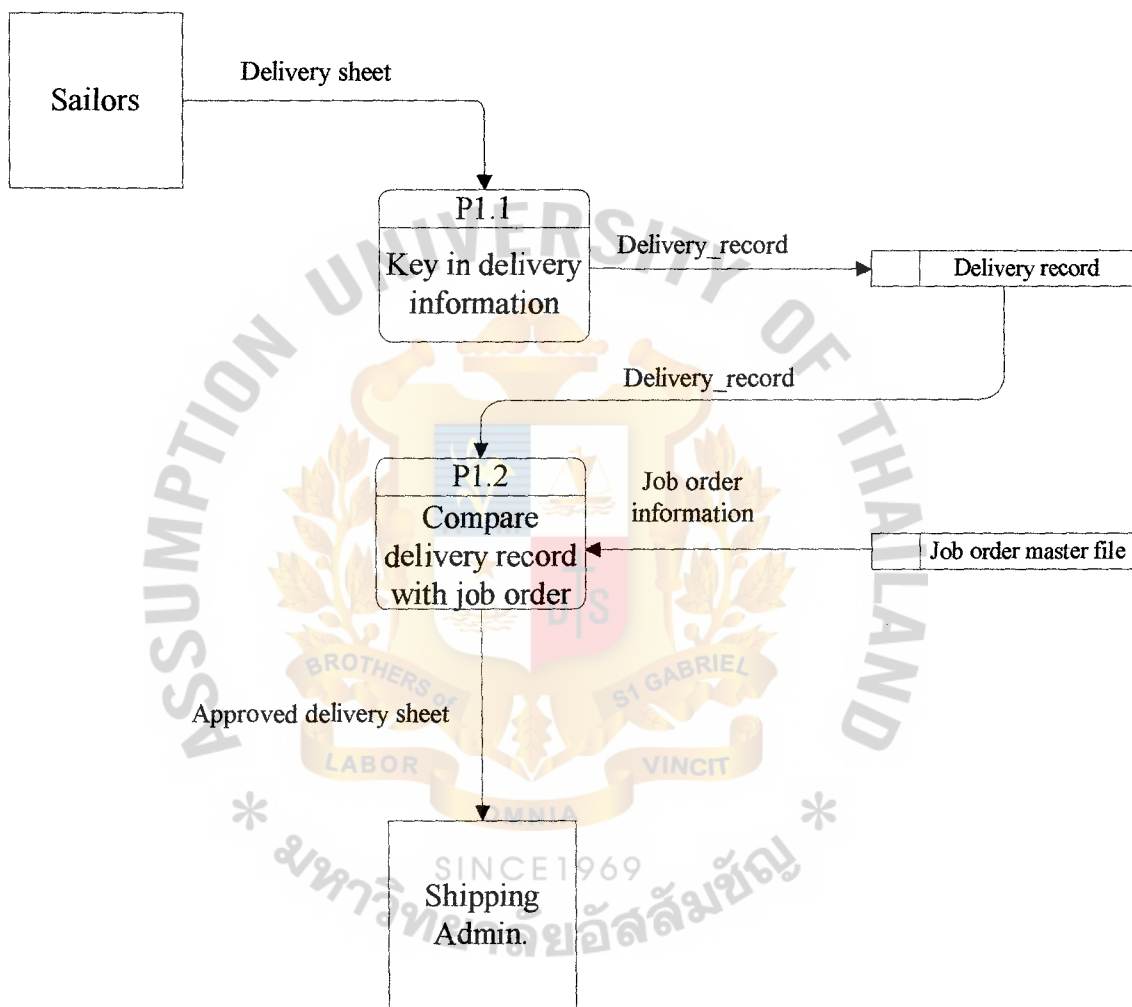


Figure 3.3. Level 1 Data Flow Diagram of Process 1 Approved Delivery Sheet.

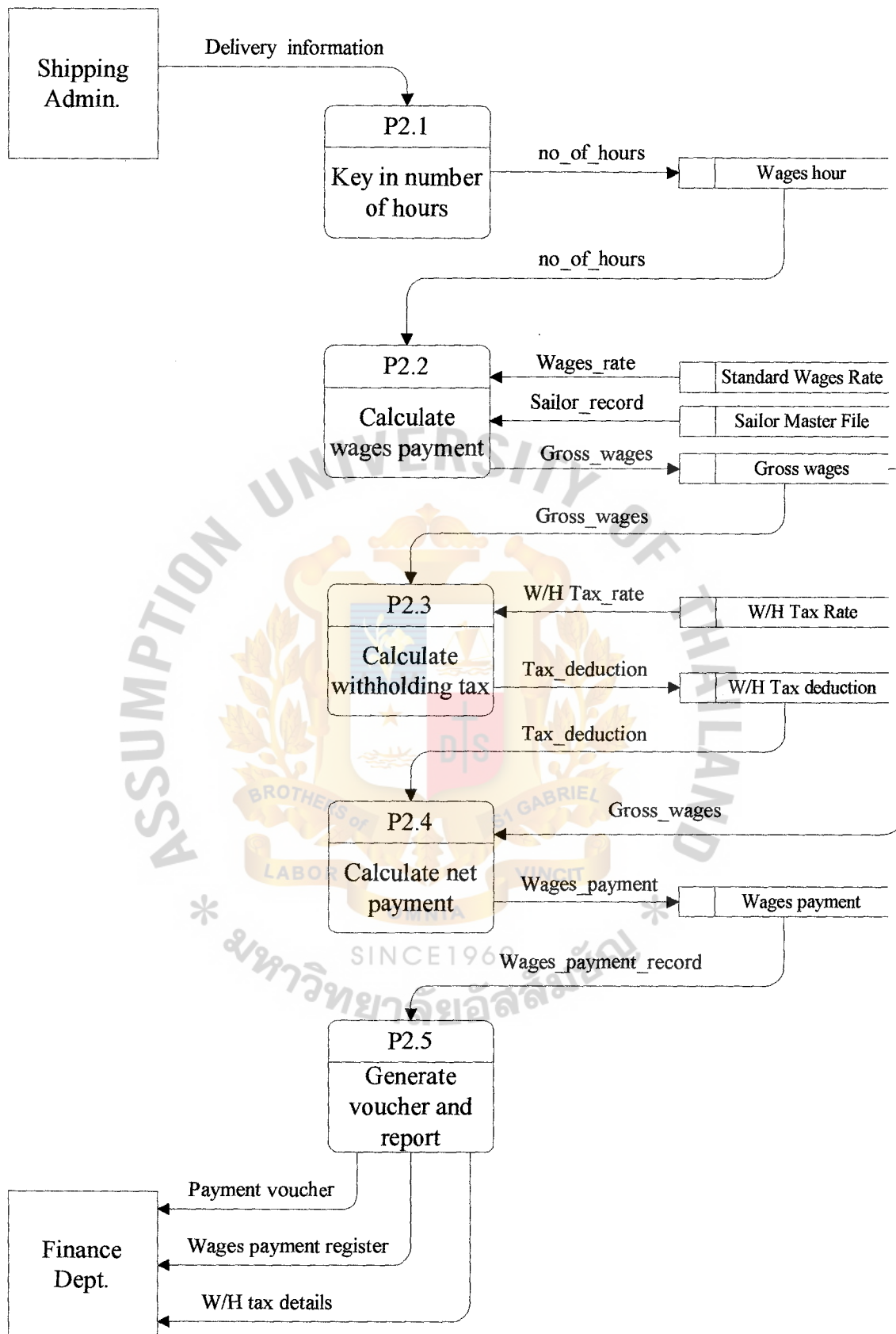


Figure 3.4. Level 1 Data Flow Diagram of Process 2 Calculate Wages Payment.



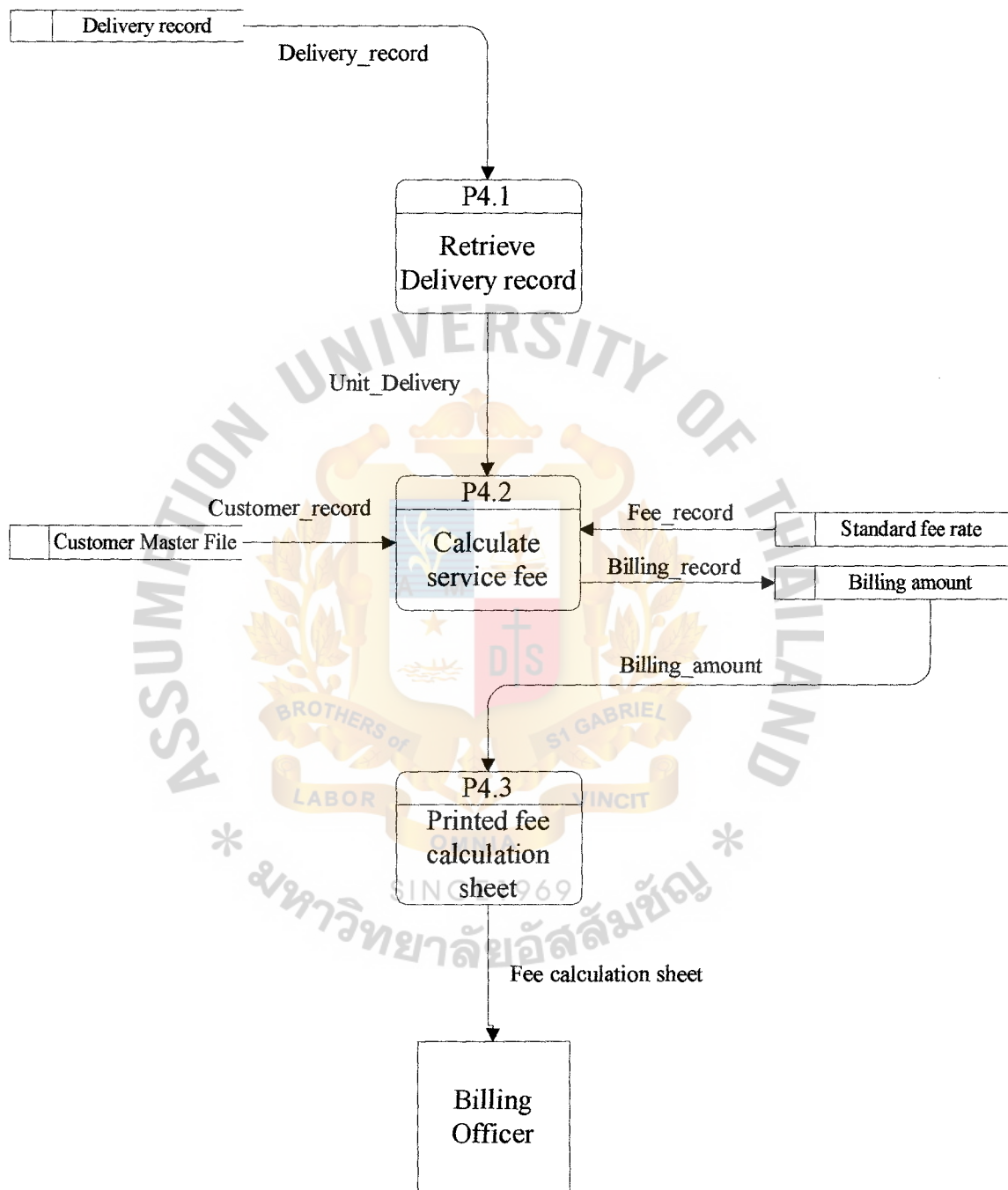


Figure 3.5. Level 1 Data Flow Diagram of Process 4 Calculate Service Fee.

### 3.3 Hardware and Software Requirement

The proposed new system is a computer-based system. So there is the need to purchase and develop new hardware and software. Set out below are the hardware and software specification required for the new system.

#### 3.3.1 Hardware Requirements

- (a) 1 set of database server
- (b) 3 sets of personal computer (clients)
- (c) 2 sets of printers
- (d) 1 set of UPS

The detail specification of each type of hardware is defined as follows:

(a) Database Server

CPU Intel Pentium III 500  
SD RAM 128 MB Bus 133 MHz  
Hard Disk 20 GB  
Cache memory 512 MB  
CD ROM 50 X max  
Disk Drive 1.44 MB  
Monitor 15" Super VGA Color-digital  
Keyboard 104 Keys support Window 98  
Mouse  
Medium Tower Case

(b) Personal Computer (clients)

CPU Intel Pentium II 300  
SD RAM 64 MB Bus 100 MHz  
Hard disk 8 GB

CD ROM 40 X

Cache memory 64 MB

Disk Drive 1.44 MB

Monitor 14" Super VGA

Keyboard 104 Keys support Window 98

Mouse

Medium Tower Case

(c) Printer

Dot matrix printer (EPSON LQ 1170 ESC/P 2)

(d) UPS

UPS (Uninterrupted Power Supply) 1 KVA for server

### 3.3.2 Software Requirements

The software requirements for the server and client machines are identified as follows:

Operating system

Microsoft Windows 98 (Thai Edition)

Application software

Microsoft Visual Studio 98

Microsoft Office 2000 Professional Edition (comprises the Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Access, Microsoft Photo Editor, and other accessory programs)

Table 3.1. The Hardware Specification for Each Server Machine.

Hardware	Specification
CPU	Intel Pentium III 500
Cache	512 MB
Memory	128 MB
Hard Disk	10 GB
CD-Rom Drive	40X
Floppy Drive	1.44 MB
Display	15" Super VGA
Printer	Color Ink Jet (EPSON STYLUS COLOR 660)
UPS	1 KVA

Table 3.2. The Software Specification for Each Server Machine.

Software	Specification
Operating System	Microsoft Windows 98 (Thai Edition)
Application Software	1) Microsoft Visual Studio 98
	2) Microsoft Office 2000 Professional Edition

Table 3.3. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	Intel Pentium III 300
Cache	64 KB
Memory	32 MB
Hard Disk	4.2 GB
CD-Rom Drive	40X
Floppy Drive	1.44 MB
Display	15" Super VGA
Printer	Color Ink Jet (EPSON STYLUS COLOR 660)
UPS	1 KVA

Table 3.4. The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 98 (Thai Edition)
Application Software	1) Microsoft Visual Studio 98
	2) Microsoft Office 2000 Professional Edition



### 3.4 Security and Control

There are four types of processing controls: source-document controls, input transmission controls, output controls, and computer program controls. The new proposed system is designed to have all of these controls within the system. The details of each control are listed below:

#### 3.4.1 Source-Document Controls

The source-document control procedures are designed to verify that all data have been entered into processing and that the source documents can be recovered should the content of data transmission have some errors.

Each source-document e.g. the delivery sheet, payment voucher, certificate of withholding tax deducted at source has its own format and color. So the users can easily identify the form to be used by its color. The risk of misunderstanding or mix-ups is low in this case.

Each form provides space at the bottom of the form for the authorization signature of the manager. The staff has to observe the approval signature before inputting the information into the system. This will prevent unauthorized documents from being processed into the system. Moreover, the form also provides space for the staff to sign after processing that form. This signature is the evidence that the form is already processed and it can protect the duplicate processing.

Each source-document has its own sequential number on the top right of the form. So after the processing the staff have to file all of the forms in separate file running by the sequential number. Performing this, the staff can ensure the completeness of the documents being processed into the system and can detect the missed documents on a timely manner. All of the forms are kept at the company's warehouse for at least 5 years as required by the Revenue Department.

### 3.4.2 Input-Transmission Controls

Input-transmission controls are designed to verify that the computer receives data keyed to processing. The input-transmission controls designed in the proposed new system can be summarized as follows:

(a) Flashback (echo) checks

The staff has to enter a customer number or the sailor's ID code into the input screen and then the computer will respond by returning the customer's name or the sailor's name. This control is designed to help staff check the accuracy of the input information.

At the same time, using the customer number or the sailor's ID code is quite short and can reduce the time to key in all the information by the staff him/herself. In addition, this control can also reduce the number of human errors from the typing process.

(b) File-balance controls

There is the transmission of the billing information from the shipping administrative module to the fee calculation module in order to issue the invoice to customers.

The system has to check the total number of record being sent from the shipping administrative module and compare with the number of record received by the fee calculation module. If there is a difference, the system will prompt warning statement to the users so that the data can be re-transmitted again.

(c) Journaling

This control is designed to permit the recovery of data should the data transmission be faulty. As stated in the file-balance control, there is the

transmission of information between the sub-system. So every time there is the transmission of data, that file will be kept in the spool file for a period of time. Until it receives the signal that the data is transmitted completely without any error, then that temporary spool file will be deleted.

### 3.4.3 Output Controls

Output controls are designed to verify that all data have been sent from processing and unauthorized personnel cannot obtain output materials. The new system controls the output from the system by printing out the register. This control is considered to be the most traditional type of output control.

The system can provide many reports and register. The wages and overtime payment report is to be printed out and reviewed by the chief accountant before approving the payment voucher. In this report, it shows the total number of transactions and the total amount to be paid. The chief accountant can cross check the total number of cheque issued to the sailors with the total number of transactions to ensure the completeness of the transactions.

The system also provides the withholding tax deducted at source report to be checked by the chief accountant before submitting the cheque to the Revenue Department.

In order to have the restricted access to the system, the new system has the security control to block the intruders from gaining access to sensitive materials. Each staff has specific user name and password. The system requires multiple passwords to gain access to particular work area. The password has to be changed every 3 months.

The user is given three chances to enter a correct user name and password. After three incorrect tries, the computer is locked and forbids any future attempts. Once locked, the manager of each department is the one that can unlock the computer.

#### 3.4.4 Computer Program Controls

The computer program controls are designed to validate the accuracy of the programmed procedures. The proposed new system has various data validation procedures as follows:

(a) Field-tests

This control is designed to test the accuracy of input information. For example the field to input customer code and sailor ID code accepts only numeric data. If the staff key in alphabetic data, the program will alert the warning statement to tell the user that input data is wrong.

(b) Range tests

This is to test whether a value assigned to a variable falls within an acceptable range. The number of overtime hours should not be over the maximum range. If there is an error, then the message telling that the number of hours exceeds the maximum range will be pop up.

(c) Combination tests

This control is to combine the values of several fields to determine whether their combined value is valid. The number of overtime hours has to be compared with the number of regular hours. The warning message will be shown in the case that the overtime hours are over the regular hours.

### 3.5 Cost and Benefit Analysis

The analysis of the cost of the existing system is shown in Table 3.5. The analysis of the cost of the new proposed system is shown in Table 3.6. The comparison of the cost and the benefit of the new proposed system to the existing system is also prepared and presented in Table 3.9 and Table 3.10.

The cost of the new system comprises the cost of hardware, software, maintenance, system development, and system implementation. The benefit from the implementation of the new system mainly comes from the decrease in staff cost. There is no need to hire temporary staff to collect the information during the busy season and no need to hire typing clerks to prepare the invoices and other documents manually.

#### 3.5.1 Benefits from the Proposed System

The company will have both financial and non-financial benefits from the new proposed system. The benefits derived from the new system can be classified into cost-saving benefits, cost-avoidance benefits and improved-service-level benefits.

##### (a) Cost-saving benefits

The company will save some administrative and operating expenses from the use of the new system. From the analysis in Table 3.9, the company can save the staff cost totaling 1,723,997 Baht within 5 years. The net present value of the total benefits over the whole life of the project is about 1,347,490 Baht.

However, the company has to pay for the system development cost for the lump sum of 613,000 Baht during the first year of the project. It also has to pay for the operating and maintenance cost of about 652,646 Baht through the life of the project. The net present value of cumulative costs over the lifetime is 1,103,380 Baht.



Finally, the cost and benefit analysis of the new project gives the following results:

- (1) The payback period is 3 Years and 5 months.

The payback period is derived from the Table 3.10. At the end of 4<sup>th</sup> year the cumulative time-adjusted of net benefit has the positive value.

Therefore, the payback period is between 3 and 4 years. The formula to get exact payback period is as follow:

$$3 \text{ Years} + 79,290 / (79,290 + 94,159) * 12$$

Therefore, Payback period = 3 years and 5 months.

- (2) The break-even point is 1 Year and 11 months.
- (3) Return on investment is about 22 % (given the discount rate of 10%).
- (4) Net present value of the net benefits of the project is 244,111 Baht.

- (b) Cost-avoidance benefits

The company can eliminate the future administrative and operational expenses. The new computerized system can support the increase in business transactions and the expansion of the business. So the company can expand its business and perform all of the workflow using the same level of staff. However, this benefit is not included in the analysis table because it is difficult to estimate the amount of future cost avoidance.

- (c) Improved-service-level benefits

During the problem identification stage, various problems occurred from the existing systems such as errors in invoice sent to customers, delay in sending invoice, delay in payment of wages to sailors, etc. These problems cause reduction in the level of customer's satisfaction and also the level of employees' satisfaction.

With this new system, the company can prepare the invoice accurately and on a timely manner. The sailors will get their wages quicker than before. The information or report produced from the system is more accurate and consistent with other information generated from the same system. So the new system improves the service level of the company to both its customers and its employees.

This financial figure is hardly derived from the level of satisfaction because this type of benefit is in the form of intangible rather than tangible. It is difficult to estimate the amount of intangible benefits, so the cost and benefit analysis is not included this type of benefits in the calculation table.

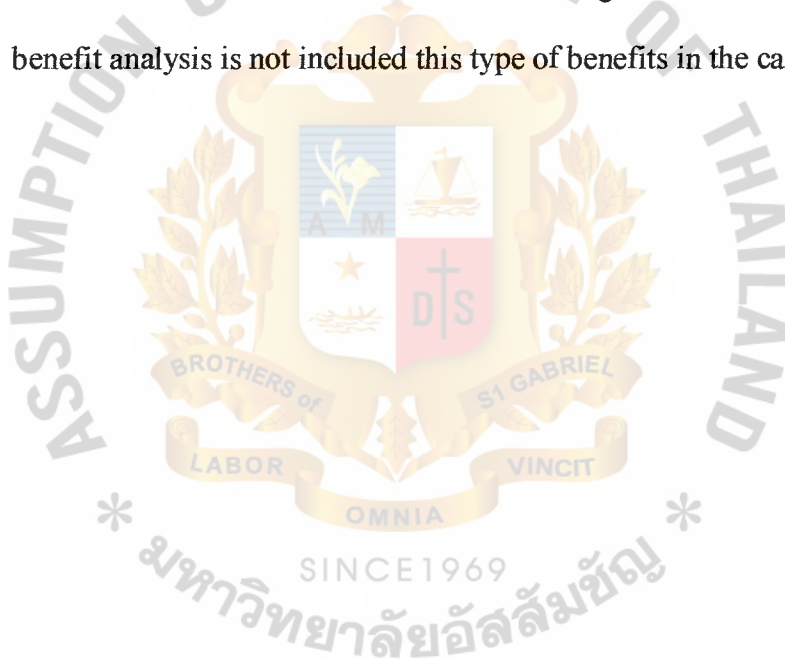


Table 3.5. Existing System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
<u>Office Equipment Cost:</u>					
Electric typewriter	17,000	-	-	18,700	-
Calculator	7,500	-	-	8,250	-
Total Office Equipment Cost	24,500	-	-	26,950	-
<u>Operating Expenses:</u>					
<u>Staff Cost:</u>					
Finance Manager	420,000	441,000	463,050	486,203	510,513
Cashier	264,000	277,200	291,060	305,613	320,894
Shipping Admin. Manager	360,000	378,000	396,900	416,745	437,582
Shipping Admin. Officer	276,000	289,800	304,290	319,505	335,480
Billing officer	432,000	453,600	476,280	500,094	525,099
Typing clerks	192,000	201,600	211,680	222,264	233,377
Temporary staff	120,000	126,000	132,300	138,915	145,861
Total Staff Cost	2,064,000	2,167,200	2,275,560	2,389,338	2,508,805
<u>Office Supplies &amp; Utility Expenses:</u>					
Stationery	6,000	6,300	6,615	6,946	7,293
Printing materials	30,000	31,500	33,075	34,729	36,465
Miscellaneous expenses	10,000	10,500	11,025	11,576	12,155
Utility expenses	36,000	37,800	39,690	41,675	43,758
Total Office Supplies & Utility Expenses	82,000	86,100	90,405	94,925	99,672
Total Operating Expenses	2,146,000	2,253,300	2,365,965	2,484,263	2,608,476
Total Existing System Cost	2,170,500	2,253,300	2,365,965	2,511,213	2,608,476

Table 3.6. Computerized System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
<u>Office Equipment Cost:</u>					
Hardware Cost:					
1 set of Computer Server	50,000	2,500	2,625	2,756	2,894
3 sets of Client Computers	120,000	6,000	6,300	6,615	6,946
2 sets of Printers	50,000	2,500	2,625	2,756	2,894
Other Hardware Cost	100,000	5,000	5,250	5,513	5,788
Total Hardware Cost	320,000	16,000	16,800	17,640	18,522
Maintenance Cost:					
Maintenance Cost	-	14,000	14,700	15,435	16,207
Total Maintenance Cost	-	14,000	14,700	15,435	16,207
Software License Cost:					
Software License Cost	100,000	5,000	5,000	5,000	5,000
Total Software Cost	100,000	5,000	5,000	5,000	5,000
System Development Cost:					
System Development Cost	120,000	-	-	-	-
Total System Development Cost	120,000	-	-	-	-
System Implementation Cost:					
Training Cost	30,000	5,000	5,250	5,513	5,788
Set up Cost	40,000	-	-	-	-
Total Implementation Cost	70,000	5,000	5,250	5,513	5,788
Other Office Equipment Cost:					
Calculator 2 units @ 1,500	3,000	-	-	3,000	-
Total Other Office Equipment Cost	3,000	-	-	3,000	-
Total Office Equipment Cost	613,000	40,000	41,750	46,588	45,517

Table 3.6. Computerized System Cost Analysis, Baht (Continued).

Cost Items	Years				
	1	2	3	4	5
<u>Operating Expenses:</u>					
<u>Staff Cost:</u>					
Finance Manager	420,000	441,000	463,050	486,203	510,513
Cashier	264,000	277,200	291,060	305,613	320,894
Shipping Admin. Manager	360,000	378,000	396,900	416,745	437,582
Shipping Admin. Officer	276,000	289,800	304,290	319,505	335,480
Billing officer	432,000	453,600	476,280	500,094	525,099
Total Staff Cost	1,752,000	1,839,600	1,931,580	2,028,159	2,129,567
<u>Office Supplies &amp; Utility Expenses:</u>					
Stationery	5,000	5,250	5,513	5,788	6,078
Printing materials	15,000	15,750	16,538	17,364	18,233
Miscellaneous expenses	10,000	10,500	11,025	11,576	12,155
Utility expenses	48,000	50,400	52,920	55,566	58,344
Total Office Supplies & Utility Expenses	78,000	81,900	85,995	90,295	94,809
Total Operating Expenses	1,830,000	1,921,500	2,017,575	2,118,454	2,224,376
Total Computerized System Cost	2,443,000	1,961,500	2,059,325	2,165,041	2,269,893



Table 3.7. Five Years Accumulated Existing System Cost, Baht.

Year	Total Manual Cost	Accumulated Cost
1	2,170,500	2,170,500
2	2,253,300	4,423,800
3	2,365,965	6,789,765
4	2,511,213	9,300,978
5	2,608,476	11,909,455
Total	11,909,455	-

Table 3.8. Five Years Accumulated New Proposed System Cost, Baht.

Year	Total Computerized Cost	Accumulated Cost
1	2,443,000	2,443,000
2	1,961,500	4,404,500
3	2,059,325	6,463,825
4	2,165,041	8,628,866
5	2,269,893	10,898,760
Total	10,898,760	-

Table 3.9. Cost and Benefit Analysis, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Benefits						
Staff Cost Saving		312,000	327,600	343,980	361,179	379,238
Other Operating Cost Saving		25,500	4,200	4,410	28,581	4,862
Total Benefits from New System	-	337,500	331,800	348,390	389,760	384,100
Discount factors for 10%:	-	0.91	0.83	0.75	0.68	0.62
Time-adjusted benefits (NPV)	-	306,818	274,215	261,751	266,211	238,496
Cumulative time-adjusted benefits over lifetime	-	306,818	581,033	842,784	1,108,995	1,347,490
Costs						
System Development cost	-613,000					
Operation & maintenance cost (5% increase annually)	0	-118,000	-123,650	-132,583	-135,812	-142,602
Discount factors for 10%:	1	1	1	1	1	1
Time-adjusted costs (NPV)	-613,000	-107,273	-102,190	-99,611	-92,761	-88,545
Cumulative time-adjusted costs over lifetime	-613,000	-720,273	-822,463	-922,074	-1,014,835	-1,103,380
Cumulative time-adjusted net amount	-613,000	-413,455	-241,430	-79,290	94,159	244,111
Return on Investment						244,111

Return on Investment: 22 %

Pay back period : 3 Years and 5 Months

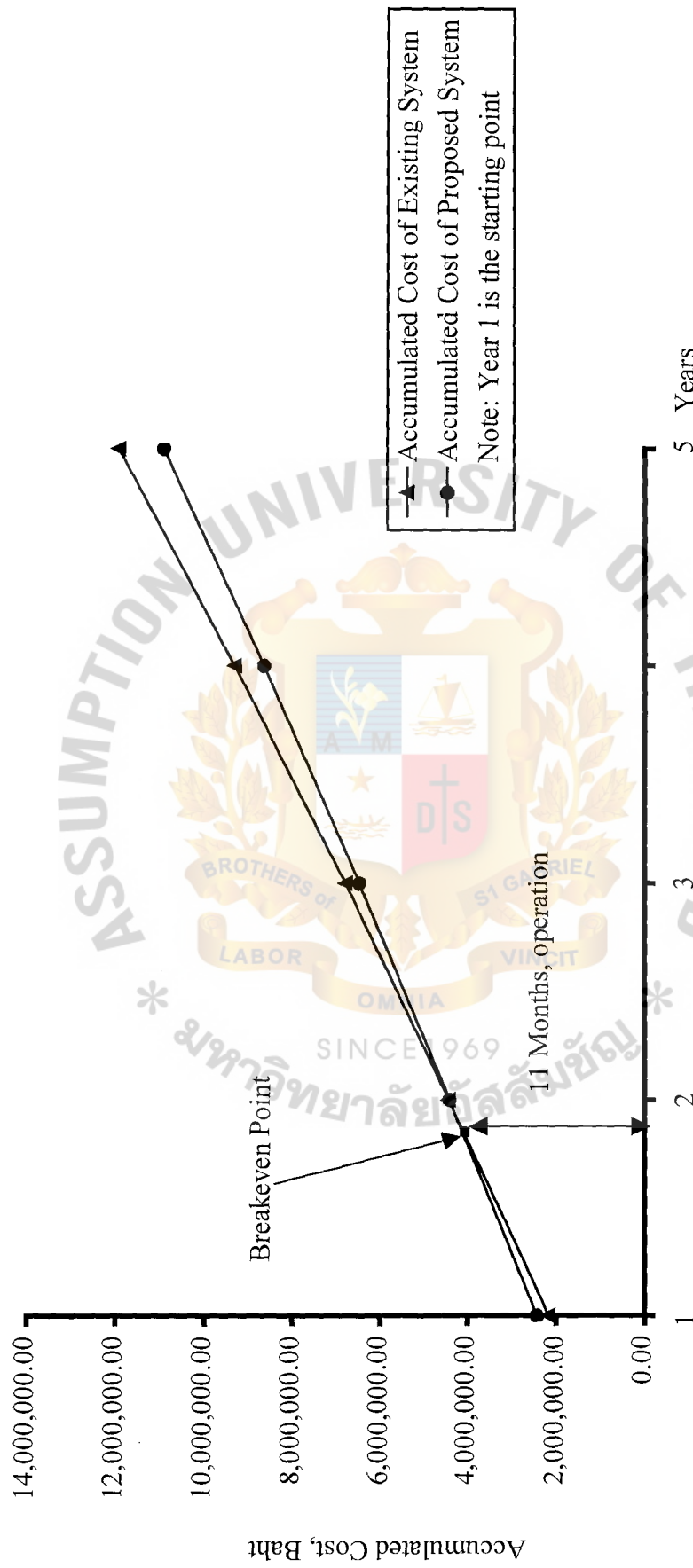


Figure 3.6. Cost Comparison between the Existing System and the Proposed System.

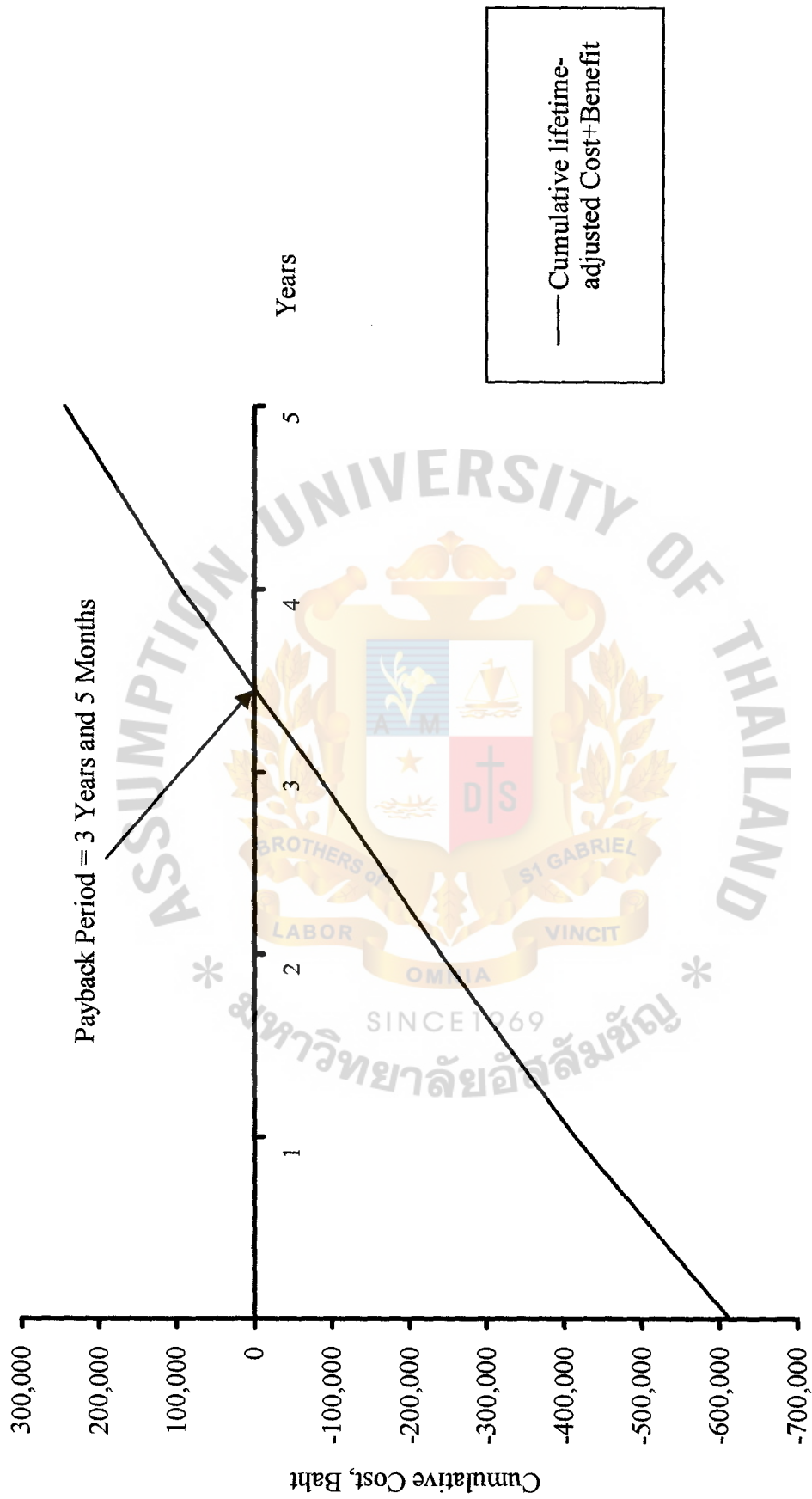


Figure 3.7. Payback Period of the Proposed System.

### 3.6 Budget for the Proposed System

The budget for this new computerized system is about 610,000 Baht. The budget is classified into 4 main categories, which comprise cost of hardware, software, system development and system implementation. Although it involves quite high investment in the initial stage, it is a one-time cost. For the following year, the company may have to only pay for little maintenance cost. Please see the details of the computerized system in Table 3.7.

The major cost of this project is the hardware cost because the company has to invest for the new computer equipment amounting to 320,000 Baht. The hardware specification is identified in section 3.2 already mentioned above. The new system requires 1 server, 2 client personal computers, 2 printers, and 1 UPS.

Moreover, the company has to spend on the software license and on the system development cost at about 220,000 Baht. The software license cost is for the general application software such as Microsoft office software. The system development cost is for the system analyst and programmer to design and write the computer program for the new system.

Finally, the company has to pay another 70,000 Baht for the implementation cost. This cost includes the set up cost for the new computerized system and the training course to be provided to the company's staff.



Table 3.10. Budget Cost for the Computerized System, Baht.

Cost Items	Amount
Hardware Cost:	
1 set of Computer Server	50,000
3 sets of Client Computers	120,000
2 sets of Printers	50,000
Other Hardware Cost	100,000
Total Hardware Cost	320,000
Software License Cost	100,000
System Development Cost	120,000
System Implementation Cost:	
Training Cost	30,000
Set up Cost	40,000
Total Budget Cost for the Computerized System	610,000

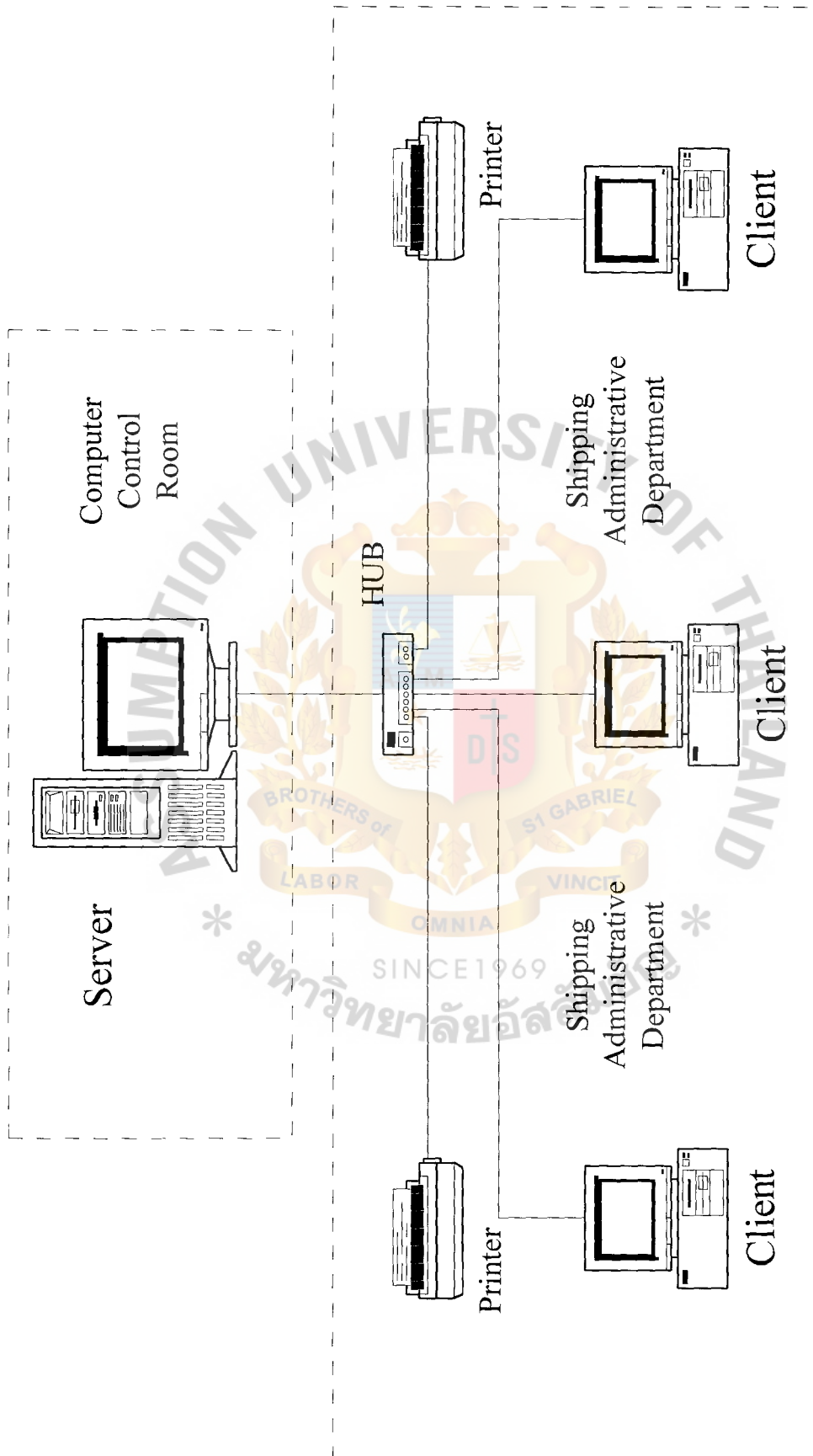


Figure 3.8. Configuration of the Proposed System.

## **IV. PROJECT IMPLEMENTATION**

### **4.1 Overview of Project Implementation**

System implementation is the plan to convert the manual system to computerized system. The plan for the implementation of new computerized system comprises coding, testing, hardware and software installation and system conversion.

It takes quite long period of time to complete the coding process. Then the system testing has to be performed to ensure the correctness and investigate for any errors or wrong function of the system. During the system testing process, the program may be modified to remove all of the errors.

After system testing and modification of the program, the system analyst will install the hardware and software program. Before conversion to computerized system, the users have to attend the training course in order to be familiar with the new system. The new computerized system has to be parallel run with manual system for a period of time before fully conversion to new system.

### **4.2 Source Code**

This project uses software, Microsoft Access 97, as the application for the database and user interface design. The database and user interface designs are preformed simultaneously. The manual and user guides are provided to the users after the system is ready to be used.

### 4.3 Test Plan

Before conversion to the new system, the system testing has to be performed for at least 1 month. This is to test the logic of the system and to ensure that the output of the system is accurate and coincide with the users' needs. From the testing, the users can identify the errors or any wrong function of the system. Then the system analyst can modify and remove all of the errors from the system.

During the testing phase, the users have to perform the computerized system parallel with the manual work so that they can compare the result of the 2 systems and can check for any errors that may occur from the new system.

The system testing is to be performed by the shipping administrative officer and billing staff, who are directly responsible for the work process, and the manager in charge of each process. The test data has to be carefully prepared in order to cover all conditions and alternatives provided in the system. The number of unit testing data has to be identified appropriately before the testing.

The time to start testing the program is after the completion of system installation. After the testing, the testing team has to give the response to the system analyst. The system failures are to be documented along with the success. Any errors or requirements for modification of the program also have to be carefully documented.

Then it will take a couple of days to correct the errors. Once again any modification made to the program has to be recorded by the programmer in order to provide the audit trails for future modification. After the final testing, the result of the system has to be carefully checked and compared with the manual work to ensure system correctness and avoid any system resistance by the users.

## 4.4 Conversion

System conversion consists of installing the system software and making it fully operational. There are 2 activities occurring simultaneously during the conversion: making new software operational, to replace the existing system, and helping users understand and operate the new software. There are 5 steps in making the transition from the old manual system to the new computerized system.

### 4.4.1 Install the New System

During this phase, the parallel method is recommended. It involves the concurrent operation of both the old and the new systems until the new system is judged to be effective. This method permits system results to be compared and corrective action to be taken if results show any deviation.

Although it is costly and may place some pressures on the company's staff by asking them to work two jobs at the same time, it has considerable advantages for the company to use this method. The greatest advantage of the parallel method is that it preserves the audit trail. The result of the new and the old systems can be compared to verify that the new system leads to correct results.

### 4.4.2 Create the New Database

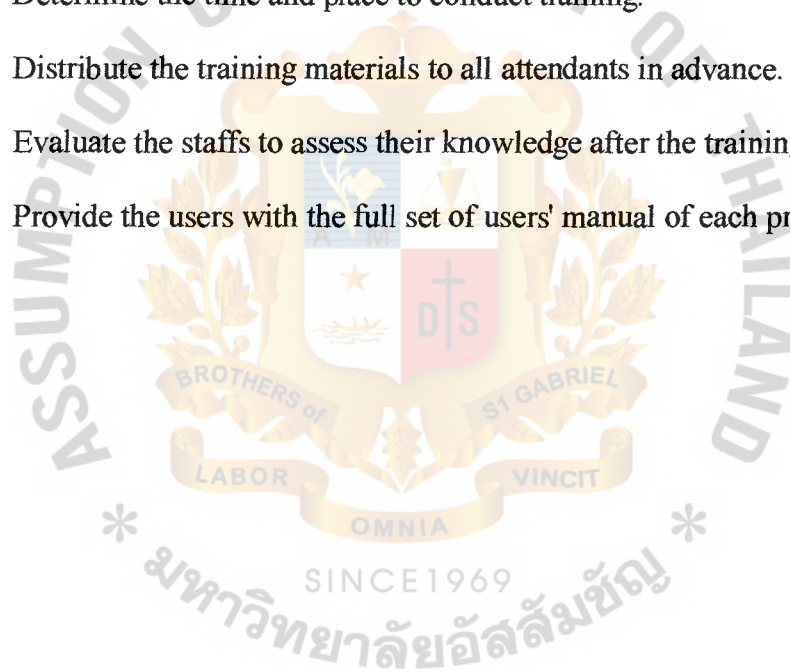
Since the existing system is performed manually, there is not any database in the computerized system. The shipping administrative officer and billing staff has to key in the data to many master databases after the new system is installed. This step can take considerable time because the information about the sailors and customers are extensive.



#### 4.4.3 Train Users

User training is one of the most important parts of conversion. This stage is to provide users with experience with the new system. The billing staff and shipping administrative officer are the ones who must attend the training courses. The steps in arranging the training session are as follows:

- (1) Identify the staffs who have to attend the training for each function.
- (2) Design the training media and the topics to be presented.
- (3) Select the most appropriate method to be used in training courses.
- (4) Determine the time and place to conduct training.
- (5) Distribute the training materials to all attendants in advance.
- (6) Evaluate the staffs to assess their knowledge after the training.
- (7) Provide the users with the full set of users' manual of each process.



## **V. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Conclusions**

After the system analysis and design, the computerized system is the best solution to solve the current existing problem of the company. Currently, the company faces many problems about the incorrectness and inconsistent data and timeliness of producing various report.

The company has to pay for the penalty for the late submission of the withholding tax. During the busy season, the company has to hire temporary staff to prepare various reports. The customers complain about the incorrect billing invoices. The staff has to work harder during the busy season in order to collect and consolidate the data from many sources to produce the reports. The company's management does not have the required report on time.

During the analysis phase, the author conducts the interview sessions with the company's management and staffs. Various users' requirements are derived from those interviews. The requirement analysis is performed together with the system analysis phase. The result of analysis shows that the major cause of the current problems is from the manual system. So the computerized system is recommended for this company.

The new system can reduce the redundancy of the work and can accelerate many processes. The conversion from the manual to the computerized system involves quite high initial investment. The company has to purchase new computer equipment and software. It has to pay for the system development and system conversion cost. To analyze the project feasibility, the cost and benefit analysis is performed during the analysis phase.

The cost and benefit analysis show return on investment for the new system of about 22%. The breakeven point is about 1 year and 11 months. The cumulative cost of the existing system was about 11,909,455 Baht comparing with the cumulative cost of new system of 10,898,760 Baht. So by implementing this project, the company will gain about 1,010,695 Baht or the net present value of 244,111 Baht.

The wages calculation and billing processes will take less time. The information produced from the system will be more accurate and consistent with the data produced from other process. The level of customers and employees' satisfaction will be improved. Please see the below table for the degree of achievement of the proposed system.

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

Process	Existing System	Proposed System
Billing Issue Process	4 hrs.	30 mins.
Wages Calculation Process	3 hrs.	20 mins.
W/H Tax Calculation Process	30 mins.	10 mins.
Wages Payment Process	3 hrs.	2 hrs.
Total Wages Process	10.5 hrs.	3 hrs.

(1) Billing Issue Process

In the Existing System, the Billing Issue Process is performed manually by the billing staff. The billing staff has to type all details using the typewriter. The Proposed System is computerized system, so it reduces the processing time of the invoices. The user has to input the required information in the system and the invoices are printed automatically.

(2) Wages Calculation Process and W/H Tax Calculation Process

The Existing System is the manual process. The shipping administrative staff has to collect all data and calculate the wages using the calculators. Furthermore, the withholding tax deduction at source has to be calculated for each sailor manually by using the calculators. The reports for the wages and W/H tax are also prepared manually. All of these processes are time-consuming and have many mistakes.

With the Proposed System, the information for the trips can be retrieved from the billing module. There is no need to gather all of information about the work performed by each sailor again. The system has integrated with the formula and can give the wages payment results quickly and correctly.

(3) Wages Payment Process

The payment process is done manually by the shipping administrative staffs. After calculating the wages amount and withholding tax, the finance staff has to prepare the payment vouchers and cheque to be paid to the sailors. The Proposed System is computerized and the payment vouchers can be printed automatically. So the new system will reduce the time in this process.

Table 5.1 shows the time used in each process comparing between the Existing System and the Proposed System. The new system uses less time in each process. After the consideration of advantages and disadvantages of the project the new proposed system is recommended to be used to increase the system efficiency of the company. Finally the new computerized system can support the change in the business activities and the expansion of the business in the future.

## 5.2 Recommendations

The new computerized system is expected to solve the current problems of the company. The new system should be implemented as soon as possible. However, in the future, the company will expand and the number of business transactions will be increased so the company will have to improve its system as follows:

- (1) The company has to develop its staff and provide training to them so that they will get familiar with the computer and can catch up with the changes in technology.
- (2) The company should keep the user manual of the new system in the safe place. Every time that there are system modifications or changes, the user manual should be updated at the appropriate level of details.
- (3) The number of sailors or the customers will be increasing, it is very important to consider whether the current database can support the changes in the volume of transactions.
- (4) The requirements of the staffs and the company's management will be increasing, so the user interface may have to be changed. The user interface of the new proposed system has to be in the same direction as that of the current system.
- (5) The requirements for various reports may be changed at all time. Therefore, the design of the reports should be flexible to support all of those needs.
- (6) At present, the e-business is considered to be very important for every industry. The company should have a good plan to catch up with the advanced technology in order to compete with others.
- (7) The security within the computer system is to be carefully designed to protect the important data from getting accessed by intruders.





**APPENDIX A**  
**USER INTERFACE**

Login Form : Form

Please enter your password login

User\_id

Password

Record: 14 of 1

Figure A.1. Login Form.

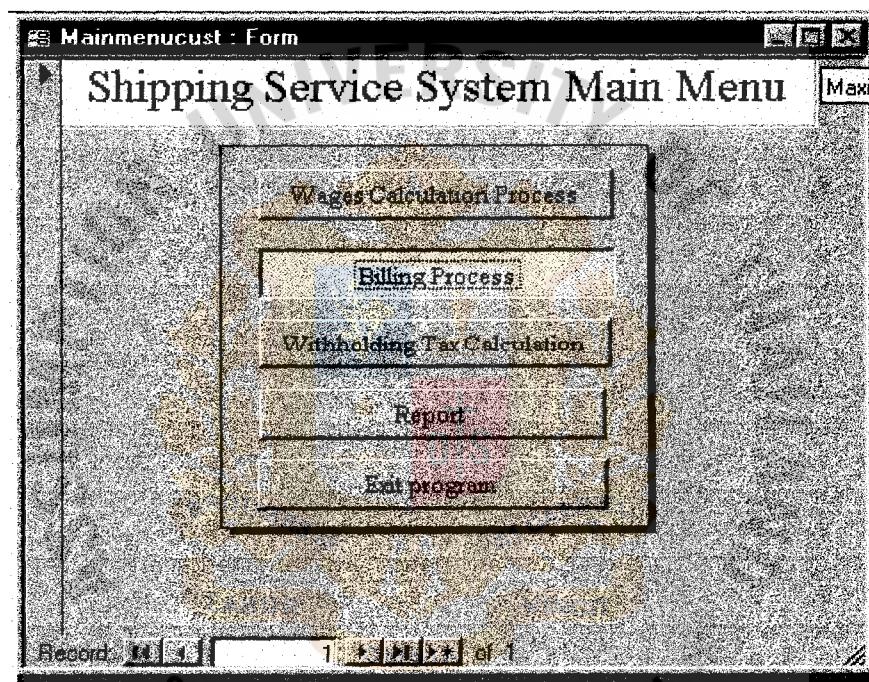


Figure A.2. Shipping Service System Main Menu.

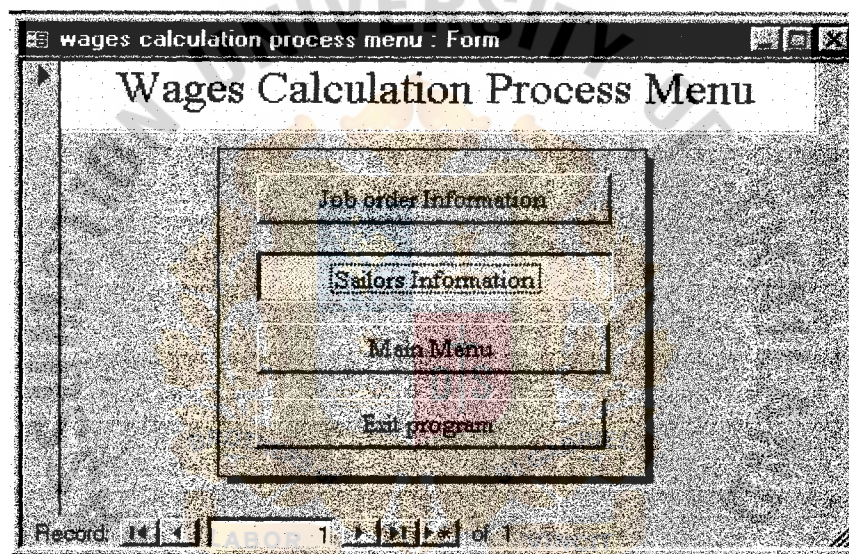


Figure A.3. Wages Calculation Process Menu.



joborder information menu : Form

## Job order Information Menu

Job order no:  Order Date:

Customer name:

Community:  Vessel name:

Warehouse:  Destination:

Unit:  tons order amount:

Record:  1 of 1

Figure A.4. Job Order Information Menu.



delivery details menu : Form

## Delivery Details Menu

Delivery no.  Date

Job order no  Ship by

Vessel name

Unit  tons Delivery amount

remaining amount  tons

FirstRecord

PreviousRecord

NextRecord

LastRecord

Add

Edit

Delete

Find

Cancel

Exit Main Menu

Update Remaining Amount

Record: 14 | 1 |  1 | 2 | 3 | 4 | 5 of 1

Figure A.5. Delivery Details Menu.

sailors information menu : Form

## Sailors Information Menu

Sailors code:  Start Date:

Name:  Telephone:

Address:

Sex: ☒ Male ☐ Female

Marital: ☒ Single ☐ Married ☐ Other

Provident fund:  baht Ship no:

First Record Previous Record Next Record Last Record

Add Edit Delete Find Cancel

Exit to Main Menu Update / delete data

Record 11 of 1

Figure A.6. Sailors Information Menu.



Billing process main menu : Form

## Billing Process Main Menu

Customer Information
Service Fee Calculation
Standard Fee rate
Main Menu
Exit

Record: 1 of 1

Figure A.7. Billing Process Main Menu.

Customer Information Menu : Form

## Customer Information Menu

Customer no:  Date:

Name:  Tax id:

Address:

Telephone no:  Fax no:

Contact person:

First Record

Previous Record

Next Record

Last Record

Add

Edit

Delete

Find

Cancel

Edit Main Menu

Service Fee Calculation

Record 1 of 1

Figure A.8. Customer Information Menu.



Service Fee Calculation Menu : Form

## Service Fee Calculation Menu

Customer no:  Date:

Job order no:  Delivery no:

Vessel name:

Delivery amount:  Baht Fee rate:

Billing amount:  Baht

Outstanding amount:  Baht

First Record Previous Record Next Record Last Record

Add Edit Delete Find Cancel

Exit Update Outstanding Amount Standard Fee Rate

Record:  1 of 1

Figure A.9. Service Fee Calculation Menu.

Standard Fee rate Menu : Form

## Standard Fee rate Menu

Customer no.

Commodity

Destination

Standard Fee Rate

Latest update on

First Record	Previous Record	Next Record	Last Record	
Add	Edit	Delete	Find	Cancel
Exit				

Record 14 of 1

Figure A.10. Standard Fee Rate Menu.



Withholding Tax Calculation Menu : Form

## Withholding Tax Calculation Menu

Sailor Code

Sailor Name

Gross wages

Tax rate

Withholding Tax

Net Payment

First Record Previous Record Next Record Last Record

Add Edit Delete Find Cancel

Exit

Record: 14 of 1

Figure A.11. Withholding Tax Calculation Menu.

Reporting Menu : Form

## Report Menu

Select Report (select one at a time)

Customer Detail
Sailor Information
Invoice Billing
Job order Detail
Delivery Detail
Wages Payment
Withholding Tax Deduction

Process Print Cancel Exit

Record: 1 of 1

Figure A.12. Reporting Menu.



**APPENDIX B**  
**REPORT DESIGN**



Table B.1. Report of Customer Detail.

Customer No.	Name	Address	Telephone	Fax.	Contact person
1	Aon Chemical Ltd.	123 South Sathorn Rd. Bangkok 10120	312-5467	312-5468	Somsak
2	Asia Cements Ltd.	2/2 Sukhumvit 21, Asoke Rd. Bangkok	245-5000	245-5050	Kanchana
3	Boonma Seeds Co., Ltd	373 Rajivithree Rd. Bangplad, Bangkok	750-2121	750-2120	Nattipan
4	Bangkok agroline Ltd.	4 Pomprab Bangkok 14021	900-4545	900-4550	Watchara
5	Chaiyaphan Co., Ltd.	131 Bangkokpi Bangkok 10140	840-8123	840-8999	Kanlaya
6	Commerce Feeds meal	12 Soi Ruamrudi, Wireless Rd, Bangkok	745-5555	271-5778	Duangjai
7	CSS Group	7/17 DinDang Bangkok	654-1234	654-0002	Junpen
8	D Square Co., Ltd.	39 Nana Bangkok 11110	470-8754	470-8755	Cherdpong
9	Evergreen Group	9/9 Ngamwongwan Nonthaburi 11000	654-3215	654-3216	Sompong
10	Electromac Group	10/10 RongMuang Bangkok 14054	784-6565	784-6570	Sirisuk
11	Fishing meals Ltd.	11/18 Suanluang Pravate Bangkok	654-7894	654-0021	Sinriri
12	Ganlong Co., Ltd	78/2 Pomprab Bangkok	478-5555	478-5558	Pinanong
13	Javeenon Co., Ltd	100/24 Ratvithi Bangkok	987-9879	987-9880	Sutharat
14	Quanto Co., Ltd	45/97 Silom Bangkok	455-7852	455-7853	Marisa
15	Quagrive Co., Ltd	12/120 Samutprakarn	741-5456	741-5457	Napa
16	Sereen Co., Ltd	31/45 Ladprao 115 Bangkok	456-7892	456-7893	Chanchai
17	Serage Group	209/5 Phahonyothin Bangkok	222-9988	222-9900	Rattapong
18	Tauson Co., Ltd	123/45 Pradipat Bangkok	784-7788	784-7799	Somchart
19	Tritepson Co., Ltd	253/1 Klongtey Bangkok	456-7892	456-7893	Kobkaew
20	Romruen Group	27/87 Pravate Bangkok	666-9894	666-9897	Boonsong
21	Valuable products Ltd.	34/34 Bangrak Bangkok	741-1234	741-1122	Linda
22	Wandi Group	123/1 Ngamwongwan Bangkok	423-4657	433-9999	Orapin

Table B.2. Report of Sailors Information.

Sailor Code.	Name	Address	Telephone	Ship No.	Start Date
1	Mr. Chai Nampen	32/1 Rajvithree Rd. Bangplad Bangkok	750-2111	UE 1	15/1/1982
2	Mr. Somchat Noijaiya	2110 Ramkanhaeng 5, Klongtan, Bangkok	303-0110	UE 2	31/1/1983
3	Mr. Chuan Rakdee	373 Ladprao Rd. Bangkok, Bangkok	303- 9987	UE 3	31/1/1983
4	Mr. Rakkitti Samranjai	99 Vorachak Bangkok 14021	233-8274	UE 4	2/2/1983
5	Mr. Somsak Boonmak	1/3 Bangkok Bangkok 10140	749-0544	UE 5	15/3/1985
6	Mr. Rong Sendee	12 Wireless Rd., Bangkok	211-0065	UE 6	31/3/1985
7	Mr. Surat Chairattana	88/2 Rajthavee, Bangkok	215-0098	UE 7	30/4/1987
8	Mr. Pramote Boonchuay	40 New Phetchaburi Rd. Bangkok 11110	216-9942	UE 8	31/5/1987
9	Mr. Nattipan Rungrueng	9/2 Ngamwongwan Nonthaburi 11000	959-9874	UE 9	1/3/1988
10	Mr. Rattapong Sirikul	3/88 RongMuang Bangkok 14054	478-9332	UE 10	1/3/1988
11	Mr. Prawit Vichayayon	134 Suanluang Pravate Bangkok	311-0645	UE 11	2/7/1989
12	Mr. Kajorn Liangwattana	203/1 Pomprab Bangkok	223-0117	UE 12	2/7/1989
13	Mr. Boonchai Rakkiat	300 Vorachak Bangkok	232-1187	UE 13	1/8/1992
14	Mr. Surin Pornprasert	546 Bangklo Bangkok	455-7852	UE 14	16/9/1992
15	Mr. Nat Siripornchai	12/4 Samrong Nue, Samutprakarn	652-0689	UE 15	16/9/1992
16	Mr. Chaiyanan Rungroj	90/2 Ladprao 10 Bangkok	713-8739	UE 16	2/3/1993
17	Mr. Preamsak Pongsurat	102 Phahonyothin, Suthisarn Bangkok	303-0911	UE 17	16/3/1993
18	Mr. Somchart Viparat	334 Satsiri Rd., Pradipat Bangkok	330-2298	UE 18	1/2/1994
19	Mr. Surachart Somwang	554 Rama IV Rd, Sapanlueng, Bangkok	213-8221	UE 19	16/9/1994
20	Mr. Prakorb Preechachan	89/33 Srinakarin Private Bangkok	779-8910	UE 20	30/9/1994
21	Mr. Yuttana Rakkandee	41/99 Charoenkrung Bangrak Bangkok	232-3098	UE 21	16/9/1995
22	Mr. Numchai Wattanachai	398 Laksi, Bangkaen, Bangkok	529-9844	UE 22	1/11/1995

Table B.3. Report of Invoice Billing.

Invoice No.	Job Order No.	Date	Name	Vessel name	Unit	Delivery amount	Unit price	Invoice Amount
30053	0980	03/07/2000	Chaiyaphan Co., Ltd.	UKNOF	Tons	9,500	145.00	1,377,500
30054	0981	03/07/2000	Ganlong Co., Ltd	-	Sacks	12,000	20.00	240,000
30055	0975	05/07/2000	Quagrive Co., Ltd	QUAKE	Tons	8,000	145.00	1,160,000
30056	0976	05/07/2000	Javeenon Co., Ltd	SALVAS	Tons	9,000	145.00	1,305,000
30057	0988	06/07/2000	Chaiyaphan Co., Ltd.	GULSEA	Tons	12,000	145.00	1,740,000
30058	0999	07/07/2000	Commerce Feeds meal	EQUALA	Sacks	10,000	30.00	300,000
30059	0960	13/07/2000	Tauson Co., Ltd	ASPASIA	Tons	8,000	145.00	1,160,000
30060	0971	13/07/2000	D Square Co., Ltd.	-	Tons	18,000	120.00	2,160,000
30061	0982	18/07/2000	Tritepson Co., Ltd	-	Sacks	9,500	20.00	190,000
30062	0989	20/07/2000	Aon Chemical Ltd.	SASOON	Drums	20,000	25.00	500,000
30063	0995	21/07/2000	Valuable products Ltd.	ASPASIA	Tons	12,000	55.00	660,000
30064	0996	24/07/2000	Sreen Co., Ltd	EAQLA	Tons	12,000	145.00	1,740,000
30065	0997	24/07/2000	Serage Group	S.V.A.	Tons	11,000	145.00	1,595,000
30066	0977	27/07/2000	Wandi Group	KULNOR	Tons	5,000	145.00	725,000
30067	0985	27/07/2000	Quanto Co., Ltd	S.V.A.	Tons	5,000	145.00	725,000
Total invoice billing								15,577,500



Table B.4. Report of Job Order Detail.

Job Order No.	Date	Name	Commodity	Warehouse	Destination	Vessel name	Unit	Total amount
1000	01/07/2000	Valuable products Ltd.	Grains	Nakornluang	Koh Sri Chang	UKNOF	Tons	22,000
1001	01/07/2000	Ganlong Co., Ltd	Powder	Ayudhaya	Bangkok Silo	-	Sacks	30,000
1002	01/07/2000	Boonma Seeds Co., Ltd	Grains	Nakornluang	Koh Sri Chang	LAPIS	Tons	12,000
1003	04/07/2000	Javeenon Co., Ltd	Cement	Asia cement	Koh Sri Chang	ASPASIA	Tons	45,000
1004	04/07/2000	Chaiyaphan Co., Ltd.	Powder	Rumchai	Koh Sri Chang	GULSEA	Tons	25,000
1005	05/07/2000	Commerce Feeds meal	Grains	Nakornluang	Koh Sri Chang	EQUALA	Sacks	15,000
1006	05/07/2000	Tauson Co., Ltd	Cement	Asia cement	Koh Sri Chang	ASPASIA	Tons	80,000
1007	05/07/2000	D Square Co., Ltd.	Grains	Nakornluang	Bangkok Silo	-	Tons	25,000
1008	07/07/2000	Evergreen Group	Powder	Nakornluang	Bangkok Silo	-	Sacks	15,000
1009	10/07/2000	Aon Chemical Ltd.	Chemical	Saithip	Koh Sri Chang	SASOON	Drums	20,000
1010	10/07/2000	Romruen Group	Cement	Asia cement	Koh Sri Chang	ASPASIA	Tons	12,000
1011	10/07/2000	Fishing meal Ltd.	Grains	Nakorn luang	Bangkok Silo	-	Tons	8,000

Table B.5. Report of Delivery Details.

Job Order No.	Date	Delivery No.	Ship by	Commodity	Warehouse	Destination	Vessel name	Unit	Delivery amount	Remaining amount
1000	03/07/2000	-	-	Grains	Nakornluang	Koh Sri Chang	UKNOF	Tons		22,000
		1000/1	UE 3						5,000	15,000
		1000/2	UE 4						5,000	10,000
		1000/3	UE 5						5,000	5,000
1001	05/07/2000	-	-	Powder	Ayudhaya	Bangkok	-	Sacks		30,000
		1001/1	UE 35						15,000	15,000
		1002/2	UE 36						15,000	-
1002	05/07/2000	-	-	Grains	Nakornluang	Koh Sri Chang	LAPIS	Tons		12,000
		1002/1	UE 21						4,000	8,000
		1002/2	UE 22						4,000	4,000
		1002/3	UE 23						4,000	-
1003	04/07/2000	-	-	Cement	Asia cement	Koh Sri Chang	ASPASIA	Tons		45,000
		1003/1	UE 11						9,000	36,000
		1003/2	UE 12						9,000	27,000
		1003/3	UE 13						9,000	18,000
		1003/4	UE 14						9,000	9,000
		1003/5	UE 15						9,000	-

Table B.6. Report of Wages Payment.

Date	Sailor Code	Name	Regular wages	Overtime	Gross wages	W/H tax deduction	Net wages payment
14/7/2000	1	Mr. Chai Nampen	4,500.00	450.00	4,950.00	148.50	4,801.50
14/7/2000	2	Mr. Somchat Noijaiya	5,300.00	350.00	5,650.00	169.50	5,480.50
14/7/2000	3	Mr. Chuan Rakdee	4,800.00	600.00	5,400.00	162.00	5,238.00
14/7/2000	4	Mr. Rakkitti Samranjai	4,300.00	850.00	5,150.00	154.50	4,995.50
14/7/2000	5	Mr. Somsak Boonmak	4,250.00	450.00	4,700.00	141.00	4,559.00
14/7/2000	6	Mr. Rong Sendee	5,200.00	350.00	5,550.00	166.50	5,383.50
14/7/2000	7	Mr. Surat Chairattana	3,950.00	500.00	4,450.00	133.50	4,316.50
14/7/2000	8	Mr. Pramote Boonhuay	4,400.00	330.00	4,730.00	141.90	4,588.10
14/7/2000	9	Mr. Nattipan Rungrueng	4,850.00	250.00	5,100.00	153.00	4,947.00
14/7/2000	10	Mr. Rattapong Sirikul	3,800.00	600.00	4,400.00	132.00	4,268.00
14/7/2000	11	Mr. Prawit Vichayayon	4,900.00	750.00	5,650.00	169.50	5,480.50
14/7/2000	12	Mr. Kajorn Liangwattana	5,200.00	450.00	5,650.00	169.50	5,480.50
14/7/2000	13	Mr. Boonchai Rakkiat	4,300.00	900.00	5,200.00	156.00	5,044.00
14/7/2000	14	Mr. Surin Pornprasert	4,450.00	420.00	4,870.00	146.10	4,723.90
14/7/2000	15	Mr. Nat Siripornchai	3,800.00	380.00	4,180.00	125.40	4,054.60
14/7/2000	16	Mr. Chaiyanan Rungroj	4,200.00	560.00	4,760.00	142.80	4,617.20
14/7/2000	17	Mr. Preamsak Pongsurat	4,300.00	740.00	5,040.00	151.20	4,888.80
14/7/2000	18	Mr. Somchart Viparat	4,500.00	380.00	4,880.00	146.40	4,733.60
14/7/2000	19	Mr. Surachart Somwang	4,950.00	330.00	5,280.00	158.40	5,121.60
14/7/2000	20	Mr. Prakorb Preechachan	5,100.00	450.00	5,550.00	166.50	5,383.50
14/7/2000	21	Mr. Yuttana Rakkandee	3,950.00	880.00	4,830.00	144.90	4,685.10
			95,000.00	10,970.00	105,970.00	3,179.10	102,790.90

Table B.7. Report of Withholding Tax Deduction.

Date	Sailor Code	Name	Address	Gross wages	W/H Tax rate	Tax Deduction
14/7/2000	1	Mr. Chai Nampen	32/1 Rajvithee Rd. Bangplad Bangkok	4,950.00	3%	148.50
14/7/2000	2	Mr. Somchat Noijaiya	2110 Ramkanhaeng 5, Klongtan, Bangkok	5,650.00	3%	169.50
14/7/2000	3	Mr. Chuan Rakdee	373 Ladprao Rd. Bangkapi, Bangkok	5,400.00	3%	162.00
14/7/2000	4	Mr. Rakkitti Samranjai	99 Vorachak Bangkok 14021	5,150.00	3%	154.50
14/7/2000	5	Mr. Somsak Boonmak	1/3 Bangkapi Bangkok 10140	4,700.00	3%	141.00
14/7/2000	6	Mr. Rong Sendee	12 Wireless Rd., Bangkok	5,550.00	3%	166.50
14/7/2000	7	Mr. Surat Chairattana	88/2 Rajthavee, Bangkok	4,450.00	3%	133.50
14/7/2000	8	Mr. Pramote Boonchuay	40 New Phetchaburi Rd. Bangkok 11110	4,730.00	3%	141.90
14/7/2000	9	Mr. Natipan Rungrueng	9/2 Ngamwongwan Nonthaburi 11000	5,100.00	3%	153.00
14/7/2000	10	Mr. Rattapong Sirikul	3/88 RongMuang Bangkok 14054	4,400.00	3%	132.00
14/7/2000	11	Mr. Prawit Vichayayon	134 Suanluang Pravate Bangkok	5,650.00	3%	169.50
14/7/2000	12	Mr. Kajorn Liangwattana	203/1 Pomprab Bangkok	5,650.00	3%	169.50
14/7/2000	13	Mr. Boonchai Rakkiat	300 Vorachak Bangkok	5,200.00	3%	156.00
14/7/2000	14	Mr. Surin Pomprasert	546 Bangklo Bangkok	4,870.00	3%	146.10
14/7/2000	15	Mr. Nat Siripornchai	12/4 Samrong Nue, Samutprakarn	4,180.00	3%	125.40
14/7/2000	16	Mr. Chaiyanan Rungroj	90/2 Ladprao10 Bangkok	4,760.00	3%	142.80
14/7/2000	17	Mr. Preamsak Pongsurat	102 Phahonyothin, Suthisarn Bangkok	5,040.00	3%	151.20
14/7/2000	18	Mr. Somchart Viparat	334 Setsiri Rd., Pradipat Bangkok	4,880.00	3%	146.40
			Total	90,310.00		2,709.30





**APPENDIX C**  
**DATABASE DESIGN**

Table C.1. Customer Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Cust_No	Int (5)	Y	Y				Primary
2	Cust_Name	Varchar (20)	Y					Attribute
3	Cust_Address	Varchar (40)						Attribute
4	Cust_Tel	Varchar(10)						Attribute
5	Cust_Fax	Varchar (10)			Y			Attribute
6	Contact_Person	Varchar (15)						Attribute
7	Date	Date	Y				> 1 Jan 1976	Attribute
9	Special_Rate	Varchar (1)	Y				Y or N	Attribute



Table C.2. Sailors Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Sailor Code	Int (5)	Y	Y				Primary
2	Sailor Name	Varchar (20)	Y					Attribute
3	Sailor Address	Varchar (40)						Attribute
4	Sailor Tel	Varchar(10)			Y			Attribute
5	Ship No.	Varchar (5)	Y					Attribute
6	Start Date	Date	Y				> 1 Jan 1976	Attribute
7	Sex	Varchar (1)					M or F	Attribute
8	Status	Varchar(1)					S or M	Attribute
9	Provident Fund	Varchar(1)					Y or N	Attribute

Table C.3. Standard Wages Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Sailor Code	Int (5)	Y	Y		Sailors		Primary
2	Wages_Rate	Int (5)					Between 0 and 1,000	Attribute
3	Update_Date	Date						Attribute

Table C.4. Standard Fee Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Cust_No	Int (5)	Y	Y		Customer		Primary
2	Fee_Rate	Int (5)					Between 0 and 10,000	Attribute
3	Unit	Varchar (10)						Attribute
4	Update_Date	Date						

Table C.5. W/H Tax Rate Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Service_Type	Varchar (10)	Y	Y				Primary
2	Tax_Rate	Int (5)						Attribute
3	Update_Date	Date						Attribute

Table C.6. Job Order Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Job_No	Int (5)	Y	Y				Primary
2	Job_Date	Date	Y				> 1 Jan 1976	Attribute
3	Cust_No	Int (5)	Y	Y		Customer		Attribute
4	Commodity	Varchar (10)						Attribute
5	Warehouse	Varchar (15)						Attribute
6	Destination	Varchar (15)						Attribute
7	Vessel	Varchar (10)	Y		Y			Attribute
8	Unit	Varchar (10)						Attribute
9	Order_Amt	Int (8)					Between 0 and 999,999	Attribute

Table C.7. Delivery Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Delivery_No	Int (5)	Y	Y				Primary
2	Delivery_Date	Date	Y				> Job Date	Attribute
4	Job_No	Int (5)	Y			Job Order		Attribute
5	Cust_No	Int (5)	Y	Y		Customer		Attribute
5	Ship_No	Varchar (5)	Y					Attribute
6	Delivery_Amt	Int (8)					Between 0 and 999,999	Attribute
7	Remain_Amt	Int (8)					< Order_Amt	Attribute

Table C.8. Wages Payment Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Sailor Code	Int (5)	Y	Y		Sailors		Primary
2	Payment Date	Date	Y					Attribute
3	Gross_Wages	Int (8)						Attribute
4	Overtime	Int (8)					< Gross Wages	Attribute
5	Tax_Deduct	Int (8)					< Gross Wages	Attribute
6	Wages_Payment	Int (8)					< Gross Wages	Attribute

Table C.9. Withholding Tax Deduction Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Sailor Code	Int (5)	Y	Y		Sailors		Primary
2	Payment Date	Date	Y					Attribute
3	Gross_Wages	Int (8)						Attribute
4	Tax Rate	Int (5)						Attribute
5	Tax_Deduct	Int (8)					< Gross Wages	Attribute



Table C.10. Invoice Billing Database Table.

No.	Field Name	Field Type	Index	Unique	Nullable	Foreign Key to Table	Check	Key Type
1	Invoice No	Int (5)	Y	Y				Primary
2	Job No	Int (5)	Y			Job Order		Attribute
3	Invoice Date	Date	Y					Attribute
4	Cust No	Int (5)	Y	Y		Customer		Attribute
5	Delivery Amt	Int (8)					< Gross Wages	Attribute
6	Fee Rate	Int (5)						Attribute
7	Billing Amt	Int (10)						Attribute



**APPENDIX D**  
**PROCESS SPECIFICATION**

Table D.1. Process Specification of Process 1.1.

Process Name:	Key in Delivery Information
Data In:	Delivery Sheet
Data Out:	Delivery Record
Process:	(1) Receive Delivery Sheet from Sailors
	(2) Verify Delivery Sheet
	(3) If Delivery Sheet is valid then
	Do step x to y
	Else If Delivery Sheet is Invalid then
	Do step x to y
	(4) Edit Delivery Information into Delivery Record
	(5) Edit Delivery Sheet into Customer Name
	(6) Edit Delivery Sheet into Sailor Name
	(7) If End-of-File then
	Create New Delivery Record
	Else Edit Delivery Information into Delivery Record
	(8) Send Delivery Record to Compare with
	Job Order Information
	(9) Store Delivery Record in Delivery File
	(10) Edit Delivery Record into Reject Delivery Record
	(11) Return Reject Delivery Sheet to Sailors
Attachment:	(1) Sailors
	(2) Data Store (Delivery Record)

Table D.2. Process Specification of Process 1.2.

Process Name:	Compare Delivery Record with Job Order
Data In:	Existing Delivery Record
	Job Order Information
Data Out:	Approved Delivery Sheet
Process:	(1) Receive Delivery Record from Key in Delivery Information Process
	(2) Read Job Order Information from Job Order Master File
	(3) Compare Delivery Record with Job Order Information
	(4) If End-of-File then
	Do Step 5 to 6
	Else if Delivery Record is not Matched then
	Repeat step 5 to 6
	Else if Delivery Record is Matched then
	Do Step 7
	(5) Create List of Invalid Delivery Record
	(6) Return Delivery Sheet to Sailors
Attachment:	(7) Update Delivery Record
	(8) Approve Delivery Sheet
	(9) Send Delivery Record to Calculate Service Fee Process
	(10) Send Delivery Information to Calculate Wages Payment Process
	(11) Send Approved Delivery Sheet to Shipping Administrative Department
Attachment:	(1) Shipping Administrative Department
	(2) Data Store (Job Order Master File)

Table D.3. Process Specification of Process 2.1.

Process Name:	Key in Number of Hours
Data In:	Delivery Information
Data Out:	No. of Hours Record
Process:	(1) Receive Delivery Information from Approve Delivery Sheet Process
	(2) Create No. of Hours Record
	(3) Store No. of Hours Record to Wages Hour File
	(4) Send No. of Hours Record to Calculate Wages Payment Process
Attachment:	(1) Shipping Administrative Department
	(2) Data Store (Wages hour)



Table D.4. Process Specification of Process 2.2.

Process Name:	Calculate Wages Payment
Data In:	No. of Hours Record
	Wages Rate Record
	Sailor Record
Data Out:	Gross Wages Record
Process:	(1) Receive No. of Hours Record from Key in Number of Hours Process
	(2) Read Wages Rate Record from Standard Wages Rate Record
	(3) Read Sailor Record from Sailor Master File
	(4) Calculate Gross Wages from $\text{Gross Wages} = \text{No. of Hours} * \text{Wages Rate}$
	(5) Create Gross Wages Record
	(6) Store Gross Wages Record in Gross Wages File
	(7) Send Gross Wages Record to Calculate Withholding Tax Process
	(8) Send Gross Wages Record to Calculate Net Payment Process
Attachment:	(1) Data Store (Standard Wages Rate File)
	(2) Data Store (Sailor Master File)
	(3) Data Store (Gross Wages File)
	(4) Data Store (Wages Hour File)

Table D.5. Process Specification of Process 2.3.

Process Name:	Calculate Withholding Tax
Data In:	Gross Wages Record W/H Tax Rate Record
Data Out:	Tax Deduction Record
Process:	(1) Receive Gross Wages Record from Calculate Wages Paymant Process (2) Read W/H Tax Rate Record from W/H Tax Rate File (3) Calculate Tax Deduction from Tax Deduction = Gross Wages * W/H Tax Rate (4) Create Tax Deduction Record (5) Store Tax Deduction Record in W/H Tax Deduction File (6) Send Tax Deduction Record to Calculate Net Payment Process
Attachment:	(1) Data Store (Gross Wages File) (2) Data Store (W/H Tax Rate File) (3) Data Store (W/H Tax Deduction File)

Table D.6. Process Specification of Process 2.4.

Process Name:	Calculate Net Payment
Data In:	Gross Wages Record
	Tax Deduction Record
Data Out:	Wages Payment Record
Process:	(1) Receive Gross Wages Record from
	Calculate Wages Payment Process
	(2) Receive Tax Deduction Record from
	Calculate Withholding Tax Process
	(3) Calculate Wages Payment from
	Wages Payment = Gross Wages -
	Tax Deduction
	(4) Create Wages Payment Record
	(5) Store Wages Payment Record in
	Wages Payment File
	(6) Send Wages Payment Record to
	Generate Voucher and Report Process
Attachment:	(1) Data Store (Gross Wages File)
	(2) Data Store (W/H Tax Deduction File)
	(3) Data Store (Wages Payment File)

Table D.7. Process Specification of Process 2.5.

Process Name:	Generate Voucher and Report
Data In:	Wages Payment Record
Data Out:	Payment Voucher
	Wages Payment Register
	W/H Tax Details
Process:	(1) Receive Wages Payment Record from
	Calculate Net Payment Process
	(2) Read Wages Payment Record from
	Wages Payment File
	(3) Create Payment Voucher
	(4) Create Wages Payment Register
	(5) Create W/H Tax Details
	(6) Send Payment Voucher to Finance Department
Attachment:	(7) Send Wages Payment Register to
	Finance Department
	(8) Send W/H Tax Details to Finance Department
	(1) Finance Department
	(2) Data Store (Wages Payment File)

Table D.8. Process Specification of Process 3.

Process Name:	Prepare Cash Payment
Data In:	Approved Payment Voucher
Data Out:	Cash Payment
Process:	(1) Receive Approved Payment Voucher from Finance Department
	(2) Prepare Cash for the amount identified in Approved Payment Voucher
	(3) Pay Cash to Sailors
Attachment:	(1) Finance Department
	(2) Sailors

Table D.9. Process Specification of Process 4.1.

Process Name:	Retrieve Delivery Record
Data In:	Delivery Record
Data Out:	Unit Delivery Record
Process:	(1) Receive Delivery Record from Approve Delivery Sheet Process
	(2) Read Unit Delivery Record from Delivery Record File
	(3) Send Unit Delivery Record to Calculate Service Fee Process
Attachment:	(1) Data Store (Delivery Record File)



Table D.10. Process Specification of Process 4.2.

Process Name:	Calculate Service Fee
Data In:	Unit Delivery Record
	Customer Record
	Fee Record
Data Out:	Billing Record
	Billing Amount Record
Process:	(1) Receive Unit Delivery Record from Retrieve Delivery Record Process
	(2) Read Customer Record from Customer Master File
	(3) Read Fee Record from Standard Fee Rate File
	(4) Calculate Billing Record from $\text{Billing Record} = \text{Unit Deliver} * \text{Fee}$
	(5) Create Billing Record
	(6) Store Billing Record in Billing Amount File
	(7) Send Billing Amount Record to Printed Fee Calculation Sheet Process
Attachment:	(1) Data Store (Customer Master File)
	(2) Data Store (Standard Fee Rate File)
	(3) Data Store (Billing Amount File)

Table D.11. Process Specification of Process 4.3.

Process Name:	Printed Fee Calculation Sheet
Data In:	Billing Amount Record
Data Out:	Fee Calculation Sheet
Process:	(1) Receive Billing Amount Record from Calculate Service Fee Process
	(2) Read Billing Amount Record from Billing Amount File
	(3) Create Fee Calculation Sheet
	(5) Send Fee Calculation Sheet to Billing Officer
Attachment:	(1) Billing Officer
	(2) Data Store (Billing Amount File)

Table D.12. Process Specification of Process 5.

Process Name:	Prepare Invoice
Data In:	Billing Information
Data Out:	Invoice
Process:	(1) Receive Billing Information from Calculate Service Fee Process
	(2) Create Invoice
	(3) Send Invoice to Customers
	(4) Send Fee Calculation Sheet to Billing Officer
Attachment:	(1) Billing Officer
	(2) Customers



**APPENDIX E**  
**DATA DICTIONARY**

## DATA DICTIONARY

Object Name	:	Delivery Sheet
Object Type	:	Data Flow
Definition	:	The Delivery Sheet is prepared by the sailors. The information in Delivery Sheet comprises Delivery Number, Delivery Date, Job Order Number, Customer name, Sailor Name, Vessel Name, Warehouse, Destination, Commodity, Unit of Delivery, Delivery Amount, and Number of Hours.
Object Name	:	Delivery Record
Object Type	:	Data Flow
Definition	:	The record of delivery information, which is keyed into the system in "Key in Delivery Information Process", from the Delivery sheet.
Short Definition	:	Delivery Record = Delivery_No + Delivery_Date + Job_No + Cust_Name + Sailor + Vessel + Warehouse + Destination + Commodity + Unit + Delivery_Amt + No_of_hours
Object Name	:	Job Order Information
Object Type	:	Data Flow
Definition	:	The information of the job agreed with each customer. The job order information comprises Job Order Number, Job Order Date, Customer Name, Commodity, Warehouse, Destination, Vessel Name, Unit of Delivery, and Order Amount.
Short Definition	:	Job Order Information = Job_No + Job_Date + Cust_Name + Commodity + Warehouse + Destination + Vessel + Unit + Order Amt

Object Name : Approved Delivery Sheet

Object Type : Data Flow

Definition : The Shipping Administrative Officer will approve the Delivery Sheet after checking validity compare Delivery Record with Job Order Information. This document will be used as the source for calculation the wages.

Object Name : No of Hours Record

Object Type : Data Flow

Definition : This record contains information about the number of hours worked in each delivery trip by each sailor. The number of hours will be used as a base in calculation of the wages.

Short Definition : No\_of Hours = integer numeric with maximum length of 5 characters

Object Name : Sailor Record

Object Type : Data Flow

Definition : The information about the sailors, which comprises Sailor Code, Sailor Name, Address, Telephone Number, Ship Number, and Starting Date.

Short Definition : \* Sailor Record = Sailor\_Code + Sailor\_Name + Sailor\_Address + Sailor\_Tel + Ship\_No + Start\_Date

Object Name : Wages Rate Record

Object Type : Data Flow

Definition : The wages rate record is stored in the Standard Wages Rate File. This is the information about the standard wages rate to be used in calculation of wages. Only the authorized person can access this file. Any changes in the standard wages rate have to be approved by the manager prior to updating into the system.

Short Definition : Wages\_Rate = integer numeric with maximum length of 5 characters.



Object Name : Gross Wages Record

Object Type : Data Flow

Definition : This record is derived from the "Calculate Wages Payment Process" by multiplying No Of Hours with Wages Rate. The Gross Wages Record will be used as a base in calculation of withholding tax in the "Calculate Withholding Tax Process".

Short Definition :  $Gross\_Wages = No\_Of\_Hours * Wages\_Rate$

Object Name : W/H Tax Rate Record

Object Type : Data Flow

Definition : The W/H Tax Rate is stored in the W/H Tax Rate File. This is the rate to be in calculation of the withholding tax to be deducted from the wages. Only the authorized person can access this file. Any changes in the standard wages rate have to be approved by the manager prior to updating into the system.

Short Definition : Tax\_Rate = 2 decimal numeric with maximum length of 4 characters.

Object Name : Tax Deduction Record

Object Type : Data Flow

Definition : \* The withholding tax deduction from gross wages. The amount of withholding tax is calculated by multiplying the gross wages with the W/H tax rate. The amount of tax deduction will be used to calculate the net wages by deducting from the gross wages.

Short Definition :  $Tax\_Deduct = Gross\_Wages * Tax\_Rate.$

Object Name : Wages Payment Record

Object Type : Data Flow

Definition : The wages payment record is calculated automatically by the system. This amount is the net wages payment after withholding tax deduction. The Finance Department has to prepare the cash payment to the Sailors according to the amount of Wages Payment.

Short Definition :  $Wages\_Payment = Gross\_Wages - Tax\_Deduct.$

Object Name : Payment Voucher

Object Type : Data Flow

Definition : The Payment Voucher is printed out from the system. The Finance Department has to review and approve the Payment Voucher before making any payment to the sailors.

Object Name : Wages Payment Register

Object Type : Data Flow

Definition : Wages Payment Register is generated by the system. This report is sent to the Finance Department for checking the total amount of wages paid to all sailors during the month. The Wages Payment Register has the details about the Payment Date, Sailor Code, Sailor Name, Gross Wages, W/H Tax Deduction, and Net Wages.

Short Definition :  $\text{Wages Payment Register} = \text{Payment\_Date} + \text{Sailor\_Code} + \text{Sailor\_Name} + \text{Gross\_Wages} + \text{Tax\_Deduct} + \text{Wages\_Payment}$

Object Name : W/H Tax Details Report

Object Type : Data Flow

Definition : This is the report to be attached with the Tax Return Form every month. The report has the details about the Payment Date, Sailor Code, Sailor Name, Sailor Address, Gross Wages, W/H Tax Rate and Withholding Tax Deduction.

Short Definition :  $\text{W/H Tax Details Report} = \text{Payment\_Date} + \text{Sailor\_Code} + \text{Sailor\_Name} + \text{Sailor\_Address} + \text{Gross\_Wages} + \text{Tax\_Rate} + \text{Tax\_Deduct}$ .

Object Name : Approved Payment Voucher

Object Type : Data Flow

Definition : The Payment Voucher approved by the Finance Manager for the wages to be paid to sailors.

Object Name : Customer Record

Object Type : Data Flow

Definition : The record contains all of information about customer. The details recorded in Customer Record include Customer Number, Customer Name, Customer Address, Customer Telephone Number, Customer Fax Number, and Contact Person.

Short Definition : Customer = Cust\_No + Cust\_Name + Cust\_Address + Cust\_Tel + Cust\_Fax + Contact\_Person.

Object Name : Fee Record

Object Type : Data Flow

Definition : The Fee Record is the standard service fee rate to be charged to each customer. The rate is multiplied with the amount of goods delivered to get the billing amount. Only the authorized person can access this file. Any changes in the standard fee rate have to be approved by the manager prior to updating into the system.

Short Definition : Fee\_Rate = 2 decimal numeric with maximum length of 8 characters..

Object Name : Billing Amount

Object Type : Data Flow

Definition : The Billing Amount to be charged to each customer for the work performed by the sailors. The Billing Record is calculated by multiplying amount of goods delivered with the standard fee rate.

Short Definition : Billing Amoount = .Delivery\_Amt \* Fee\_Rate.

Object Name : Fee Calculation Sheet

Object Type : Data Flow

Definition : The Fee Calculation Sheet is printed out from the system. The billing officer used this worksheet to review the correctness of the invoice before sending to customers.

Object Name : Billing Information

Object Type : Data Flow

Definition : The Billing Information is used by Billing Officer in the preparation of invoice. The information is received automatically from the Fee Calculation Sheet printed out from the system. The Billing Officer has to compare the information in the invoice with the Fee Calculation Sheet before sending invoice to the customer.

Object Name : Invoice

Object Type : Data Flow

Definition : The invoice generated by the system to be sent to the customers. The amount of goods delivered in invoice should be matched with the amount of goods delivered according to the job order. Each invoice has the details about the Invoice Number, Invoice Date, Customer Name, Customer Address, Commodity, Vessel Name, Unit, Delivery Amount, Fee Rate, and Billing Amount

Short Definition : Invoice = Inv\_No + Inv\_Date + Cust\_Name + Cust\_Address + Commodity + Vessel + Unit + Delivery\_Amt + Fee\_Rate + Billing\_Amt.

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