



ASSUMPTION UNIVERSITY

ELECTRONIC MAIL SYSTEM
FOR SCT COMPUTER CO., LTD.

by

Miss Rattiya Limpiteep

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

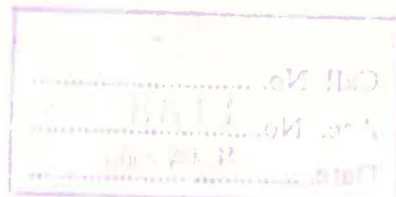
December 1991

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Project Title : Electronic Mail for SCT Computer Co.,
Ltd.
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Academic Year : 1991

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

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ABSTRACT

This project presents the implementation of electronic mail for SCT Computer Co., Ltd.. Electronic mail system can provide better communication among different divisions of the organization and also solve various problems of documentation flow within the company.

This report is intended to demonstrate how electronic mail system can increase the efficiency to internal communication instead of using manual system in the document delivery system. The guideline for developing Thai language on electronic mail - Unix operating system is also introduced in this project.

ACKNOWLEDGEMENTS

The author appreciates the contributions by various people who make the completion of this project possible.

Firstly, she would like to express her warm appreciation to Dr.Suthiporn Patumtaewapibal for this instruction, suggestions and guidance through out this project study.

The author is grateful to Mr.Pichit Woranansiri, Office Automation Department Manager, for his assistance for the success of this project.

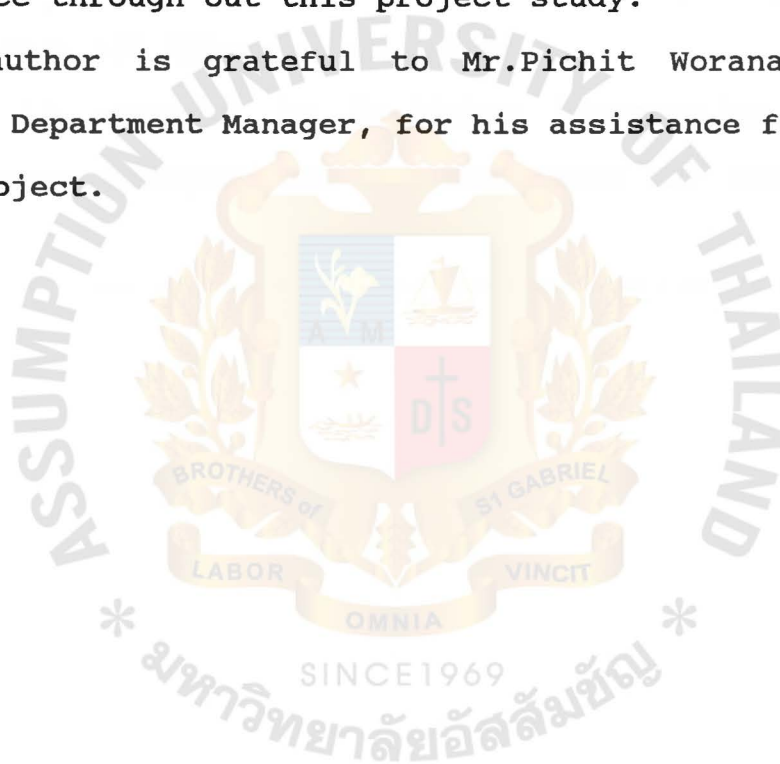


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1. INTRODUCTION

1.1. Project Introduction

Electronic mail is sending message through one computer to other computers by using computer network. Electronic mail is introduced to SCT Computer Co., Ltd. to increase the efficiency to internal communication by replacing manual system in some type of document delivery system especially for memorandums. The guideline for developing Thai language on electronic mail - Unix operating system is also introduced in this project. Electronic mail also offers good image to SCT Computer Co., Ltd. This project is included the training course to SCT Computer's staffs to improve the capability in using electronic mail for internal communication. The scheduling and planning of implementing electronic mail system is also included in this project. This project is consumed the time about 8 months from March 1991 to October 1991.

1.2. Objectives of Introducing Electronic Mail

- 1) To provide good image for SCT Computer Co., Ltd. :

SCT Computer Co., Ltd. is trading firm that sells advanced technology products into the market. Using electronic mail in the company will be good image to company itself because electronic mail is a high technology in the computer communication today.

2) To increase the efficiency in internal communication

Electronic mail can make better internal communication to company.

3) To absorb the fringe benefits from electronic mail by solving the following problems:

- Delay in document delivery within SCT Computer company.
- Document are lost on the way of delivery.
- High expenses of document and paper in SCT Computer company.
- The secrecy information is revealed.
- Messengers complaint of the large amount of document delivery.

1.3.Topics in The Project

The project consists of five main topics that are as follows

1. Introduction

This chapter is included the project introduction, objectives of introducing electronic mail in SCT Computer Co., Ltd. and topics included in the project.

2. Overview of SCT Computer Co., Ltd.

This chapter is included the background of company, company organization with SCT Computer organization chart and information flow system within SCT Computer company.

3. Electronic mail system for SCT Computer Co., Ltd.

This chapter is included the questionnaire with analyzing that uses to support the implementation of electronic mail system within company. It is also included the selection of operating system for electronic mail system, guideline to develop Thai language on electronic mail, and estimated cost of electronic mail system.

4. Development of electronic mail system in SCT Computer company :

This chapter is included hardware, software and network configuration that are installed to support electronic mail system. Detailed cost comparison between electronic mail system and document delivery system is also included in this chapter. The implementation by using training course is consisted in this chapter.

5. Summary and recommendations

The last chapter is the summary of whole project and recommendations to increase the efficiency in using electronic mail system within SCT Computer Co., Ltd.

TABLE 1.1

PROJECT SCHEDULE USING A GANNT CHART

[illegible]

2.OVERVIEW OF SCT COMPUTER CO.,LTD.

2.1.Background of SCT Computer Co.,Ltd.

2.1.1.SCT Company Introduction

SCT Computer is a broad base organization in the computer and solution provider field. It's established in 1983 as a member of Siam Cement Group, one of the most respected and well-known industrial conglomerate in Southeast Asia. In 1990, SCT Computer is took over by IBM with 30%, Manager Information System-MIS with 40%, CMIC Finance and Securities with 10%, and a group of top executives and staff who hold the remaining 20%. Since the company has increased its registered capital from baht 10 million to baht 50 million and expanded into overall business of computer and communication. The privately-held company exclusively distributes computer systems and communication equipments, covering full range of IBM's products from PS/1, PS/2, AS/400, RS/6000, ES/9370 and IBM ES/9000. SCT's sales philosophy provide appropriate solutions and satisfaction to customers which to provide hardware and software solution with good services to meet customer requirements.

2.1.2. Company Organization (see Appendix A, B)

SCT Computer Co.,Ltd. is divided into 4 divisions as follows:

- Marketing Division
- Service Division
- Finance and Administration Division

- Product Division

There are 4 offices location. Three of four are located on SP Building, 388 Phaholyothin Road, Bangkok and on separate Floor: 3rd Floor, 11th Floor, 13th Floor. The other one is on OA Building 330 Phaholyothin Road, Bangkok. SP Building and OA Building is about 70 metres far from OA Building.

2.1.3. Company Profile

Company Name : SCT Computer Co.,Ltd.

Address : - SP Building 3 Fl.,11 Fl.,13 Fl.
388 Phaholyothin road,
Bangkok 10400
Thailand
- OA Building
330 Phaholyothin Road,
Bangkok 10400
Thailand

Telephone No.* : OMNI 273-0037, 279-4461, 279-3087

Telex No. : 81164 INTENCO TH.

Facsimile : 273-0563, 271-3725

Contact Party : Suradej Mukyankoon

Year Established : 1983

Paid Up Capital : 50 Million Baht

2.1.4. Product Represents

IBM Products

- PS/1
- PS/2
- CERVINO Point of Sale
- RISC System/6000
- AS/400
- IBM 9370
- ES/9000

AST Computer Products

- AST Personal Computer

NOKIA Data Communication

SAHO Access Control System

3COM LAN Product

NEC Printer

Software Products

- CAD ATS Supervision
- MICRO CADAM
- Professional CADAM
- Mainframe CADAM
- Business MAPICS/DB
- BUSPAC
- TIMS

2.2.Current Problem of Document Delivery System

(see Appendix C, D)

2.2.1.General Internal Communication System in SCT Computer

Company

General internal communication system in SCT Computer are as follows :

- 1) Telephone Communication
- 2) Document Delivery System
- 3) Facimile Message

1.Telephone Communication - is widely used as an internal communication system in SCT Computer company which is not concerned with document. Internal telephone switching between SP Building and OA Building has the limited trunk, so it is difficult to contact among staffs between OA Building and SP Building . Sometimes, it is difficult to get hold of the person they want.

2.Document Delivery System - is one method of internal communication system in SCT Computer Co.,Ltd. This communication system requires messengers to carry the document from senders to receivers. It consumes more time in document delivery from one office to another because of the large quantities of document and the limited quantities of the messengers.

3.Facimile Message - is also the transmission of message. It is a method of internal communication system of company between SP Building and OA Building. There are 2 facimiles machine located on floor 11 - SP Building and floor 2 - OA

Building.

Nowadays, the business is more competitive. The important factor is the accurate information that receives at the right time. It can push up the business in a more efficient way. Some businessmen will only look at the external information but they overlook the internal information. In reality, internal information is as important as external information. Reliability internal information can be the factor of efficiency and effectiveness in operation within the company.

With 200 staffs, 4 offices separately-located location, there are some difficulties in document delivery path because of the offices location constraints.

Problem of document delivery within organization comes from the delay of document delivery between one office to others. If there are no well-control system or checking book, sometimes the documents can be lost. But if there is too much control, it will consume more time in checking which can cause the delay of the document delivery to the right time.

Top management of SCT Computer Co., Ltd. also need the computerized system to work in effectively and efficiency way within company.

2.2.2. Type of Documents in SCT Computer Company

There are documents that is internally distributed within SCT Computer company, which are classified into 6 groups as follows :

- Report
- Selling Document
- Technical Information Document
- Memorandums
- News
- Other Documents

1) Report

There are many types of report, such as, sale report, inventory report, account receivable report etc.

2) Selling Document

- Cost Sheet (see Appendix H)

The selling of computer usually requires spare parts and peripherals which can be bought from local suppliers. Their price fluctuates rapidly. Cost Sheet is aiding document in storing the required product. The stock staff can inform purchasing staff to order additional product which are out of stock. Cost Sheet can help to clarify problem of deficiency products. The priority of reservation for required product can be arranged by using Cost Sheet. Cost Sheet will be flowed from marketing department through stock.

- Purchasing Order (see Appendix I)

There are local order and international order. The purchasing order consists of 3 copies for accounting, purchasing, and stock. The original document is for supplier.

3) Technical Information Document (see Appendix J)

High technology products (computer, data communication, etc.) usually change the model more faster than other products. The technology developed so fast. There are system engineer in each department whose specializes in their area, such as, LAN, Unix, AIX etc. It means each system engineer will have special knowledge for specific field . When they face the problems beyond their control, they can inquire from other system engineers by issuing inquiry letter or using telephone.

4) Memorandums (see Appendix K)

There are many types of memorandums, such as, document for approval, document for acknowledgement etc.

5) News (see Appendix L)

There are both internal and external news document. The internal news is called " SAIYAI". It is the internal news that inform all staffs about the latest information or internal news of SCT Computer, issued monthly.

6) Other Documents

- Conference Document (see Appendix M)

SCT Computer company is the company that has complex structure and many location of offices. The executive level will use the conference to be the way of supervision and control for the operation of each department. Consequently, there are many appointments for conference in one week about 20 conferences for one week, such as, conference among departments, conference within departments, conference with customers, etc.

The documents that required in each conference are as follows :

- 1) Inviting document for conference with agenda
- 2) Memorandums for conference
- 3) Referenced document (if necessary)

The appointment for conference sometimes can cause the problems , for example, some urgent conference can not be appointed the participants as the time required because the staff cannot prepare the conference document in time.

Apart from the above documents, there are other type of document and announcement that flow in the company, such as, announcement for reshuffling staff, announcement for resign etc.

2.3.Problem Signals:

- 1) Delay in document delivery within SCT Computer company.
- 2) Document are lost on the way of delivery
- 3) Messengers complaints of the large amount of document delivery.
- 4) High expenses of document and paper in SCT Computer company.
- 5) The secrecy information is revealed

2.4.Scope of The Study:

1) The study of the current document delivery system will cover the whole company.

2) Define current problems of the current document delivery system.

3) Study the existing computerized system to order to design electronic mail system.

4) Design electronic mail system on Unix in SCT Computer company including studying the development of Thai language for electronic mail system.

5) Implementation of electronic mail system.



3. ELECTRONIC MAIL SYSTEM FOR SCT COMPUTER CO., LTD.

3.1. Electronic Mail System

Nowadays, the technology is more advance. Not only computer is a high technology product that offers the convenience to the business but also the price of computer is cheaper. On-line network works as a important part in the computer system, especially for the control of accounting system and inventory control. We can immediately update the data under the same database by using on-line network. On-line network also offers many utilities from its system that can increase the efficiency and productivity. Electronic mail (sending message through one computer to other computers by using computer network) is one of utility in network system.

In the case of setting up the network, it will be worth for using only electronic mail system. Almost, many corporations already use network system to link accounting system, so it is useful and worth to invest in some parts of hardware & software and get electronic mail system.

Using of electronic mail can reduce paper expenditure, filing cabinet and other costs. The perfect electronic mail system need the cooperative from all staffs to log-in name to their own terminals. They should log-in Unix system twice a day (9.00 AM, 14.00 PM) to electronic mail system in order to check mail in mail box. Software can check mail-box as we log-in.

Network has already allocated to the computer system in some parts, so it is easy to extend the network to all parts of company. SCT Computer Co.,Ltd. operates the computer business.

Staffs are easy to train and study electronic mail system because they already have the knowledge in computer field. Consequently, SCT Computer Co.,Ltd. can show the good image to the public in the sense of expert on the network computer system as SCT can set up the perfect route of network within the company. It can increase the efficiency to internal communication within SCT Computer Co., Ltd.

3.1.1. Advantages of Electronic Mail

Advantages from electronic mail can be classified into 2 ways as follows :

- 1) General advantages from using electronic mail system
- 2) Specific advantage from using electronic mail system received by SCT Computer Co., Ltd.

General Advantages of Using Electronic Mail System

Unlike telephone call, electronic message from other people won't interrupt the receivers. They can read their electronic mail whenever they choose. If system is allowed to use a modem, users can use it to read electronic mail from any other remote location. They can see how electronic mail allows them to handle correspondence quickly. The things that users need is their keyboard and terminal. If they want to edit the message, they can call up one of the Unix editors. Sending a message by electronic mail requires only one simple command; there's no need to go to a post office or mail drop.

With the telephone, it's often difficult to get hold of the person you want. Much time is wasted playing "telephone tag" : sender calls when receiver's out; when receiver returns your call, sender's out. With electronic mail, sender can act on it immediately by creating a message and sending it. He/she don't need to consider whether the other person is available. He/she can act on a bright idea that comes at 2 A.M. This immediacy makes electronic mail ideal for groups that need to inform their members of late-breaking events. The only hitch with electronic mail is that recipients must log into the Unix system to know whether they have received any messages.

There are obvious another benefits and uses of this technology :

- Reduce of "shadow functions," such as leaving messages with the intended recipient's secretary.
- Elimination of interruptions. a cuing system that delivers messages at the appropriate times translate into labor savings.
- No more "telephone tag," because the message is stored by the computer until the recipient is ready for it.
- Low preparation costs and quick message distribution. this means simultaneous distribution of message to their respective destinations.

Specific Advantages from Using Electronic Mail System Received by SCT Computer Co.,Ltd.

The advantages that SCT Computer Co., Ltd. will get from the utilization of electronic mail system are as follows :

1. Good image for SCT Computer Co., Ltd. to external society
2. Ability to utilize network system with more effectiveness and efficiency
3. Develop the skillful of SCT's staffs in using computer in multi-user status beyond from single-user or stand-alone
4. Better utilization of computer within SCT Computer Co.,Ltd.

The additional benefits from using electronic mail for SCT Computer Co.,Ltd. are the problem-solving of listing problem signal :

- Delay in document delivery within SCT Computer company
- Document are lost on the way of delivery
- Messengers complaint of the large amount of document delivery
- High expenses of document and paper in SCT Computer company
- Secrecy information is revealed

3.1.2. Electronic Mail System and SCT Document Delivery

Most of the document delivery problem comes from the delay in document delivery or lost of document on the way. SCT Computer Co.,Ltd. has complex organization that needs a lot of copy documents to send those messages to many receivers, that means we have document expenses and cabinet filing expenses especially for secrecy information may be exposed to public or competitors.

So document delivery system should be improved to get the best efficiency by reducing delivery time, the amount of lost document, the expenses and controlling secrecy information. Those are qualifications of electronic mail system. Electronic mail is the sending information method by computer system from sender to receiver or receiver group. The information is send to mailbox of each receivers. Receivers can consider how much the information is important and keep in hard disk if it is important. Electronic mail system can save paper expenditures, reduce keeping document cost. In case of secrecy information, each user has his/her own specific password. Other users will not know if he/she don't tell his/her password to other person. For the keeping of important or special information, we also encrypt the information that it will be more secure to those information.

3.2.Problem and Solution by Electronic Mail System

3.2.1.Problem of Human Issue (see Appendix N)

From psychological effect, people always trend to resist the changing. In SCT Computer Co., Ltd., there are also resistance from some SCT's staffs in introducing electronic mail system in SCT's computer network because it is the changing from manual system to computerized system. To reduce the psychological effect, the training course is introduced to make the staffs to familiar with electronic mail system. Before the training course is implemented in SCT Computer Co., Ltd., questionnaire is a method to find out the information in order to design training course , know the priority of document type to implement etc.

Then we try to evaluate attitude of 30 staffs in middle level management to evaluate capacity of them in order to

- To set up appropriated training course
- To specify the volumn of document , type of document used in company in order to know which type of document should be initially implement in the first phase and other phases.

Analyst Answer of Questionnaire from Middle Management Level

From the questionnaire, we can conclude that :

- Internal document in SCT Computer Co.,Ltd. can be clearly classifed into daily document, weekly document, and monthly document.
- Company has internal document delivery problem.

- Electronic mail can solve the problem.

- SCT Computer Co., Ltd. is ready to implement electronic mail system because of the following factors :

- . Ready in hardware because there are installation of computer in every departments.

- . Ready in staffs (capacity at least basic computer knowledge) because SCT Computer is in computer business, so there are many specialists.

- . Ready in situation because most of staffs have met the same of document delivery. it 's time to solve this problem.

- Electronic mail system should be implemented and memorandums should be the first document in the first phase of implementation.

3.2.2. Selection of Operating System for Electronic Mail

Nowadays, electronic mail plays more important role in network communication system. There are many standard specifications, such as, X.400 on OSI (Open System Interconnection), SMLT etc. Those will provide the convenience in the installation of electronic mail on the varied machines and easy for data communication.

The scope of this project is only emphasize on using within the company. There are 3 alternatives of electronic mail based on hardware and software available in the company as follows :

1. Electronic mail on OS/400 in IBM AS/400
2. Electronic mail on NETWARE - LAN (local area network)
3. Electronic mail on Unix operating system

Alternative 1 : Electronic Mail on OS/400

Nowadays, SCT Computer uses IBM minicomputer model AS/400. there are many terminals on this system. So it is possible to develop electronic mail on it, but it is very expensive because we have to invest additional on the hardware, such as, personal computer, emulation card, communication cable etc. It consumes too high cost for using electronic mail on AS/400.

Alternative 2 : Electronic Mail on NETWARE - Local Area Network

SCT Computer Co.,Ltd. sells and installs the large amount of LAN (local area network) on PC (personal computer) to customers until the staffs are expert on LAN system. Not only TOKEN-LINK of IBM, but also ethernet of Novell that SCT's staffs are expert. The best selection of LAN is ethernet of Novell because it is easy to extend the system. Nowadays, we can use coaxial cable or unshield twisted pair in 10base-T system. It is more flexible than before.

Although the development of computer system on Novell is more comfortable, low cost than on AS/400, but LAN (local area network) is suitable only the communication within the same building because there is the constraint of distance. The longest distance of LAN cable is 200 metres. It should be at least 3

Novell hosts at 11th floor, 3rd floor at SP Building and at OA Building. It is also difficult and expensive to connect Novell hosts together.

The important factor of consideration to ignore LAN is the increasing of investment cost. LAN system need ethernet card to install in every terminals, so investment cost is very high.

Alternative 3 : Electronic Mail on Unix Operating System

Unix operating system is the open system which can be easily to communicate between Unix computer with Unix computer by using TCP/IP standard. It is cheaper than the other types of using electronic mail. Unix server can also communicate with LAN on Novell.

System engineer can be flexible to design the communication system, such as, link by using ethernet in coaxial cable or unshield twisted pair, link by serial port, link by using modem etc. The terminal line is cheaper because we can use telephone line as terminal line.

The selection of Unix system can solve the communication problem between 2 building (Office Automation Building and SP Building). Unix host with TCP/IP protocol will be placed on each location and linked by outdoor coaxial cable (use ethernet bus) between 2 buildings, and indoor coaxial cable between 3rd Floor and 11th Floor in SP Building.

For application software - accounting system, we use "TIMS" on Unix operating system.

TABLE 3.1

**COMPARISON OF OPERATING
SYSTEM**

FEATURE	OPERATING SYSTEM		
	OS/400	NOVELL	UNIX
TECHNICAL FEASIBLE	YES	YES	YES
SUPPORT ELECTRONIC MAIL	YES	YES	YES
TERMINAL	AS/400 DUMP TERMINAL (\$250) PC WITH 5251 EMULATION CARD	PC WITH ETHERNET CARD	PC WITH ETHERNET CARD PC USING TERMINAL EMULATION PROGRAM
CABLE	TWIN COAXIAL	THIN COAXIAL	THIN COAXIAL TELEPHONE CABLE
INVESTMENT COST	HIGH	MEDIUM	LOW
MAINTENANCE	DIFFICULT	MEDIUM	EASY
INSTALLATION TIME	3 MONTHS	2 MONTHS	1 MONTHS

So the selection of operating system in electronic mail communication, system engineer can choose among the electronic mail on AS/400 or LAN (Novell) or Unix which system engineer selects Unix operating system in the present time.

Unix operating system on RISC System/6000 is AIX. and Unix operating system on AST computer is SCO Unix. This alternative can give the best effectiveness in the communication, the cheapest investment and the perfect application software on Unix is ready to use.

Why Unix?

- Best way to utilize the existing computerized system
- Cheaper investment cost
- "TIMS" runs on Unix
- Open system

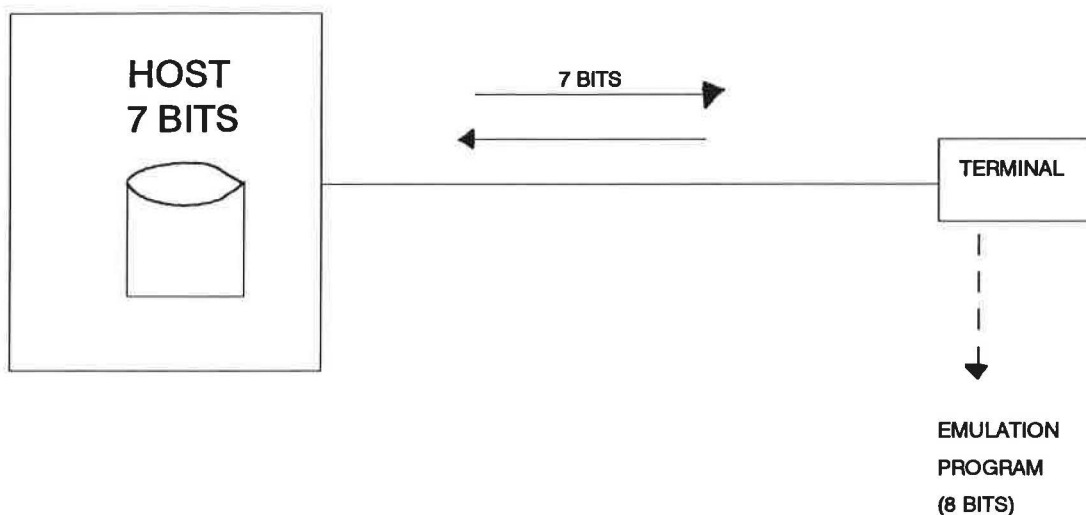
3.2.3. Development of Thai Language

The development of Thai language for electronic mail system on Unix operating system is necessary for implementing all document delivery within SCT Computer Co., Ltd. because some document need to use only Thai language. After the overall system can use electronic mail (only English language), some internal document can be implemented by using electronic mail but some internal document need to implement electronic mail in Thai language.

The development of Thai language for electronic mail on Unix operating system has the problem of software on electronic mail. Electronic mail on Unix operating system accepts 7 bits. But Thai language need 8 bits ($2^7 = 128$ characters, $2^8 = 256$ characters) because there are more characters in Thai language.

There is a method for developing Thai language on electronic mail in Unix operating system by "Developing Emulation Software on Unix Terminal". Emulation software has to develop to manage the conversion from 7 bits to 8 bits at the Unix terminal side. The process of conversion will use special character to be convertor at terminal of Unix host. Router display of terminal will receive 7 bits. When special character appears, router display will change the mode to acknowledge 8 bits. It means it will accept the display of Thai language on screen of Unix terminal.

The example of emulation software to convert from 7 bits to 8 bits is shown in the next page.



FOR EXAMPLE, WE SEND MAIL : "E-MAIL ทั่วไทย". THE FORMAT OF 7 BITS

SENDING IS AS FOLLOWS :

	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS	7BITS
AS SENDING FROM HOST	45	2D	4D	41	49	4C	~	40	52	49	52	64	37	42

"~" CHARACTER IS USED AS SPECIAL CHARACTER TO CONVERT 7 BITS ASCII CODE TO 8 BITS ASCII CODE.

	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS	8BITS
AS RECEIVING AT TERMINAL	49	2D	4D	41	49	4C	C0	D2	C9	D2	E4	B7	C2

FIGURE 3.1

EXAMPLE OF TRANSMISSION THAI LANGUAGE ON ELECTRONIC MAIL BETWEEN UNIX HOST AND TERMINAL

3.3. Time Comparison between Electronic Mail System and Document Delivery System

Since SCT Computer Co.,Ltd. is in trading computer business, most of employees have their own computer. Most of documents of SCT Computer Co.,Ltd. is produced by using computer. Time of entry the message between the existing document delivery system and electronic mail system is the same. In the existing delivery system, the staff has to print by printer. In the case of no printer linked with that computer, the staff need to copy the required file into the diskette and bring it to print at the computer linked with printer. After the document is ready, that staff or authorized person has to sign the name in the document. the document will be in the normal channel of sending the message which it takes time about 6 hours or more.

In electronic mail system, authorized person can issue that document by himself/herself. Although the entry time will take the additional time, but after it finish, it can suddenly send those message. It has not to wait for the signature of the authorized person or the availability of printer which those process consume the time about 2 hours. The document delivery process will consume the time about 6 hours which electronic mail system consumes time only 2-3 minutes.

When each filing staff receives the document, she/he will distribute the document to the destinated person. For electronic mail system, it will be send directly to each required mail-box.

The answer can be send back suddently by electronic mail system which it is faster than the existing delivery system.

The estimated time in using electronic mail system can save the time about 6 hours or approximately 99.17%.

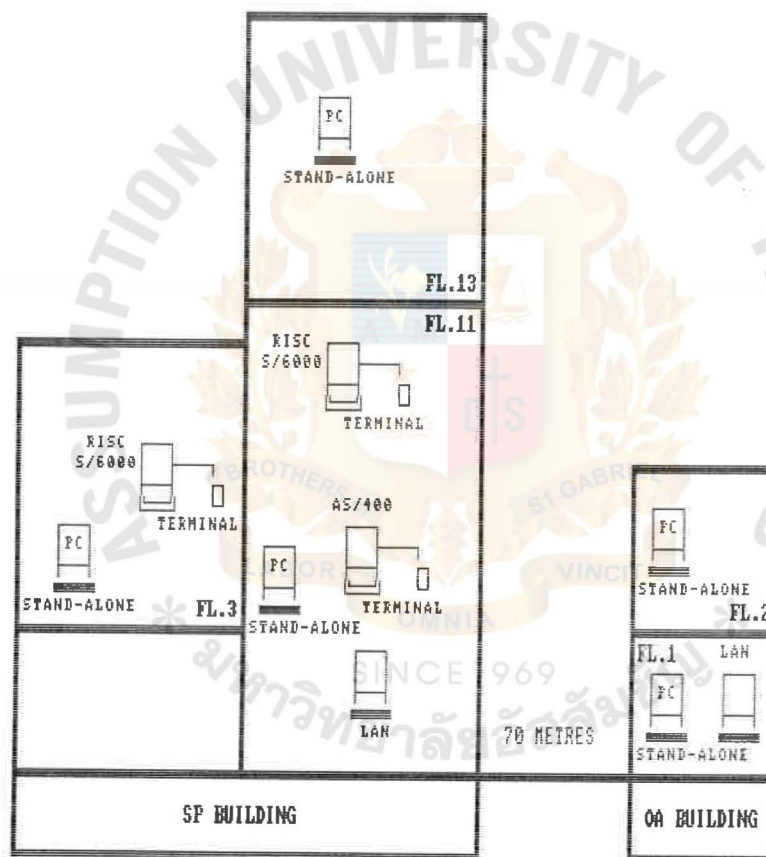
3.4.Existing Hardware and Network in SCT Computer Co.,Ltd.

Not only SCT Computer Co.,Ltd. is the trading firm in computer business that sells computer product from mainframe to micro computer, but also it has the business of R&D, development of software. Each department is almost their own different networks, such as,

- AS/400 department uses AS/400 linked with personal computer to be terminal and uses 5250 emulation card.
- RISC System/6000 department uses RISC S/6000 linked with personal computer to be terminal and links each other by serial port.
- PS/2 uses TOKEN-RING and Novell ethernet.
- AST uses as stand-alone computer.

Most of marketing department uses stand-alone computer. Accounting & Finance department has RISC System/6000 linked with terminals. Installation department uses LAN-Novell to link among all terminals within department.

EXISTING HARDWARE AND NETWORK IN SCT COMPUTER CO., LTD.



SP BUILDING : 388 PHAHOLYOTHIN

OA BUILDING : 330 PHAHOLYOTHIN

FIGURE 3.2

3.4.1. Hardware and Network for Electronic Mail System

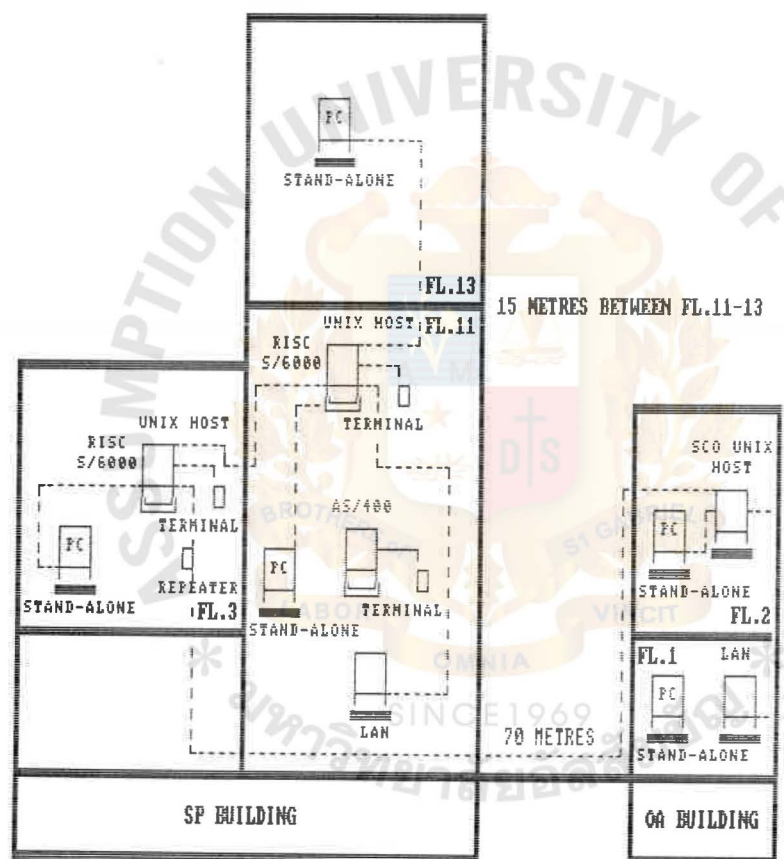
The system that SCT Computer Co.,Ltd. is installing is AIX on System/6000 for accounting system. Finance & Accounting Department, stock and marketing department use the same database on AIX. Three Unix hosts are located at 3rd Floor - S.P.Builliding, 11th Floor - S.P.Building and Office Automation Building. It can cover 4 offices location within company because RISC System/6000 department is allocated RISC System/6000. Those 4 offices can link with each other by Unix on System/6000 - AIX and SCO-Unix.

From AIX system is designed by using coaxial cable to link among 4 offices. IBM-RISC System/6000 is placed on 3rd Floor - SP Building by using TMS - Application software on Unix operating system, 11th Floor - S.P. Building using IBM-RISC System/6000 that is used for the development for RISC System/6000 department. SCT office on 13th Floor uses AIX host from the machine on 11th Floor. And the remaining area-Office Automation Buillding will be allocated with SCO-Unix operating system by using TCP/IP protocol.

In the area that use LAN-Novell or ethernet bus can suddently link with AIX network by workstation with TCP/IP protocol (not ipx). TCP/IP can communicate with server LAN with PC-NFS program. The area that doesn't use LAN (local area network) - AS/400, it can place the serial cable from Unix host to PC terminal.

HARDWARE AND NETWORK IN SCT COMPUTER CO., LTD.

(AS IMPLEMENTING E-MAIL SYSTEM)



SP BUILDING : 388 PHAHOLYOTHIN

OA BUILDING : 330 PHAHOLYOTHIN

FIGURE 3.3

3.5. Estimated Cost for Electronic Mail System

Each department in SCT Computer Co.,Ltd. have their own computer & network, but the job is mainly on operating staffs (secretary, filing staffs, etc.). The internal borrowing for micro computer is about 100 units but most of department managers don't have their own personal computers on their desk. In order to get the most effectiveness and efficiency, department managers should have their own personal computer. The additional quantities is about 10 units.

For the network system in ethernet bus type, we need not to buy the additional equipment except the coaxial cable and installation cost.

The existing personal computer which is not in LAN system has to link with Unix host by using serial port with 2 pair unshield twisted pair. Unshield twisted pair is cheaper than coaxial cable. It also can extend one serial port to be 8 ports.

Estimated Cost - Hardware

Micro Computer	10 units	@Baht 60,000	Baht 600,000
Serial Ports	4 units	@Baht 40,000	160,000
Coaxial Cable	1 roll	@Baht 2,000	2,000
Unshield Twisted Pair	4 roll	@Baht 500	2,000
Installation Cost			5,000
Repeater	1 unit	@Baht 30,000	30,000

		Total	799,000
		Total Cost	199,000
			=====
		(deduct borrowing product)	

We cannot include Baht 600,000 for micro computer price in the cost because they are the internal borrowing product from SCT's stock. It has no cost in this part. It means we have to deduct Baht 600,000 from total Baht 799,000 that is equal to Baht 199,000.

Two main factors for considering break-even of electronic mail system within SCT Computer Co.,Ltd. are as follows :

- 1) Quantities and the importance of sending messages
- 2) Additional investment in hardware from existing hardware

In the present time, there are few specialist in specified field in SCT Computer Co.,Ltd.. Most of inquiry the technical problem is using the internal memo to inquiry system engineer. It takes a long time in waiting for the answer. Sometimes, salesman lost the account because of delay in answering technical problem to customer. The document is always lost along the way in carrying those document. The company will lost both paper expenses and marketing opportunities. For the efficiency sending message system, it will increase the effectiveness to the organization which is so difficult to measure to the monetary term. Therefore, all messengers have other main duty except messenger duty. It means the company need not to pay more for messenger duty. We can conclude that we cannot compare electronic mail system with the existing delivery document system in the monetary term.

4.DEVELOPMENT OF ELECTRONIC MAIL IN SCT COMPUTER COMPANY

(see Appendix B, E, F)

4.1.System Configuration

System configuration is consisted of :

- 1.1) Hardware configuration
- 1.2) Software configuration
- 1.3) Network configuration

4.1.1. Hardware Configuration

From the existing system, most of hardware is located in company. Those computer can link each other by using network system among 4 office location : floor 11 - SP Building, floor 13 - SP Building, floor 3 - parking building of SP Building, and Office Automation building. In each location has their own Unix host to be sited. We will mention hardware of each office locations as follows :

1. SCT office on floor 11 - SP Building

IBM RISC System 6000 model 530 is sited on floor 11 at System 6000 department. It is used as the development in this department and is also used as Unix host for electronic mail system.

Specification of IBM RISC System 6000 Model 530

Packageing	deskside
Processor Type	IBM power architecture
Clock Speed	25 Mhz
Performance Benchmarks	34.5 Mips
	10.9 Mflops

System Memory Standard		16 Mbytes
	Maximum	128 Mbytes
Micro Channel Adapter Slots		8
Communication Support		Asynchronous ETA- 232D, EIA-422A 1- and 16 bit per second IBM token-ring ethernet (thick and thin) X.25 interface 3270 connection SSLA and PSLA serial links optional channel adapter
Diskette Drive		3.5 inch
Fixed Disk	Standard	355 Mbytes
	Maximum	2571 Mbytes
Data Cache		64 kb
Instruction Cache		16 kb
Memory Bus Width		128 bits

Terminals to link with RISC System/6000 have 2 groups. The first group, terminals are linked with thin ethernet of IBM RISC System/6000. Those terminals run on LAN-Novell which are used in PS/2 department. The other group is the remaining computers except terminals of LAN-Novell that link through asynchrnous or serial port - RS232.

Micro computer on floor 11 are always changed because most of departments on floor 11 are the development product job. Main

job is the test of product in especially for job of communicate with the larger CPU computer, so the micro computers may be AST or IBM brand with CPU 286, 386SX up to 486. Ethernet card may be 8 bits, 16 bits or 32 bits. It means hardwares which link with Unix host - RISC System/6000 on floor 11 - SP Building are difficult to specify.

2. SCT office on floor 13, SP Building

The distance between floor 11 and 13 is about 15 metres, so terminals in floor 13 can link with host Unix on floor 11 by using asynchronous line. The asynchronous cable can be place in the channel of telephone line. On floor 13, there are 3 department of marketing. 8 Asynchronous cables are placed between floor 11 and floor 13. On floor 13, PS/2-model 30 & model 50Z and model 55SX are used as terminals which those computers have their own available serial port. Serial port are used to link between RISC System/6000 on floor 11 with terminals on floor 13. It is no need to invest for the additional communication cards.

Specification of IBM PS/2 Model 30 F31

Processor	80286 10 Mhz 1 wait state
Memory Standard	1 Mbyte
Maximum	16 Mbytes
Integrated Function	VGA display port
	Serial port
	Parallel port
	Pointing device port

	Keyboard port
	Diskette controller
System Expansion	Three available 16-bit expansion slots
Storage	One 1.44 Mb 3.5 inch diskette drive
	One 30 Mb fixed disk

Specification of IBM PS/2 Model 50Z

Processor	80286 10 Mhz 0 wait state
Memory Standard	1 Mbyte
Maximum	16 Mbytes
Integrated Function	VGA display port
	Serial port
	Parallel port
	Pointing device port
	Keyboard port
	Diskette controller
System Expansion	Three available expansion slots (micro channel)
Storage	One 1.44 Mb 3.5 inch diskette drive
	One 30 Mb fixed disk

Specification of IBM PS/2 Model 50SX

Processor	80386SX 16 Mhz 0-2 wait stat
Memory Standard	2 Mbytes
Maximum	16 Mbytes
Integrated Function	VGA display port Serial port Parallel port Pointing device port Keyboard port Diskette controller
System Expansion	Three available expansion slots (micro channel)
Storage	One 1.44 Mb 3.5 inch diskette drive One 30 Mb fixed disk

3. SCT office on floor 3 - parking building of SP Building

There are IBM RISC System/6000 model 320 to run application program in accounting as the main job. This application program is called "TIMS". TIMS runs on Unix operating system, so IBM RISC System/6000 is also Unix host for Finance & Accounting department on floor 3 - parking building of SP Building.

Specification of IBM RISC System 6000 Model 320

Packageing	Desktop/side
Processor Type	IBM power architecture
Clock Speed	20 Mhz
Performance Benchmarks	27.5 Mips 7.4 Mflops
System Memory Standard	8 Mbytes
Maximum	32 Mbytes
Micro Channel Adapter Slots	4
Communication Support	Asynchronous ETA-232D, EIA-422A Ethernet (thick and thin)
Diskette Drive	3.5 inch
Fixed Disk Standard	120 Mbytes
Maximum	640 Mbytes
Data Cache	32 kb
Instruction Cache	8 kb
Memory Bus Width	64 bits

Besides IBM PS2 model 30, 50Z, and 55SX that they are used as terminals, AST model Bravo 386SX/16 & PremiumII 386SX/20 have yet used as terminals in this office.

Specification of AST Bravo 386SX/16

Specifications :

CPU	80386SX-16
CPU speed (Mhz)	16
Wait-states	0

Co-processor support 80387SX-16

Memory

Standard	1 Mb
Maximum on system board	4 Mb
System maximum	16 Mb

Expansion Slots

8 bit slot	1
8/16 bit slots	3

Keyboard 101 keys yes

Integrated Functions

Serial ports	1
Parallel ports	1
Diskette controller	yes
Hard disk controller	yes
Clock/calendar	yes

Power Supply 100 watts

Software

Disk caching	yes
Utilities	yes
Diagnostics	yes
Support EMS 3.2E	yes

Specification of AST PremiumII 386SX/20

Specifications :

CPU	80386SX-20
CPU speed (Mhz)	20
Wait-states	0

Co-processor support 80387SX-20

Memory

Standard 2 Mb

Maximum on system board 16 Mb

System maximum 16 Mb

Expansion slots

8 bit slot 1

8/16 bit slots 2

8/16/32-bit slots 3

Keyboard 101 keys yes

Integrated Functions

Serial ports 2

Parallel ports 1

Mouse ports 1

Diskette controller yes

Hard disk controller yes

Clock/calendar yes

Power Supply 145 watts

Software

Disk caching yes

Utilities yes

Diagnostics yes

Support EMS 3.2E yes

4. SCT office of Office Automation Building

The distance between Office Automation Building and SP Building is about 60-70 metres. Unshield twisted pair or coaxial cable is used to install between two buildings, but we should use coaxial cable because there are many transactions between warehouse-OA Building and Finance and Accounting Department-floor 3 : parking building of SP Building. The coaxial cable - outdoor cable will offer the best selection for high speed data transmission.

AST Bravo 486/25 is selected as Unix host at OA Building. it is installed in OA department on floor 2 of OA Building.

Specification of Bravo 486/25

Processor	80486 25 Mhz
Memory	10 Mbytes
Integrated Function	VGA display port Two display ports Parallel port Mouse port Keyboard port Diskette controller
System Expansion	5 Expansion slots
Storage	One 1.44 Mb 3.5 inch diskette drive One 400 Mb fixed disk

Communication Card

3 COM etherlink II
specialix intelligent
serial port 16 ports

Connectivity of micro computer between purchasing section on floor 2 and warehouse on floor 1 in Office Automation Building will link through serial ports. IBM model 30, 50Z, 55SX and AST 386SX/16, Premium386SX/20 are used as terminals at OA Building. for service department which is on the first floor of OA Building uses netware system- Novell LAN, so those computer can directly connect with Unix host by ethernet bus. In this department, computer will always change to suit for the situation as SCT's office on floor 11.

IBM PS2 model 35 is selected to use for the manager of each department. It is the newest model of IBM which the size is small with high efficiency. the specification is listed below :

Specification of IBM PS2 Model 35SX

Processor	80386 20 Mhz
Memory Standard	2 Mbyte
Maximum	8 Mbytes
Integrated Function	VGA display port Serial port Parallel port Pointing device port Keyboard port Diskette controller
System Expansion	Three expansion slots

Storage

16 bits (AT-Bus)

One 1.44 Mb 3.5 inch
diskette drive

One 40 Mb fixed disk

Technical problem of hardware is less because we use computer with high reliability. Especially for IBM RISC System/6000 which is mini computer. The connectivity equipment to computer is in the high standard by the manufacturer recommendation.

We don't use dumb terminal or intelligent terminals because the price is nearly to the price of micro computer but the efficiency of micro computer is higher. Micro computer has yet operated the other job, such as, wordprocessor, spread sheet etc.

4.1.2. Software Configuration

There are 3 main operating system to be used in the network as follows :

1. Unix operating system

Unix operating system is loaded in Unix host on 2 units of IBM RISC System 6000-model 530 & 320. Unix on IBM is called "AIX" which is already attached with IBM hardware. For Unix operating system on Bravo 486/25, we use SCO Unix which this software is bought separately from hardware. Both AIX & SCO Unix are developed from AT&T Unix system v release 3 that there are the same standard of command. It means both AIX and SCO Unix can easily link with each other.

2. Netware (LAN-Novell)

Netware is operating system that is installed on LAN server. in this point, we shall mention only ethernet bus with Unix host. For the communication between LAN & Unix is ignored for this time.

3. DOS (Disk Operating System)

DOS is the most importance for operation within SCT Computer Co.,Ltd. because most of the staffs are familiar with application software on DOS. Terminals of Unix are micro computer which are operated by DOS.

Micro Computer Can Access Through Unix Host by 2 Methods As Follows :

First : Communicate Through Ethernet Bus

For this method, micro computer can communicate with Unix host with the speed 10 mb/sec through ethernet card. In the case of many Unix hosts, micro computer can also select to communicate to any hosts by using host id number. In each micro computer has their own host id. this method of communication, each micro computer must have ethernet card which those micro computer are in LAN system.

For accessing from micro computer through ethernet bus, we use PC-NFS(personal computer-network file system) software which can call from Unix host. There are many ways to call :

1.Using remote terminal which will use telnet or rlogin command

2.Transferring files which will use ftp or rep command

3. Using NFS in order to mount file system of host server to client

In the case of electronic mail, we will mention only login by using remote terminal. We have to use rlogin in order to offer micro computer to be a user of Unix host to execute command mail as need.

If user only uses rlogin and becomes user of Unix host, other operating method in mail command is the same as other terminals which connect by asynchronous port.

Second : Communicate Through Asynchronous Port

Software on micro computer is emulation software which can swapt micro computer to be terminal of Unix host by selecting any type of terminals, such as, vt100, vt200, vt300, ansi, etc. Nowadays, there are many types of emulation software, such as, ProcommIII Plus, Carbon Copy, etc. The method of using is easily and convenience because it has the menu and help key in the user friendly type that is easily to learn.

When we already run emulation software, terminal screen of Unix system will show as terminal screen of dump terminal. The command and operation are the same as Unix system.

4.1.3. Network Configuration

The connectivity among Unix host is network connectivity on TCP/IP protocol by using thin ethernet coaxial cable. This connectivity is divided into 2 parts : between floor 3 - parking building of SP Building and OA Building. Thin ethernet is used

for the connectivity between floor 3 and floor 11. Indoor cable is used for the connectivity between floor 3 and OA Building.

There is constraint of thin ethernet in the distance point of view. The distance of the connectivity should not over 185 metres, but overall distance of this connectivity is over 185 metres. It can solve by using repeater or router is used for amplify the signal. The distance between floor 3 and floor 11 is about 60 metres. The distance between floor 3 and OA Building is about 70 metres. The network is included the connectivity with netware system on floor 11 and in OA Building. The overall distance is certainly over 185 metres. The repeater is installed at floor 3 because floor 3 is the middle distance of overall network.

TCP/IP protocol is specified as protocol for this network because the high standard in the present time.

-TCP/IP protocol

TCP/IP has four software layers built on an underlying hardware layer. Its model is shown below :

Layer	Functionality
4	Application
3	Transport
2	Internet
1	Network Interface

The above layers operate as follows :

- Network Interface Layer Accepts and transmits data over the network

- Internet Layer Takes care of the communication among machines
- Transport Layer Provides communication between application
- Application Layer Accesses the internet, and sends and receives data

TCP/IP is a set of protocols used to interconnect computer networks and to route traffic among many different computers. "TCP" means transmission control protocol, and "IP" means internet protocol. Protocols are standards which describe allowable formats, error handling, message passing, and communications standards. Computer systems which conform to communications protocols such as TCP/IP are thus able to speak a common language. This enables them to transmit messages accurately to the correct destination, despite major differences in the hardware and software of the various machines.

Many large networks have been implemented with these protocols, including the darpa internet (defense advanced research projects agency internet). A variety of universities, government agencies, and computer firms are connected to an internetwork which follows the TCP/IP protocols. Thousands of individual machines are connected to this internet. Any machine on the internet can communicate with any other. (The term internetworking is used to refer to the action of joining two or more networks together. The result can be described as a

network of networks, which is called an "internet."). Machines on the internet are referred to as "hosts" or "nodes".

TCP/IP provides the basis for many useful services, including electronic mail, file transfer, and remote login. Electronic mail is designed to transfer short text files. The file transfer application programs can transfer very large files containing programs or data. They also can provide security checks controlling file transfer. Remote login allows users on one computer to log in at a remote machine and carry on an interactive session.

IP

The internet protocol, IP, defines a connectionless packet delivery. This packet delivery connects one or more packet-handling networks into an internet. The term "connectionless" means that the sending and receiving machines are not connected by a direct circuit. Instead, individual packets of data (datagrams) are routed through different machines on the internet to the destination network and receiving machine. Thus, a message is broken up into several datagrams which are sent separately. Note that connectionless packet delivery by itself is not reliable. Individual datagrams may or may not arrive, and they probably won't arrive in the order in which they were sent. TCP add reliability.

A datagram consists of header information and a data area. The header information is used to route and process the

datagram. Datagrams may be fragmented into smaller pieces, depending on the physical requirements of the networks they cross. (When a gateway sends a datagram to a network which cannot accomodate the datagram as a single packet, the datagram must be fragmented into pieces that are small enough for transmission.) The datagram fragementts into the complete datagram. Fragments do not necessarily arrive in order, the software module implementing the IP protocol on the destination machine must reassemble the fragments into the original datagram. If any fragments are lost, the entire data gram is discarded.

The Transmission Control Protocol (TCP)

The transmission control protocol, TCP, works with IP to provide reliable delivery. It provides a means to ensure that the various datagrams making up a message are reassembled in the correct order at their final destination and that any missing datagrams are sent again until they are correctly received.

The primary purpose of TCP is to provide a reliable, secure, virtual circuit connection service between pairs of communicating processes on top of unreliable subnetworking of packets, where loss, damage, duplication, delay or misordering of packets can occur. Also, security provisions such as limiting user access to certain machines can be implemented through TCP.

TCP is concerned only with total end-to-end reliability. It makes few assumptions about the possibility of obtaining reliable datagram service. If a datagram is sent across an internet to a

remote host, the intervening networks do not guarantee delivery. Likewise, the sender of the datagram has no way of knowing the routing path used to send the datagram. Source-to-destination reliability is provided by TCP in the face of unreliable media; this makes TCP well-suited to a wide variety of multi-machine communication applications.

Reliability is achieved through checksums (error detection codes), sequence numbers in the TCP header, positive acknowledgement of data received, and retransmission of unacknowledged data.

How Are Messages Routed?

These two concepts are the key to understanding how datagrams are routed through an internet.

Gateways

The various networks which compose an internet are connected through gateway machines. A gateway is a machine that is connected to two or more networks. It can route datagrams from one network to another. Gateways route the datagrams based on the destination network, rather than the individual machine (host) on the network. This simplifies the routing algorithms. The gateway decides which network should be the next destination of a given datagram. If the destination host for the datagram is on that network, the datagram can be sent directly to that host. Otherwise, it continues to pass from gateway to gateway until it reaches the destination network.

Network Addresses

Each host machine on a TCP/IP internet has a 32-bit network address. the address includes two separate parts : the network id and the host machine id. Machines which serve as gateways will thus have more than one address, since they are on more than one network. Internet addresses are assigned by the Network Information Center (NIC) located at Sri International in Menlo Park, California. The NIC assigns only network id's; the individual network administrators then assign the host machine id's for their network.

There are three classes of network addresses, corresponding to small, medium, and large networks. The larger the network, the larger the number of hosts on that network; likewise, smaller networks have fewer hosts. Thus, when the 32-bit network address is divided between the network id and the host machine id, larger networks will need a larger number of bits to uniquely specify all the hosts on the network. Also, there are only a small number of really large networks, and so fewer bits are needed to uniquely identify these networks. The network addresses have thus been divided into three classes, identified as a, b, or c. The following table lists these classes and their formats.

Class	Network Size Configuration
Class A	Allocates a 7-bit network id and a 24-bit host id.
Class B	Allocates a 14-bit network id and a 16-bit host id.
Class C	allocates a 21-bit network id and an 8-bit host id.

All network addresses are 32 bits. The first bit of a class A address is 0 (zero), to identify the address as class A. Class B addresses begin with the digits 10, and class C addresses begin with 11.

This system of network address classes provides a unique address for the entire statistical distribution of types of networks that might be expected among the various networks using this address system. There are a smaller number of large networks, having many hosts (class A), a larger number of small networks, consisting of a lesser number of hosts (class C), and a medium number of networks made up of a medium number of hosts (class B), network address are often written as four decimal integers separated by period (.), where each decimal number represents one octet of the 32-bit network address. For example, a machine might have the address 128.12.3.5.

Ports and Sockets

TCP also uses a 16-bit number called the "port" to address a connection. The port specifies the particular destination program or utility, such as ftp (file transfer program).

A socket is an address that specifically includes a port identifier, that is, the concatenation of an internet address with a TCP port. Port connections are displayed in the active connections display of netstat (tc).

ICMP Error and Control Messages

ICMP is the internet control message protocol. It defines the error and control messages for IP. ICMP messages are sent in datagrams, like other network messages. These message can be error messages, such as unreachable destinations, or requests for information, such as a particular network address. ICMP messages are also used to request timestamps, which are useful when synchronizing the clocks of various hosts on a network.

Protocol Layering

Communications software protocols are divided into different layers, where the lowest layer is the hardware which physically transports the data, and the highest layer is the applications program on the host machine. Each layer is very complex in its own right, and no single protocol could encompass all the tasks of the various layers. The internet protocol handles the routing of datagrams, while the transmission control protocol, which is the layer above ip, provides reliable transmission of messages which have been divided into datagrams. The applications programs in turn rely on TCP to send information to the destination host. To the applications programs, TCP/IP appears to provide a full-duplex virtual circuit between the machines. In actuality, all information is divided into datagrams, which may then be further fragmented during transmission. The software modules implementing ip then reassemble the individual datagrams, while the modules implementing TCP make sure that the various datagrams are reassembled in the order in which they were

originally sent.

There are several higher-level specialized protocols for specific applications such as terminal traffic (telnet(tc) and file transfer (ftp(tc), and protocols for other network functions such as gateway-status monitoring.

4.2. Cost Comparison Between Document Delivery System and Electronic Mail System

Electronic mail system is partially used in the initial phase of implementation to solve document delivery problem. It effects on the expenditure of SCT Computer Co., Ltd. as follows :

- Expenditure of staff

The increasing rate of staffs to support the increasing job will decrease because all system become to computerized system.

Forecast of business growth is more than 20% per year. The required increasing of staff is at least 10% per year. Electronic mail system can reduce the increasing of required staffs because each staffs can work convenience and faster, so the expected number of staff will increase only 8% per year.

The expenditure of staffs are listed as follows :

- 1) Salary/wages
- 2) Welfare
- 3) Travelling expense
- 4) Entertainment
- 5) Training

In 1991, the estimated expenditure for all staffs are about 25 million baht.

- Office rental expenditure

The decreasing of increasing rate of staff makes the decreasing in extension of working area/space. And the reduction of paper in working is less required filing cabinet that means we can utilize those available working space.

Without electronic mail system, we expect to increase at least 2% in the working area. With electronic mail system, additional working space is not required.

In year 1991, the estimated expenditures about office rental is about 8 million baht.

- Expenditure of stationary & form

Using electronic mail helps to reduce the document . It means we can save the expenditure of stationary and form. We expect that business growth makes the increasing of stationary and form expenditure about 10% per year. With electronic mail system, this expenditure will not increase.

In 1991, the estimated expenditure of stationary and form is about 2 million baht.

(The next page is summary of expenditure in year 1991 & 1992)

TABLE 4.1

COST COMPARISON BET.DOC. DELIVERY & E-MAIL SYSTEM

o SUMMARY FOR EXPENDITURE

(MILLION BAHT)

YEAR	1991	1992	
	NO E-MAIL	NO E-MAIL	E-MAIL
PERSONAL	25	27.5	27
RENTAL	8	8.16	8
STATIONARY & FORM	2	2.2	2
	35	37.86	37

YEAR 1992 SAVE EXPENDITURE BAHT 860,000

YEAR 1991 INVESTMENT FOR E-MAIL BAHT 199,000

SAVE TIME 99.17 %

4.3.Implementation

4.3.1.Training Course for Electronic Mail on Unix

The training of electronic mail system is divided into :

- 1) Communication between terminal and Unix host
- 2) Command of electronic mail on Unix operating system

The training in communication between terminal and Unix host can classify into 2 types :

- Using PC-NFS program
- Using terminal emulator program

For the training of electronic mail command will emphasize on the understanding of multi-user system. It will start from "login" to the Unix system to "logout" from the system in order to help the user to understand and act the right behavior in multi-user system. Multi-user system is different from single-user system or stand-alone. And mail command will be described in sending and receiving the data with other person who is in the same network.

The detail of training course is shown as follow as :

PC-NFS Program

The period of training	3 hours
The audient	The employees who use computer in LAN system & other employees (interested in course)
Required basic knowledge for audient	Understanding in DOS (Disk Operating System)

moderate understanding in LAN
system

- Topics
- Describe how the operation of TCP/IP protocol that is different from pc-netware
 - Describe how Unix-OS & PC-netware can work together
 - Describe the using method of telnet, flp, rlogin, and rcp
 - Describe the method of mount file system from server
 - Describe the assign of network & host id
 - Describe the method of using pc-nfs software
 - Practice the using of software

- Expected result
- To make employees understand TCP/IP protocol
 - To make employees understand nfs protocol
 - To make employees know how to access & use file from Unix host
 - To make employees understand the basic knowledge of communication between terminal and Unix host

- Expected benefits
- To get the additional knowledge of TCP/IP
 - To get the additional knowledge of NFS
 - To get the additional knowledge of Unix OS
 - To make employees accept in new utility, such as, mail etc.

- Employees can apply the command with their job
- To be the starting point of the study & additional studying

Terminal Emulator Program

The period of training 3 hours

The audient SCT's staffs

Required basic knowledge Understand the operation of DOS
for audient (Disk Operating System)

- Topics
- Describes the easily operation in multi-user of Unix system
 - Describe the concept of Unix terminal
 - Describe the emulation of micro-computer to be the terminals
 - Describe the using of procomm plus software
 - Practice the using of software

Expected result - To make audients understand Unix & emulation program and easily to study the additional Unix & emulation program

Expected benefits - To make audients better understand communication between 2 computers

Electronic Mail Command Program

The period of training	3 hours
The audient	SCT's staffs
Required basic knowledge for audient	Understand the operation of DOS (Disk Operating System) pass the training course of PC-NFS or terminal emulation program

- Topics
- Basic fundamental of using electronic mail
 - Method of retrieving the data in their own mail box
 - Method of sending mail through other users
 - Practice the using of software

Expected result - To make audients understand the basic of using electronic mail

Expected benefits - Increase the efficiency in the internal communication system

- Develop the skillful of SCT's staff in using the computer in network system & the communication

There are 200 employees within SCT Computer Co.,Ltd. that the cost of training is not too much for all employees because this training only help SCT's staffs to understand general fundamental of electronic mail. The specialist in electronic mail system will teach the user as on the job-training again.

Each class of training course is consisted of 50 audients.

each course must have at least 4 classes. The training will start from 15.30-18.30 which is consumed SCT's working time about one hour and a half and the remaining time for out of office hour.

The training will start from pc-nfs to terminal emulation to electronic mail. each program has 4 classes that consist of total 12 classes. Total time for training is 12 days, or 2 weeks and 2 days.

4.3.1.1. Command of Electronic Mail on Unix

Mailboxes

It is useful to think of the mail system as modeled after a typical postal system. What is normally called a post office is called the "system mail-box". The system mailbox contains a file for each user in the directory /usr/spool/mail. Mail sent to receiver is put in his/her system mailbox and is automatically saved in his/her mailbox after he/she has read it. Note that the user mailbox differs from a real mailbox in these respects :

1. The user mailbox is not the place where mail is initially routed that place is the system mailbox in the directory /usr/spool/mail.
2. Mail is not picked up from your user mailbox.

SENDER SIDE

LOGIN :

PASSWORD :

\$ MAIL.....(NAME OF LOGIN IN RECEIVER'S SIDE)

SUBJECT :(THE MESSAGE)

(PRESS CTRL+D)

EOT

RECEIVER SIDE

\$ MAIL

&(RECEIVING MAIL MESSAGE)

& XIT (LEAVING FROM MAIL PART)

\$

FIGURE 4.1

COMMAND OF ELECTRONIC MAIL ON UNIX

Messages

In mail, the message is the basic unit of exchange between users. Messages consist of two parts : a heading and a body. The heading contains the following fields :

- to:** This field is mandatory. It contains one or more valid user names to which you can send mail.
- subject:** This optional field contains text describing the message.
- cc :** The carbon copy field contains one or more valid names of those who are to receive copies of a message. Message recipients see these names in the received message. This field is optional.
- bcc:** The blind carbon copy field contains the one or more valid names of people who are to receive copies of a message. Recipients do not see these names in the received messages. This field is optional.

The body of a message is the text you enter exclusive of the heading. The body can be empty.

Modes

The mail program provides two distinct functions : sending mail and managing messages. Mail's two main modes are compose mode and command mode.

The most common way of using mail is to begin a session by entering :

mail

If users have mail waiting, this command automatically places them in command mode. In this mode, they can enter commands for handling their mail. If they have no mail waiting, you see the message "no mail in /usr/spool/mail/login" and are returned to the Unix shell.

From the shell or from mail command model, they can enter compose mode to create a message with:

mail user

Where user is the user name of the person to whom they want to send mail. In compose mode, they can enter the text of their message ending each line with a <return>. Send the message by pressing <ctrl>d on a new line; then exit from the mail program and return to the Unix shell.

If they want to mail a message that already exists in a file, you can do so from the command line (without entering mail) as follows :

mail john < letter

Here, the file letter is sent to the user john.

When invoking mail from the shell, certain mail command-line options are available. Two useful command-line options are the -s "subject" option and the -c "carbon copy" option. They can specify a subject and carbon copy recipients on the command line with these options. For example, they could send a file named note with the subject line "important meeting" by entering the following command :

mail -s "important meeting" -c"ted bob" bill joe sue <note

The to : field will contain bill, joe, and sue; the cc:field will contain ted and bob.

All command-line options must appear before the list of users for the to: field. If an argument to an option contains multiple words, the entire argument set must be enclosed in quotes.

Header

When entering mail command mode, a list of message headers is displayed that looks something like this :

	n	3	john	wed	sep	21	09:21	26/782	"notice"
>	n	2	sam	tue	sep	20	22:55	6/83	"meeting"
	u	1	tom	mon	sep	19	01:23	6/84	"invite"

a header is a single line of text containing descriptive information about a message. (Note that we use the word heading to describe the first part of a message, and header to describe mail's one-line description of a message.) The header contains:

- . A greater-than sign (>) pointing to the current message
- . A status indicator: "n" for new and "u" for unread
- . The number of the message
- . The sender
- . The date sent
- . The number of lines and characters
- . The subject (if the message contains a subject : field)

Setting Up Your Environment

Users can define mail environment with switch and string options that can be set with the mail commands `set` and `unset`. A switch option is either on or off (set or unset). String options are strings of characters that are assigned values with the syntax `option = string`. Multiple options can be specified on a line. For example, you might have a `set` command that looks like this :

```
set dot askcc shell=/usr/bin/sh
```

The options `dot` and `askcc` are switch options; `shell` is a string option.

The `set` command with no arguments displays the options currently set.

Users can create a personal mailing list with the `alias` (a) command. By using an alias, users can send mail to one name and have it go to a group of people. With no arguments, `alias` displays all currently defined aliases. With one argument, it displays the users defined by the given alias.

It is most useful to place `set`, `unset`, and `alias` commands in the file `.mailrc` in your home directory, where they define your personal default environment when you invoke mail. Whenever mail is invoked, it first reads the file `/usr/lib/mail/mailrc`, then the file `.mailrc` in the user's home directory. System-wide set options and system-wide aliases are defined in `/usr/lib/mailrc`. These are installed by whoever is in charge of your system. personal aliases and personal set options are defined in `.mailrc`.

The following is a sample .mailrc file :

```
# number sign introduces comments
# personal aliases office and cohorts are defined below
alias office bill joe sue
alias cohorts john mary bob beth mike
# set dot lets messages be terminated by period on new line
# set asksub prompts for subject: before entering compose

mode set dot asksub

# changes to always begin executing from the same directory
cd
```

The following sections demonstrate how to create mailing lists and describe a few of the common set options. Refer to the mail(c) manual page for details about other options.

creating mailing lists : a

The alias command links a group of names with the single name given by the first argument, thus creating a mailing list. For example, you could enter:

```
alias beatles john paul george ringo
```

So that whenever you used the name beatles in a destination address (as in "mail beatles"), it would be expanded so that you are really referring to the four names aliased to beatles.

Aliases are expanded in mail sent to others so that they will be able to reply to each individual recipient. For example, the to : field in a message sent to beatles will read:

```
to: john paul george ringo
```

and not:

```
to: beatles
```

Keeping mail in the system mailbox: hold

The hold option determines whether messages remain in the system mailbox when you exit mail. If you do not set hold, the examined messages are automatically placed in the mbox file in your home directory (your user mailbox). They are removed from the system mailbox when you quit.

The cc prompt: askcc

The askcc switch causes prompting for additional carbon copy recipients when you finish composing a message. Responding with a <return> signals your satisfaction with the current list. Pressing interrupt displays:

interrupt
(continue)

So that you can return to edit your message.

Listing messages in chronological order

The chron switch causes messages to be listed and displayed in chronological order. By default, messages are listed and displayed with the most recent first. Set chron when you want to read a series of messages in the order they were received.

The mchron switch, like chron, displays messages in chronological order, but lists them in the opposite order, that is, highest-numbered, or most recent, first. This is useful if you keep a large number of messages in your mailbox and you want to list the headers of the most recently received mail first but read the messages themselves in chronological order.

Using Advanced Features

This section discusses advanced features of mail, which are useful to those with some existing familiarity with the mail system.

Using Mail as a Reminder Service

Besides sending and receiving mail, you can use mail as a reminder service. Several Unix commands have this idea built in to them. For example, the Unix `lp` command's `-m` option causes mail to be sent to the user after files have been printed on the lineprinter. When you log in, the operating system automatically examines the file named `calendar` in each your home directory and looks for lines containing either today or tomorrow's date. These lines are sent to you by mail as a reminder of important events. If you program in the shell command language, you can use mail to signal the completion of a job. For example, you might place the following two lines in a shell procedure:

```
biglongjob  
echo "biglongjob done"| mail self
```

You can also create a logfile that you want to mail to yourself. For example, you might have a shell procedure that looks like this:

```
dosomething > logfile  
mail self < logfile
```


Handling Large Amounts of Mail

Eventualllly, you will face the problem of dealing with an accumulation of messages in your user mailbox. There are a number of strategies that you can employ to solve this problem concerning space in your mailbox file. keep in mind the dictum :

when in doubt, throw it out.

This means that you should only save important mail in your user mailbox. If your mailbox file becomes large, you must periodically examine its contents to decide whether messages are still relevant. To save space, consider summarizing very long messages.

The previously mentioned measures are not always helpful enough in organizing the many messages that you are likely to receive. another effective approach is to save mail in files organized by sender , by topic, or by a combination of the two. However, be forwarned-this approach to organizing mail quickly eats up disk space.

You can create a directory to hold your mail folders and define that directory to mail with the folder = option.* Then, whenever you save a message without giving a pathname, mail puts the message in a file (or folder) in that directory. For example, if you want to save your messages by default in the directory mail in your home directory, use :

```
set folder=mail
```

If you forget the names of your mail folders, you can use the

folders command to display the names of the files in the directory set by the folder=option.

4.3.2. Schedule for Implementation

Electronic mail system is taken to the internal delivery document system. We should consider and classify the type of document which one is suitable for using in electronic mail system.

We can classify the document to be implemented into :

1. Memorandums
2. Others - conference document
3. Technical information document
4. News - internal news document
5. Selling document - cost sheet

Phase I:

The first implementation should be on the simple document. Receiver and sender should firstly accept electronic mail system. They must have their own computers on their working tables.

So the simple document that should use electronic mail system is memorandums.

Therefore, memorandums is used as internal document in communication among the middle management level, marketing executives or engineer who most of them have their own computers. The senders and receivers don't also need the original document as document for approval from top-management level. So the

acceptable for electronic mail system in memorandums should be firstly implemented because of easier in implementing than other type of document.

Phase II:

The documents that should be implemented in phase II is as follows :

- Conference document

Conference document need many copies for many receivers. The sending message through electronic mail can be the convenience method in both the issuer of document and messengers. The overall cost can be reduced from electronic mail system.

Other documents shall be implemented after the two documents are already implemented. It also depends on the capacity of increasing the number of computer in each departments. In the first period, staffs in a department can share the computer with other staffs. Each staffs will be specified their own password. The most importance of electronic mail system is the time of login system. If noone logins system, electronic mail doesn't certainly work. All staffs that use electronic mail service have to login the system at least 2 times/day.

TABLE 4.2

o IMPLEMENTING SCHEDULE FOR ELECTRONIC MAIL SYSTEM

YEAR 1991		OCT				NOV				DEC			
SCHEDULE NAME	S OR C	7	14	21	28	7	14	21	28	7	14	21	28
IMPLEMENT E-MAIL FOR MEMORANDUMS	S												
	C												
IMPLEMENT E-MAIL FOR CONFERENCE DOC.	S												
	C												
IMPLEMENT THE REMAINING DOCUMENT	S												
	C												

5. SUMMARY AND RECOMMENDATIONS

Summary

SCT Computer Co., Ltd. has 4 offices location. Three offices are in the same building, but the other one is in other building that is far from each other about 70 metres. Electronic mail can increase the effectiveness and efficiency in document delivery system. SCT Computer Co., Ltd. are ready in hardware because SCT Computer is the dealer of IBM computer and the distributor of AST computer. Although there are a large quantities of computer installed at each department in company, they are used as stand-alone. Some groups of computers are linked as network.

Electronic mail system is the project that is proposed to provide the better communications among different departments by utilizing existing hardware and network. Electronic mail on Unix operating system is the appropriated alternative from three (Electronic mail on OS/400, electronic mail on Novell - Local Area Network, electronic mail on Unix operating system) because main application software named "TIMS" for accounting task runs on Unix - AIX on IBM RISC System/6000.

In the initial stage, electronic mail system is implemented in middle management level. Memorandum is the first document to be implemented because it is simple document that the form is not required as cost sheet. The result of implementation in the first phase is in the required level because users have sufficient knowledge in computer. They are willing to use electronic mail system, so the training can easily to operate.

Recommendations

In the mean time, electronic mail system is used for sending and receiving of only memorandums in SCT Computer Co., Ltd.. Other document will be implemented step by step.

There are some recommendations in order to improve the efficiency in using electronic mail system in SCT Computer Co., Ltd. as follows :

- User-friendly

In the initial phase, users have to use mail command on Unix shell and editor of Unix in typing letter.

In order to make the user convenience in using electronic mail system, we should build mail shell program for user. It means we have to build mail shell program.

- Purchase additional software

In the initial phase, SCT Computer company only uses mail command that attaches with Unix operating system. The form of mail is simple.

After all types of document that is not necessary to use form in electronic mail are implemented, the document that need form will be implemented. It need word processor software on Unix operating system to build those forms, such as, cost sheet etc.

- Development of Thai language on Unix operating system

In the initial phase, electronic mail on Unix can work only on English language because function of mail on Unix accepts sending and receiving mail only 7 bits. Thai language need 8 bits in sending and receiving the message which Unix operating

system cannot operate now.

Thai language is necessary for operating staffs who don't understand well in English language. The development of Thai language should be made by software development team of SCT Computer.



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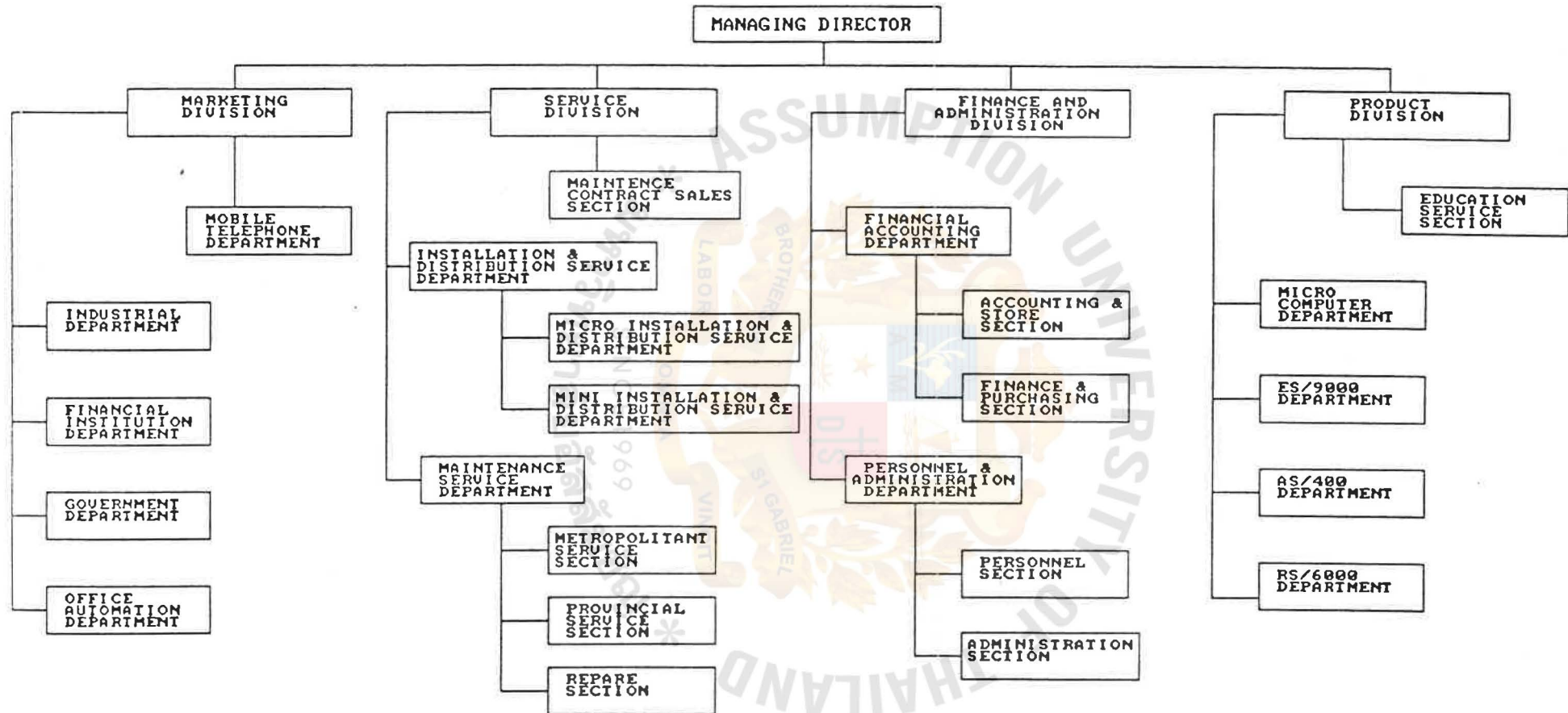
APPENDICES



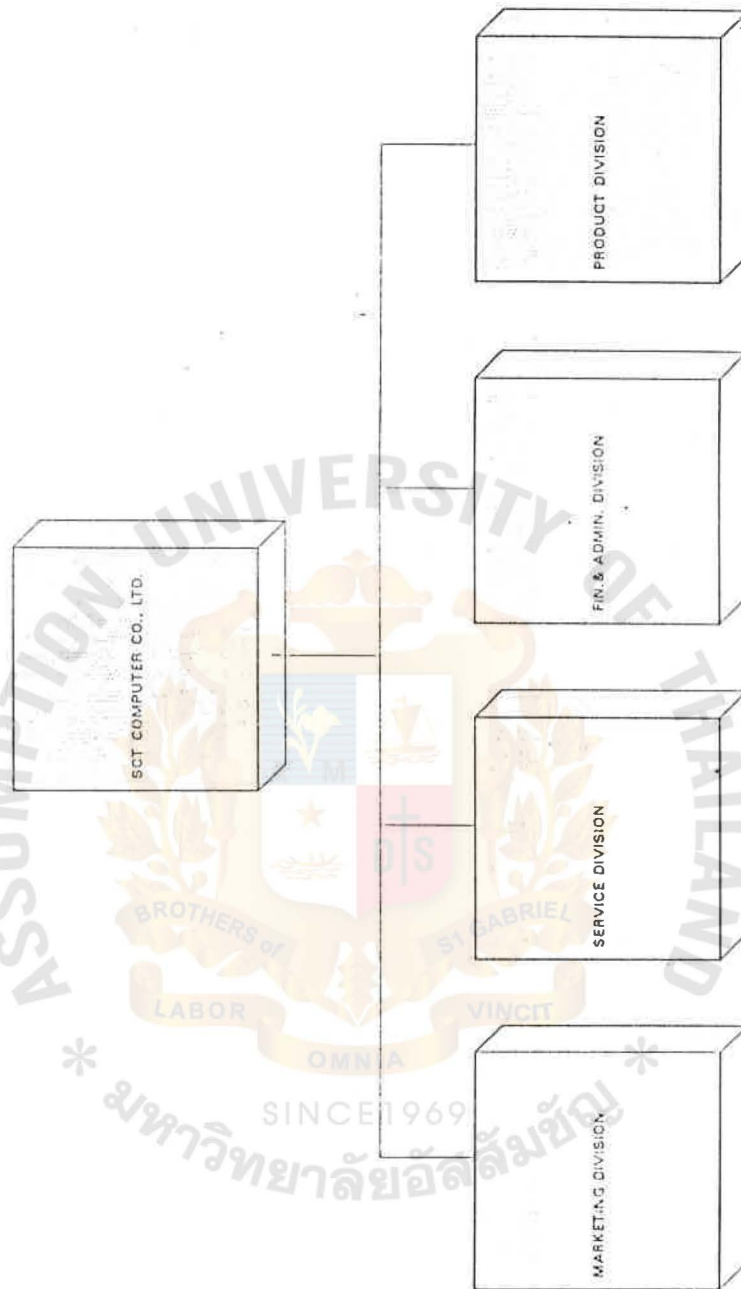
APPENDIX A



SCT'S ORGANIZATION CHART

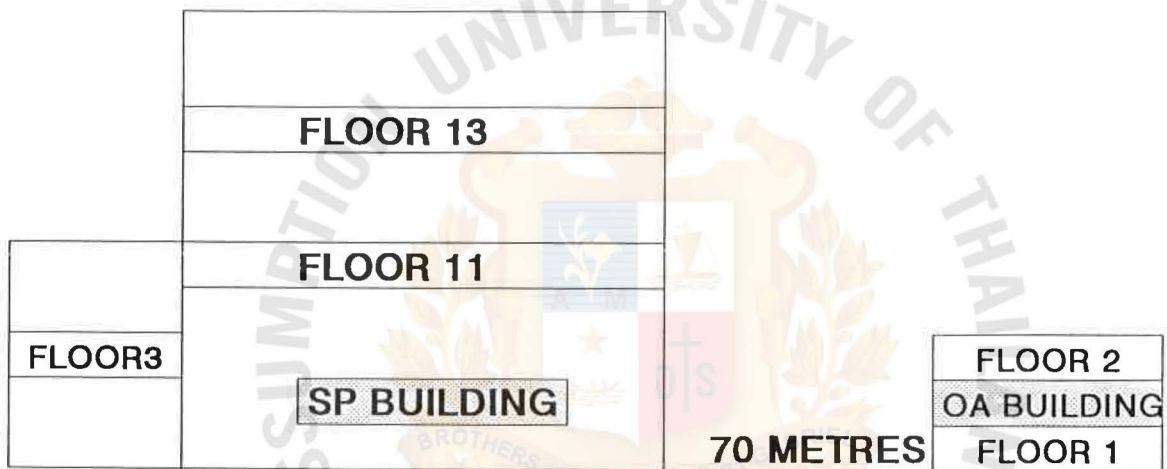


ORGANIZATION CHART



APPENDIX B

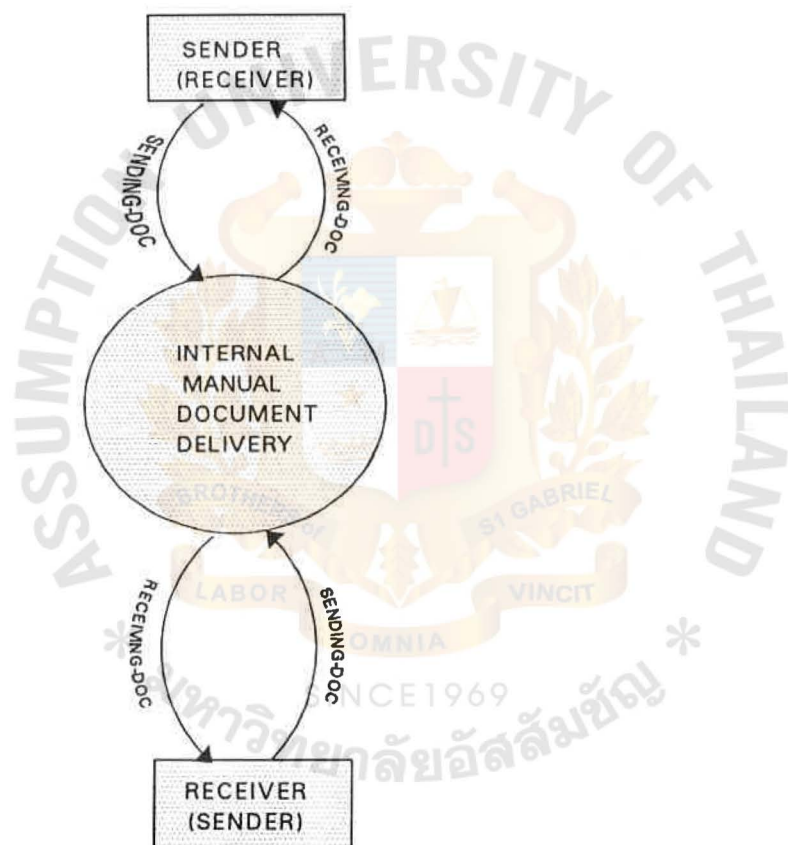
OFFICE LOCATION OF SCT COMPUTER CO., LTD.



SP BUILDING : 388 PHAHOLYOTHIN ROAD, BKK

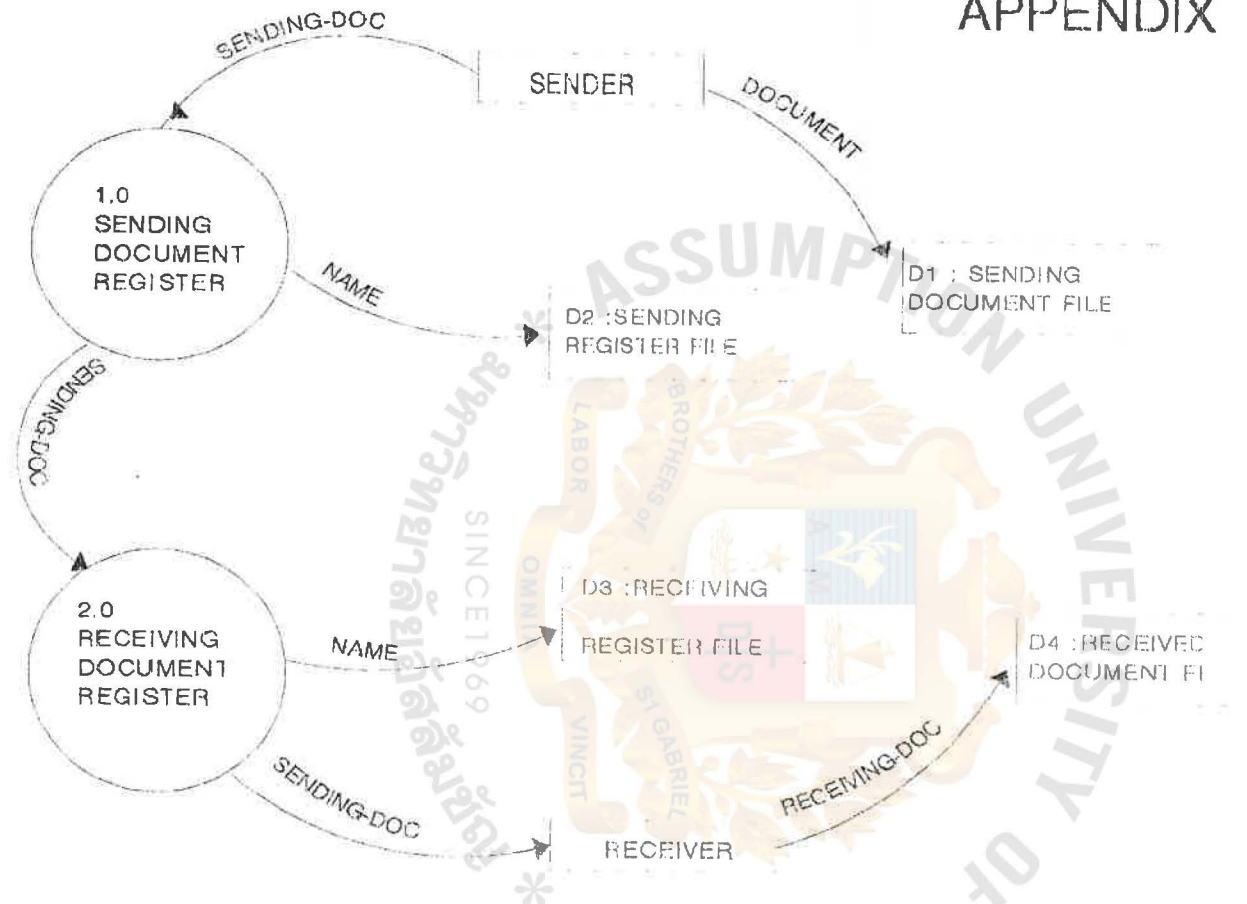
OA BUILDING : 330 PHAHOLYOTHIN ROAD, BKK

APPENDIX C



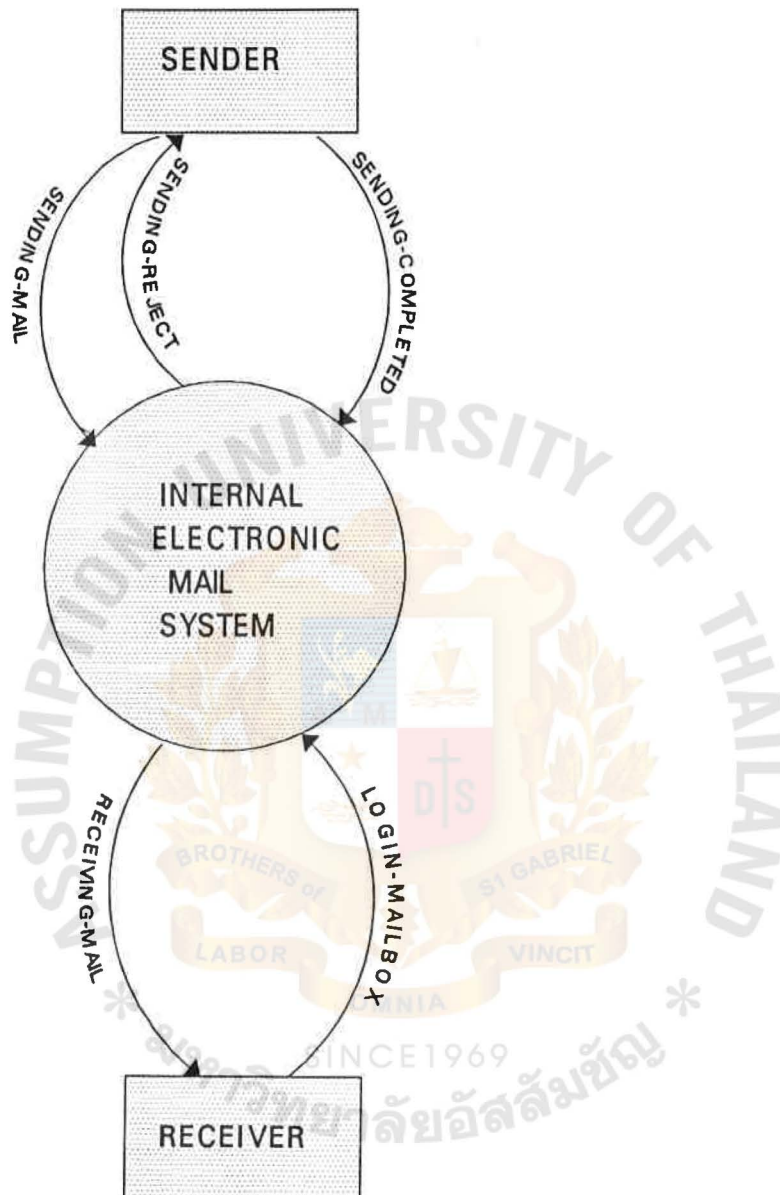
CONTEXT DIAGRAM :
INTERNAL MANUAL DOCUMENT DELIVERY-
SCT COMPUTER CO., LTD.
(EXISTING SYSTEM)

APPENDIX D



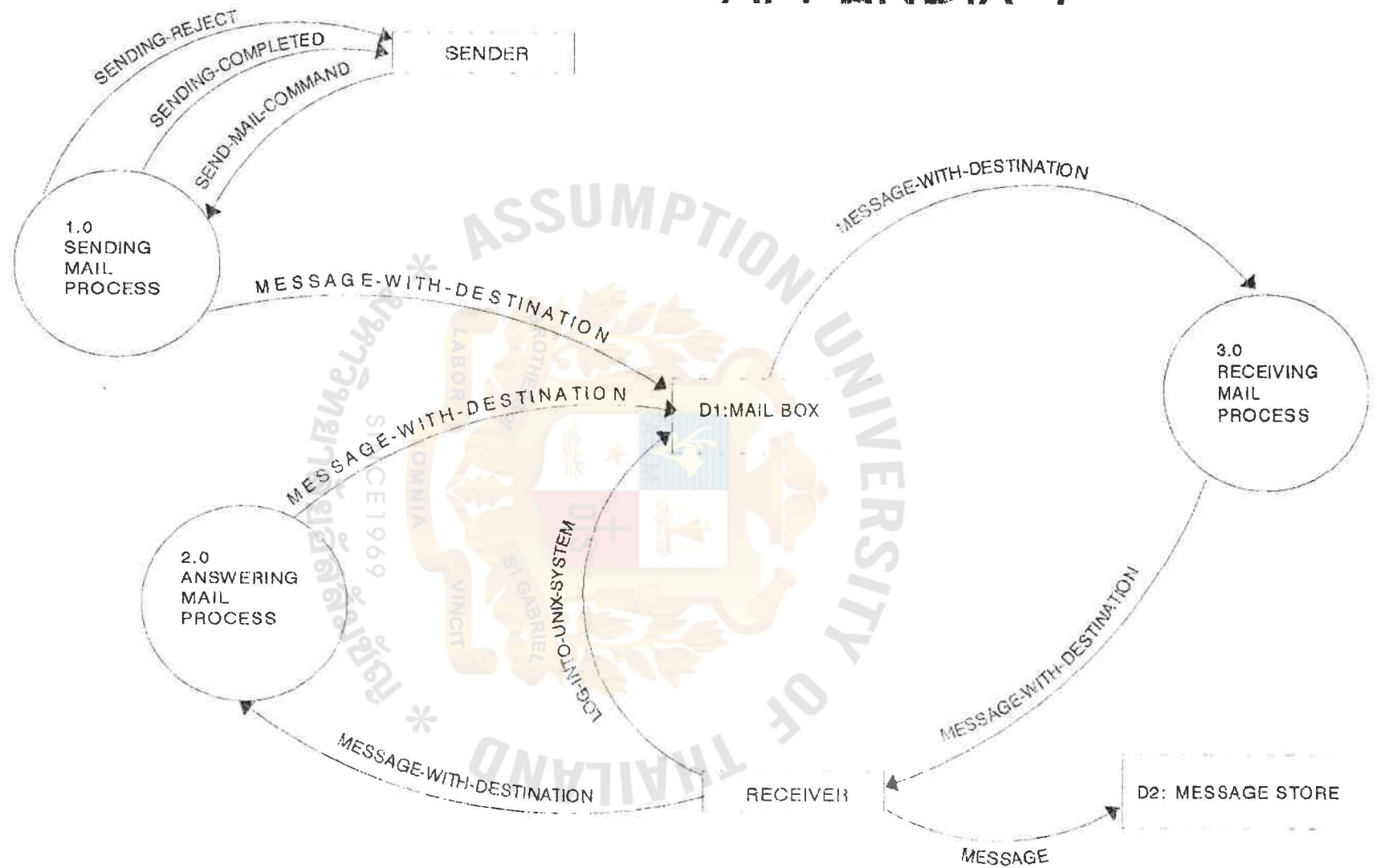
DATA FLOW DIAGRAM (LEVEL 0)
(EXISTING SYSTEM)

APPENDIX E



CONTEXT DIAGRAM :
INTERNAL ELECTRONIC MAIL
SYSTEM
SCT COMPUTER CO.,LTD.
(NEW SYSTEM)

APPENDIX F



DATA FLOW DIAGRAM (LEVEL 0)
(NEW SYSTEM)

DATA DICTIONARY

SENDING-DOC = IT IS THE DOCUMENT THAT IS SENT FROM
SENDER TO RECEIVER.

RECEIVING-DOC = IT IS THE DOCUMENT THAT THE RECEIVER
RECEIVES FROM SENDER.

SENDING-MAIL = IT IT THE MESSAGE THAT IS SENT THROUGH
ELECTRONIC MAIL SYSTEM FROM SENDER TO
RECEIVER.

SENDING-REJECT = IT IS THE REJECTED MESSAGE THAT IS SHOWN BY
REJECTING FROM SENDING MAIL PROCESS. THE
MAIL CANNOT SEND AS THIS STATUS OCCURS.

SENDING-COMPLETED = IT IS THE MESSAGE SHOWN IN THE SENDING
MAIL PROCESS TO RESPONSE THE COMPLETION
OF SENDING MAIL .

RECEIVING-MAIL = IT IS THE MAIL THAT THE RECEIVER SIDE WILL
RECEIVE FROM ELECTRONIC MAIL SYSTEM.

SEND-MAIL-COMMAND = IT IS THE MAIL COMMAND THAT WILL USE AS
SENDER WOULD LIKE TO SEND MAIL TO
RECEIVER SIDE.

MESSAGE-WITH-DESTINATION = IT IS THE MESSAGE THAT IS
SPECIFIED THE RECEIVER
DESTINATION, SUCH AS, NAME OF
RECEIVER ETC.

LOG-INTO-UNIX-SYSTEM = THE RECEIVER HAS TO LOG INTO UNIX
HOST IN ORDER TO RECEIVE THE
ACKNOWLEDGEMENT OF THEIR MAIL.

MESSAGE = THE MESSAGE FROM SENDER THAT RECEIVER WOULD LIKE
TO STORE FOR RECORDING IN REFERENCES OR OTHER
PURPOSES.



APPENDIX H



COST SHEET

NO. :

DATE :

☐ MANUFACTURING & SCG

☐ GOVERNMENT

☐ FINANCIAL & BANKING

☐ OFFICE AUTOMATION

☐ INVOICE

☐ ON LOAN

INSTALL DATE : _____

บริษัท _____

ส่งของที่ _____

ที่อยู่ _____

ชื่อลูกค้า _____

ที่อยู่ _____

โทร. _____

โทร. _____

ITEM	SIT	PART NO	DESCRIPTION	QTY	PRICE	AMOUNT	COST	PO NO SCT-C
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
				TOTAL				
				MARGIN				

*** แผนกคลังสินค้าจะจัดและส่งสินค้าตามรหัสสินค้าและจำนวนที่ระบุมาใน COST SHEET นี้เท่านั้น ***

REMARKS

ผู้เสนอราคา _____

แผนกคลังสินค้า _____

ผู้จัดการส่วน _____

หน่วยงานจัดซื้อ _____

APPENDIX I





SCT COMPUTER CO., LTD.

Services Division : 330 Phaholyothin Road, Bangkok 10400, Thailand
Tel. 2730037, 2793087, 2794461 Fax: (662) 2713725 G.P.O. Box 39

ใบสั่งซื้อ PURCHASE ORDER	เลขที่: NO.
	วันที่: DATE

เรียน: TO	รหัสผู้ขาย : SUPPLIER CODE
	วันที่ส่งของ: SHIPMENT DATE

บริษัทตกลงซื้อขายของตามรายการและราคาข้างล่างนี้ และถือว่าท่านมีข้อผูกพันความเงื่อนไขที่ระบุไว้ด้านล่างใบสั่งซื้อนี้

ลำดับ ITEM	รหัสสินค้า PRODUCT CODE	รายการสินค้า PRODUCT DESCRIPTION	จำนวน QTY	ราคาต่อหน่วย UNIT PRICE (BAHT)	ราคารวม AMOUNT (BAHT)

	ราคารวม TOTAL
--	------------------

ส่งมอบที่: PLACE OF DELIVERY	ผู้มีอำนาจลงนาม AUTHORIZED SIGNATURE
ระยะเวลาประกัน: TERM OF WARRANTY	
กำหนดชำระเงิน: TERM OF PAYMENT	

APPENDIX J



AAT021

COMPATIBILITY OF AST PRODUCTS AND THE IBM 3270 COMPUTER

The attached charts illustrate the level of compatibility of the IBM 3270 computer with AST PC enhancement products. These results were obtained through performance of the AST Product Compatibility Test, Revision A.

The level of compatibility achieved is indicated by one of the following symbols:

- "Y" - Successfully passed all aspects of the AST Product Compatibility Test.
- "N" - Did not successfully pass the AST Product Compatibility Test.
- "/" - This feature or option does not apply to this product.
- "*-n" - Conditionally passed the AST Product Compatibility Test
See note "n".
- "NT" - This feature was not tested.

It should be noted that a Personal Computer is a system and that compatibility is affected by all aspects of that system (ie. computer, AST products, other vendor products, software, etc.).

APPENDIX K

MEMORANDUMS



บันทึกภายใน
INTERNAL MEMO

เรียน To	ผจฉ. กท. ๓๖๓๕	วันที่ Date	03-04-3๕.
จาก From	ผจฉ. กท. ๐๓.	โทร. Tel.	
เรื่อง Re	Specification ของ BOT Project		

ตามที่ ท่าน ได้ส่ง Specification ของ BOT
Project ไปตรวจสอบ แล้ว ครับ. ได้ส่ง AST และ
IBM. ไปตรวจสอบ ได้ ตาม Spec. หัวข้อ ๓๓'
Peripheral ของ Third Party ตรวจสอบ Test
กับ Hardware หัว: เหนือ อีกครั้ง ให้แน่นอน.

APPENDIX L



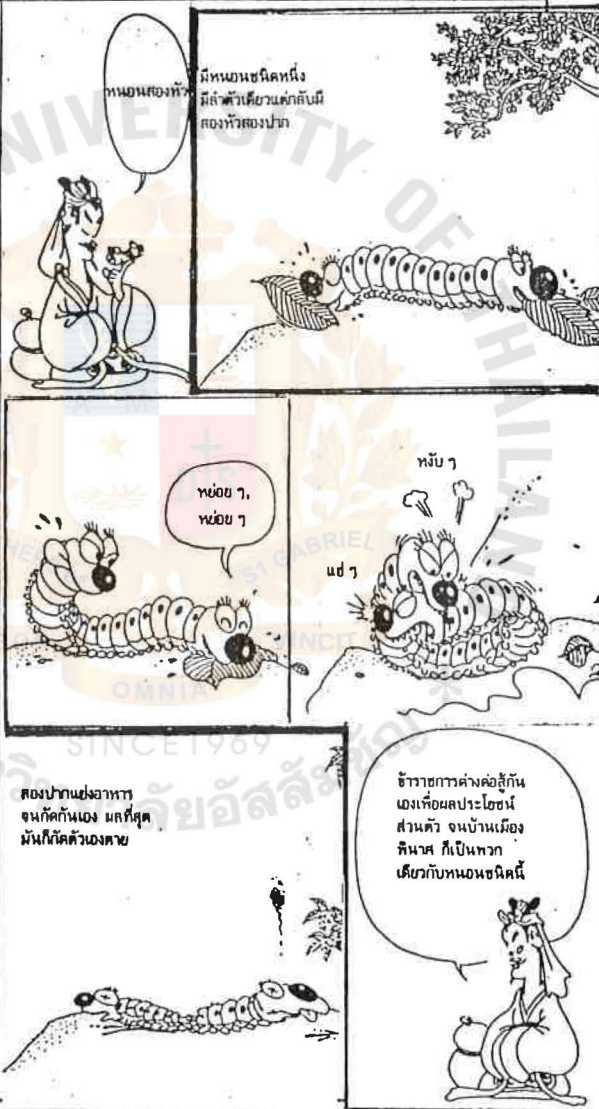
ឧប្បត្តិ 12/34

โต๊ะ ฟีนอลิก SCT-C

ก็ที่บ้านๆ เนี่ย เพราะหลายครั้งเลยละ ที่
เราไม่ได้รับความร่วมมือจากแหล่งข้อมูลระดับสูง
ทำเอาต้องกุมขมับหิบบินเรื่องชาวบ้านชาวช่อง
มาลงกันบ้าง อย่างการชุมนุมขับหน้าปก ก็
มาจากความไม่เจตนาจริงๆ เพราะหลังจากเล่น
เรื่อง FAST START คิค่อกันมา ก็หวังว่าจะ
ขอปิดฉาก 3 เดือนแห่งความหึงหึงไปอย่างสวย
งามแต่ต้องจบเห่ที่บั้งเอือมข้อมูลการกรรรมเอ๊ย
ไฟ้อข้อมูลและคิวเลรถลอบก๊อเท้านั้นเองจริงๆ

เราและ"สายใย"ก็จะทำกันไป (ก็มันเป็นงานเหมือนกันนี่) จนกว่าถูกกบว.(คณะกรรมการบริหารระดับสูงต่อว่า) เล่นงานเอา

កងបត្រ.



APPENDIX M



ด่วนมาก

วันที่ 19 กุมภาพันธ์ 2534

เรื่อง ขอเชิญประชุมเตรียมงาน Marketing Information Seminar
เรียน ผู้ที่เกี่ยวข้องทุกท่าน

ด้วยบริษัท จะจัด Marketing Information Seminar สำหรับพนักงานฝ่ายการตลาด และฝ่ายผลิตภัณฑ์ ในวันเสาร์ที่ 9 มีนาคม ศกนี้ โดยมีคณะผู้เตรียมงานดังรายชื่อต่อไปนี้

- | | | |
|-----------------|----------------|----------------------|
| 1. นางอรัญญา | วิริยานนท์ | หัวหน้าคณะทำงาน |
| 2. นายกิตติกุล | ปฐศรี | คณะทำงาน |
| 3. นางรุ่งรัตน์ | ประภาศิริกุล | คณะทำงาน |
| 4. นางอัญชลี | เอื้อ เอ็ดดกุล | คณะทำงาน |
| 5. นางสาวใจ | บุญพงษ์ | คณะทำงาน |
| 6. นายวสิน | เต็มทรัพย์ | คณะทำงาน |
| 7. นายพรพจน์ | สันติลักษณ์ | คณะทำงาน |
| 8. นายธรรมบุญ | ชินวรรโณ | คณะทำงาน |
| 9. นางพนิดา | ขุนาค | คณะทำงาน |
| 10. นางสาวศศิมา | สุจริตวิมลกุล | คณะทำงาน |
| 11. ม.ล.ภัทรชัย | ชยางกูร | คณะทำงาน |
| 12. นายพิชิต | วาร์นันท์ศิริ | คณะทำงาน |
| 13. น.ส.รัชราพร | นิรนาทรังสรรค์ | คณะทำงาน |
| 14. นางวรรณภา | ผลประเสริฐ | คณะทำงาน |
| 15. นายธนโรจ | วรรณศรีสวัสดิ์ | คณะทำงานและเลขานุการ |

จึงขอเชิญคณะทำงานทุกท่าน เข้าร่วมประชุมโดยพร้อมเพรียงกัน เพื่อเตรียมการจัดงานดังกล่าว ในวันพฤหัสบดีที่ 21 กุมภาพันธ์ ศกนี้ เวลา 14.00 น. ณ ห้องประชุม IEC 2 ชั้น 12

๑. ๑๑๑

อรัญญา วิริยานนท์
หัวหน้าคณะทำงาน

APPENDIX N



แบบสอบถาม

เรื่อง ระบบการส่งเอกสารภายใน บริษัท เอสซีที คอมพิวเตอร์ จำกัด

1. ประเภทเอกสารดังต่อไปนี้ ท่านได้รับหรือส่งมากน้อยเพียงใด

	ทุกวัน	ทุกสัปดาห์	ทุกเดือน	นานๆ ครั้ง	ไม่เคย
- MEMORANDUMS
- CONFERENCE DOCUMENT
- ANNOUNCEMENT
- NEWS
- TECHNICAL INFORMATION
- COST SHEET
- REPORT

2. เอกสารที่ท่านรับส่ง ท่านมีความรู้สึกถึงความรวดเร็วในการรับส่งเอกสารนั้นในปัจจุบัน เมื่อเทียบกับความถี่ของการเอกสารนั้น เป็นอย่างไร

- ไม่ทันกับความถี่การใช้งาน
- เหมาะสมพอดี
- รวดเร็วมาก

3. ถ้าท่านสามารถรับส่งเอกสาร หรือได้ติดต่อกับผู้อื่นได้ทันที ท่านคิดว่าจะสามารถเพิ่มประสิทธิภาพการทำงานของท่านหรือไม่

- ไม่เพิ่มเลย
- เพิ่มได้น้อย
- เพิ่มได้มาก

4. ในการทำงานในปัจจุบันท่านให้ความสำคัญต่อ เอกสารมากน้อย เพียงใด

- สามารถปฏิบัติงานได้ เพียงการยืนยันทางโทรศัพท์
- ต้องมีสำเนาเอกสาร แต่ไม่ต้องมีลายเซ็นของผู้มีอำนาจครบ
- ต้องมีเอกสารตัวจริง และเป็นเอกสารที่สมบูรณ์เท่านั้น จึงปฏิบัติงานได้

5. ถ้าท่านจะต้องพิมพ์ เอกสาร เองทั้งหมด ท่านมีความคิดเห็นอย่างไร

- ยุ่งยากและเสียเวลามากขึ้นมาก
- มีความลำบากเพิ่มขึ้น เล็กน้อย
- สามารถทำได้ไม่ลำบาก

6. เอกสารที่ท่านส่งและได้รับเป็นเอกสารอะไรบ้าง (เรียงจากมากไปหาน้อย)

- ___ MEMORANDUMS
- ___ CONFERENCE DOCUMENT
- ___ ANNOUNCEMENT
- ___ NEWS
- ___ TECHNICAL INFORMATION DOCUMENT
- ___ COST SHEET
- ___ REPORT

7. ปัจจุบันท่านใช้คอมพิวเตอร์

- ประจำตัวท่านเอง
- ประจำส่วนงาน
- ของส่วนงานอื่นๆ
- ไม่เคยใช้เลย

8. ท่านเคยประสบปัญหาการส่งเอกสารด่วน หรือไม่ ถ้าเคยแก้ไขอย่างไร

- ไม่เคย
- เคย แก้ไขโดย
 - นำส่งเอง
 - ฝากผู้อื่นที่ไม่ใช่เจ้าหน้าที่โดยตรงส่ง
 - ให้ผู้รับมารับเอง
 - ยังคงส่งตามขั้นตอนเดิม

9. ระบบ E-MAIL ให้ใช้ในการติดต่อสื่อสารในปัจจุบัน ท่านจะใช้หรือไม่

- ไม่ใช้
- ใช้ ใช้กับเอกสาร
 - MEMORANDUMS
 - CONFERENCE DOCUMENT
 - ANNOUNCEMENT
 - NEWS
 - TECHNICAL INFORMATION DOCUMENT
 - COST SHEET
 - REPORT

ประวัติผู้ตอบแบบสอบถาม

1. เพศ

2. อายุ

3. ระดับการศึกษา

4. ส่วนงาน

- MARKETING
- SERVICE
- FINANCE & ADMINISTRATION
- PRODUCT
- (โปรดระบุ)

5. ตำแหน่ง (โปรดระบุ)

สรุป

1. จากการวิเคราะห์ ความถี่ของการรับส่งเอกสาร แยกตามประเภท พบว่าเอกสารที่มีความถี่ของการรับ-ส่งมากที่สุดคือ MEMORANDUMS
2. ผู้ตอบทั้งหมดมีข้อคิดเห็นว่าการส่งเอกสารในปัจจุบันไม่ทันท่วงที ต่อการใช้งาน
3. ผู้ตอบทั้งหมดมีข้อคิดเห็นว่าการส่งเอกสารที่รวดเร็วขึ้นจะเพิ่มประสิทธิภาพในการทำงาน
4. งานภายในบริษัท ให้ความสำคัญกับผู้รับผิดชอบมาก
5. ผู้ตอบส่วนใหญ่คิดว่า ยุ่งยากเพิ่มบ้างเท่านั้น
6. เอกสารที่ได้รับส่งมากเป็น MEMORANDUMS
7. ปัจจุบันพนักงานใช้คอมพิวเตอร์อยู่แล้ว และมีเครื่องทุกส่วนงาน
8. ทุกคนเคยประสบปัญหาเอกสารด่วน
9. ผู้ตอบทั้งหมด มีข้อคิดเห็นว่าจะใช้ โดยส่วนใหญ่จะใช้ E-MAIL SYSTEM กับ MEMORANDUMS ก่อน

การวิเคราะห์

- เนื่องจาก SCT-C เป็นบริษัทผู้จำหน่ายเครื่องคอมพิวเตอร์ จึงให้มีจุดเด่นหลายประเด็น คือ มีเครื่องจำนวนมากกว่าบริษัททั่วไป มีพนักงานส่วนหนึ่งมีเครื่องประจำของตน และทุกส่วนงานมีเครื่องประจำส่วนงาน อีกทั้งพนักงานส่วนใหญ่ หรือทั้งหมดมีความรู้พื้นฐานคอมพิวเตอร์ในระดับดีมาก การฝึกอบรมสามารถทำได้ง่าย อีกทั้งถ้าเกิดปัญหาใดๆ จะสอบถามจากพนักงานด้วยกันง่าย และสะดวกมาก
- ระบบการทำงานยังมีติดระบบเอกสารมาก โดยให้ความสำคัญต่อเอกสารต้นฉบับหรือ ต้องมีลายเซ็นผู้รับผิดชอบครบ ทำให้ระบบงานต้องรอคอยเอกสาร ความเร็วในการส่งเอกสารจึงเป็นปัจจัยที่สำคัญที่สุด ในการเพิ่มประสิทธิภาพของงาน การแก้ไขควรแก้ไขให้ลดความสำคัญ ที่ต้องตรวจสอบต้นฉบับ การใช้ PASSWORD สามารถตรวจสอบ AUTHORIZED USER ได้ดีแล้ว ซึ่งจะทำให้ระบบ E-MAIL เข้ามาแก้ไขปัญหาได้อย่างมีประสิทธิภาพ
- พนักงานส่วนใหญ่พร้อมที่จะใช้ E-MAIL ระบบซึ่งจะใช้เวลาน้อยมาก และส่วนใหญ่ คิดว่าการที่ต้องพิมพ์เอกสารเองยุ่งยากเพิ่มขึ้น เพียงเล็กน้อย

APPENDIX O

ASCII CODE TABLE



ตารางรหัส ASCII (PC CODE)

Hex Digit 1st + 2nd +	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0				0	@	P	'	p				ฉ	ภ	ะ	เ	อ
-1			!	1	A	Q	a	q			ก	ท	ม	ะ	แ	อ
-2			"	2	B	R	b	r			ข	ฅ	ย	า	โ	อ
-3			#	3	C	S	c	s			ช	ณ	ร	า	ใ	อ
-4			\$	4	D	T	d	t			ค	ค	ก	า	ไ	อ
-5			%	5	E	U	e	u			ค	ค	ล	า	า	อ
-6			&	6	F	V	f	v			ข	ก	ภ	า	า	อ
-7			'	7	G	W	g	w			ง	ท	ว	า	อ	อ
-8			(	8	H	X	h	x			จ	ช	ค	า	'	อ
-9			)	9	I	Y	i	y			ฉ	น	ช	า	า	อ
-A			*	:	J	Z	j	z			ช	บ	ค	.	า	
-B			+	;	K	[	k	{			ช	บ	ท		+	
-C			,	<	L	\	l	|			ณ	ณ	พ		'	
-D			-	=	M	]	m	}			ณ	ณ	อ		'	
-E			.	>	N	^	n	~			ฉ	พ	ย			
-F			/	?	O	_	o				ฉ	พ	า	า		

\$ cat memo

INTERNAL MEMO

TO SENIOR MANAGER PUBLIC SECTOR DEPARTMENT
FROM OFFICE AUTOMATION MANAGER
SUBJECT SPECIFICATION
DATE 03-04-34

REFER TO YOUR BOT PROJECT'S SPECIFICATION DOCUMENT,
I ALREADY CHECK. AST COMPUTER AND IBM COMPUTER CAN MEET ALL
BOT'S REQUIREMENT, BUT PERIPHERAL OF THIRD PARTY SHOULD BE
TESTED WITH HARDWARE BEFORE THE INSTALLATION.

MR.PICHIT WORANANSIRI

\$ mail rattiya < memo
\$

\$ cat conference

CONFERENCE DOCUMENT

DATE 19/02/91

SUBJECT INVITING TO PREPARE THE MEETING OF MARKETING
INFORMATION SEMINAR
TO WHOM IT MAY CONCERN

SCT COMPUTER WILL HAVE MARKETING INFORMATION SEMINAR FOR
STAFFS OF MARKETING AND PRODUCT DEPARTMENT ON 9/03/91 BY HAVING
BOARD OF PLANNING TEAM AS FOLLOWS :

1. MRS.ARUNNEE VIREEYANONDA
2. MR.KITTIKUM PUNSRI
3. MRS.RUNGRAT PRAPASIRIKUL
4. MRS.ANCHAREE CHERTKUL
5. MRS.SOMJAI BOONPONG
6. MR.WASIL PUMSUB
7. MR.PORNPOJ SUNTILUKKANA
8. MR.THAMMANOON CHINWANNO
9. MRS.PANIDA BOONNAK
10. MRS.SATIMA SUNTILUKKANA
11. ML.PATTARACHAI CHAYANGKUL
12. MR.PICHIT WORANANSIRI
13. MISS RATCHARAPORN NEERANAT
14. MRS WANYA POLPRASERT
15. MR.THANAROJ WANSRISAWAT

BOARD OF PLANNING TEAM WILL HAVE THE CONFERENCE ON 21/02/91

- 14.00 AT IEC MEETING ROOM, FLOOR12. PLEASE COME ON TIME

MRS.ARUNNEE VIRIYANONDA

\$ mkt1="kittikun rungrat ancharee somjai wasil pornpoj thammanun
panida satima pattarachai pichit ratcharaporn wanya thanaraj"
\$ mail -s "conference" \$mkt1 < conference
\$

APPENDIX R

\$ mail rattiya

Subject: MARKETING SEMINAR

MARKETING DEPARTMENT WILL HAVE THE MARKETING SEMINAR AT MEETING ROOM 1, IEC FLOOR12 ON 11/11/91. PLEASE CONFIRM TO ME BEFORE 5/11/91.

SIRIRAT TUNSRI.

EOT
\$



```
$ mail
SCO System V Mail (Version 3.2) Type? for help.
"/usr/spool/mail/rattiya": 1 message 1 unread
> U 1 root Tue Feb 12 01:31 13/376 MEETING
& alias mkt1 pichit wasun sirirat
& mail mkt1
Subject: MARKETING SEMINAR
```

MARKETING DEPARTMENT WILL HAVE THE MARKETING SEMINAR AT MEETING ROOM 1, IEC FLOOR 12 ON 11/11/91. PLEASE CONFIRM TO ME BEFORE 5/11/91.

RATTIYA LIMPITEEP

```
EOT
& quit
$
```

