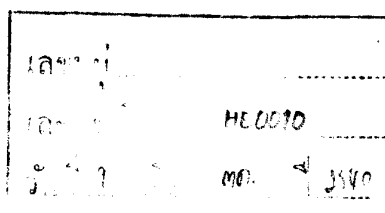


**ANALYSIS AND DESIGN COMPUTER SYSTEM
FOR
PUBLIC PROVINCIAL HEALTH OFFICE**



สถาบันวิจัยระบบสาธารณสุข

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- A file server
- 19 sets of workstations
- Office accessories such as printers, modems, Uninterrupt power supplies, etc.
- Database application and LAN application programs

3. Establishing a Computer Department

In order for the network to work efficiently, an independent “Computer Department” is required. Its mission involves system analysis and design, system maintenance and training. The department will have at least 7 officers for the following responsibilities:

1. Maintenance
2. Planning and system analysis
3. Training
4. System development

At present, there is an inadequate number of computer specialists particularly in the governmental section because of low benefit. An alternative solution is to offer existing personnels who are interested in computing for a higher education. An actual position for a computing staff will definitely be allocated in every PPHO in the near future.

It is urgent to have a computer department ready for the installed network. The government must have a clear vision on what is going to be in the future world of information. It is therefore wise to prepare oneself for the coming technology both in manpower and equipment. Every one has to realize that computers can be used more than a word processor.

4. Training Programs

It is necessary to provide all officers with different levels of computer training. The budget is estimated to cost about 137,000 Baht for each PPHO. This plan is composed of 3 levels as follows:

1. Seminar/Workshops for the executive level
2. Workshops for users in a relevant department
3. Continuing education for the computer officers

5. System Installation

We suggest that computer system in the PPHO be installed by a private sector. The installation cost is expected to be approximately 150 million Baht for all PPHOs and it will take 5 years to complete the installation. A private computer dealer must be carefully selected in order to fit the need of each PPHO.

EXECUTIVE SUMMARY

Health System Research Institution (HSRI) has realized the importance of using computer technology in public health, especially in the Provincial Public Health Office (PPHO) which is the main administrative office responsible for all public health tasks in the provincial level. Our research was funded to study the necessity and feasibility of using computers in the PPHO by HSRI and WHO.

1. Computerized Tasks

Having studied in four provinces (Ayudhaya, Nakorn Sawan, Samut Prakarn and Phuket), we propose that the following 5 main tasks could be computerized :

- 1.1 Budgeting and Financial system
- 1.2 Personnel system
- 1.3 Inventory system
- 1.4 Health Consumer protection and Drug administration
- 1.5 Information system

All of the proposed systems will be designed to be integrated and closely related to each other. For example, the budgeting and financial system and information system share some information with the personnel system. In order to get computer system, we need to work on the network system and adjust working process.

2. Hardwares

Among various network systems in the market, we decide to use Local Area Network (LAN) for the PPHO. It is estimated to cost about 1.8 million Baht per PPHO. A system will consist of

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CHAPTER 1 : INTRODUCTION

Statement of the Problem

The economic in Thailand has been grown rapidly in the past ten years. People's life style has already changed from agricultural to industrial. Both governmental and private sectors need precise and fast information in this competitive world.

This is why Thai government announced the year of 1995 to be "Thailand Information Technology Year". This is to encourage relevant sectors to utilize the information technology in many ways such as solving traffic problems, developing an on-line classroom in urban areas, solving fundamental public health problems, handling public information, etc.

In order to keep pace with the advanced technology and make the public health work more efficient, the Health System Research Institution has funded the investigators to study the necessity and feasibility in using computer system in the PPHO level .

Objectives

1. To study and propose a computer system suitable for the PPHO operation and coordinate with the government and private organizations in analyzing their needs in the operation system.
2. To coordinate with private section for design computer system.
3. To study the old operation system and its limitations. Propose solutions for the most efficient computer system.
4. To design the implementation plan for computer system.
5. To study the feasibility for an information system linking all databases from PPHOs.

Level of research

1. Four provinces including Ayudhaya, Samut Prakarn, Nakorn Sawan and Phuket have been sampled.
2. The computer system has been designed to fit only sample provinces.

Methodology

1. Collecting data in sample provinces using questionnaires
2. Examining the operation system in the PPHOs by interviewing and observing
3. System analysis
4. Designing an appropriate computer system
5. Conclusion and evaluation

Budget

The project was funded by the Health System Research Institution

Project Duration

May 1, 1994 to August 31, 1994

Expected benefits

1. A suitable prototype which can be further developed will be proposed.
2. Listed hardwares available
3. A guidance for computer users in the PPHO can be further established.

CHAPTER 2 : THE PROVINCIAL PUBLIC HEALTH OFFICE (PPHO)

Mission

A provincial public health office is a governmental provincial unit representing the Ministry of Public health in a province. The provincial public health doctor, being the head of the office, is responsible for reporting, promoting, supporting, controlling, and coordinating any health activities within the area. The mission is to make Thai people healthy both in their body and mind with a good quality of life.

The organization of a PPHO's mission is shown in Fig. 2.1 and can be listed as follows:

1. Operating and coordinating all public health works in the province.
2. Regulating and supporting lower health promoting units in the province (Community hospitals, district public health office, and small health stations).
3. Supporting any relevant government units.

The 5 main missions of the PPHO are

1. Administration

1.1 **Administration** responsible for resource management for example, man power, financial and accounting paper works, legal documents, inventory and construction projects.

1.2 **Policy** responsible for writing policies (for all levels) as well as data analysis, making statistics, and research proposal.

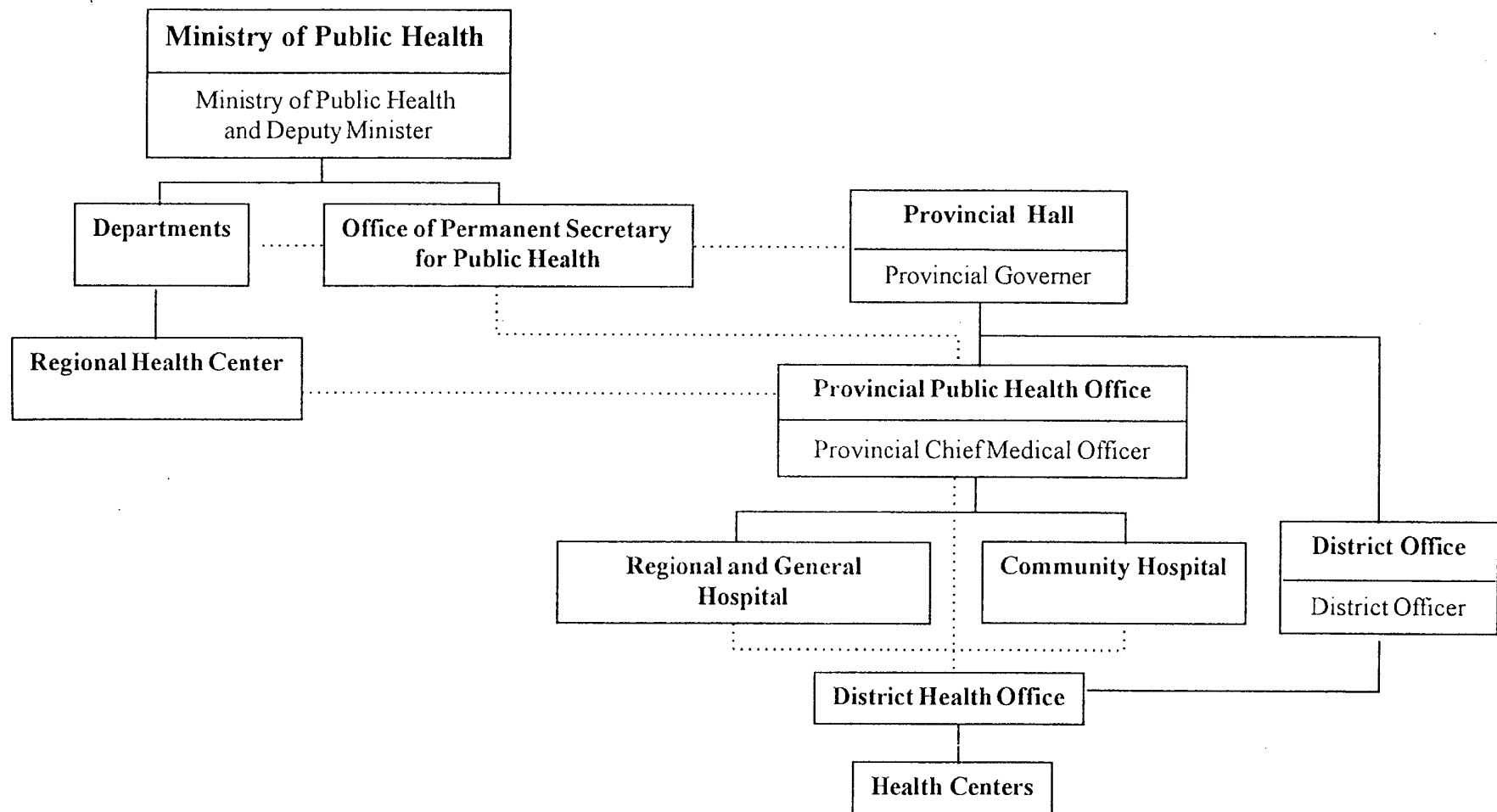


Figure 2.1 Organization of the Ministry of Public Health

2. Public Health

2.1 Health Education responsible for evaluating people's health education background both their attitude and knowledge as well as executing relevant projects in order to improve health and reduce mortality rate. The department is also responsible for the production of health media and public relation.

2.2 Human Development responsible for surveying training needs and proposing relevant plans for the health officers' (and volunteers') continuing education (in all levels).

3. Health Services

3.1 Dental Health responsible for dental health survey, proposing and executing dental plans, training, and dental health education.

3.2 Health Promotion responsible for health survey, proposing an appropriate plan for disease control and rehabilitation as well as health education.

3.3 Endemic Disease Control responsible for surveying local endemic diseases and proposing prevention and vaccination plans as well as providing health education to local people.

3.4 AIDS and Veneral Disease Control responsible for surveying the epidemiology of AIDS and other veneral diseases within the local area as well as proposing prevention plans, e.g. AIDS surveillance programs, officer training, health education etc.

4. Environmental Health and Sanitation

Responsible for resolving environmental health problems for example, water pollution, air pollution etc. as well as proposing a solution. Its mission also includes providing clean water for a community, pet control, sewage system and sanitation.

5. Public Consumer Protection and Health Pharmacy

Responsible for surveying the product quality in the market as well as taking care of medical supplies and needs in hospitals.

Present organization

The PPHO comprises 9 departments as shown in Figure 2.2

The responsibility of each department can be described as follows:-

1. Administration Department is responsible for housekeeping routines such as officers' records, salary, budget, inventory, maintenance and interdepartmental communication. The responsibilities can be categorized as below:

1.1 Documentation

- preparing and distributing official documents as well as destroying unused documents

- mailing and telephone system

- keeping confidential records

1.2 Finance and budgeting

- Accounting

- Preparing financial reports , budget allocation and adjustment.

- Regulating expenditure. Make sure that all expenditures are appropriate and legally spent.

- Salary , pension and welfares

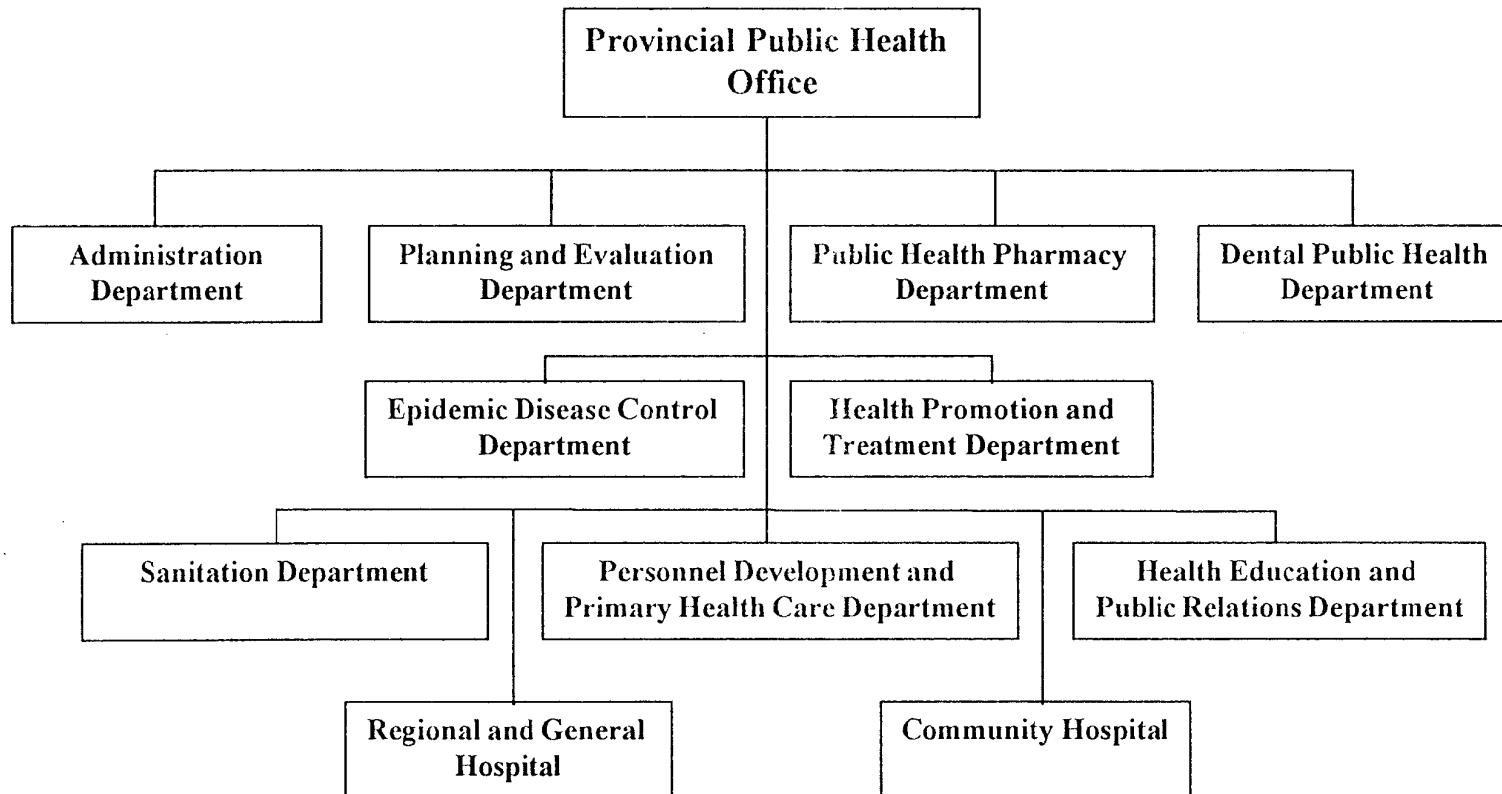


Figure 2.2 Organization of Provincial Public Health Office

1.3 Personnel Affairs

- Employing , hiring and unemploying officers
- Allocation of officers within the province
- Promotion and punishment
- Officer' s records
- Officer's welfare documentation

1.4 Legal Affairs

- Interpretation of law and regulations as well as issuing legal documents
- Prosecution of misbehaved officers, dealers or factories
- Revision of out-of-date regulations

1.5 Construction and Maintenance

- Proposing contruction or renovation plans for hospitals and health units
- Land management
- Signing a contract and monitoring the construction
- Inspection of any constructions being built by the PPHO
- Building maintenance
- Coordinating with the Environmental Health and Sanitation Department

1.6 Inventory and Vehicles

- Proposing and executing a yearly purchasing plan for all departments in the PPHO
- Maintenance of the vehicles used in the PPHO
- Keeping records of all purchased material and registered equipment as well as

maintenance

- Looking after any budget vehicle purchasing programs (cars, motorcycles)

established by the PPHO

- Looking after any budget cellular phone purchasing programs established by the PPHO

1.7 Public Relations

1.8 Coordination

1.9 Occasionally Assigned Jobs

2. Planning and Evaluation Department is responsible for writing up the master public health plan, operation plan and the province development plan. Therefore, it is needed to be the public health information center.

2.1 Public Health Information Center

1. Analysis of public health resource data

- Analyzing resource data from the resource report (#6)
- Collecting and analyzing expenditure budget and other reports

2. Collecting and analyzing health data (population, vital statistics, morbidity rate etc.)

3. Collecting and analyzing public health activity information

- monthly report
- special event report
- report of diseases
- budget report
- epidemic disease surveillance report
- any other important reports

4. Collecting economic and social information

5. Report distribution

6. Setting up the public health information office

7. Distribution of report forms

- instruction
- distribution

2.2 Public Health Planning

- Writing and proposing the provincial public health plan, both the master and operation plans
- Adjusting the plans
- Establishing a working annual schedule
- Coordinating the Health Assistance Network

2.3 Training Plan

- Analyzing and planning for the man power and proposing a suitable man power frame
- Surveying academic needs
- Establishing a training plan for eligible officers

2.4 Monitoring and Follow Up

2.5 Research Promotion

- Doing and supporting research
- Publicizing the research

2.6 Evaluation

- Collecting the number of works being done and comparing with the master plan

2.7 Epidemic disease control

- Surveillance system
- Collecting , analyzing and reporting epidemic disease data

2.8 Special projects

2.9 Occasionally assigned jobs

3. Public Health Pharmacy Department is responsible for administering all medical supplies in the hospitals, quality control , health consumer protection as well as supporting the primary health care through health education programs and monitoring. Tasks can be classified as follows,

3.1 Consumer Protection

1. activating laws and enactment such as:

- Food enactment
- Drug enactment
- Addicted drug enactment etc.

by inspecting the manufacturer and issuing appropriate licenses, registration of health products and penalizing those who misbehave.

2. Activation of the Practitioner License Enactment

3. Activation of the Practitioner Office Enactment

4. Establishing the provincial consumer protection board in order to propose a consumer protection plan

5. Health Education

3.2 Medical Supplies And Equipment Standard

3.3 Providing Medical Supplies And Equipment For Hospitals

3.4 Technical Support

3.5 Occasionally Assigned Jobs

4. Dental Public Health Department is responsible for planning and administering dental public health works, doing dental health research, supporting dental services within the province and evaluating dental public health projects as well as establishing training programs. Tasks can be classified as follows,:

- 4.1 Dental Clinic
- 4.2 Mobile Dental Clinic
- 4.3 Dental Public Health Promotion
- 4.4 Preventive Dentistry
- 4.5 Training Programs
- 4.6 Evaluation
- 4.7 Occasionally Assigned Jobs

5. Epidemic Disease Control Department is responsible for planning , supporting relevant epidemiology studies and research. It is also responsible for training health officers , monitoring, evaluating , and giving advice to the practitioners.

5.1 Control Of General Endemic Diseases :

- 1. Control of general endemic diseases
 - Control of gastrointestinal tract diseases
 - Control of parasitic diseases
 - Control of rabies
- 2. Control of insect-carrier diseases
 - Control of hemorrhagic fever and meningitis
 - Control of malaria
- 3. Control of vaccinate diseases

4. Control of contactable diseases

- Control of tuberculosis
- Control of leprosy

5.2 Control Of Veneral Diseases And AIDS

- Searching for V.D patients
- Treatment of V.D. patients
- Follow up of V.D. patients
- Control of V.D. sources
- Health education
- Laboratory investigation e.g. culturing, staining from direct smearing,

microscopic examination

- AIDS local surveillance program
- Control of AIDS' epidemiology
- Establishment of no-name clinics
- Blood examination
- Training and education
- Departmental coordination
- Analysis and Evaluation

6. Health Promotion and Treatment Department is responsible for planning, supporting, treating as well as rehabilitating people. Also included are the promotion of relevant research, monitoring, evaluation, training and educating people.

6.1 Mother and Child Care

- Planning and establishing relevant projects
- Budget management
- Short course training

- Health education and public relation
- Monitoring system
- Promotion of community involvement
- Departmental coordination

6.2 Family Planning

- Planning
- Establishment of family planning clinics
- Establishment of the effective information system - Budget management
- Surveillance of uterus cancer
- Preparation of investigating medical supplies
- Task analysis and evaluation
- Monitoring
- Training and health education

6.3 School Health Program

- Planning
- Establishment of the effective information system
- Preparation of medical supplies
- Preparation of recording forms
- Training of student leaders
- Analysis and reporting
- Services
- Monitoring

6.4 Nutrition Program

- Planning
- Data analysis and statistics
- Nutrition campaigns, e.g. school supplementary food, children weight

surveillance.

- Monitoring
- Training and education

6.5 Social Welfare Program

- Counseling
- Health education
- Departmental coordination

6.6 Mobile Health Services

- Planning
- Preparation of medical supplies
- Establishment of emergency units
- Evaluation

6.7 Health Services on Air

- Establishment of the radio network for remote areas
- Preparation of medical supplies via the radio network
- Training via the radio network
- Monitoring and evaluation

6.8 Supporting and Development of the Health Service System

- Technical development
- Development of the referral system
- Monitoring and evaluating the health service centres of all levels

6.9 Non Communicable Diseases Program

- Data collecting
- Promotion and development of small remote centres
- Research

6.10 Occasionally Assigned Jobs

7. Sanitation Department is responsible for job planning, academic supports and research in relevant issues. Also included are officer training, monitoring and consulting in order to support and improve the quality of services.

7.1 Rural Tap Water Project

7.2 Sanitation Project

7.3 Environmental Care Project

7.4 Disease Carrier Controls

7.5 Bio-Sanitation Project

7.6 Occasionally Assigned Jobs

8. Personnel Development and Primary Health Care Department is responsible for writing up plans and training, research, monitoring, evaluation and giving advice to all health personnels in order to obtain the most effective primary health care.

8.1 Academic Training

8.2 Job Training

8.3 Primary Health Care

9. Health Education and Public Relations Department is responsible for planning and executing the relevant health education programs, as well as research and counseling.

9.1 Health Education

9.2 Public Relations

9.3 Publication

9.4 Media Production

CHAPTER 3 : DEVELOPMENT OF THE COMPUTER SYSTEM

Having analysed all essential requirements in our health system, the authors are proposing to make use of the computers in the following routines within a Provincial Public Health Office (PPHO).

- A. Budgeting and financial system
- B. Personnel system
- C. Inventory system
- D. Health Consumer protection and medical supplies system
- E. Information system

The above systems have been designed to serve all Provincial Public Health Offices' routine works. Therefore, they can be modified to fit the office's need in every province.

In designing the systems, the authors have mainly focused on reducing the burdens of all practitioner levels and not causing any conflicts to the former official regulations.

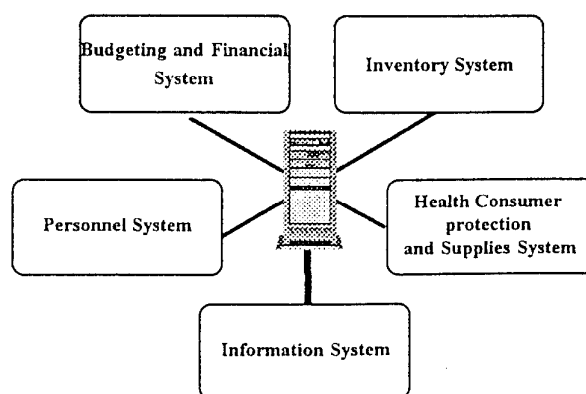


Figure 3.1 showing the proposed computer network in a Provincial Health Office

A. BUDGETING AND FINANCIAL SYSTEM

This is the first priority in the PPHO, responsible for budget control of all levels. Job loading was found to be the highest and always result in the overtime job. The process was also found to have a considerable amount of processing errors.

The budgeting and financial system is divided into 7 sub-systems as follows:-

1. Reimbursement system
2. Payment system
3. Budget control
4. Budget postponing
5. Salary and taxes
6. Accounting
7. Loans

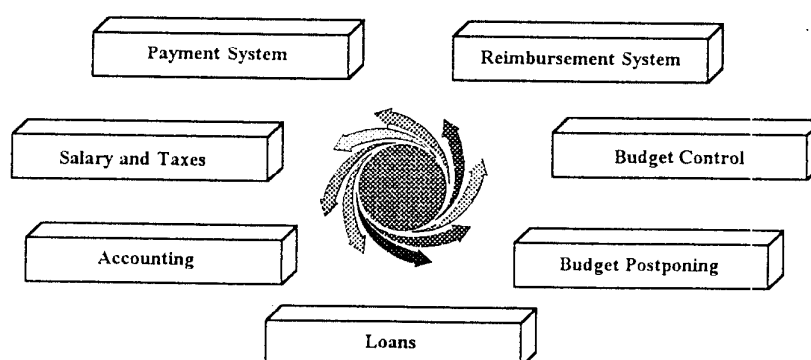


Figure 3.2 Budgeting and financial sub-systems

1. Reimbursement system

Responsible for drawing the money from the provincial level. The officials have to collect the forms '350' from all sublevels and send a "budget requirement form" for each category to the Provincial Financial Ministry in order to get the proposed budget.

The problems faced are the large number of documents received in the PPHO and the time consuming steps to classify the documents into the appropriate categories. Furthermore, all tax-reduction documents need to be done at this level.

2. Payment system

Responsible for paying all the sublevels according to the form 350. This includes all payments to the dealers as well as to the persons who have advanced the money.

The problem is the large number of money orders that needs to be paid to the dealers correctly, especially near the end of the year during which there is the highest rate of purchasing. We also have difficulties to check the amount that has been advanced by each person. Minor mistakes here can cause crucial conflicts.

3. Budget control

Responsible for controlling and checking the income and expense balance. This is very important for budget administration.

The problem is we used to spend a considerable amount of time to know the balance or how much money left by going through all paper works. Even worse is that some data is not recorded.

4. Budget postponing

When the money cannot be used by the end of the year, the budget is postponed. This is necessary for long continuous projects such as a construction project. The amount of the real budget needs to be distinguished from the amount postponed each year.

We do not have much problem in this procedure because there are quite few cases every year. However, the accuracy is very important.

5. Salary and taxes

Responsible for paying salary or extracting any amount from the salary. The money is usually transferred to individual banking accounts. In addition to the salary, we need to inform them the amount of taxation as well.

The problem is there are so great a number of salary and taxing documents need to be done by the end of each month. Quite frequently, a number of personnels move in and out the area causing mis-transferring the money.

6. Accounting

Responsible for all financial records, e.g. receipts, loans, money transfer etc.

Accounting seems to be the heart of budget administration. It usually takes a considerable amount of time to keep and report these financial records.

7. Loans

Responsible for borrowing and returning money in some health relevant projects. A large number of borrowing records have to be kept for investigation.

Loaning needs to be in accord with real payment. The correct amount must be put back into the provincial account each year.

Proposed plan for the development of budget administration

From what previously described, three main problems can be addressed:

1. Too large number of documents
2. Too many complicated procedures
3. Lack of good corresponding

In order to avoid the above problems, an effective computer network should be introduced to reduce unnecessary checking steps and therefore the original data will not be repeatedly recorded. The computer surely can also do a large number of calculation within a short period of time.

The authors here have proposed three main computer systems for budget management:

1. Budget system
2. Accounting system
3. Salary and Taxes

B. PERSONNEL SYSTEM

Each PPHO comprises about 700 personnels working in Subdistrict, District and provincial levels. Individual biographical data are kept in the PPHO by the personnel section.

The personnel section is responsible for keeping individual records (form 7), available vacation, promotion, moving in and out of the officers etc. The data are useful in the distribution of manpower such as the recruitment plan, personnel transfer , promotion plan, retirement and pension plan of officers.

The problem of the personnel system is the difficulty of data searching which delays other processes. Searching through all paper works is time consuming and not appropriate. Using computers will be able to solve this drawback.

The purposes of using computers are as follows:-

- keeping and sorting individual records
- managing manpower
- assisting in transferring and promotion of officers
- keeping vacation records
- keeping rewarding records
- others

The design of the system is based on the Relational Database Model. The model will make use of the relationship between tables and columns in the ER-diagram. Users must know how to operate database browser or database query softwares.

We expect that the introduction of computers will

- avoid repeating collecting the same data
- reduce the time used in searching data
- allow the administrators easily browsing through the database
- improve the personnel management in all levels

C. INVENTORY SYSTEM

1. General information about stock management

Stock is defined as all usable and edible things. It can be classified into materials (which cannot be reused) and hardwares (which can be reused) which are readily described in the stock handbook. It is necessary to keep an eye on stock management whether things are correctly and economically used because the budget is always allocated with limitation.

Stock management aims towards the most effective ways to supply needs in all practical levels. The procedure is composed of acquiring, controlling, maintaining and delivering stock. Figure 3.3 shows how the materials and hardwares are grouped.

1. Acquiring stock

- surveying for needs
- proposing the annual plans
- executing the proposed plans

2. Controlling stock

- checking in the stock
- stock registration
- issuing the stock

3. Maintaining stock

- repairing
- returning fixed hardwares

4. Delivering stock

- examination of impaired stock
- stock delivery

STOCK	
Hardware Section	Material Section
Office hardwares	Office materials
Transportation hardwares	Electrical materials
Agricultural hardwares	Housing materials
Construction hardwares	Edible materials
Electrical hardwares	Construction materials
Media	Transportation materials
Medical and scientific hardwares	Fuel
Housing hardwares	Medical and scientific materials
Factory hardwares	Agricultural materials
Sports hardwares	Media
Field hardwares	Clothings
Muscial hardwares	Printing materials
Computing hardwares	Computer supplies

Figure 3.3 Classification of stock

2. Present Situation

Nowadays the PPHO's stock section is the only department that looks after all procedures in stock management. Some PPHO's are trying to incorporate the computer system in some simple processes, e.g. preparing documents, making a stock list etc. The comprehensive usage of the computer network has, however, not been implemented.

3. Problems

The most serious problem is the limitation of the number of the officers in charge. Followings list the consequences.

1. There are either over- or under-estimates of the stock.
2. The stock balance cannot be adjusted immediately, causing some discrepancy between the documents and the real stock.
3. Some items had been delivered, lost or moved but mistakenly not recorded.
4. The registration number is not well-organized and sometimes uninspected.
5. Searching and retrieving data are extremely slow without computers. There is also not enough room to keep all records.
6. The information highway about history of stock, quality evaluation etc. cannot be established without computers.

D. HEALTH CONSUMER PROTECTION AND DRUG ADMINISTRATION SYSTEM

1. General Information

This has been responsibility of the Public Health Pharmacy Department at the PPHO. Jobs can be classified as :

1.1 Purchasing plan

- Retrieving previous data
- Estimating future usage
- Purchasing
- Keeping purchasing record

1.2 Acquiring Supplies

- Surveying needs
- Choosing suppliers
- Purchasing documents
- Inspecting received items

1.3 Stock

- Check-in
- Delivering
- Checking stock balance

E. INFORMATION SYSTEM

It used to be so complicated and time-consuming for the information to be transferred from primary sources, i.e. Health Care Units and District Hospitals to the provincial level. This prolonged the working time and accumulated data errors. Using computers will therefore help reduce those preventable mistakes.

We have designed 5 basic information systems for the PPHO as follows:-

1. Population data
2. Statistical data
3. Health resources data
4. Epidemiological data
5. Health knowledge data

From now on, there will be only one department that is responsible for collecting a particular piece of information. For example, collecting school data will be done by the Health Promoting Department. The other department can only use these data but not be able to edit them.

Retrieval of data will be made via the computer network.

CHAPTER 4 : THE STRUCTURE OF THE COMPUTER NETWORK

The Design

Based on our preliminary evaluation, we propose here the use of PCs for the LAN servers and terminals as shown in Figure 4.1.

Eventually, there will be at least 1 PC set as a workstation in each department in each PPHO. It will be linked to the PPHO server via LAN and to the Ministry of Health via modems. In addition, all rural departments can communicate via modems.

1. LAN Servers.

LAN is widely used nowadays due to its simplicity although its capacity is close to that of minicomputers. Lots of marketing competition result in almost 100% compatibility of the softwares. The users can be easily get used to the system because LAN runs on the commonly used PCs.

However, we choose to establish the graphics user interface in order to obtain the friendly using environment.

The requirements for the LAN server can be specified as follows:-

- A high-speed CPU (e.g. Pentium 90 MHz up) with at least 32 MB RAM (expandable to at least 64 MB), cache memory and floating point hardware.
- At least one high density 3.5 " floppy disk drive
- At least 1 GB SCSI-II hard drive, average access time 12 ms.
- At least one 14"-1024x768 color monitor with at least 1 MB video memory
- One digitizing tablet or mouse

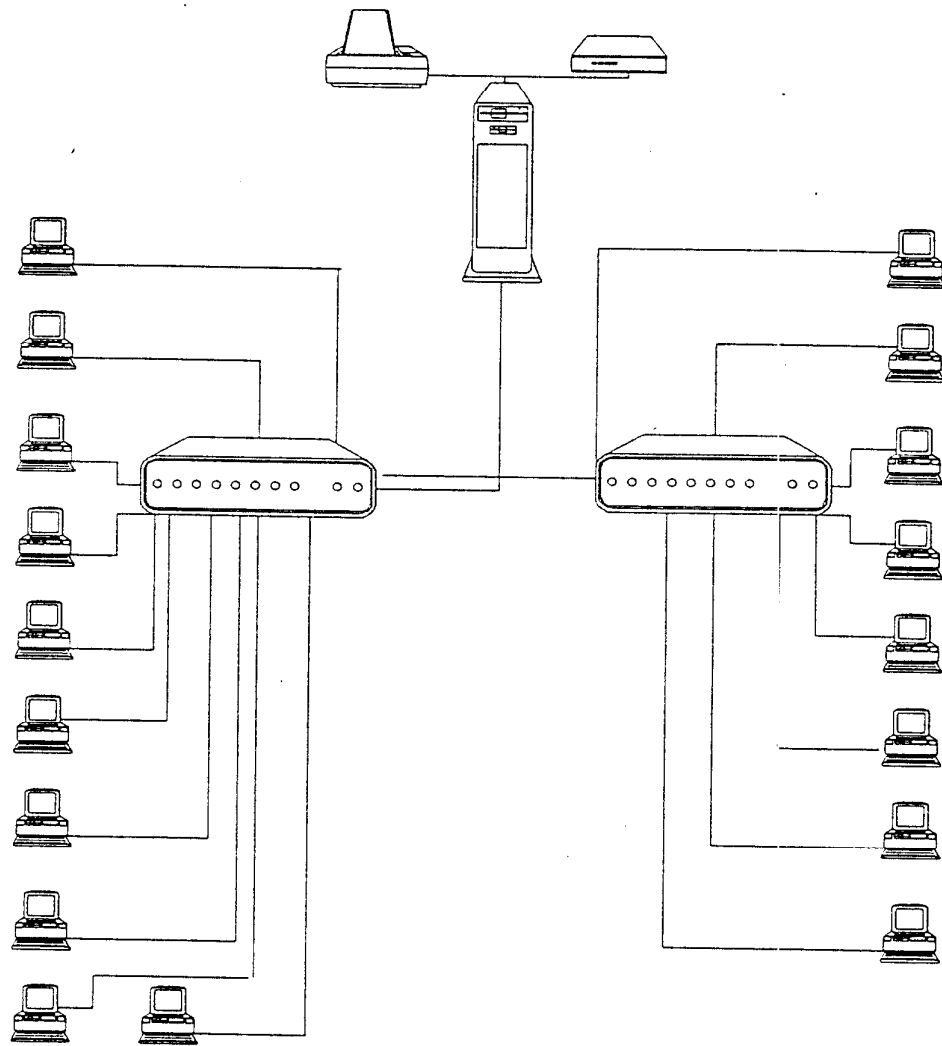


Figure 4.1 illustrates the proposed computer network

We compare here the three different operating systems including Windows NT Advanced Server 3.5, Novell Netware 3.12 and UNIX.

Item	Windows NT	Netware 3.12	Unix
1. User Interface	Graphics	Text	Graphics or Text
2. Processing	Distributed	Distributed	Centralize
3. User limit	No limit	Depend on price	Depend on price
4. Familiarity	Good	Fair	Poor
5. Administrative	Easy	Fair	Difficult
6. Network Protocol	TCP/IP,IPX,NDIS Microsoft Network ODBC	TCP/IP,IPX	TCP/IP

Table 4.1 Comparison between three popular LAN operating systems

We prefer Windows NT for the reason that it is manufactured by the Microsoft Group who makes Windows 3.1 that we have already been familiar with. Moreover, the further development of the software on Thai language is possible. We suggest Windows NT Advanced Server version 3.5 up.

2. Workstation

- At least 80486 DX-2 66 Mhz. CPU, 8 MB RAM (expandable to 64 MB) with Cache Memory and Floating Point Hardware.
- At least one 3.5" floppy disk drive
- At least one 400 MB hard disk with less than 12 ms average access time
- A 1024 x 768 resolution 14" monitor with at least 1MB Video memory

- A graphical pointing device e.g. a mouse
- Windows Thai Edition for Workgroups 3.11 up for the most effective connection with the server

3. Accessories

3.1 Network Interface Card, Unshield Twisted Pair (UTP) type, 16 Bit

3.2 LAN Hub with at least 12 UTP ports

3.3 At least 14.4 Kbps Fax Modem

3.4 Heavy duty dot matrix printer, 132 characters/line, Thai-English capability, at a speed of at least 300 characters/sec.

3.5 Voltage regulator and power reservation unit capable of supplying at least 1.2 KVA

4. DBMS (Data Base Management System)

In order to obtain the most effective database system, we prefer the DBMS. The system is infinitely fast, convenient with great accuracy. Furthermore, it is designed for future development of the whole system, e.g. data conversion at a low cost. The comparison of the DBMS with other database management system (xBASE) is shown in Table 4.2. Having considered all the information, we suggest that the DBMS is the appropriate one and it has to be in Client Server Architecture.

xBase	DBMS
1. inexpensive	1. great security
2. easy access	2. great accuracy
3. familiar to all programmers	3. self direct database management
4. no need for a powerful server	4. easy to develop the system
	5. easy for system check-up

Table 4.2 Comparison of advantages between xBASE and DBMS

xBase	DBMS
1. low security 2. database managed by programmers 3. low accuracy 4. difficult for system development and check-up	1. expensive 2. efficiency dependent of servers 3. need more training for users

Table 4.3 Comparison of disadvantages between xBASE and DBMS

The investigators have also compared various commercialized DMBS as in Table 4.4.

Item	Oracle	Ingres	MS SQL Server
1. Distributor	Oracle(Thailand)	Micro-X	Value Soft
2. Price	++++++	+++++	+++
3. User limit	Depend on price	Depend on price	No limit
4. Hardware	Unix Host or PC	Unix Host or PC	PC LAN Server

Table 4.4 Comparison of DBMS from different dealers

We recommend Microsoft SQL Server for the PPHO since it is independent of database managing softwares and is fully compatible with the Windows NT operation system. The price is also reasonable. Table 4.5 shows the comparison of three popular client database softwares.

Item	MS Access	Power Builder	Delphi
1. Price	+++	++++	+++++
2. Easy to Develop Program	+++++	+++++	+++
3. Rapid to learn	+++++	+++++	+++
4. Compatibility with Windows NT and MS SQL Server	+++++	+++	++++
5. Compatibility to Thai Language	Yes	None	None

Table 4.5 Comparison of three popular database softwares.

We recommend Microsoft Access version 2.0 since it is fully capable of all kinds of database management (with 4GL specification, SQL language, report generator etc.). It is also fully compatible with the SQL Server.

In conclusion, we suggest

1. Microsoft SQL Server as the database server
2. Microsoft Access 2.0 (Thai version) as the client with GUI user interaction.

Summary of the budget for establishing the health computer network in each PPHO.

1. Hardwares

- 1 File Server @ Bht 150,000
- 19 Workstations @ Bht 40,000
- 20 LAN cards @ Bht 2,400
- 2 Hubs @ Bht 20,000
- 1 Modem @ Bht 10,000
- 5 Printers @ Bht 100,000

- 5 UPS @ Bht 10,000
- LAN installation, cable @ Bht 20,000

2. Softwares

- 1 Windows NT Advanced Server 3.5 for the file server @ Bht 35,000
- 15 Windows 3.11 Thai Edition for Workgroups @ Bht 3,000
- 1 SQL Server @ Bht 60,000
- 1 Microsoft Access 2.0 Thai @ Bht 20,000
- 5 management softwares for PPHOs @ Bht 500,000

TOTAL Bht. 1,838,000

19 Workstations will be allocated for

- Administrative and financial office (3)
- Personnel Management department (1)
- Inventory department (1)
- Public Pharmacy department (1)
- Policy and Evaluation department (1)
- Dental Health department (1)
- Disease Control department (1)
- Health Promotion and Nursing (1)
- Sanitary and Environmental department (1)
- Personnel Development and Primary Health Care (1)
- Director Office (1)
- Prevention Specialist Office (1)
- Public Health Specialist Office (1)
- Reserved (4)

CHAPTER 5 : ESTABLISHING A COMPUTER DEPARTMENT

In order to effectively run the whole computing network in a PPHO it is necessary to have its own department. The department will be responsible for designing, maintaining and supporting the computer system as well as providing essential training programs to all users.

We need computer specialists to be responsible for the job. The old traditional way using volunteers will no longer be used.

The Department's Responsibilities

1. Maintenance

Responsible for structuring workstations and supplying essential softwares, repairing as well as assigning personal codes for all users.

2. Planning and Analysis

Responsible for writing and proposing computer provincial plans as well as being a system analyst and designer. These include establishing standard method to input data and database structure. The department will also help the administrative team make decisions on how the system could be further developed in future.

3. Training

Responsible for establishing essential training programs for the users and updating the users' knowledge in computer softwares and hardwares.

4. System Development

Responsible for writing and testing a specific computer program.

Manpower

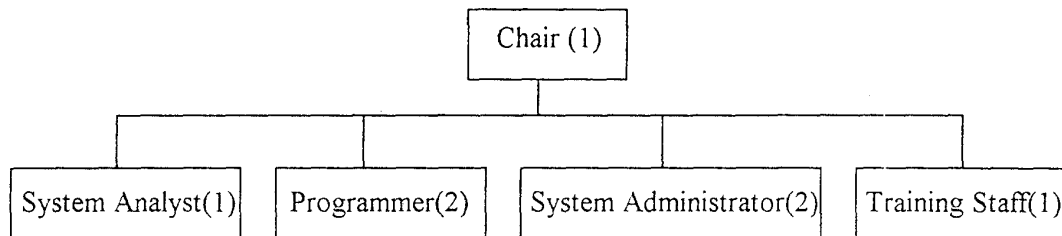


Figure 5.1 Proposed structure for the man power in the computer department

1. Chair (1)

Responsible for administrative works and inter-departmental relationship. We require a BSc. degree (at least) in computing sciences for this position.

2. System Analyst (1)

Responsible for collecting needs from the users and proposing a comprehensive plan to serve those needs. The analyst has to work closely with programmers in order to effectively develop the system.

3. Programmer (2)

Responsible for writing and testing computer programs.

4. System Administrator (2)

Responsible for looking after the computers and keeping the system healthy.

5. Training Staff (1)

Responsible for establishing and organizing training programs for users in the PPHO.

Plans to establish the department

Phase I

This requires at least 2 pioneers from the PPHO who are interested in computers. They will be trained and responsible for the temporary department. Their responsibility will mainly involve organizing basic training programs. Those pioneer staff who want to pursue will be provided with a chance to upgrade their knowledge up to a qualified degree.

Phase II

The Ministry of Health will allocate permanent positions primarily for the pioneer officers who previously worked in the department or secondarily for the ones who are qualified. The PPHO should encourage them for advanced training by collaborating with universities and also provide essential support.

The government must put lots of effort to prevent the "brain drain" problem. This may be done by restructuring the position of the officers starting from the departmental level so that the salary can be increased and more effectively distributed. Although it is difficult, the PPHO should try its best to fit an appropriate person in the position, i.e. the one who loves computing and programming and most importantly the one who understands the governmental system.

CHAPTER 6 : TRAINING PROGRAMS

It is important that the administrators in the PPHO and the pioneers in the computer department be advised about the network being installed.

Proposed Plans for Training

1. Training for executive level

The term "executive level" include the PPHO director, PPHO specialists and departmental chairs. These people need to be informed about the whole idea of the system in order to be able to see how the system can be applied to their own routine tasks.

1.1 A course in Management of the Information System

This 1-2 day course will provide the insight about the application of a computer especially in the PPHO's routines.

1.2 A computer workshop for administrators

This 1-2 day workshop will provide a practical aspect of the computer's application using popular commercialized packages.

2. Training for users

The users need to understand and be able to use the computer to do at least basic works.

2.1 Fundamental Knowledge in Computers

This 1-day course will provide some fundamental knowledges which will be necessary for the beginners.

2.2 Packaged Software Training

This course will provide skills for the trainees to use a computer in word processing and spreadsheet formats.

2.3 Desktop Publishing Training

This is an exclusive course for the officers who are responsible for public relation or designing.

2.4 Application Program Training

This course will instruct the users to understand the data input formats in the application programs being developed for a specific task.

2.5 Advanced Courses in Computer

This course will provide users some skills in writing a macro, in basic programming (in Microsoft Access, Microsoft Foxpro etc.) so that some advanced users will be able to develop or modify their own applications.

3. Training for computer officers

As proposed in Phase I that the department will be run by some pioneer officers who may not have been trained. It is therefore important to upgrade their knowledge by providing an opportunity to pursue their special interests in computing sciences, especially in Management of Information System (MIS) or Information Technology (IT), as follows.

3.1 System Setup Training

This can be organized by the computer dealers to advise the officers how to set up the system and configure the softwares as well as how to solve common trouble shootings.

3.2 Database Management and Programming

This course will provide knowledges in the database management system and compilers.

3.3 Specific Training

This is to provide those officers who have special interests in a particular application, for example, System Analysis and Design, Programming Concept, Data Communication Network, Database Design etc., most of which are being provided in academic institutions.

Course	Duration	Trainee	Remarks
1. Introduction to Computer	1-2 days	Executive Level	by Educational Institution or Private Sector
2. MIS	1-2 days	Executive Level	by Educational Institution or Private Sector
3. Setup and Administrative	-	Computer Staff	by Contractor
4. - Word Processing	-	User	by Contractor
- Spreadsheet			
- Desktop Publishing			
- Presentation			
5. Application Software	-	Computer Staff and User	by Computer Staff
6. - System Analysis and Design	-	Computer Staff	by Educational Institution or Private Sector
- Programming Concept			
- System Operation			
- Database Design			
- Data Communication			
7. Software and Database Development	-	Computer Staff	by Educational Institution or Private Sector

Table 6.1 summarizes the basic training required for a PPHO.

Course	Price/Unit (bht.)	Persons	Total	Trainee
1. Introduction to Computer	2,000	14	28,000	Executive level
2. MIS	2,000	14	28,000	Executive level
3. Setup and Administrative	3,000	2	6,000	Computer Staff
4. - Word Processing	2,000	20	40,000	User
- Spreadsheet				
- Desktop Publishing				
- Presentation				
5. Application Software	1,500	10	15,000	Computer Staff and User
6. - System Analysis and Design	5,000	2	10,000	Computer Staff
- Programming Concept				
- System Operation				
- Database Design				
- Data Communication				
7. Software and Database Development	5,000	2	10,000	Computer Staff
Total	20,500	64	137,000	

Table 6.2 shows the estimated expense for the courses.

CHAPTER 7 : INSTALLATION PROCEDURES

The PPHO computer system includes a file server, clients (connected by LAN) and operation systems (OS).

In order to successfully install the system, we recommend a private sector for the responsibility since it is fast and less risky. The PPHO should carefully establish a system specification and seek the most appropriate and reliable dealer for the job.

Procedures:

Activities	2539	2540	2541	2542	2543
1. Setup Computer Department	—				
2. Submit Proposal	—				
3. Prepare Specification	—				
4. Bidding	—				
5. Benchmark Test		—			
6. Sign Contract		—			
- Hardware		—			
- Application Software		—			
7. Installation (Hardware/Software) in 4 Provinces		—			
8. Check system		—			
9. Installation (Hardware/Software) in 20 Provinces			—		
10. Installation (Hardware/Software) in other 20 Provinces				—	
11. Installation (Hardware/Software) in rest					—
12. Training			—	—	—
12. Follow up / Evaluation		—	—	—	—

Table 7.1 summarizes all necessary steps for the installation.

1. Establishing a computer department who will be authorized to take care of the whole system. This also includes the allocation of man power.
2. Proposing for the budget required for installation.
3. Setting the specifications for all needed hardwares and softwares.
4. Arranging an opened bidding in order to seek the best-fitted private dealer who will be in charge of the system.
5. Seeking the places to install all hardwares. This usually means the rooms with minimal humidity and appropriate temperature following the standard set by the factory. The main room needs to be easily cabled to other terminals. The dealer has to inform the PPHO the need for air conditioners, electricity, emergency and security system, reserved power supply, fire emergency, file storage equipment etc. if necessary.
6. Training the users how to use the computer both in basic skills and in application softwares. This could be held periodically for both administrators and the user level.
7. Converting any existing data to the new system and developing a computerized format for the future data.
8. Installing and checking the system.
9. Evaluating the system periodically in order to see the progress and any problems that may occur.

Estimate for installation budget

The amount of Bht. 2,000,000 is estimated to be spent for the whole installation with Bht. 1,800,000 for hardwares and softwares and Bht. 200,000 for training programs. This will cost altogether about Bht. 150,000,000 to install the system in all PPHOs within a 5-year period.
