



CHAPTER 3

RESEARCH METHODOLOGY

3.1 Data Collection

The field - visit was made to collect the data of the fiscal year 1998 (May 1998 to April 1999). The two types of data sources from;

Primary data This type of data came from the observation and an interview i.e. the administrator of Khon Kaen Medical Education Centre also some of the administrative committee and the MEC staff.

Secondary data Data were collected from the Office of Collaboration to Increase Production of Rural Doctor, Health Policy and Planning, MOPH, the database of Khon Kaen Regional Hospital, Financial and Accounting Department, Policy and Planning Office, Maintenance and Purchasing Department, Medical Illustration and Audiovisual technology department.

3.2 Cost Classification

A good classification scheme depends on the specific need, situation or problem. There are three essential elements to classify the cost components (Creese and Parker, 1994); i) it must be relevant to the particular situation, ii) not overlap, and iii) must cover all possibilities. In the economic sense cost is defined as the value of resources used to produce something, including a particular service.

3.2.1 Classification by inputs

This type of classification, inputs were grouped into categories which have similar characteristics. A classification of costs by inputs with sample of each categories is shown in the table 3.1

Table 3.1 Classification of costs by inputs

Cost categories	Inputs
<p><u>Fixed cost (FC)</u></p> <p>A. Building, space</p> <p>B. Equipment</p> <p>C. Salary, wage</p> <p>D. Training</p>	<ul style="list-style-type: none"> - Administrative Office, Housekeeping, Library, Audiovisual Lab, Dormitory - Computer set, Facsimile machine, Air conditioning, Overhead Projector, Microscope, etc. - Instructors' salaries (FTE), MEC staff salaries - Medical Education Training for instructor, Training activities for the personnel that occur only once or rarely.
<p><u>Variable cost (VC)</u></p> <p>A. Material cost</p> <ul style="list-style-type: none"> - Office material - Household material - Teaching material - Operation & maintenance <p>B. Non – material cost</p>	<ul style="list-style-type: none"> - Paper, stationery, Diskette, Whiteboard marker, Recording book, Paper clip, Transparency, Small equipment (unit cost less than 1,000 Baht) - Glass, Toilet paper, Soap, Washing powder, Floor cleaning liquid, Brush, Mattress, Pillow, Towel - Whiteboard pen, Transparency, A4 paper, Paper chart, Pointer, Film slide, Flip chart - Building, operation & maintenance: Electricity, Water, Teleappliances. - Security payment - Housekeeper payment - Teaching fee

3.2.2 Classification by function / activity

This type of classification involves the kind of activity or function for which the resources are used, but one thing to be careful about when estimating the costs of

multiple activity programmes. The shared resources among the activities must be allocated so that each is charged only for its proper share (Creese and Parker, 1994).

3.2.3 Classification by level

This type of classification to divide up resources is according to the level of resources that are used. A decision making for each cost analysis whether the need to classify the results by level, according to where the output occur.

3.2.4 Classify by sources

This type of classification concerns the provider of the resources. These contributors may include the Ministry of Public Health, national government, international donors or private organizations, individuals and the groups of community.

3.2.5 Classification by currency

This classification is involved with the sources of the resources that the type of currency required to purchase those resources. International donors very often supply equipments and services that need to be purchased in foreign currency. However, international donors may not be able to continue , so it is useful to know what the foreign currency burden would be on the government.

Table 3.2 List of Activities in Medical Education Centre

Activities	Measurement Unit	Data Sources
A. Administration		
1. General Administration	- Personnel cost	- Financial department
2. Housekeeping	- Space utilized (sq.m.)	- Maintenance department
3. Registry	- Several	-MEC's registration recorded
B. Education Supporting		
4. Student Affairs	- No. of activities	- Annual report, Registry
5. Library	- No. of user	- Library checking list
6. Audio-visual	- Pieces of work	- Audio-visual department
C. Education		
7. Education Development	- Teaching hour	- MEC's recorded file
8. Curriculum Evaluation	- No. of evaluation subject	- MEC annual report

In this study the adopted the steps of estimation of the unit cost from the "Subdistrict Health Centre Costing Manual" (Tangcharoensathien and Rungkittiwattana, 1998) applied to the Medical Education Programme at Khon Kaen Medical Education Centre due to the health centre and MEC quite similar in their management of organization not clearly defined as in each department in the hospital, so after system analysis of the MEC was done, to estimate the unit cost of medical education programme will more simplified by using the activity approach.

3.3 Calculating Cost

3.3.1 Fixed cost

Fixed cost is the cost of the smallest (least expensive) batch of inputs that the firm can buy if it is to be able to produce any output at all. An important facet of fixed costs is that they must be paid for even if the firm output is zero (Barron & Lyndi, 1989). This study of fixed cost was classified into i) Capital depreciation cost which including long – term training cost, ii) Salaries of instructor and MEC staff. The Fixed costs were defined into 8 activities as shown in Table 3.2. Capital items are the assets having an economically useful life exceeding one year. A unit cost

analysis which ignores capital is essentially assuming that the present physical assets will be available forever (Shepard et al, 1998). In reality, assets are being worn down by the organizations, daily activities, and this depreciation is an expense. However, depreciation is not an expenditure; it does not require an actual cost outlay. There are many methods to calculate depreciation cost (English, 1984). These are;

Straight-line depreciation This method is the simplest and most widely used. The value of the asset is divided by the number of years used.

Declining balance depreciation The depreciation is calculated as a negative exponential, but done in discrete increments.

Sum of the digit depreciation This method provides a declining allowance schedule that bring the value to zero at the end of the depreciable life. This method found that by summing the depreciable life year:

$$S = 1+2+3+4+\dots+n \quad (3.1)$$

The i^{th} year's allowance is the ratio $(n-i+1)/S$ times the original asset cost. For example, if the depreciable life is 10 years, the summing up $S = 55$ and the first year's depreciation is $2/11$ of the asset value.

Sinking- fund depreciation. The basis of this method is a hypothetical deposit into a sinking fund accumulated at a special interest rate. Sinking-fund depreciation has the effect of producing a slow decline of value in early years and faster in later years.

This study , capital cost is calculated on an annualized basis by following on cost analysis in primary health care : A training manual for programme managers (Creese and Parker, 1994).

3.3.2 Variable cost

Variable cost is the cost of production that varies with the amount of output produced, such as the costs of teaching fee, security payment, housekeeping

and materials. This study, variable cost was classified into material and non material cost;

- 1) **Material cost:** The supplies used up for the one year course, as direct input to the principal activities as used during the programme. To establish a cut-off value that marks the boundary between material and equipment cost. For example, if the unit price of an item is less than 1,000 Baht, even if it lasts for longer than one year, it will be simpler to consider it in the recurrent input category of supplies and count in full any such items purchased during the year. If the price of the item is 1,000 Baht or higher, then the capital category, equipment will be more appropriate. The cost supplies should include all the material consumed and any that lost or wasted but supplied to be costed do not include those are distributed but kept in store (as inventory stocks).

- 2) **Non-material cost:** The cost of teaching fee is calculated by multiplying the number teaching hour of an instructor by the teaching fee per hour, then sum up the teaching fee of the instructors in each department. For the security guard and housekeeper, the payment are paid annually since it being contracted.

Allocating shared inputs: However often people, buildings, vehicles and supplies are used for many tasks, within the programme, there will be a variety of services that depend on shared inputs, such as the staff members who provide various types of care. In some cases, the term “shared resources” simply means that the same types of input are used for different programmes or activities (Creese and Parker, 1994). It is helpful to start by thinking about the particular components of the various inputs that determine costs. The table 3.3 below lists for each type of resources that most directly determines the cost.

Table 3.3 List for each type of resources and the cost components most directly determines

Input	Component that determines cost
Building space	Time worked
Equipment	Time used
Instructor and Personnel	Time worked
Material	Weight / volume,
Non-material	Miscellaneous
Building operation and maintenance	Time used / Space used

The Step in Estimating Unit Cost of Medical Education Programme.

- I. Identifying Activities in Medical Education Centre.** It is divided into 3 sections, i.e. Administration, Education supporting, and Education as shown in table 3.2. Each section has the following activities;

A. Administration Section

1. General administration. Responsible to office management, take care of budgeting by coordination with Financial and Accounting Departments, coordinates both inside and outside the MEC, and is responsible for maintenance and utilities.
2. Housekeeping. The MEC has 4 housekeepers to take care of the compound and dormitory, to attend to laundry for the live-in staff and live-in students. Two of the housekeeper are paid by the MEC, and the another two are employed by the hospital.
3. Registry. Responsible to take care of the registration of material and equipments, the contraction documents of the students, and the others about registration in the MEC.

B. Education Supporting Section

1. Student Affairs. Responsible for any activity involved of the students including the dormitory arrangement.

2. Library. The library is one department of the hospital built-in the MEC building provide services to the whole staff of the hospital and the medical students. They make a check list of the number of the daily users.
3. Audiovisual. This department is a part of the hospital. It was built in the compound of the MEC. This department serves the whole hospital to produce all the teaching material and audiovisual, slide and VDO for the teaching purpose.

C. Education Section

1. Education Development. This section is the main activity of the MEC, It takes care of all the learning and teaching for staff and the students both inside and outside of the MEC. The training arrangement of the teaching staff both inside country and abroad. They have to take care of setting up the clinical practice schedule cooperation with each department and preparing the teaching material and texts for the students as well.
2. Curriculum Evaluation. At present, the MEC have no their own curriculum. The clinical teaching curriculum of Medical Education Programme in the MEC has been from the adopted curriculum of faculty of Medicine, Khon Kaen University which has developed in 1997 (please refer to appendix III for medical curriculum). Curriculum evaluation of MEC is the collaboration with the faculty of medicine and the OCPIRD. The report of the students and montly and annually summary of the activities in the MEC is the main activity of curriculum evaluation.

II. Cost Data Collection by cost components. These are;

A. Fixed Cost

The Fixed cost, such as capital depreciation cost, salaries of instructors and MEC staff were collected from the hospital database and Financial and Accounting Department. Capital depreciation cost data (Building and Equipment); for the building the data information on the space used in each section received from the Building & Maintenance department, then measured the space used in each section and activity from the construction's blueprint.

1) Salaries Salaries of the instructors and the MEC staff in this study included the fringe benefits such as hospitalization fees, school fees, child benefit allowance, house rentals plus compensation for doctors unable to practice private medicine. Due to the MEC coming under the organization line of the hospital. The staff of the MEC are still working for the hospital and their salaries are paid by the hospital. To analyze the labour cost of the staff takes great effort to make the time allocation study of their allocation time for the MEC. Due to the limitation of time and their job description that is not clearly defined, this study used the presence of FTE (Full Time Equivalent) form (Refer to Appendix IV for FTE form) of the MOPH for the teaching staff and interview the administrator of the MEC for the proportion of time allocation of the staff spent for each activity in MEC. To identify how many hours the physicians spent their time for administration, medical services and teaching. This study concerns only on the hour number the physicians spent to teach the medical students of Medical Education Programme.

FTE in this study assume the working hour of the physician is 35 hours /week (7 hours a days, and 5 days a week). A physician may work more than 35 hour/week. After knowing the number of working hours spent on each activity, then summing up the total number of working hours in one week of three activity divided by 35, this number will be the FTE value, then will use this value to estimate the total labor cost on teaching. (Refer to Appendix IV for FTE Survey Sheet).

1) Capital Cost The assets which have a life expectancy of more than one year are capital items, all land, buildings, office equipment and medical equipment. In theory, there are many methods available in computing the capital cost or the fixed assets. To calculate the economic capital cost, i.e. the present value of money, the opportunity cost, etc., into consideration (Satsanguan and Leoparote, 1992). Capital depreciation cost data; for the building the data information on the space used in each section received from the Building & Maintenance department, then measured the space used in each section and activity from the construction's blueprint. Due to the absence of the current value of some used items, the annualized cost of each capital item, i.e. building and equipment were selected to calculate the economic cost of equipment on an "annualized" (cost per year) basis, use the following approaches.

- **Current value** Estimate the current value of the capital item, as the amount to pay to purchase a similar item now (i.e. the replacement value rather than the original price).
- **Useful life** To estimate the total number of years of useful life the item can realistically be expected to have from the time of purchase. The study used the "Estimated Useful lives of Depreciable Hospital Assets", American Hospital Association (1978 Edited).
- **Discount rate** To find out the discount rate used by the Ministry of Finance. This study adopted the World Bank discount rate of 10 % due to the fluctuation of interest rate and inflation rate in country. The building has useful life for 25 years, material equipment for 5 years, human capital useful life is 10 years, this come from the experts' opinion. A more difficult approach would be to calculate the real rate of interest, i.e. the rate of interest that could be obtained by depositing money in the bank minus the rate of inflation.
- **Annualization factor** To define the base on the real interest rate and the total life of the asset, values are provided in Appendix V.
- **Calculation of annual cost** is calculated by dividing the current value of the item by the annualization factor.

For a 10,000 Baht price of equipment, the approach above could be applied as follow;

- Current value: 10,000 Baht
- Discount rate: 10%
- Annualizing factor: 3.791 (from standard table Appendix V)
- Calculation of annual economics cost:

$$10,000 \text{ Baht} / 3.791 = 2638 \text{ Baht per year (rounded figure).}$$

Building: To calculate the depreciation of a building, the space used was measured in square metres for each activity and multiplied by the depreciation cost / Square metre / year.

B. Variable Cost

The expenditure on material cost and non-material cost. For the material cost, such as office material, teaching material, utilities, i.e. water, electricity, telephone and maintenance. The material cost data was collected from the receipts and the recording of MEC and some data are from the Purchasing department. The material cost data, i.e. water electricity supply and telephone were not available due to the sharing resources with the hospital. There was no separate meter to measure the unit of water and electricity supply. These utilities and maintenance costs were included to the hospital budget bills. Form MC-1 produces detailed information relating to the value of each type of general material used by each activities. (Refer to appendix IV for MC-1 form).

III. Total Cost analysis

The total cost (TC) of Medical Education Programme is the sum of Total Fixed Cost (TFC), i.e. Capital depreciation cost, staff's salaries and the instructors' salaries and Total Variable Cost (TVC), i.e. material and non-material.

IV. Average Total Cost

Average Total Cost (ATC) is the total cost (TC) of Medical Education Programme divided by the number of students (Q) or Average Fixed Cost (AFC) plus Average Variable Cost (AVC).

3.4 Costing methods

This study will examine only the costs of Medical Education Programme at MEC in the academic year 1998 and project to the next 2 academic years , 1999, 2000 of the programme to estimate the total cost of the 3-year programme at MEC and then the unit cost of this programme.

3.4.1 Fixed Cost (FC):

- i) Capital depreciation cost : Costs of any item which have a life expectation of one year or more, or have value equal to or more than 1,000 Baht such as the building; the MEC office building which includes the class rooms, conference rooms, dormitory for the living-in students, also the built-in equipment assumes the building are fully utilized. Equipment: All equipment in the MEC office and those involved in teaching –learning of this programme such as microscope, overhead-projector, VDO player, and etc.
- ii) Salaries and any fringe benefits of personnel including the teaching fee of the instructors (teaching hours x teaching fee/hour).
- ii) Long - term training: All cost occurred for long-term training for the teaching staff and the personnel of MEC were taken into account.

3.4.2 Variable Cost (VC): They are classified into 2 groups, i.e.

- i) Material cost; such as office material, teaching materials, household material (including maintenance cost).
- ii) Non-material cost; such as teaching fee, security guard payment, and housekeeper payment.

3.5 Unit Measurement

The unit cost of cost components were identified as shown on Table 3.4.

Table 3.4 Unit Measurement of Cost Components

Cost components	Measurement	Value
<u>Fixed Cost (FC)</u>		
• Building	Space utilized (sq. m)	Depreciated the building's price
• Equipment	Time allocation (apportion)	Depreciated the equipment's price
• Instructors	Salary, wages	FTE (Full Time Equivalent)for teaching per year
• Staff	Salary, wages	Time allocation for each activities per year
• Long – term training	Time used for training	Amount of money spent per year.
<u>Variable Cost (VC)</u>		
• Material cost		
Office material	Unit / Volume used	Price / unit, Price / volume
Household material	Unit / Volume used	Price / unit, Price / volume
Teaching material	Unit / Volume used	Price / unit, Price / volume
Water & Electricity	Unit / Volume used	Price / unit, Price / volume
Telephone	Time used	Amount of money spent / year
Operation & Maintenance	Repair recorded	Amount of money spent /year
• Non-material cost	No. of teaching hour	Expenditure / year
Instructors' salaries	Salary, wage	Payment / year
Security guard	Salary, wage	Payment / year
Housekeeper	Salary, wage	Payment / year

3.6 Costing Assumptions

3.6.1 Cost calculation is based on the uses of resources for Medical Education Programme, and based on these assumptions;

- i) Capital (depreciation) cost: all of the capital inputs are fully utilized.
- ii) Salaries: the labor inputs of 20 personnel are fully utilized.

3.6.2 This cost calculation was based on the number of medical students in the academic year 1998 and projected to the next 2 academic years (1999, 2000) of the Medical Education Programme and the estimated costs of the full programme at MEC (3-year programme) was based on the assumptions that;

- i) There is no drop out of the medical students in this study.
- ii) There is no change of the pattern of resources consumption in this programme
- iii) The MEC staff and the instructors do not change (no loss or gain of staff and the instructors) in number during this time period.

3.6.3 The overall was expenditure in the next 2 academic years of the programme was based on the value of the academic year 1998.

3.7 Data Analysis

The total cost of Medical Education Programme at MEC is the total fixed cost plus the total variable cost of the 4th, the 5th and the 6th year medical students each.

Total fixed cost (TFC) defined as the sum of the costs of all the fixed inputs, in this study it defined as the capital depreciation cost, the salaries and wages of the instructors and the MEC's staff and the long-term training cost.

Total variable cost (TVC) is the sum of the amounts the MEC spends for variable inputs employed in the production process, the variable in this study is the teaching material, household material, office material and utilities.

The Total cost (TC) of a given output rate in the short run is the sum of Total fixed cost and Total variable cost:

$$TC_{MEP} = TFC_{MEP} + TVC_{MEP}. \quad (3.2)$$

Where:

TC_{MEP} = Total cost of Medical Education Programme.

TFC_{MEP} = Total fixed cost of Medical Education Programme

TVC_{MEP} = Total variable cost Medical Education Programme

Average fixed cost is defined as total fixed cost divided by the units of output, or

$$AFC_{MEP} = \frac{TFC_{MEP}}{Q} \quad (3.3)$$

Where:

AFC_{MEP} = Average fixed cost of Medical Education Programme

TFC_{MEP} = Total fixed cost of medical Education Programme

Q = Number of medical students

Average variable cost is total variable cost divided by the number of units of output, or

$$AVC_{MEP} = \frac{TVC_{MEP}}{Q} \quad (3.4)$$

Where:

AVC_{MEP} = Average variable cost of Medical Education Programme

TVC_{MEP} = Total variable cost of Medical Education Programme

Q = Number of medical students

Average total cost is defined as total cost divided by the units of output, or

$$ATC_{MEP} = \frac{TC_{MEP}}{Q} \quad (3.5)$$

Where:

AC_{MEP} = Average cost of Medical Education Programme

TC_{MEP} = Total cost of medical Education Programme

Q = Number of medical students

However, since $TC_{MEP} = TFC_{MEP} + TVC_{MEP}$

$$\begin{aligned} ATC_{MEP} &= TC_{MEP} / Q \\ &= (TFC_{MEP} + TVC_{MEP}) / Q \\ &= (TFC_{MEP} / Q) + (TVC_{MEP} / Q) \\ &= AFC_{MEP} + AVC_{MEP} \end{aligned} \tag{3.6}$$