CHAPTER 4

METHODOLOGY

4.1 Study design

The research design of this study is a retrospective study made by using secondary data to identify / analyze cost and revenue during last 3 years (1998-2000), and to explore the potential cost recovery in year 2003 in Takeo hospital.

4.2 Study population

The population of this study is public hospital in Takeo province. The data in this study is the secondary data of the Takeo hospital, which is purposively selected.

4.3 Operational Definition

Cost recovery : is the ratio of revenue to cost (Cost recovery ratio = Revenue / Cost)

Cost recovery potential : is the capacity to generate the revenues

This means the ratio increase when the hospital either brings in more revenues or lower production costs or even both. So a facility with high cost recovery potential indicates a facility that is able to generate a lot of revenues and also operate in an efficient manner.

Cost: the cost of good or services is the value of the resources spent for the acquisition of those good or services, which may be expressed as a monetary or non-monetary value.

The accounting cost of goods or services may be defended as the monetary value of actual expenditure for the acquisition of those goods or services.

Example 1: if the thermometer use by health personnel is purchased at a market price $ 1, its account cost is $1.

Example 2: if the salary of the nurse is $ 200 per month, the employment of that nurse therefore incurs an accounting cost of $200 per month for the hospital

Capital cost: The cost of building, and equipment which have life expectancy of 1 year or more which use by the health services.

Recurrent cost: are the costs for operating hospital including salary, recurrent costs have material costs and labor costs

Labor cost (LC): Cost of wages, bonus, and salaries including fringe benefits such as hospitalization fees (bonus in this study is the incentives).
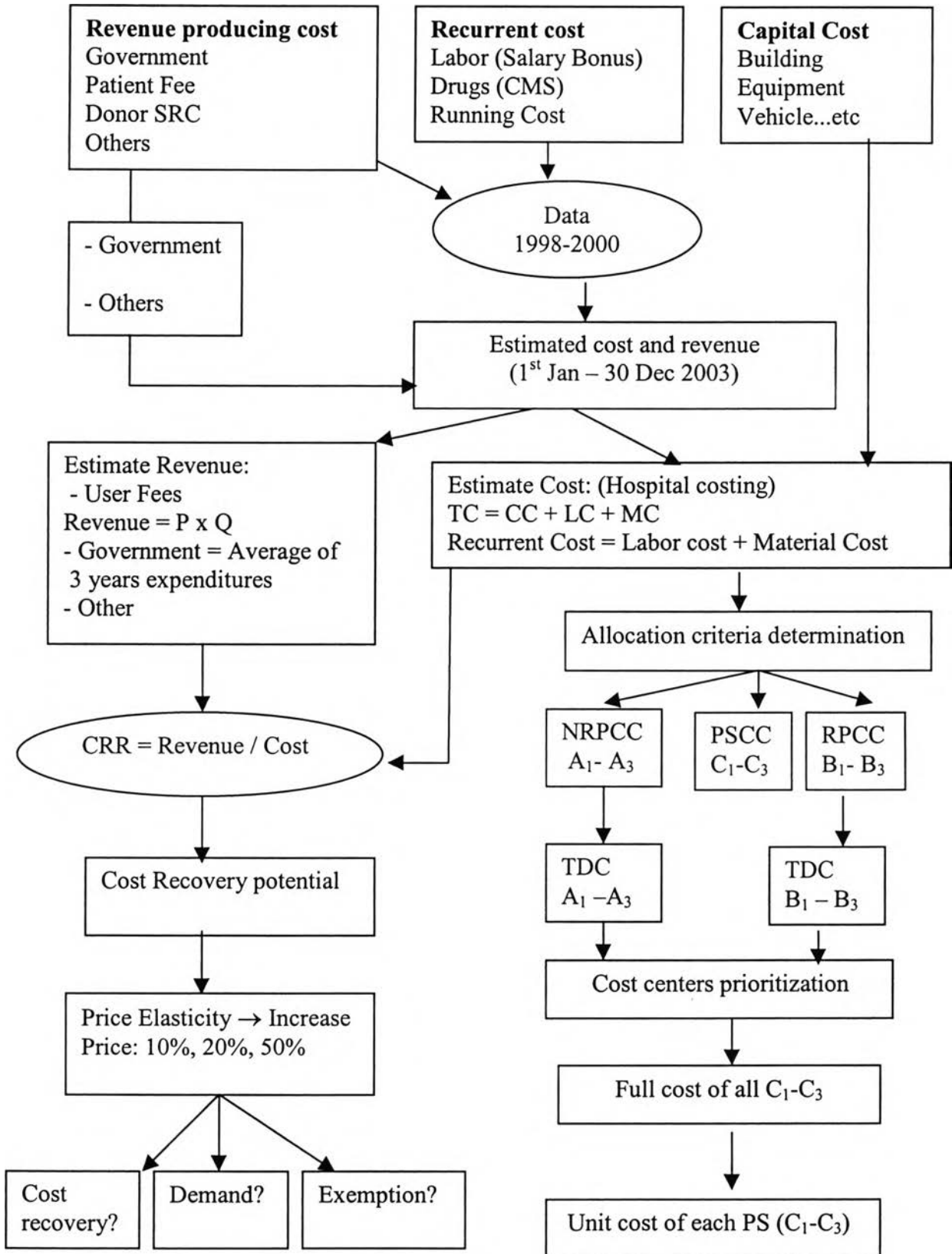
Material cost (MC): The cost of resources that are purchased and use within one year/under one year including electricity, mailing, Fax, and telephone charges.

Total hospital budget revenue: The revenue supported from government, contributed from patient (patient fees), and others etc.

Elasticity: Percentage change in one variable result from a 1 percent increase in another.

Price elasticity of demand: is a percentage change in quantity of demanded of a good or services resulting from a one- percent increase in its price.

4.4 Conceptual Framework:

Revenue producing cost	Recurrent cost	Capital Cost
Government	Labor (Salary Bonus)	Building
Patient Fee	Drugs (CMS)	Equipment
Donor SRC	Running Cost	Vehicle...etc
Others		

- Government

- Others

Data
1998-2000

Estimated cost and revenue
(1st Jan – 30 Dec 2003)

Estimate Revenue:
 - User Fees
Revenue = P x Q
 - Government = Average of
 3 years expenditures
 - Other

Estimate Cost: (Hospital costing)
TC = CC + LC + MC
Recurrent Cost = Labor cost + Material Cost

Allocation criteria determination

NRPCC A_1- A_3	PSCC C_1-C_3	RPCC B_1- B_3

CRR = Revenue / Cost

TDC A_1 –A_3

TDC B_1 – B_3

Cost Recovery potential

Cost centers prioritization

Price Elasticity $\rightarrow$ Increase
Price: 10%, 20%, 50%

Full cost of all C_1-C_3

Cost recovery?	Demand?	Exemption?

Unit cost of each PS (C_1-C_3)

This study four step, the first step describes the components the hospital cost and revenue, the second step is to estimate and calculate the revenue and cost for the year 2003, the third step is to do the hospital costing and calculate the unit cost of each patient services (PS), the four step is the sensitivity analysis to identify the potential cost recovery in year 2003.

4.5 Data collection

Data collection (1998 to 2000), secondary data: Financial report of the Takeo hospital, annual budget plan of the hospital, provincial, and Ministry of health (See tables in Appendix 1, 2).

4.6 Data Analysis

4.6.1 Estimate total Cost of the hospital:

Total hospital cost = Capital cost + Recurrent cost

Recurrent cost = Material cost + Labor cost

TC = CC + MC +LC

(TC; total cost, CC: capital cost, MC: material cost, LC: labor cost)

4.6.1.1 Capital cost:

The capital cost is cost of resources that have a useful life of 1 year or more. In this study The capital cost are the cost of the building, equipment, vehicles price of the equipment and building were calculated from the purchase prices to be the price in year 2003 or assessed from price list that could be purchase in year 2003. The capital prices in year 2003 were calculated from the purchased price in year " t " by the following formula.

$$C_{2003} = C_t (1+r)^{2003-t}$$

Where; C_{2003} = the value of the capital in year 2003

C_t = the purchased value of marking or buying the capital in year t

r = discount rate at the specific period

t = the year that capital was bought or completed

Discount rate used to calculate the capital cost in this study is the World Bank rate of 10%, which is generally used to calculate the capital cost (Creese and Paker).

Depreciation value of capital or annual cost will calculate by dividing value in year 2003 of item by the annualization factor obtain from the table or by multiplying the value in year 2002 of the item to the factor obtain from the annualization formula as the following equation.

Annual economic cost = Current value / Annualization factor

Annualization factor; the factor use to determine how much one received or paid annually for x year is worth today, was applied from standard table (Creese and Paker, 1994).

4.6.1.2 Recurrent cost (RC):

Recurrent cost = Material cost + Labor cost

① **Material Cost (MC)**: is the average material cost expenses of the hospital during last 3

years (1998, 1999, and 2000)

TMC (Cost expenses) = [MC Y_1 + MC Y_2 + MC Y_3]

AMC per year = [MC Y_1 + MCY$_2$ + MCY$_3$]/ 3

(Average material cost per year)

(MCY$_1$: Material cost year 1998, MCY$_2$: Material cost year 1999, MCY$_3$: Material cost year 2000)

Average Material Cost of last 3 years is a MC per year in 2003

② **Labor Cost (LC)**: is the average labor cost expenses of the hospital during last 3 years

TLC =[LC Y_1 + LC Y_2 + LC Y_3]

ALC per year = [LC Y_1 + LCY$_2$ + LCY$_3$]/ 3

(Average labor cost per year)

TC per year = CC per year + MC per year + LC per year

(Total cost per year)

4.6.2 Calculate Unit Cost of each Patient Services:

To calculate the unit cost of each patient service we have to estimate the output of year 2003. In this study we use cost of the secondary data, but the output we will estimate by using the demand estimation formula as below:

Demand this year = Demand last year $* e^r$

Where r : is the annual growth rate of population

e : is the natural value

Assume that growth rate of population and price elasticity is constant

$$\widehat{lnQ_{2001}} = ln\ Q_{2000} + r$$

Where $\widehat{Q_{2001}}$ is the demand in year 2001, if then were no price change

Estimate price elasticity

The difference between $\widehat{Q_{2001}}$ and actual demand Q_{2001} is due to price elasticity.

$$E = [lnQ_{2001} - \widehat{lnQ_{2001}}] / [ln(P_{2001}/P_{1999})]$$

Where E is price elasticity

Estimate demand for year 2003

$$lnQ_{2003} = [(2*r) + lnQ_{2001}] + [E * ln(P_{2003}/P_{2001})]$$
$$Q_{2003} = e^{lnQ_{2003}}$$

Where Q_{2003} : is quantity of the demand estimation year 2003

P_{2003} is Price of services year 2003

e: is the natural value (e = 2.7183)

Steps in Hospital Costing:

-     Cost Centers Identification & Grouping
-     Total direct cost determination
-     Allocation
-     Full cost determination
-     Unit cost calculation

a) Cost centers identification and grouping

The cost centers were divided to non- revenue producing cost centers (NRPCC), revenue producing cost centers (RPCC), and patient service cost centers (PSCC).

1). Non-revenue producing cost centers (NRPCC)

The cost centers that support other cost centers to service patients. The outcomes of work are not directly related to the patients. These cost centers don't produce revenue to the hospital. These cost centers as a following list:

$$\begin{array}{ll}\text{Administration} & (A_1)\\ \text{Catering} & (A_2)\\ \text{Laundry} & (A_3)\end{array}$$

2). Revenue producing cost centers (RPCC):

These cost centers provide services to the patient and can produce the revenue for the hospital. The list as the following:

$$\begin{array}{ll}\text{Pharmacy} & (B_1)\\ \text{Laboratory} & (B_2)\\ \text{X-Ray \& Ultrasound} & (B_3)\end{array}$$

3). Patient service cost centers (PSCC)

Outpatient department or OPD (C_1)

Inpatient department or IPD (C_2)

Surgeries (not including IPD) (C_3)

b) Total direct cost determination:

The direct cost of each cost centers comprises capital costs (CC), labor costs (LC), and material costs (MC).

c) Allocation criteria determination

All total direct cost of non-revenue producing cost centers (NPCC) and revenue producing cost centers (RPCC) are allocated to be direct cost of patient services cost centers (PSCC). Costs are allocated by step down method.

d) Prioritization of cost centers

The cost centers providing services to the highest number of cost centers is the first priority to be allocate, the one that provides services to the least number of cost centers is the last priority to be allocate.

Administration

Catering

Laundry

Pharmacy

Laboratory

X-Ray & Ultrasound

Allocation of direct costs of NRPCC and RPCC to PS

e) Allocation criteria

Table 4.2 Allocation criteria from NRPCC and RPCC

Overhead cost centers	Unit measurement
Space related cost center (capital cost) **NRPCC**	- Proportion of space of each cost centers (Unit measurement sqm^2)
1. Administration	- Proportion of salary &bonus of each cost centers
2. Catering	- Proportion of patients visits of each PSCC for number of IPD cases and Surgery cases.
3. Laundry	- Proportion of number of OPD, IPD, and Surgery cases.
RPCC	
1. Pharmacy	- Proportion of average 3 years charges of drugs and medical supplies of each cost centers (0.16% allocate to laboratory, 0.64% for X-ray & ultrasound, 8.94% for OPD, 80.62% for IPD, 9.64% for Surgery)
2. Laboratory	- Proportion of average 3 years charges of laboratory of each PSCC (20% allocate to OPD, 45% for IPD, 35% for Surgery)
3. X-Ray, Ultrasound, ECG	- Proportion in average 3 years charges of X Ray, Ultra sound, and ECG services for patients of each PSCC (30% allocate to OPD, 38% for IPD, 32% for Surgery)

f) Full cost determination

Full cost of each PSCC =   (Direct cost + Indirect cost)

g) Unit Cost Calculation:

Unit cost of OPD (C_1)

Unit cost of IPD (C_2)

Unit cost of operation (Surgery) (C_3)

Unit by patient services cost centers will calculate from the following formula.

Unit Cost = Total cost at PSCC / Unit at PS

Unit of OPD (C_1): Number of visits of OPD (2003)

Unit of IPD (C_2): Number of inpatients (2003)

Unit of Surgery (C_3): Number of operation (2003)

(The number of visits OPD, IPD, and Surgery Operation will get from demand estimation).

4.6.3 Estimate the total revenue

- **Estimate the Revenue from Government:**

Total Government revenue = $(GY_1 + GY_2 + GY_3) / 3$

Where GY_1 : is the revenue from government in year 1998

GY_2 : is the revenue from government in year 1999

GY_3: is the revenue from government in year 2000

- **Estimate the Revenue from the other:**

Total other revenue = $(OY_1 + OY_2 + OY_3) / 3$

Where OY_1: is the revenue from other in year 1998

OY_2 : is the revenue from other in year 1999

OY_3: is the revenue from other in year 2000

- **Estimate Revenue (2003) from User fees:**

We assume that the quality of health care services will not change, the growth rate population, price elasticity, and inflation rate are constant until year 2003, the analysis/ calculation below will show the effect of price change, and the relationship between price with the revenue, the demand, and the poor exempted (In term of equity).

Revenue = P_{2003} x Q_{2003}

Where P_{2003}: Price for services year 2003

Q_{2003}: Quantity of demand 2003

4.6.4 Cost recovery:

Cost Recovery = Revenue / Cost

(Revenue from user fees)

Cost recovery potential

If P_{2003} change $\Rightarrow$ ln(Q_{2003}) change $\Rightarrow$ Revenue change $\Rightarrow$ Cost recovery change

Sensitivity analysis by using the following equation:

From the formula above, it shows the relationship of Q (demand of health care), P (price) and R (revenue). Accordingly, this section performs the sensitivity analysis to see the effect of price to demand of health care. This study uses 3 values of price, which are 10%, 20% and 50%, there will be new prices (P_{2003}: change). Thus, demand and cost recovery ratio is also changed. To estimate a new demand we applies by the formula as below:

lnQ_{2003} = [(2 * Growth rate pop. + lnQ_{2001}] + [E * ln (P_{2003}/P_{20001})]

Where E is price elasticity, Q_{2003} is a new demand after increase price by 10%, 20%, and 50%. Q_{2003} will change by several price increases.

P_{2003} is a new price with increasing 10%, 20%, and 50%

Scenario 1: If price increase 10%, we will get a new Q_{2003}, and a new CRR

Scenario 2: If price increase 20%, we will get another Q_{2003}, and another CRR

Scenario 3: If price increase 50%, we will get a new demand and a new CRR deferent from scenario 1, and 2.

Exemption for the poor patients:

We assume that, Takeo hospital will provide free services 20% of the total volume patients to who are very poor, not to pay for services.

So that the volume of patients exempted by the hospital, will change by several scenarios. We will see in the chapter 5 (Result and Analysis).