

Network Operation Cost Model to Achieve Efficient Operation and Improving Cost Competitiveness

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Abstract— In today's competitive environment, for telecom service providers, estimating the cost for providing their services is becoming increasingly important. Moreover, cost estimation in the telecommunication industry becomes more difficult because of increasing indirect cost upon digital convergence, expanding multipurpose facilities, complexity of service product, etc. Nevertheless, not much seem to have done in improving estimation methodology of the cost of telecommunication operations. As a result, the quality of cost information on network operations and network facilities has deteriorated and now even decision makers in the industry dismiss the information. Recently, Telco companies have more concerned about network OPEX (operation expenditure) for their profitability and cost competitiveness which is essential for the company's survival. In this paper, we study the general network cost methodology of network facilities and operations. Especially, we suggest the new cost estimation method and procedure by applying ABC (Activity-Based Costing) method in the network operations to deal with the issue on network OPEX and cost reduction. And we explain how this method can estimate the operation cost more accurately and precisely than other previous methods and how this can help to analyze the cause of cost expenses and to establish the strategy and plan to improve the operational process and to reduce the operational cost. We also suggest several useful use-cases of the suggested cost estimation method and describe expected effects.

Keywords— Operation Cost Model, Activity-Based Cost, OPEX, Cost Reduction, Cost Estimation

I. INTRODUCTION

Today's telecommunication operators, in order to respond to saturation of the market growth and fierce competition, are considering the efficiency of the cost of providing the service as the most important management issue along with the developing the new growth engine. As in any business area, to improve service profitability and cost efficiency, cost information is used as most basic decision making information such as in service profitability analysis, business section

profitability analysis, new service pricing, performance evaluation of organization, etc.

Construction of the network to provide telecommunications services and related IT equipment takes a huge investment in facilities due to the nature of the communications industry. Therefore service providers had been giving an effort to improving effectiveness in their investment in facilities traditionally. In Addition to the telecommunication technology and network equipment development, an effort to make efficiencies in facility investment has been achieving effectiveness in network facility cost steadily. On the other hand, the importance of network operation cost, due to the service diversity, acceleration of network equipment and operation change, workforce aging and rising wages, has become increased. Operators have to reduce the operation cost and achieve effective operations and cost competitiveness.

In the communication industry, considering the characteristics of telecommunication industry and communication service characteristics in the view of costing, many cost estimation model has been studied and correspondents have been used. In this study, we will review as-is network cost models and derive the improvement point and established the directions and the design principle of network operation cost estimation method.

As established directions and design principle, we designed the network operations costing process and derived the operations cost elements and cost driver and defined the relationship between the cost elements and defined cost allocation arithmetic expression.

Finally we show some useful use-cases of this model and suggest expected effects.

II. BACKGROUNd

Cost Estimation in the communication industry, as the characteristics of regulation industry and cost characteristics, has been differentiated from general cost estimation and has developing several network cost models and applied these models. Before analysing the current cost estimation status, we review the costing characteristics of communication industry as below [1].

(1) Telecommunications industry has the characteristic of equipment industry having high portion of facility cost.

(2) With the advent of various convergent and composite services using the same facilities, portion of overhead costs is growing rather than direct expenses. For example, such as the introduction of the MSPP which can provide internet access and transmission equipment simultaneously

(3) As network equipment, to provide communications services, is configured to a complex layer (OSI 7 Layers), the primary distribution method for estimating the cost is limited.

(4) Telecom business as a public project to promote the welfares of the people, have various government regulation. Government regulates service prices and trade exchange between service providers such as communication services price regulation, interconnection fee regulation and network elements usage fee regulation.

By the needs of reliable and objective cost information in regulatory regime and the industry characteristics by aspects of the cost, the costing in the communications industry differentiates if from the common cost accounting system and cost methodologies have been developed and are being used now. Table 1 shows the costing models in the telecommunications industry and its characteristics [2].

TABLE 1. NETWORK COSTING MODELS

| Cost Model | Concept | Characteristics |
|-------------------------------------|--|---|
| FDC (Fully Distributed Costs) | distribute all expenditure(real cost) of company to provided services | Hard to estimate accurate cost of service due to the distortion of cost that can be caused by distribution of common cost |
| LRIC (Long Run Incremental Costing) | The additional cost when outcomes was shrunk or increased to a certain level | Focused to efficient utilization of existing network(Avoiding unnecessary duplicated investment) Using LRIC + Mark-up because of the inability to recover common cost |
| Glide Path | Continually lowering interconnection after a certain time to achieve target cost | Used by OFCOM to calculate interconnection of Mobile network in the UK |
| Element Based Model | Estimating the interconnection fee based on the cost when operators which do not own network build the network and use it | Applied by OFTEL to the network lease business (WLR: Wholesale Line Rental) |
| ABC (Activity-Based Costing) | Focused on the activities which are performed within the company, distribute the common costs t to the cost objects | The problem in the traditional costing system t which is overhead cost is distributed by just simple factor(direct labour hours) can be improved and costs can be reduced by identifying cost drivers |
| BBC (Building Block Costing) | By applying ABC to network facility, distribute common network facility costs to cost objects by cost drivers(number of lines, number of subscribers, traffic) | Able to sophisticated cost estimation by distributing common network facility cost using reasonable cost drivers |

These network cost models have been used in mainly two areas. The one is management account part for enterprise management efficiency such as services /business section profitability analysis, organization performance management, internal cost information calculation. And the other is regulation party that is used by regulatory agency in service pricing and interconnection fee estimation for the purpose of inducing fair competition among businesses, efficient investment, avoiding overlapping investment and so on.

III. NETWORK OPERATION COSTING METHODOLOGY

A. Design Principle

Today's service providers are focusing their full attention on efforts into cost savings and cost efficiency for providing their services. Meanwhile, by examining the existing methodologies introduced in Section II, we can find the fact that as-is network costing methodologies are mainly focused on the network facilities costing in the voice services and the operation cost is calculated to be proportional to the volume of the network facility cost. In these methods, operation cost is calculated from certain rate that is defined from the ratio of historical operation expenses and the volume of facility cost.

This method multiplexing the certain rate on the facility cost based on the historical operation expenses cannot meet the requirement of today's operators that can help to achieve efficient operation and cost savings.

Therefore, by examining as-is network costing models especially in the view of operation costs, interviewing the cost personnel in real business, analysing technology trend and other business cases and analysing all the requirements of operation cost methodology from various way we established the directions and design principle of network operation cost methodology as follows:

1. Efficiency

- Improvement point: provide the useful information to support decision-making for efficiency of operation and optimization of operation cost
- Solution: applying ABC (Activity-Based Costing) method to find cause and result relationship of operation cost clearly and to improve business process

2. Forward looking

- Improvement point: Not based on cost expenditure happened in the past but estimating the cost of efficient operation in the future
- Solution: setup the standard cost (target cost)

3. Fairness

- Improvement point: In the various operation environments to evaluate operation performance fairly
- Solution: Define and using correction factor considering various operation environments factors (moving distance, equipment model, services, operation type, etc.)

4. Actual Time based

- Improvement point: From using the ratio of time consumption on target activity, to total available labour time of FTE (Full Time Equivalent), to the actual working time measured by activity
- Solution: Implementation of IT infra that can measure and manage the data of operator's every activity quantitatively as automatically as possible

B. Operation Cost Estimation Process

To estimate network operation cost, we propose the following process and Figure 1 shows this process simply.

1) Analyse the operation cost structure

2) Analyse the company's operation process and classify activities and define activities clearly.

3) Measure and collect each activity's attribute such as operator, start time, end time, moving distance, services, equipment model, work type, work difficulties, worker skill, etc.

4) Allocate Operation cost to relevant activities reasonably according to causality and benefit and cost.

5) Analyse operation activity cost and find the cause of cost to establish the strategy and plan to cost reduction and cost efficiency.

6) Feedback the operation cost analysis result to set up the target(standard) cost and improve operation process

7) Virtuous circle structure of operation cost is to be made.

Process of Network Operation Costing

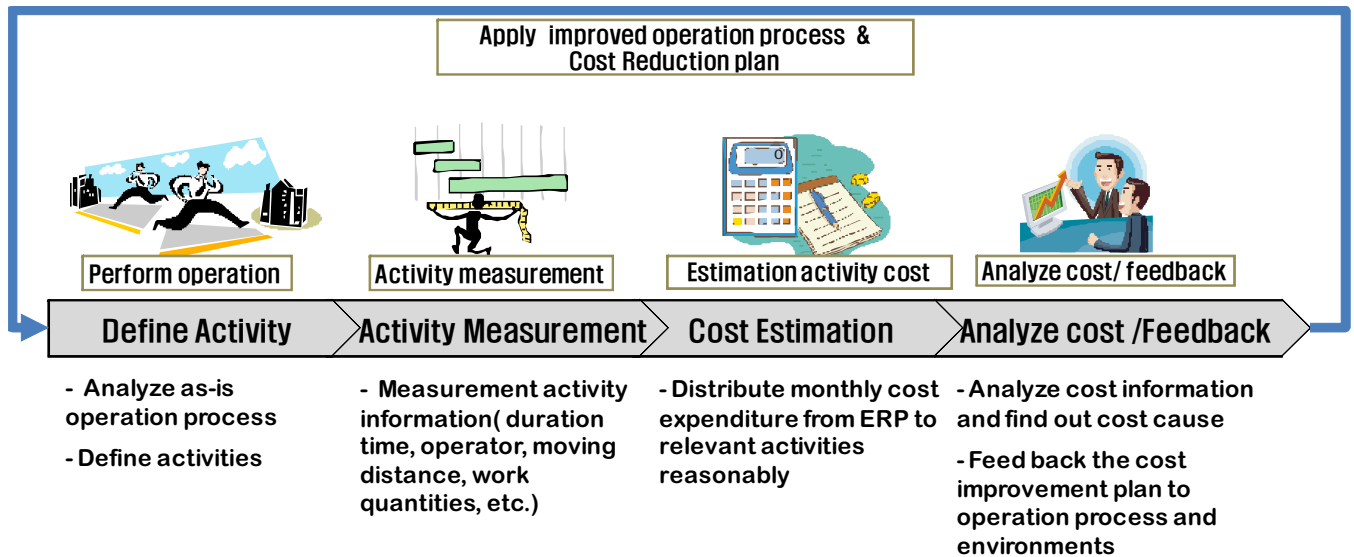


Figure 1. Process of Network Operation Costing

C. Operation Cost Structure Analysis

Operation cost can be classified by direct operation cost which is related directly to the network operation activities and indirect cost that is related to supporting and management activities [2].

Direct Operation cost is related with direct network operations such as network configuration, fault management, quality management, workforce management, etc. Indirect cost is related to general management and supporting tasks which are mainly performed in headquarter and regional headquarter /center by managers and administrative and support staffs.

Table 2 shows the classification of operation cost and related department and account.

TABLE 2. NETWORK OPERATION COST ELEMENTS

| Class | Main Activity | Department | Account |
|--------------------------|----------------------------------|----------------------------------|------------------------------------|
| Direct Operations Cost | Network Configuration | Field Network Operating Staff | Labour costs |
| | Network Trouble Management | | Repairing and maintenance expenses |
| | Network Performance Management | | Electricity cost |
| | Workforce Management | | Cost of vehicle maintenance |
| Indirect Operations Cost | Establish Standard and Guideline | Headquarter managers and support | Labour costs |

| | | | |
|--|----------------------------------|---|--|
| | Human Resource Training | department staffs | Educational cost |
| | Budget Management | | Current research cost |
| | Operational Performance Analysis | Regional Headquarter/ Center managers and support department staffs | Supplies expense |
| | | | (Office or Building) Space Rental Cost |

D. Activity Classification and Definition

To design network operation cost model, most important and time consuming work is analysing company's current operation process and classify activities and define each activities.

Activity can be defined as unit process that consumes company's resources and produces output that provides value to customers.

When activity is getting smaller, while the cost information is getting more detailed and exquisite, cost of activity management and measurement is getting bigger.

On the contrary, when activity is getting bigger and coarse-grained while the cost information is getting simple and rough, cost of activity management and measurement is getting smaller.

The granularity, level of activity is most important and difficult work. So we need to decide the activity level considering the cost information purpose, cost and benefit, maintenance, etc.

To meet these needs, we can use activity classification criteria as follows [3].

1) **Measurable and Meaningful** : To balance the maintenance cost and benefit, activity should be measurable and meaningful from operation cost point of view

2) **Standardized and efficient operation activities**: Main purpose of calculation of operation cost is to obtain operation efficiency and cost reduction. So defined activities should be able to be used as a tool for operation process improvement such as more simple and more standardized process design and elimination of unnecessary activities and reducing non-value added activities and enforcing value-added activities

3) **MECE (Mutually Exclusive and Collectively Exhaustive)**: The company's every operation activities should be measured and not to be duplicated.

E. Activity Measurement

In order to quantitatively evaluate operation business process, it is very important to measure quickly and easily how much resource were consumed and how much money it takes in the process by activities. In addition, network operation management work is difficult or a lot of activity is relatively obscure, to overcome these problems is very essential.

For activity measurement way, there is manual input which is input by operators manually. This method is easy to implement but there is some disadvantages that can be inaccurate and distorted because of the fact that it depends fully on person's memory and intends.

measure real work time of workers so cannot find if the operator is overloaded or have some usable capacities and can be inaccurate and distorted because of the same reason of manual input.

So, the most desirable way of activity measurement is automatic measurement by OSSs without manual input when OSSs have the function of measurement on each business activities and the simple example is shown in Figure 2.

By each activity's starting conditions and termination conditions, OSS can automate the activity measurement without organization's resistance due to work measurement, or the inconvenience of manual input, most of the errors in the input data can be overcome.

F. Model for estimation of operation cost by activity

In general, the process of calculating can be said the process of allocating input data (the actual costs incurred, depreciation and amortization) to the final cost objects (services, divisions, facilities, etc.) based on cost drivers (number of subscribers, direct working time, sales, depreciation, etc.). Usually because costing process is implemented by IT systems this can be implemented to IT systems by defining the input and output items and values and relationship of input and output value in terms of mathematical relationships. In this paper, the cost

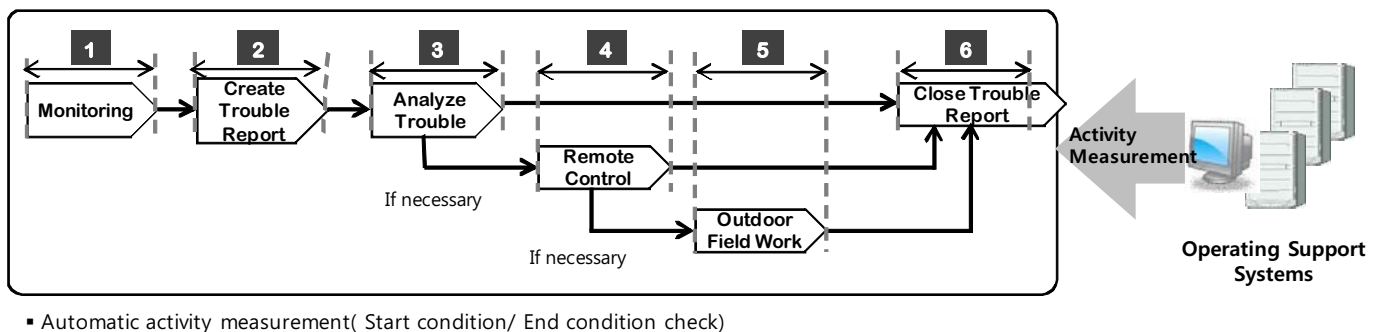


Figure 2. Example of automatic activity measurement

The other method is Ratio of time commitment. This is the ratio of time commitment on certain activity to full available work time of one worker. If one worker commits two kinds of business activities and spends 50% of his full available work time respectively, the ratio of time is 0.5 respectively. This is easy to implement and measure but also have some drawbacks that this cannot

object is defined as activity operating costs and input data can be monthly expenses incurred in ERP, organization and personnel information in HRM systems, facilities information in inventory system, OSS system's network configuration, fault, and quality management work information. The labour, supplies cost shall be distributed each activities based on the commitment time of activity. Otherwise the costs of education, vehicle

maintenance, repair, maintenance and the costs associated with certain activities should be charged to certain activities directly as direct costs. In this way, you can calculate the cost of each schedule activity [4].

G. Analyse operation activity cost and utilization of cost information

The system and model for network operation cost estimation allows you to find out how business is performed transparently and how many activities will occur or how much money will consume for each activity. Therefore various business efficiency and decision making can be done due to operating costs.

Some effects as shown in the following can be expected such as improvement of operational process and operation cost, supporting strategic decision-making by cost data.

- By cost analysis of operating activities, this method can help to remove unnecessary processes and help to be done in the most efficient process for necessary tasks and support process improvement
- By measurement working time, the cost driver, and analysis of the cause of working time for each activity, this can help improvement of working Time
- The pre and post analysis of cost effectiveness by improving operational process and OSSs can be measured quantitatively.
- Strategic management of operation processes - IT - human resources can be done due to operation cost data
- Considering lifetime operating cost of network equipment, as well as initial purchasing cost in the TCO perspective, this can support the equipment investment decision.

H. Comparison

It is helpful to see the difference and advantages and drawback of two cost estimation method.

| | Previous method | Proposed method |
|--|-----------------|-----------------|
|--|-----------------|-----------------|

| | | |
|-----------|--|--|
| Advantage | <ul style="list-style-type: none"> - Calculation is easy and simple - Cost is low - Easy to maintenance and measurement | <ul style="list-style-type: none"> - Easy to find causality of cost - To make Efficient operation, can be used in operation process improvement - Support Decision making |
| drawback | <ul style="list-style-type: none"> - Hard to find causality of cost - Inaccurate allocation of common costs - Cannot support operation efficiency, cost reduction and decision making | <ul style="list-style-type: none"> - Cost is high - Design Cost model is difficult - Current research cost - Supplies expense - Space Rental Cost |

IV. CONCLUSIONS

In this paper, we proposed network operation cost methodology for the efficiency of network operations by analyzing the cost structures of network operations and management, the classification of activities and designing operation cost model.

This activity based network operation costing methodology has improved the current cost expense way according to standards set by divisions annually and this method can help to find the causality of cost and operation activities and to price new developing services and to improve operation process and shorten the activity execution time and to optimize the operation cost.

Based on this study, we plan to continue the research on the correlation of the network operation factors, the factors for quality, network traffic, network equipment, customer satisfaction, revenue, etc. and operation cost and study to design the methodology to estimate the optimal cost of network operations from a comprehensive perspective.

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