

CHAPTER 13

IMPLEMENTATION OF THE MASTER PLAN

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In this chapter, the matters relating to implementation of the Master Plan, such as guidelines for the project implementation, guidelines for upgrade of service qualities and traffic promotion activities are described.

13.1 Guidelines for the Project Implementation

As the final stage of formulation of the Master Plan, appropriate projects, which correspond to the respective components of the Master Plan, should be selected and assigned to each phase and each telecommunication area in accordance with objectives and strategies of the Master Plan described in Chapter 5.

In this section, guidelines for selection and assignment of projects to each phase and telecommunication area are decided.

13.1.1 Key Points on Giving Priority Order to the Strategies

The strategies described in Chapter 5 are examined from the viewpoint of priority order to be assigned to each phase and each telecommunication area, taking the following five key points into consideration as shown in Table 13.1.1-1.

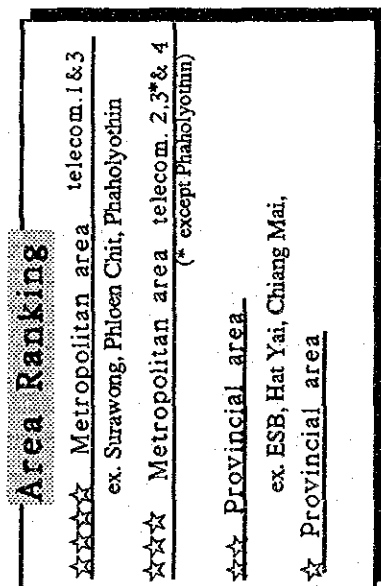
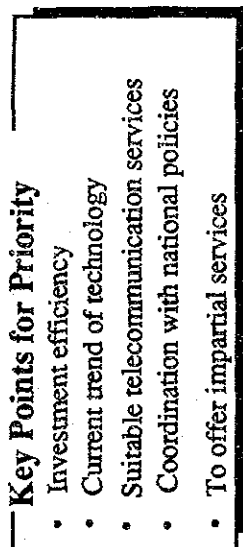
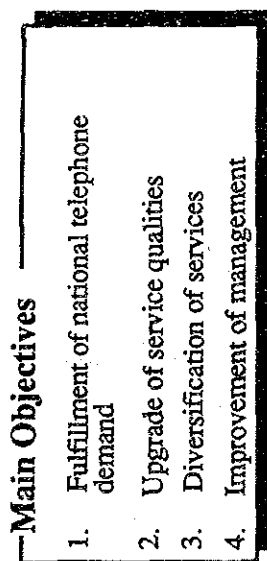
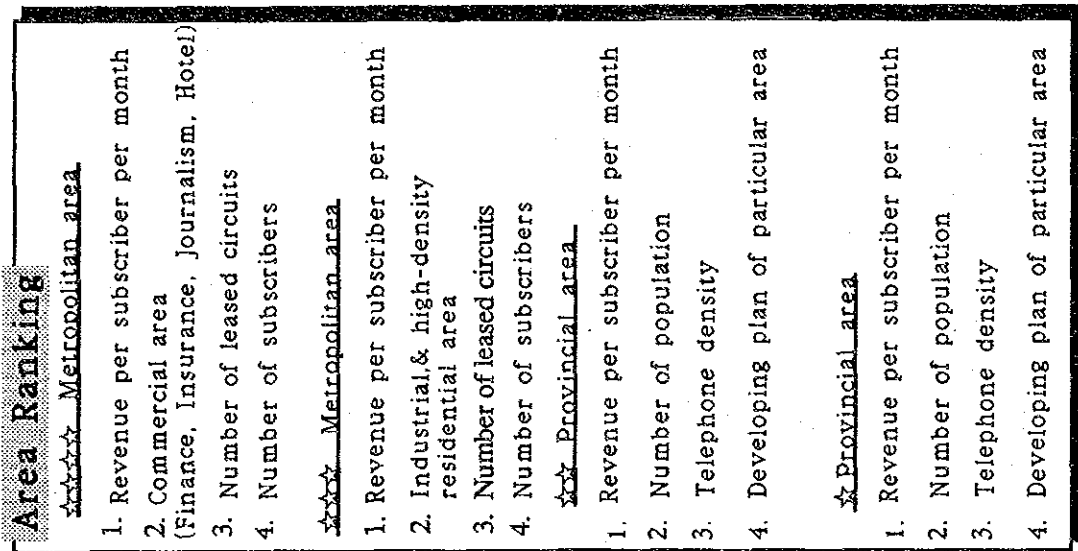
- a) Investment efficiency,
- b) Current trend of telecommunication technology in the world,
- c) Suitable telecommunication services for each area,
- d) Coordination with national development policies,
- e) To offer impartial services.

13.1.2 Assignment of Strategies to the Area

As Bangkok Metropolitan Area (as shown in Figure 7.3.2-1) is now quite different from any provincial area with respect to the number of subscribers and telephone density, telephone installation plans, which is the major part of the Master Plan, these features are studied separately for the metropolitan area and provincial areas as shown in Table 13.1.1-1.

Table 13.1.1-1 Implementation of Master Plan

Project Formation



As the result, the strategies are assigned to each of the telecommunication area of the metropolitan area and provincial areas, and also some strategies are assigned to the whole country, with the respective priority orders as described in the following.

-Metropolitan area

- 1st: Reduction of waiting applicants.
- 2nd: Introduction of ISDN and extension of various services.
- 3rd: Increase of public telephone.
- 4th: Rehabilitation of analog facilities.
- 5th: Review of outside plant maintenance center.
- 6th: Upgrade of successful call ratio

-Provincial areas

- 1st: Reduction of waiting applicants.
- 2nd: Dissolution of non-telephone communities.
- 3rd: Increase of public telephone.
- 4th: Introduction of ISDN.

-Nationwide

- 1st: Extension of cellular mobile service.
- 2nd: Improvement of operation and maintenance.
- 3rd: Improvement of management system.
- 4th: Development of satellite communication system.

1) Telecommunications Area Ranking

In the metropolitan and provincial areas, respectively, each telecommunication area should be given area ranking from the viewpoint of project implementation taking the following matters into consideration.

-Metropolitan area

- a) Business area, and commercial area, industrial and residential area.
- b) Number of leased circuits.
- c) High revenue area.

-Provincial area

- a) Telephone density.
- b) Developing area (industry, residence, port, agricultural industry, commercial, tourist resort, etc.).
- c) Number of leased circuits.
- d) High revenue area.

The detailed criteria of area ranking is shown in Table 13.1.2-1, and examples of them are shown in Figure 13.1.1-1 and Figure 13.1.1-2.

2) Consideration on Project Implementation

Proposed projects can be classified into some technical and administrative fields. For implementation of these projects, the following matters should also be taken into consideration.

a) Effective Implementation

Telecommunication services and network should be expanded efficiently from the viewpoints of rendering better service and also effective investment.

For this reason, some kind of projects aiming at the same purpose in the same area should be coordinated to be carried out in the same period.

For example, implementation periods of a switching facility expansion project and an outside plant facility expansion project for the same area should be adjusted to the same time as far as possible.

b) Coordination with National Development Policies

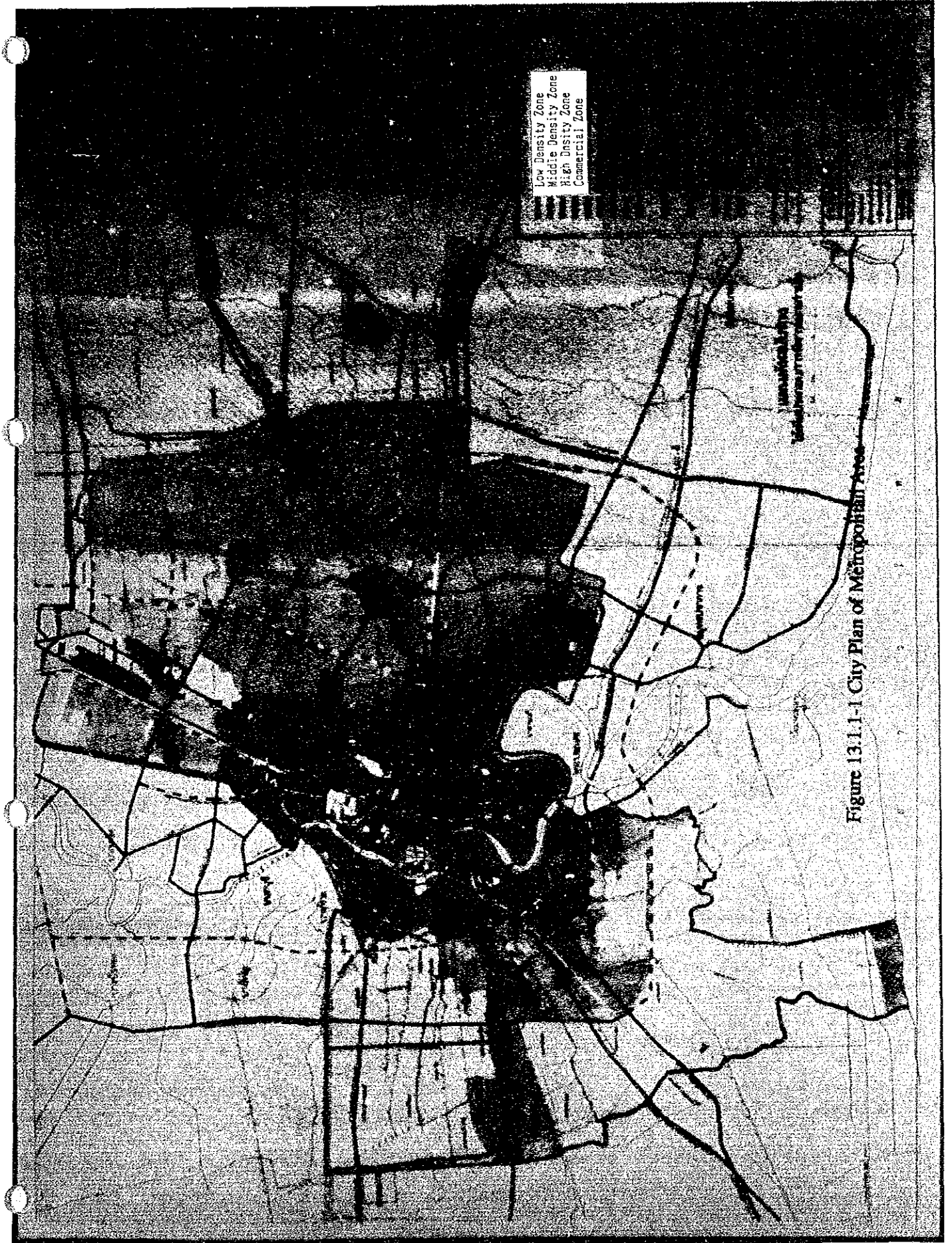
For sound development of every socio-economic sectors, reinforcement of telecommunication services in appropriate time will make a great impact. Therefore, implementation of the projects should be carried out placing emphasis on the developing areas, too, according to the Government's Development plan as well as the developed areas.

Table 13.1.2-1 Selection of Implementation Area and Work

Project	Phase-1	Phase-2	Phase-3
Reduction of w. a. ISDN & various services			
Public telephone			
Rehabilitation of analog			
Reduction of w. a. ISDN & various services			
Public telephone			
Rehabilitation of analog			
Reduction of w. a. Non-telephone community			
Public telephone			
ISDN & various services			
Reduction of w. a. Non-telephone community			
Public telephone			
ISDN & various services			
Cellular mobile service			
Improvement of O&M			
Improvement of management			
OP&C			
Satellite-communication			

Assignment of Priority Order with Strategies

PH 1	<p>Reduction of waiting applicant Introduction of ISDN various service</p> <p>1st Increase of public telephone 2nd Rehabilitation of analog facility 3rd Review of outside plant maintenance 4th Upgrade of successful call ratio</p>	<p>Reduction of waiting applicant Dissolution of non-telephone community Increase of public telephone Introduction of ISDN</p> <p>1st Increase of public telephone 2nd Rehabilitation of analog facility 3rd Review of outside plant maintenance 4th Upgrade of successful call ratio</p>	<p>Whole country</p> <p>1st Extension of cellular mobile service 2nd Improvement of operation and maintenance 3rd Improvement of management 4th Development of satellite communication system</p>
PH 2	<p>Upgrade of successful call ratio Expansion of ISDN various service Rehabilitation of analog facility Increase of public telephone</p> <p>1st Upgrade of successful call ratio 2nd Expansion of ISDN various service 3rd Rehabilitation of analog facility 4th Increase of public telephone</p>	<p>Reduction of waiting applicant Dissolution of non-telephone community Expansion of ISDN Increase of public telephone Development of satellite communication system</p> <p>1st Upgrade of successful call ratio 2nd Expansion of ISDN various service 3rd Rehabilitation of analog facility 4th Increase of public telephone 5th Development of satellite communication system</p>	<p>Whole country</p> <p>1st Extension of cellular mobile service 2nd Improvement of management 3rd Development of satellite communication system</p>
PH 3	<p>Introduction of ISDN various services Rehabilitation of analog facility Upgrade of successful call ratio</p> <p>1st Introduction of ISDN various services 2nd Rehabilitation of analog facility 3rd Upgrade of successful call ratio</p>	<p>Dissolution of non-telephone community Introduction of ISDN Upgrade of successful call ratio</p> <p>1st Dissolution of non-telephone community 2nd Introduction of ISDN 3rd Upgrade of successful call ratio</p>	<p>Whole country</p> <p>1st Extension of cellular mobile service 2nd Improvement of management 3rd Development of satellite communication system</p>



Low Density Zone
Middle Density Zone
High Density Zone
Commercial Zone

Figure 13.1.1-1 City Plan of Metropolitan Area

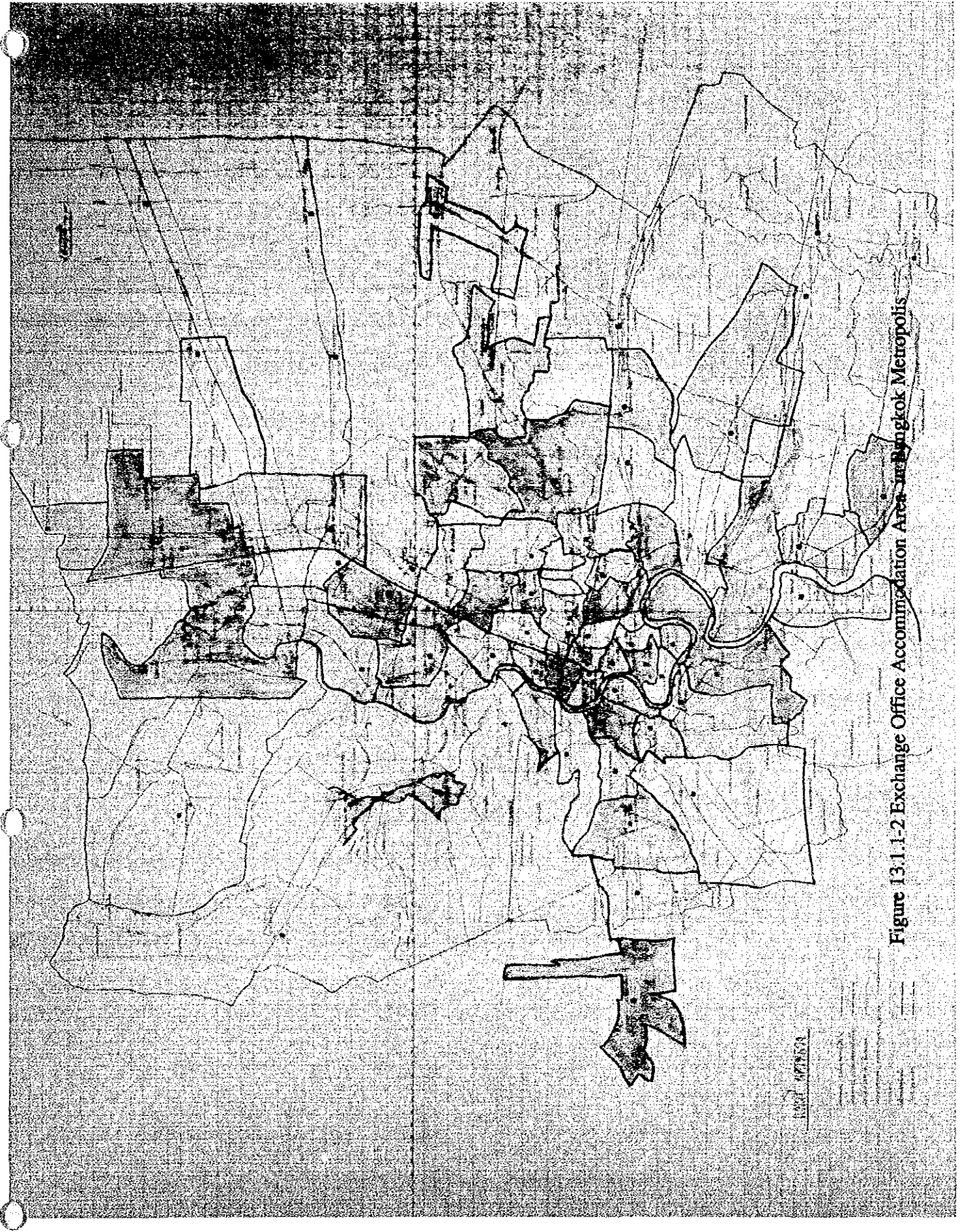


Figure 13.1.1-2 Exchange Office Accommodation Area in Bangkok Metropolis

c) To Offer Impartial Services

For the public telecommunication administration, it is essential to render the better services to all the customers as impartially as possible.

Thus, the various disparities among the telecommunication areas, which are described in section 2.5 "Present Situations of Each Telecommunication Area in TOT" should also be taken into consideration on deciding area priority of project implementation in order to dissolve such disparities in service qualities and also to improve TOT's overall management as much as possible.

13.1.3 Project Implementation Programs in the Long Range Period

The outlines of the long range project implementation program are shown in Table 13.1.3-1.

13.1.4 Project Implementation Programs in Phase-1

The outlines of the the project implementation program in Phase-1 are shown in Table 13.1.4-1.

Table 13.1.3-1 List of Proposed Projects in the Period

Strategies and Items of Implementation	Phase-1 (1993 - 1997)	Phase-2 (1998 - 2002)	Phase-3 (2003 - 2007)
1. Fulfillment of National Telephone Demand			
☆1. Local cable project	Metro. 1,908,000 L Prov. 1,862,000 L	894,000 L 1,109,000 L	983,000 L 1,331,000 L
☆2. Switching pro.	Metro. 974,000 L Prov. 923,000 L	633,000 L 615,000 L	616,000 L 730,000 L
☆3. Rural Telecom. pro.	TDMA. 6,330 L Expansion 62,000 L	TDMA. 6,330 L 138,000 L	TDMA. 9,000 L 154,000 L
☆4. Cellular Mobile pro.	Long. 107 sys.	117 sys.	153 sys.
☆5. Transmission Network pro.	Metro. 130 sys.	63 sys.	63 sys.
2. Diversification of Services			
☆6. ISDN Introduction pro.	Introduction 9 Areas	Expansion 12 Areas	Whole country
☆7. Satellite Communication Introduction pro.	Installation 17 EST	Expansion 5 EST	Expansion 4 EST
3. Upgrade of Service Qualities			
☆8. Enhancement of outside plant O&M pro.	Modernized outside job Phase-1.	Phase-2.	Phase-3.
☆9. Total operation system pro.	Improvement of operation sys.	Introduction of integrated operation sys.	
☆10. Service grade up pro.	Upgrading service cal		
(1) Upgrading successful call	Successful call ratio 60% New Engineering Std.	Successful call ratio 70%.	Successful call ratio 75 %
(2) New Engineering Std.			
4. Improvement of Management			
☆11 Financial Management Pro.	Tariff review for existing and new services.		
(1) Tariff review			
(2) Fund management	Consideration of remittance to the Treasury & review for accounting method of depreciation		
(3) Cost control	Operation of QC. circles.		
☆12 Human resource Pro.	Establishment and implementation of staffing criteria		
(1) Staffing			
(2) Reorganization	Decentralization	Establishment of profit and cost center system	

Note; L; Line Unit
EST; Earth Station

Table 13.1.4-1 List of Proposed Projects in the Period

Area	No. of Pro. In Table 13.1.3-1	Name of Project	Criteria	Sub No. of Project	Priority	Contents of Project
Metropolitan area	1	Local Cable Project No. of lines 1,908,000	Reduction of waiting applicants	1-1-(1)	#2 P-1	#1 *1. Metro. main area (Commercial area, Big amount of leased circuits & subscribers) *2. Telcom. 163 area (Surawong, Phloen Chit, Phaholyothin and so on)
	2	Switching Project No. of lines 974,000	Reduction of waiting applicants	2-1-(1)	P-2	*1. Metro. main area (High density of residential & industrial. Big amount of the revenue per month) *2. Telcom. 2&4 area (Chaiyaphuruk, On nut, Ban Su, Lat Ya, Lak Si and so on)
	6	Expansion of Public Telephone No. of tel. sets 24,470 ISDN and New Service Project	Reduction of waiting applicants Diversification of service	3-1-(1) 5-1-(1)	P-2 P-2	*1. Metro. sub main area (Commercial area, Big amount of leased circuits & subscribers) *2. Same area of the local cable project (Pro. No.1-1-(1)) *1. Metro.sub main area (High density of residential & industrial. Big amount of the revenue per month) *2. Same area of the local cable project (Pro. No.1-1-(2)) *1. The whole country *2. Objective Public tel. density 0.51 tel/1,000 persons
	5	Transmission Project No. of span 68 No. of System 130 No. of MUX. 115	Reduction of waiting applicants	4-1-(1)	P-2	*1. Metro. main area (Commercial area, Big amount of leased circuits & subscribers) *2. Telcom. 163 area (Surawong, Phloen Chit, Phaholyothin and so on)
	1	Local Cable Project No. of lines 862,000	Reduction of waiting applicants	1-2-(1)	P-3	*1. Mainly Big amount of leased circuits area, and commercial area *2. (1)Telcom. 163 area (Surawong, Phloen Chit, Phaholyothin and so on) (2)Telcom. 2&4 area (Chaiyaphuruk, On nut, Ban Su, Lat Ya, Lak Si and so on)
Provincial areas	2	Switching Project No. of lines 917,000	Reduction of waiting applicants	2-2-(1)	P-2	*1. Mainly expand according to switching facilities *2. 1st. Telcom. 163 area 2nd. telcom 2&4 area
	3	Rural Telecom. Project No. of Sys. 6,330	Reduction of waiting applicants	3-2-(1)	P-3	*1. Big amount of revenue /month/subscriber, industrial & high density of residential area, number of leased circuits and number of subscribers. *2. Chiang Mai, Khon Kaen, Nakhon Ratchasima, Chon Buri, Songkha(Hat Yai) and so on.
	5	Long Dia. Transmission Pro. No. of span 51 No. of System 51 No. of MUX. 179	Diversification of service	4-2-(1)	P-2	*1. Big amount of revenue /month/subscriber, industrial & high density of residential area *2. Phitsanulok, Nakhon Sawan, Udon Thani, Ratchaburi, Surat Thani, Phuket, Lampang Chachoengsao, Rayong, Petchaburi, Kanchanaburi, Nakhon Si Thammarat and so on.
	6	ISDN and New Service Project No. of provinces introduced 9 areas	Diversification of service	5-2-(1)	P-4	*1. Big amount of revenue /month/subscriber, industrial & high density of residential area, number of leased circuits and number of subscribers. *2. Chiang Mai, Khon Kaen, Nakhon Ratchasima, Chon Buri, Songkha(Hat Yai) and so on.
	4	Cellular Mobile Pro. No. of sub. 62,000	Diversification of service	6-(1)	P-1	*1. Big amount of revenue /month/subscriber, industrial & high density of residential area, number of leased circuits and number of subscribers. *2. Big sites along to the main high way
Nation wide	7	Satellite Communication Pro No. of earth station 17	Diversification of service	7-(1)	P-2	*1. Introduction for TV transmitting network, new services. *2. Earth stations (BKK, Nakhon Ratchasima, Phitsanulok, Surat Thani and other 7 cities)
	8	Enhancement of Outside Plan O&M Pro.	Upgrade of service	8-(1)		
	9	Total Operation Sys. Pro. (1) Centralizing operation	Upgrade of service	9-(1)		*1. Progress the operation sys. in each section.(Switching, Long distance and Metro. trans.) *2. Combine the Transmission operation sys.
	10	Service Grade up Pro. (1) Upgrade service call (2) New eng. standard	Upgrade of service Diversification of service	10-(1) 10-(2)		*1. Upgrade successful call ratio (objective 60 %) *2. Provide the TOT's telecom. service grade and service menu. *3. Engineering Standard . make up the new telecom. service menu
	11	Financial Management Pro. (1) Expert on tariff (2) Expert on total management (3) Cost control	Improvement of management	11-(1) 11-(2) 11-(3)		*1. Invitation of expert from outside for tariff *2. Invitation of expert from outside for Financial and human resource management
	12	Human Resource Pro. (1) Staffing pro. (2) Re-organization	Improvement of management	12-(1) 12-(2)		*1. Establishment and implementation of staffing criteria *2. Establishment of profile and cost center sys.
						Note1. #1 '1 reason #2 '2 rea name

13.2 Guidelines for Upgrade of Service Qualities

This section propose a guideline for upgrade of service qualities based on preventive maintenance activity.

The main purpose of the telecommunication enterprise is to provide better and more widespread telecommunications services. Therefore, maintaining the telecommunications facilities including the outside plant, switching equipment, transmission equipment, and power plant, in good condition by means of an organized system is very important toward the future.

Especially, as the outside plant is exposed to various environmental conditions such as temperature, wind, moisture, lightning, and other natural influences including sunlight, birds and insects as well as social factors such as electric power lines and road traffic, it is very difficult and also very important matters to keep telecommunication facilities in good condition. The effect of these external forces is shown in Table 13.2-1.

Table 13.2-1 Natural and Social Influences Outside Plants Concerned

	Item.	Effects on outside Plant
Natural Factors	Temperature Winds(Sea winds)etc. Rain water Moisture Lightening Topographical condition Soil Sun Mice, birds, insects	Breakage and shrinkage due to temperature change Lines down or broken due to vibration, corrosion Corrosion, water penetration Corrosion, dielectric breakdown Breaking of cable sheath, fusing cable pairs cuts, fall due sinking Fading, degradation Breaks
Social Factors	Power supply lines Power distribution lines Factory smoke Construction work Vehicle	Induction Induction, corrosion Dielectric breakdown, corrosion Cut, breaking

13.2.1 Present Situation of Outside Plant Facilities in Thailand

As described in Chapter 2, the fault ratio, namely the number of fault occurrences per month, is 4.7 per 100 subscribers as of 1987. In other words, this rate means that all subscribers served by TOT will have at least on the average one fault over two years period.

From a viewpoint of the fault contents, the number of faults caused on outside plant facilities, such as cables and drop wires, make up about 50% of the total number of faults in the year. This is true for both the metropolitan and provincial areas.

In regard to the repair period, more than 10% of all fault occurrence, in metropolitan areas, requires more than two days before the fault is corrected. It is also about 6% in provincial areas.

On the other hand, from the view point of service quality when someone is calling to the other person, they occasionally perceive some uncomfortable noise and crosstalk through telephone line.

13.2.2 On-Going Rehabilitation Project of Outside Plant in TOT

As described in Chapter 5, since 1986, TOT has been carrying out the Rehabilitation Project of outside plant in order to grade up the quality of telecommunication services, with total budget of 591 million baht and the term of 5 years.

The facilities, which is reported from their respective maintenance center as being deteriorated, have been replaced to new facilities. Implementation of the project is expected to reduce the fault occurrence and to improve the service quality. However, the standard of judgement to replace facilities is not established yet. Therefore, preventive maintenance activity, which is based on maintenance control system as described later, should be introduced as soon as possible.

13.2.3 Introduction of Maintenance Control System

Through considering the present situations above mentioned, outside plant facilities do not seem to be in good conditions. Therefore, it will be very difficult matter to make and to keep these facilities in better conditions for rendering the better service.

In Chapter 8, a rehabilitation plan was proposed to take a broad view of investment cost. Introduction of maintenance control system is indispensable to execute the rehabilitation plan.

As the trend of telecommunication maintenance activity, started from corrective maintenance in the early stage, with "repair when broken", then through the middle age of

preventive maintenance, of "prevent breakage", and finally controlled maintenance has become applied in many countries recently, on the bases of Maintenance Control System. These systems consist of four control items such as service control, plant control value, deteriorated plant control and extraordinary failure control.

First, the purpose of the control by service control value is to measure maintenance service level for customers who is unsatisfied with service, and to provide telecommunication service in good condition while improving these complaints. Therefore, the service control value is the lowest limit of service level and its limit has to be completed for every office and every circuit.

Second, the purpose of the control by plant control is to establish the plant control value related to fault occurrence by a group of facilities and to execute improvement action if the group of facility was over the limit of value.

Third, the purpose of deteriorated plant control is to establish limit value of deteriorated plant by a plant, and to reflect the plants which were picked up as a deteriorated facility, to effective maintenance activities and facilities improvement plans.

Fourth, the big scale faults that deteriorates the level of telecommunication service to a considerable extent, and the extraordinary congestion of telecommunication traffic are counted as a extraordinary failure. They are individually controlled whenever a failure occurred. While the counter measures are examined to the failure taking the occasion for the failure into consideration, it will be extended nationwide as soon as possible.

The work flow of the maintenance control system is shown in Figure 13.2.3-1.

In four factors for maintenance control above mentioned, it is considered that introduction of both maintenance control systems by plant control value and deteriorated plant control are effective for the outside plant facilities considering present situation of outside plants.

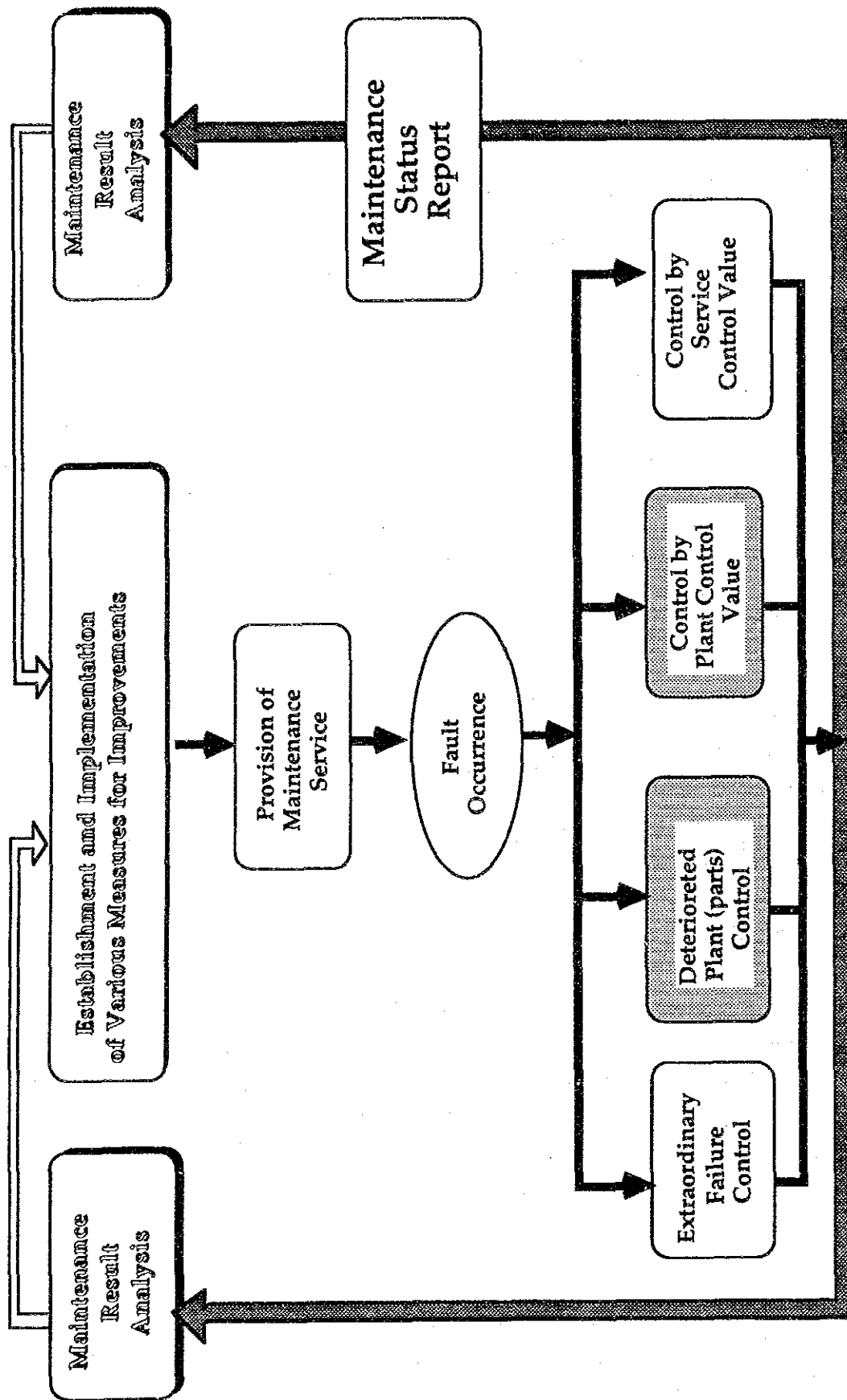


Figure 13.2.3-1 Work Flow of Maintenance Control System

13.2.4 Control by Plant Control Value

Quality of plants have usually deteriorated with the passage of time, and if it is left without any maintenance activities, it will become impossible to keep the plant quality at the level of early stage. As the result, if fault occurrence rate of the plant will be over the limit, the service quality shall be rapidly down and it will be required to work hard in order to improvement of the facility.

Therefore, it is necessary to introduce the maintenance control system which grasp actual situation of these facilities in advance.

1) Procedure of Plant Control

Management of the plant control is carried out in accordance with the following procedure.

- a) Establishment of plant control value.(fault occurrence rate)
- b) Grasp of plants over plant control value.(with daily maintenance activity)
- c) Examination of improvement plan.
- d) Execution of action plan.
- e) Evaluation of action plan.
- f) Feed back to a) or c).

2) Establishment of Plant Control Value

The plant control value should be decided in consideration of typical environmental condition in Thailand, such as temperature, lightning and rain etc. Because the value control quantity of unsuitable facilities which have to be improved. The control value is consisted of items as in Table 13.2.4-1.

Table 13.2.4-1 Plant Control Value

Items	Limit Value	Unit of Plant control Value
Aerial cable	*	Number of faults per year per rigid distribution area
Underground Primary Cable	3	Number of faults per year per entrance cable
Secondary Cable	*	Number of faults per year per rigid distribution area
Cable pair	*	Number of inferior pair per rigid distribution area

Number of Faults are total faults of being found by maintenance activities and of being complained from customers.

In the above Table 13.2.4-1, limit value (*) should be established in accordance with the number of primary cable pairs in each rigid distribution area as the example show in Table 13.2.4-2.

Table 13.2.4-2 Plant Control Value by Rigid Control Distribution Area

	100	200	300	400	500	600	700	800
Aerial Cable	2	3	4	5	6	7	8	8
Underground Secondary Cable	2	3	4	5	6	7	8	8
Cable Pair	7	12	16	21	25	29	33	37

13.2.5 Deteriorated Plant Control System

The purpose of this system is to reflect the deteriorated facilities, which were picked up, to daily maintenance work and facility improvement plans in order to maintain the service quality in good condition. Consequently, the control system is to found out deteriorated plants based on limit value of deteriorated facilities, which is set up by a part of plants.

1) Procedure of Deteriorated Plant Control System

- a) Establishment of standard for judgement of deteriorated plants
- b) Finding of deteriorated plants (with daily maintenance activity)
- c) Implementation of improvement measures on daily maintenance work
- d) Preparation of improvement plan
- e) Execution of rehabilitation plans
- f) Evaluation of the plan
- g) Feed back to a) or d)

2) Judgement Standard for Deteriorated Plants

As described in 13.2.4 about Control by Plant Control Value, this standard also should be decided in consideration of typical environmental conditions in Thailand. The judgement standard of deteriorated plants consists of two standards, which are deterioration of itself and deterioration of structure of plants as described in Table 13.2.5-1 and Table 13.2.5-2.

Table 13.2.5-1 Limit Value of Deteriorated Facilities(deterioration of itself)

Plant	Limit Value
Aerial Cable	<ol style="list-style-type: none"> 1. More than 2 spots where either is repaired or must be repaired, in a span. 2. More than 2 faults which have been occurred per km per year, caused on deterioration of plants.
Underground Cable	<ol style="list-style-type: none"> 1. Buried cable which are more than 3 spots repaired in a section about 250 m. 2. Load-up cable of gas leakage.
Others	<ol style="list-style-type: none"> 1. Messenger-wire and guy which have either corroded or damaged. 2. Impossible parts to be replaced with new ones. 3. Expensive cost and long-term for repair. 4. Dangerous plant for maintenance work
Conduit	<ol style="list-style-type: none"> 1. To unable to install cable. 2. More than 2 spots where are repaired through a pipe. 3. Broken conduit for sinking and road traffic.

Table 13.2.5-2 Limit Value of Deteriorated Facilities(Deterioration of the structure or the condition)

Plant	Limit Value
Aerial Plant	<ol style="list-style-type: none"> 1. Section over the limit of 600 pairs or 3 cables. 2. Section having to be removed for sinking and flood damage etc. 3. Section of damage by birds and insects. 4. Section of insufficient separation from power line.
Underground	<ol style="list-style-type: none"> 1. Section having to be removed for sinking and flood damage etc.
Conduit	<ol style="list-style-type: none"> 1. Section of difficult maintenance work for heavy traffic-condition. 2. No-space conduit.
Man-hole & Hand-hole	<ol style="list-style-type: none"> 1. Section of difficult maintenance work for heavy traffic-condition. 2. Man-hole with oxygen shortage. 3. Section having to be removed for sinking and flood damage etc.

13.2.6 Recommendation for Implementation of the Improvement Plan

To carry out the improvement plan on the basis of the maintenance control system for outside plant, some important items will be recommended. There are arrangement of plant record, making degree of priority for rehabilitation plans and examination of distribution system as well as establishment of research and development center for outside plant.

1) Arrangement of Plant Record

a) Necessity of Plant Records

To keep large amounts of complicated equipment in efficient working condition at all times, correct information on the status of every piece of equipment is vital importance.

To ensure efficient design and execution of new construction work, asset control and maintenance scheduling, correct information on the quantities of equipment, such as the lengths of aerial cables, the number of poles erected, and the number of conduits and manholes in which underground cables are installed, as well as on the condition of installed equipment, such as the location and structure of each device, must be made available to everyone at all times.

In particular, most of outside plant facilities are located outdoors and extend over a wide area, so that it is quite difficult to know the condition of all equipment exactly.

Accordingly, some measures must be taken to keep correct information on the condition of such equipment.

b) Updating Plant Record

Original drawing of plant records are prepared when a new work is undertaken. These drawing are not necessarily remade unless the equipment undergoes drastic changes. However, they should be corrected to reflect equipment conditions exactly each time when partial changes are made.

If these records do not reflect the actual equipment condition exactly, unexpected problems may be caused. Updating of the plant records is a most important element of maintenance work.

However, the updating of plant record is not easy, since equipment conditions are changed almost daily and such changes occur in a wide area. The original drawing must be corrected by collecting the accurate information as far as possible.

Consequently, it is necessary to establish rules for preparation, correction and control of plant records in tabular and graphic forms to enable quick and accurate updating. In most cases, all records in tabular form and part of the records in graphic form are controlled at the maintenance center, while most records in graphic forms are controlled in a centralized manner at the outside plant division of each telecommunication area.

c) Establishment of Centralized Data Processing Center for Plant Record

In order to grasp and devise the present situation of outside plants quickly and surely, it will need to establish a centralized data processing center which devise outside plant records in graphic forms. The main job in the center is as follows:

- i) To draw and maintain original of plant records,
- ii) To devised the plant records from maintenance office,
- iii) To send the devised plant records to the maintenance office.

2) Prioritization of Deteriorated Plants for Rehabilitation Plans

The plants which was justified as the deteriorated plant, have to be improved as far as and as soon as possible. But it will need very expensive costs to improve all of them. Therefore, to carry out the improvement plan more effectively and more efficiently within a limited budget, these deteriorated plants should be given a priority in consideration of the both benefit for customers and TOT.

The priority should be decided taking the following matters into consideration.

- a) The safety of people concerned
- b) The plants not conforming to the regulation in law
- c) The plant being likely to cause a grave failure if it is left
- d) Expensive maintenance cost
- e) The plants deteriorating the environmental condition

3) Examination of Distribution System for Subscriber Network

As described in Chapter 2, TOT has introduced the rigid distribution system in subscriber networks. In order to decrease many cables and wires which have been installed urban areas or developing areas, it is effective to introduce free distribution system which can access from every distribution points to subscriber premises, in subscriber networks. Therefore, in addition to present distribution system of TOT, it should be considered to introduce free distribution system to subscriber networks.

4) Establishment of Technology Research and Development Center for Outside Plant

As described in Chapter 2, various cases of faults which were related to outside plants have occurred for typical condition in Thailand. And also described in Chapter 7, new technology and new construction method will be required with expansion of OPMC. Therefore, in order to solve these problems, it will need to establish a organization for outside plant sector. And the results of research and development in the organization have to be reflected to daily maintenance activities, improvement plans and construction work for outside plants.

13.3 Traffic Promotion Activities

13.3.1 Present State of Successful Call Ratio

A telephone call is connected to the destination through the procedures of handset off, dialling, connection on the network and called party answer as shown in Figure 13.3.1-1. The successful call ratio is measured covering the whole procedures from handset off until called party answer.

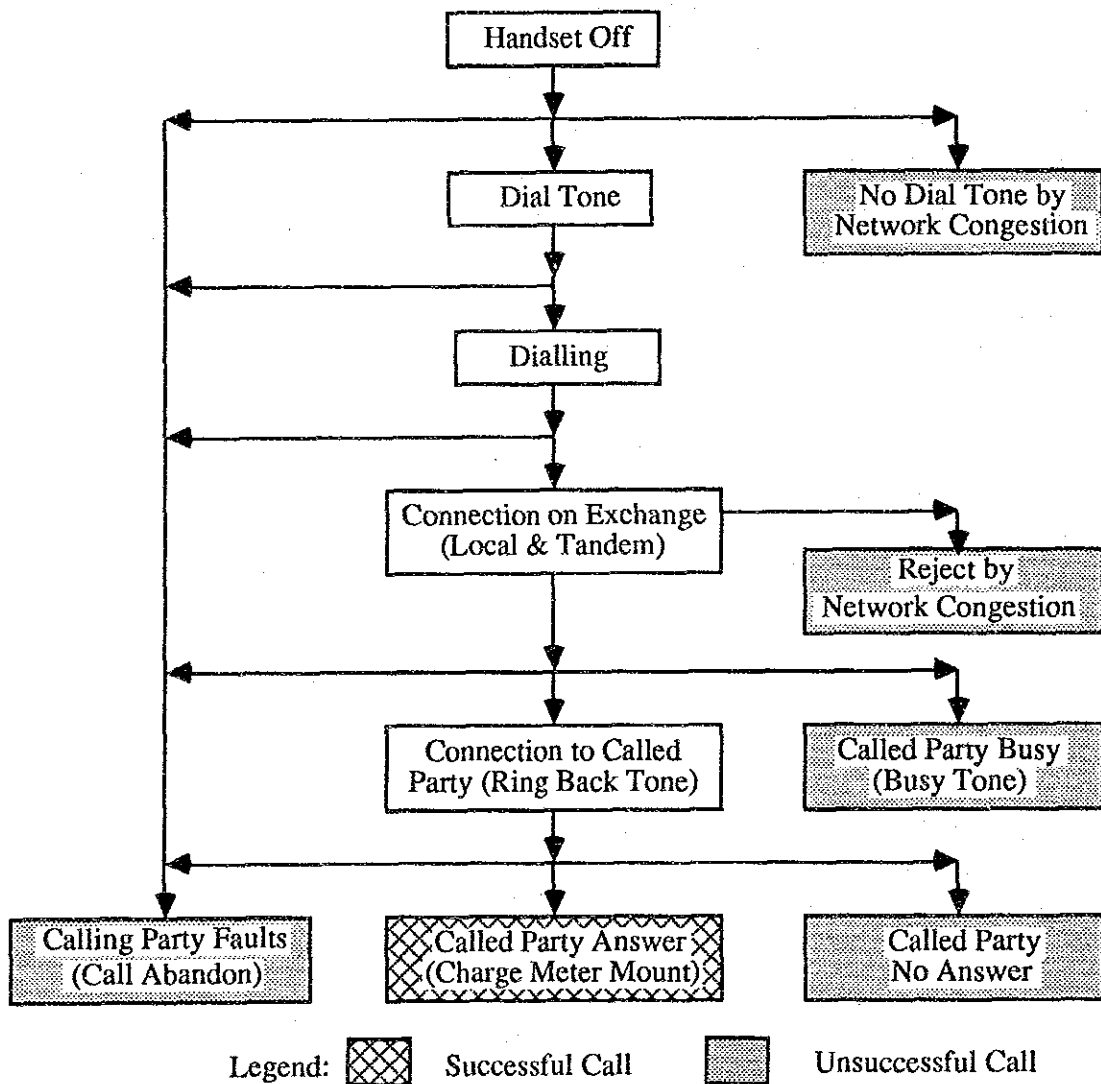


Figure 13.3.1-1 Call Connection Procedure

According to the annual statistics of TOT, the successful call ratio in Bangkok area is about 30 % in 1987 and about 50 % in 1988 as shown in Table 13.3.1-1. It seems in appearance that the successful call ratio is improved remarkably in one year. However, the statistics being examined in detail, the unsuccessful call ratio caused by calling party faults is reported as "0.00 %". It is not considered that there is no unsuccessful call caused by calling party faults. Generally, the number of unsuccessful calls caused by calling party faults is larger than those of called party busy.

As described previously, the successful call ratio should be measured covering the whole procedures from handset off until called party answer. The successful call ratio in 1988 is considered to be less reliable because of being measured without regard to the unsuccessful call caused by calling party faults. Making allowances for the above-mentioned state, the successful call ratio in 1988 is be lower in actual fact.

Table 13.3.1-1 Successful Call Ratio

(Unit : Percent)

Year	1985	1986	1987	1988
Successful Call Ratio				
Metropolitan Area	25.44	24.40	29.56	49.90
Provincial Area	No Data	55.37	60.87	58.37
Unsuccessful Call Ratio				
Metropolitan Area	74.56	75.60	70.44	50.10
Provincial Area	No Data	44.63	39.13	41.63
Network Congestion				
Metropolitan Area	7.52	4.09	4.17	0.88
Provincial Area	No Data	3.21	0.00	0.55
Called Party Busy				
Metropolitan Area	13.82	25.15	24.78	37.15
Provincial Area	No Data	24.79	24.30	28.05
Called Party No Answer				
Metropolitan Area	30.68	6.38	5.79	10.95
Provincial Area	No Data	0.82	0.92	5.17
Calling Party Faults				
Metropolitan Area	19.99	33.37	29.49	0.00
Provincial Area	No Data	12.20	11.05	5.84
Technical Faults & Others				
Metropolitan Area	2.55	6.61	6.21	1.12
Provincial Area	No Data	3.61	2.86	2.02

Source : TOT's Annual Statistical Report

13.3.2 Objectives of Traffic Promotion Activities

For the purpose of grading up the successful call ratio, the comprehensive and steady measures should be required as mentioned in the following traffic promotion activities. This

activities are composed of two major objectives, that is, one is dial consulting activities aiming at grading up successful call ratio, and the other is traffic sales activities aiming at increasing the volume of traffic as shown in Figure 13.3.2-1.

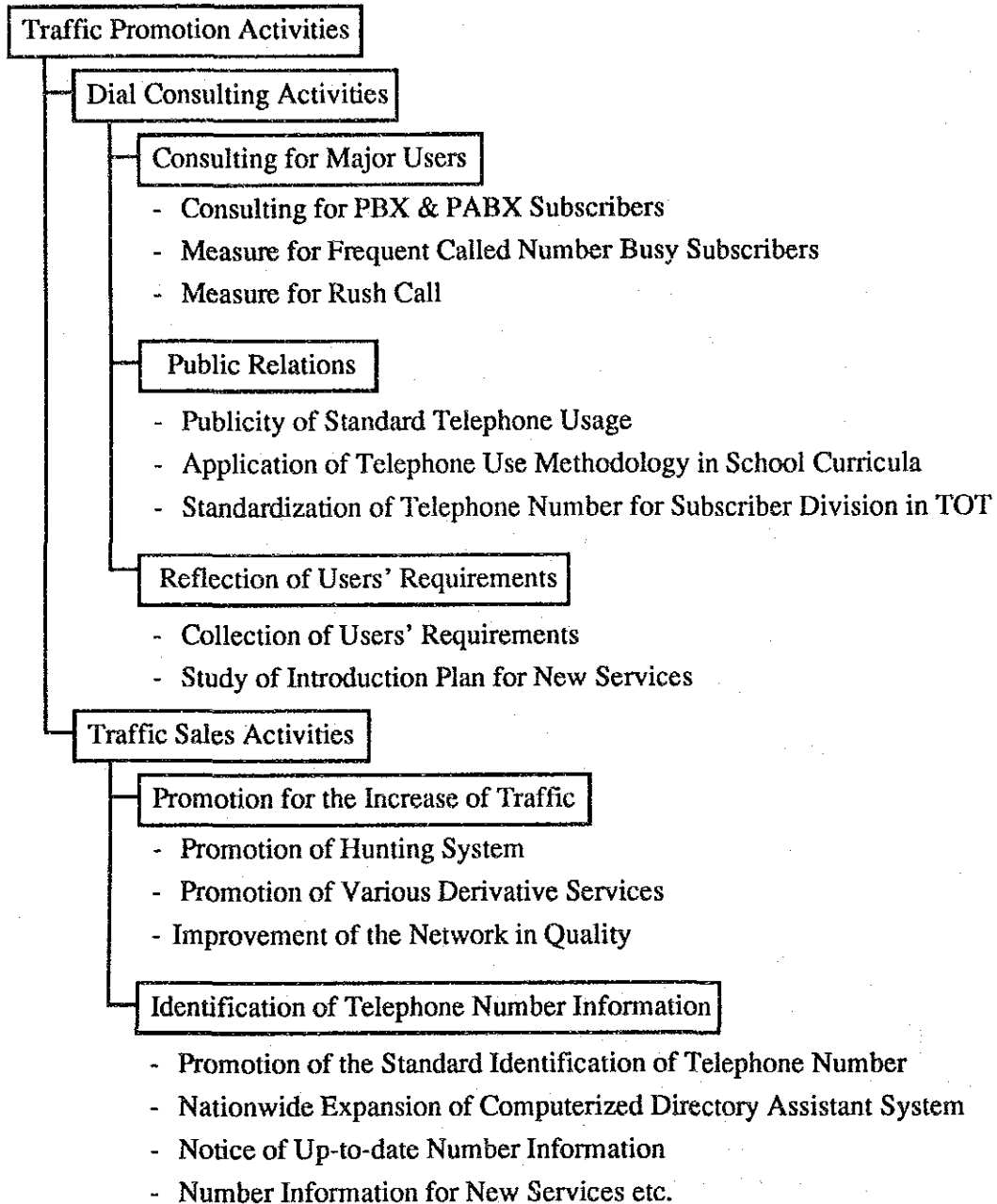


Figure 13.3.2-1 Objectives of Traffic Promotion Activity

13.3.3 Guidelines for Upgrade of Successful Call Ratio

The successful call ratio should be upgraded by carrying out the traffic promotion activities as described definitely in the below. These activities should be started as soon as possible by giving efforts. As a result, the more profits will be contributed to TOT.

As a guideline for upgrading the successful call ratio, the following target should be set up as shown in Table 13.3.3-1.

Table 13.3.3-1 Target of Successful Call Ratio

Year	Actual	Target			
	1987	1992	1997	2002	2007
Successful Call Ratio in Metropolitan Area	30%	45%	60%	70%	75%

13.3.4 Dial Consulting Activities as Definite Measures

The objectives and guidelines are described in the previous sections. In this section, the definite measures for dial consulting activities are described as in the followings.

- 1) Consulting for Major Users
 - a) Consulting for PBX & PABX Subscribers

The PBX & PABX subscribers are important customers. They contribute much revenue to the telecommunication carriers and influence the successful call ratio exceedingly. They can play an important role in leading the general public for popularizing the effective telephone usage method. Their usage methods are instructive for other subscribers as the standard usage.

Through consulting for managers, operators etc. of these subscribers, the effective telephone usage method should further be popularized and enhanced.

- b) Measure for Frequent Called Number Busy Subscribers

According to the annual statistics of TOT illustrated before (Table 13.3.1-1), the unsuccessful call ratio caused by the called party busy is about 25 %.

As a whole, it is considered that most of the causes are improved by extending line units, or otherwise adopting key telephone set and hunting system. For the definite solution method, each subscriber's case should be analyzed individually and the most suitable measure should be taken.

c) Measure for Rush Call

On occasion, rush call breaks out at a burst triggered by advertisement, disaster etc., and as a result, the whole telephone network becomes incapable of offering the service as in normal condition. These rush calls can be classified into two types, namely, one is a type of anticipated in advance while the other is a type of non-anticipated.

i) Anticipated Type

Anticipated type of rush call is mostly caused by the reservation, order entry etc. by way of a telephone call. Some of happenings can be anticipated in respect to the destination telephone number, the day & time etc. and the suitable measures can be taken in advance. The consulting should be carried out for the rush call subscribers from a viewpoint of advertisement method, number identification method, acceptance method of request etc.

ii) Non-Anticipated Type

Non-anticipated type of rush call is mostly caused by disasters. Rush calls concentrate on the specified region where disaster breaks out. The measure should be studied on the whole network basis. Even if under encountering these condition, the essential communication should be secured for the benefits of society.

As an instance of this measure, the outgoing circuits are divided into two groups, namely, one is urgent class while the other is general class. Under the normal condition, they are shared by each other, however, in case of meeting with the urgent condition, their roles are divided. That is, the calls from general subscribers are restricted for the rush call area at the originating exchange by identifying the subscriber class and the destination code.

The urgent class of subscribers is composed of government office, police & fire station, public corporation, news paper company etc. By classifying the subscribers and dividing outgoing circuits, the essential communication could be secured as shown in Figure 13.3.4-1.

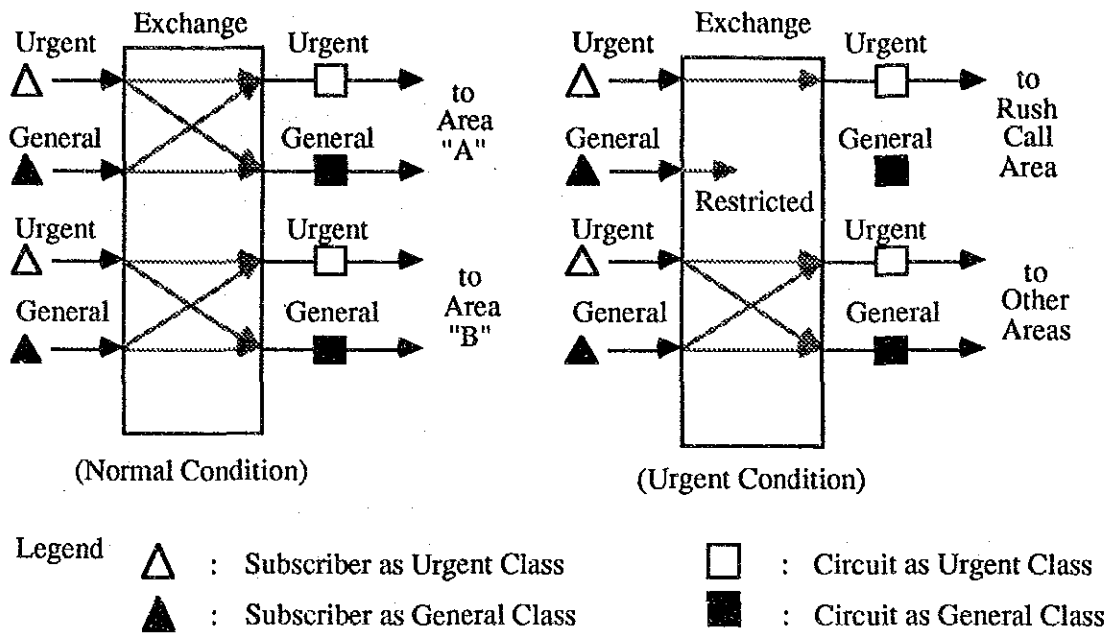


Figure 13.3.4-1 Call Restriction for Rush Call Area

2) Public Relations

a) Publicity of Standard Telephone Usage

The operation method of making telephone calls is very easy for the ordinary people. It is not until the called party answers that the telephone call is charged. Under this charging system, everybody easily tends to make calls. However, there should be some rule for dialling methodology for the purpose of sharing the telecommunication facilities effectively.

As general rules for standard dialling methodology, the followings are pointed out.

- In case of encountering the called party busy, the recall should be made after at least 3 minutes,
- The called telephone number should be dialled without interruption in order to avoid partial dialling,
- In case that the called party adopts hunting system, the dialling number should be limited to the head number, because the exchange has a function for hunting a non-engaged number automatically.

b) Application of Telephone Use Methodology in School Curricula

Children are important future customers. When they become adult, the telecommunication services will more be developing in quality and in quantity. Aiming at making acquire the standard dialling methodology in a childhood, the telephone use methodology is adopted in school curricula from the viewpoints of science and courtesy. Further, taking account of the enhanced services in the near future, not only ordinary telephone service but also some of new media such as facsimile, personal computer communication should be covered.

c) Standardization of Telephone Number for Subscriber Division in TOT

As regards the telephone number for subscriber division in the telephone directory, the numbers seem to be settled on the case by case basis and as a result have been provisional. In most cases, these numbers are composed of plural independent lines in which the hunting system is not adopted.

On the contrary, the number for telephone directory assistant has been standardized as "13", and the number for fault complaint has been standardized as "17" to be preceded by the exchange code. These number schemes are classified into Special call and actually have the function of hunting system.

In a similar way to these cases, the number for subscriber division should be standardized aiming at the customer-oriented organization.

3) Reflection of Users' Requirements

The telecommunication service is offered for the benefits of society. The user's requirements should positively be reflected in the operation philosophy.

a) Collection of Users' Requirements

With the increase of telephone subscribers, the requirements for telecommunication services will become more serious. These requirements should positively be collected especially from major subscribers such as PBX & PABX subscribers, and also from ordinary subscribers by way of News paper contribution etc.

b) Study of Introduction Plan for New Services

To satisfy the above-mentioned requirements, the suitable measures should be taken individually. Some of them can be reflected to the introduction policy of new services. In introducing new services, the past data cannot be available and the previous ones in foreign countries is not always suitable in Thailand. Accordingly, the users' requirements are precious data source for a decision-making.

13.3.5 Traffic Sales Activities as Definite Measures

The most fundamental service for telecommunication carriers is to carry calls, namely, "Traffic". The revenue greatly depends upon the volume of traffic. In order to increase the volume of traffic by offering the limited facilities efficiently, the following measures should be promoted as the definite measures for traffic sales activities.

1) Promotion for the Increase of Traffic

In order to utilize the telephone network more effectively, various derivative services have been provided as network service and as terminal connection service. These derivative services will be diversified and enhanced more and more in future.

a) Promotion of Hunting System

Hunting system is the most fundamental network function for grading up the successful call ratio. In Thailand, two methodologies are adopted for hunting system. One is One head number system mainly adopted in cross bar exchange while the other is Group head number system mainly adopted in SPC exchange. Their concepts are shown in Figure 13.3.5-1.

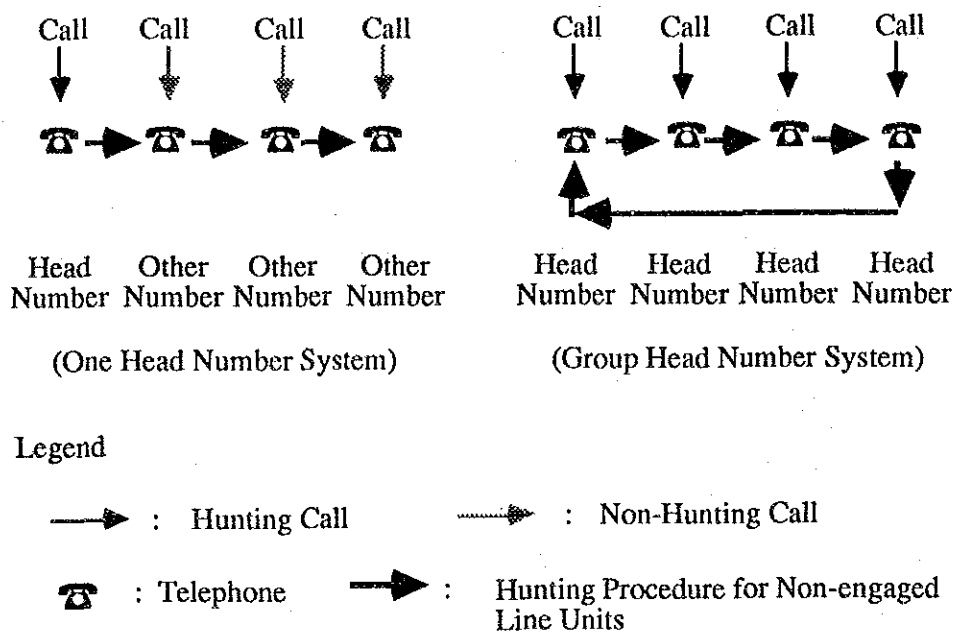


Figure 13.3.5-1 Method of Hunting System

The efficiency of line units can remarkably become higher by adopting hunting system than plural independent line units. With the increase of line units, this disparity between hunting system and independent line units becomes larger.

As an example, under the condition that the loss probability caused by the called number busy is set up as within 10 %, the maximum traffic density for accepting incoming calls can be estimated by the Erlang theory as shown in Table 13.3.5-1.

Table 13.3.5-1 Comparison between Hunting System and Independent Lines

Number of Line Units		1	2	3	4	5
Traffic Density (erl)	Hunting System	0.111	0.595	1.271	2.045	2.881
	Independent Line	0.111x1	0.111x2	0.111x3	0.111x4	0.111x5
Hunting / Independent Line		1	2.68	3.82	4.61	5.19

Number of Line Units		10	15	20	30	40
Traffic Density (erl)	Hunting System	7.511	12.484	17.613	28.113	38.787
	Independent Line	0.111x10	0.111x15	0.111x20	0.111x30	0.111x40
Hunting / Independent Line		6.77	7.5	7.93	8.44	8.74

Though hunting system has effective function for the frequently busy subscribers, this function does not seem to have been utilized adequately by the busy subscribers in Thailand, supposedly because of the following reasons:

- Branch telephone sets are connected sharing one line units,
- Enhanced key telephone sets that can accommodate plural line units are not so popular.

For promoting hunting system, the target is aimed at the subscribers having plural line units and the consulting should be carried out individually.

b) Promotion of Various Derivative Services

The telephone network offers derivative services aiming at the more convenient telephone usage. The present service menu is call waiting, call transfer etc. In future, this menu will become more and more diversified.

Taking account of this trend of diversification, the usage know-how will become very important not only for the subscribers but also for the telecommunication carrier. These usage know-how of new derivative services should be analyzed from the subscribers' viewpoint and positively be publicized towards appropriate market segments.

c) Improvement of the Network in Quality

i) Discriminated Busy Tone

The called party busy as well as the junction congestion is distinguished by the same busy tone, and the calling party cannot discriminate the causes between them.

As one of the measures for the benefits of subscribers, it is advisable that the current state of network condition should be informed to calling party by adopting announce machine (recording tape), when encountering the junction congestion etc.

ii) Speech Quality

In some cases, even if the call is connected to the destination in success, the speech quality offered is not so good because of cross talk, attenuation etc. Under this condition, the voice communication can be carried out by confirming the partner's intention each other. However, the facsimile & data communication cannot be available in case the procedure is out of order caused by the poor quality.

In general, the smooth voice communication requires the speech quality better (lower) than 0.01 as measured by bit error ratio while the smooth facsimile communication requires

the speech quality better (lower) than 0.0001. To cope with the more diversified terminals in the near future, the speech quality should be improved incessantly and steadily.

2) Identification of Telephone Number Information

The telephone number is valuable information for the general public, and can be utilized as a profitable data source for publishing the telephone directory or for introducing Videotex service. The inquiry of telephone number usually means the preceding stage for making a telephone call. Therefore, its identification method should be standardized aiming at the increase of traffic.

a) Promotion of the Standard Identification of Telephone Number

As for the identification of telephone number on the telephone directory, name card, brochure, signboard etc., various types of identification method can be found. Some of representative types are described below as examples;

i) Divider between Exchange Code and Subscriber Number

999-1026 (With divider)
or 9991026 (Without divider)

Some of the telephone numbers are identified dividing into exchange code and subscriber number by bar, and some are not. In order to memorize the number with less mistake, it is better that the number should be divided into 3 and 4 digits. The consecutive 7 digits are too long for memorization.

ii) Plural Line Units in case Telephone Numbers are not Consecutive

999-1026 999-1056 998-8635

Plural telephone numbers are identified in parallel. However, it is troublesome to identify and memorize plural telephone numbers installed at the same location. These subscribers should be promoted to adopt hunting system. Then, after hunting system is adopted, the identified telephone number should be limited as a head number only in brief and other subordinative numbers is not necessary to be identified as shown below.

999-1026 (Hunting)

iii) Plural Line Units in case Telephone Numbers are Consecutive

999-1026-8 998-8640-55

According to this identification, the former bar identifies the divider between exchange code and subscriber number and the latter bar identifies the subscriber number from to end. This identification method may lead to confusion. Sometimes, the latter bar is also utilized for the extension number of PBX and PABX. In a similar way to the case above, these subscribers should be promoted to adopt hunting system.

iv) Identification Method in Provincial Areas

Based on the telephone numbering system, the telephone number scheme is composed of 2 digits of area code, 2 digits of exchange code and 4 digits of subscriber number in provincial area. However, the following identification can sometimes be found, namely, "999-506" as a local telephone number.

On the basis of the existing numbering scheme, it should be identified as "99-9506" in provincial areas.

b) Nationwide Expansion of Computerized Directory Assistant System (CDAS)

CDAS has been introduced in Bangkok and Chiang Mai and will gradually be extended to other provincial areas. After CDAS cover the whole Kingdom, from a technical point of view, it will become possible to give the telephone number information throughout the Kingdom at anywhere its terminal is installed, because the whole telephone number informations are stored within one database.

From an operational point of view, it will become one of the major data source for Videotex service. If CDAS is connected to Videotex system and the ordinary people can freely access this database in future, the inquiry of telephone number information will become easier.

c) Notice of Up-to-date Number Information

In case that the called party removes telephone set or changes the telephone number etc., no information has been given to the calling party when dialling to the old or invalid telephone number. Namely, the ring back tone is connected to the calling party as if that

telephone number were still valid. As a result, the calling party tends to make a call continually.

Aiming at making the calling party examine the telephone number information, the up-to-date information should be provided by employing announce machine (recording tape) or the above-mentioned CDAS etc., in case calls are connected to the invalid telephone numbers.

d) Number Information for New Services etc.

The telephone number scheme for cellular mobile service is different from that of ordinary telephone service. Namely, its scheme is divided into 1 digit of cellular mobile service code "1", 2 digits of area code and 5 digits of subscriber number. In a similar way, the number scheme is sometimes specified in case of utilizing new services or connecting to other networks. For the purpose of avoiding confusion, these number schemes and services should be noticed to the general public clearly.

13.3.6 Estimation of Additional Revenue

Through the dial consulting activities and the traffic sales activities as described above, the additional revenue is contributed to the telecommunication carriers. In this section, this revenue is estimated.

1) Preconditions

In case the call is unsuccessful, some calls are abandoned and some calls are made again as shown in Figure 13.3.6-1. In proportion that the successful call ratio is improved, the additional revenue is expected as a direct effect without the increase of facilities. On the other hand, in case the call is successful, the additional revenue is expected as an indirect effect by the calls for supplementary information, response, confirmation etc. In any cases, it is profitable to upgrade the successful call ratio.

On the basis of the call procedure and formulas as described in Figure 13.3.6-1, the estimation of additional successful calls is tried by modifying the following variable preconditions.

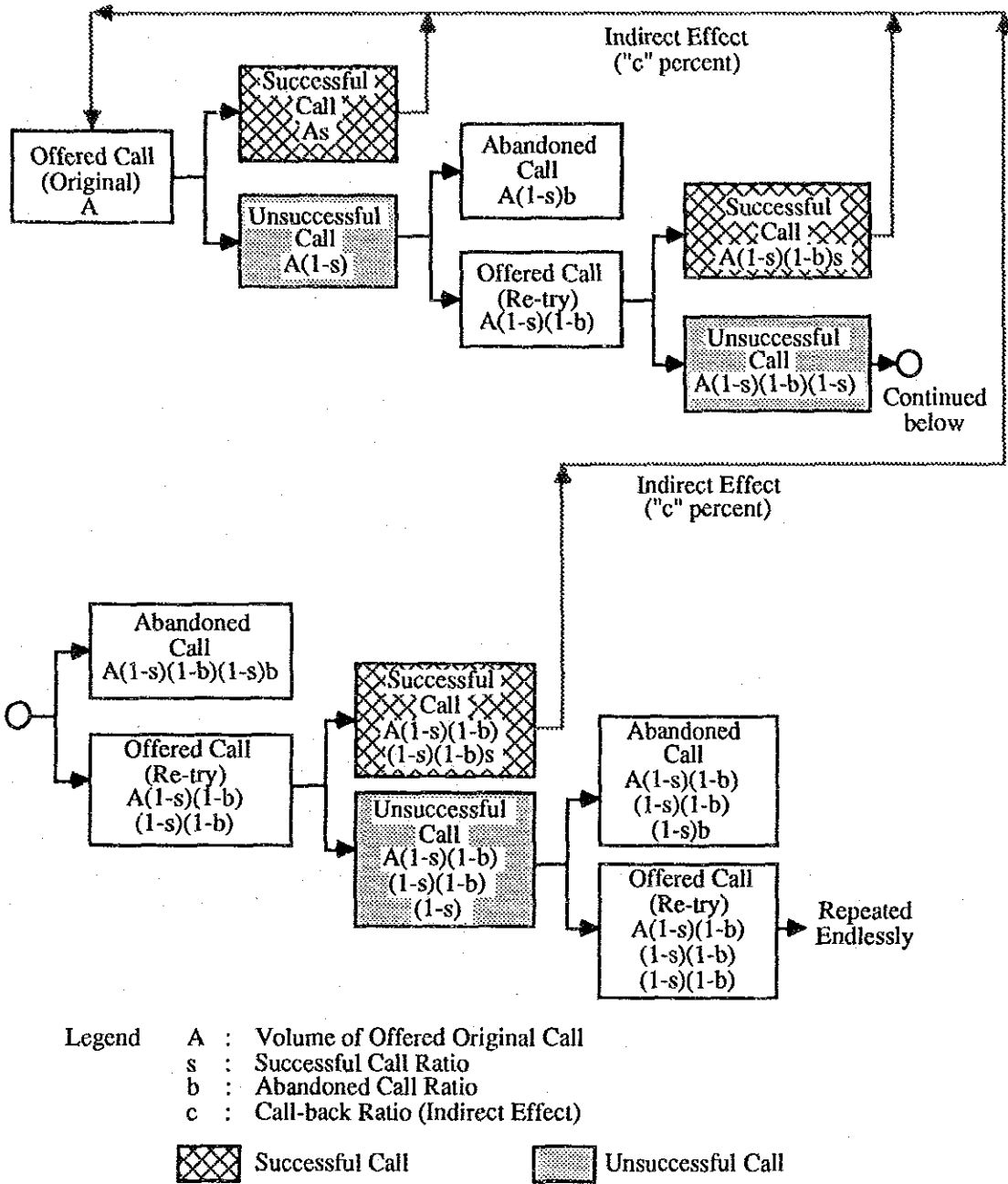


Figure 13.3.6-1 Call Procedure of Successful Call and Unsuccessful Call

a) Volume of Offered Call (Original Call & Re-try Call)

The offered original calls to be regarded as net contents of traffic are set up as 1,000,000 for trial estimation. In case the calls are unsuccessful, some of them are supposed to bring about re-try calls, and the sequence is to repeat based on the abandoned call ratio described below. On the other hand, in case the calls are successful, about 10% are supposed to newly bring about following original calls circularly for confirming the previous communications.

b) Successful Call Ratio

The successful call ratio is about 30% in Metropolitan area in 1987. Aiming at the upgrade of service quality, the target is set up as 40% to 75% in Table 13.3.3-1. Under the condition of the successful call ratio of 30% to 80%, the estimation is tried. In comparing the present state (30%) with the upgraded state (40% to 80%), the effects should be examined.

c) Abandoned Call Ratio

The abandoned call ratio may become higher, as the call attempts are repeated. This ratio is assumed to be as 10% after the 1st time call attempt, 20% after the 2nd call attempt, and so on 100% after the 10th time call attempt as shown in Table 13.3.6-1.

Table 13.3.6-1 Assumed Ratio of Abandoned Call

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Abandoned Call	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

2) Result of Estimation

Under the above-mentioned preconditions, the estimations are tried on Table 13.3.6-3 (1) - (6), and the results are summarized in Table 13.3.6-2 and Figure 13.3.6-2. These show the relation among offered calls, successful calls and unsuccessful calls, and point out the followings.

- The number of re-try calls are remarkably decreasing in proportion to the improvement of successful call ratio.
- In case the successful call ratio of 30 %, the number of re-try calls are larger than that of original calls.

- The number of unsuccessful calls are remarkably decreasing in proportion to the improvement of successful call ratio.
- It is less necessary to install additional equipments for the unsuccessful calls and to plan the network in consideration of the unsuccessful calls, provided that the successful call ratio is improved.
- The improvement of successful call ratio prevents telecommunication facilities from being worn out by unprofitable calls. This leads to the decrease of cost.
- As an indirect effect, another original calls are circularly offered, in case the call is successful. As the reliability of network becomes higher (Improvement of fault ratio & successful call ratio etc.), this indirect effect will become larger, and consequently, the volume of traffic will increase by itself.
- The improvement of successful call ratio brings about the benefits not only for society but also for TOT.

Table 13.3.6-2 Estimated Number of Calls

(Unit : Thousand)

Number of Calls	Successful Call Ratio					
	30%	40%	50%	60%	70%	80%
Direct Effect						
Offered Calls	2,263	1,962	1,718	1,517	1,351	1,213
Original Calls	1,000	1,000	1,000	1,000	1,000	1,000
Re-try Calls	1,263	962	718	517	351	213
Successful Calls	679	785	859	910	946	971
Unsuccessful Calls	1,584	1,177	859	607	405	242
Abandoned Calls	321	215	141	90	54	29
Intended Re-try Calls	1,263	962	718	517	351	213
Indirect (the 2nd) Effect						
Offered Calls	154	154	148	138	127	118
Original Calls	68	78	86	91	94	97
Re-try Calls	86	76	62	47	33	21
Successful Calls	46	62	74	83	89	94
Unsuccessful Calls	108	92	74	55	38	24
Abandoned Calls	22	17	12	8	5	3
Intended Re-try Calls	86	75	62	47	33	21
Indirect (the 3rd) Effect						
Offered Calls	10	12	12	12	12	11
Original Calls	4	6	7	8	9	9
Re-try Calls	6	6	5	4	3	2
Successful Calls	3	5	6	7	8	9
Unsuccessful Calls	7	7	6	5	4	2
Abandoned Calls	1	1	1	1	1	0
Intended Re-try Calls	6	6	5	4	3	2

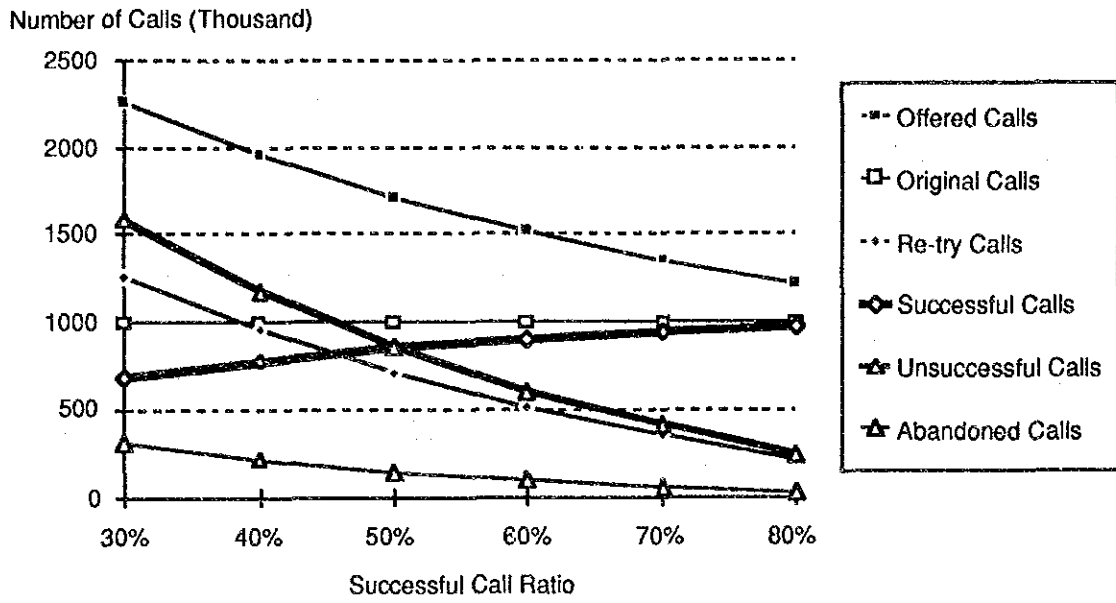


Figure 13.3.6-2 Estimated Call Relations for Direct Effect

Table 13.3.6-3 Estimation of Successful & Unsuccessful Call (1/6)

(Successful Call Ratio = 30%)

(as Direct Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	1,000,000	-	-	-	-	-	-	-	-	-	1,000,000
Offered Calls (Re-try)	-	630,000	352,800	172,872	72,606	25,412	7,115	1,494	209	15	1,262,524
Successful Calls	300,000	189,000	105,840	51,862	21,782	7,624	2,135	448	63	4	678,757
Unsuccessful Calls	700,000	441,000	246,960	121,010	50,824	17,789	4,981	1,046	146	10	1,583,767
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	70,000	88,200	74,088	48,404	25,412	10,673	3,487	837	132	10	321,243
Intended Re-try Calls	630,000	352,800	172,872	72,606	25,412	7,115	1,494	209	15	0	1,262,524

(as the 2nd Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	67,876	-	-	-	-	-	-	-	-	-	67,876
Offered Calls (Re-try)	-	42,762	23,947	11,734	4,928	1,725	483	101	14	1	85,695
Successful Calls	20,363	12,829	7,184	3,520	1,478	517	145	30	4	0	46,071
Unsuccessful Calls	47,513	29,933	16,763	8,214	3,450	1,207	338	71	10	1	107,499
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	4,751	5,987	5,029	3,285	1,725	724	237	57	9	1	21,805
Intended Re-try Calls	42,762	23,947	11,734	4,928	1,725	483	101	14	1	0	85,695

(as the 3rd Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	4,607	-	-	-	-	-	-	-	-	-	4,607
Offered Calls (Re-try)	-	2,902	1,625	796	335	117	33	7	1	0	5,817
Successful Calls	1,382	871	488	239	100	35	10	2	0	0	3,127
Unsuccessful Calls	3,225	2,032	1,138	558	234	82	23	5	1	0	7,297
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	322	406	341	223	117	49	16	4	1	0	1,480
Intended Re-try Calls	2,902	1,625	796	335	117	33	7	1	0	0	5,817

Table 13.3.6-3 Estimation of Successful & Unsuccessful Call (2/6)

(Successful Call Ratio = 40%)

(as Direct Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	1,000,000	-	-	-	-	-	-	-	-	-	1,000,000
Offered Calls (Re-try)	-	540,000	259,200	108,864	39,191	11,757	2,822	508	61	4	962,407
Successful Calls	400,000	216,000	103,680	43,546	15,676	4,703	1,129	203	24	1	784,963
Unsuccessful Calls	600,000	324,000	155,520	65,318	23,515	7,054	1,693	305	37	2	1,177,444
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	60,000	64,800	46,656	26,127	11,757	4,233	1,185	244	33	2	215,037
Intended Re-try Calls	540,000	259,200	108,864	39,191	11,757	2,822	508	61	4	0	962,407

(as the 2nd Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	78,496	-	-	-	-	-	-	-	-	-	78,496
Offered Calls (Re-try)	-	42,388	20,346	8,545	3,076	923	221	40	5	0	75,545
Successful Calls	31,399	16,955	8,138	3,418	1,231	369	89	16	2	0	61,617
Unsuccessful Calls	47,098	25,433	12,208	5,127	1,846	554	133	24	3	0	92,425
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	4,710	5,087	3,662	2,051	923	332	93	19	3	0	16,880
Intended Re-try Calls	42,388	20,346	8,545	3,076	923	221	40	5	0	0	75,545

(as the 3rd Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	6,162	-	-	-	-	-	-	-	-	-	6,162
Offered Calls (Re-try)	-	3,327	1,597	671	241	72	17	3	0	0	5,930
Successful Calls	2,465	1,331	639	288	97	29	7	1	0	0	4,837
Unsuccessful Calls	3,697	1,996	958	402	145	43	10	2	0	0	7,255
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	370	399	287	161	72	26	7	2	0	0	1,325
Intended Re-try Calls	3,327	1,597	671	241	72	17	3	0	0	0	5,930

Table 13.3.6-3 Estimation of Successful & Unsuccessful Call (3/6)

(Successful Call Ratio = 50%)

(as Direct Effect)		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	1,000,000	-	-	-	-	-	-	-	-	-	-	1,000,000
Offered Calls (Re-try)	-	450,000	180,000	63,000	4,725	4,725	142	945	142	14	1	717,727
Successful Calls	500,000	225,000	90,000	31,500	9,450	2,363	71	473	71	7	0	858,863
Unsuccessful Calls	500,000	225,000	90,000	31,500	9,450	2,363	71	473	71	7	0	858,863
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	80%	70%	80%	90%	100%	-
Abandoned Calls	50,000	45,000	27,000	12,600	4,725	1,418	57	331	57	6	0	141,137
Intended Re-try Calls	450,000	180,000	63,000	18,900	4,725	945	14	142	14	1	0	717,727

(as the 2nd Effect)

(as the 2nd Effect)		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	85,886	-	-	-	-	-	-	-	-	-	-	85,886
Offered Calls (Re-try)	-	38,649	15,460	5,411	406	1,623	12	81	12	1	0	61,643
Successful Calls	42,943	19,324	7,730	2,705	812	203	61	41	61	6	0	73,765
Unsuccessful Calls	42,943	19,324	7,730	2,705	812	203	61	41	61	6	0	73,765
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	80%	70%	80%	90%	100%	-
Abandoned Calls	4,294	3,865	2,319	1,082	406	122	28	28	5	1	0	12,122
Intended Re-try Calls	38,649	15,460	5,411	1,623	406	81	12	81	12	1	0	61,643

(as the 3rd Effect)

(as the 3rd Effect)		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	7,376	-	-	-	-	-	-	-	-	-	-	7,376
Offered Calls (Re-try)	-	3,319	1,328	465	35	139	7	7	1	0	0	5,294
Successful Calls	3,688	1,660	664	232	70	17	3	3	3	0	0	6,335
Unsuccessful Calls	3,688	1,660	664	232	70	17	3	3	3	0	0	6,335
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	80%	70%	80%	90%	100%	-
Abandoned Calls	369	332	199	93	35	10	2	2	0	0	0	1,041
Intended Re-try Calls	3,319	1,328	465	139	35	7	1	7	1	0	0	5,294

Table 13.3.6-3 Estimation of Successful & Unsuccessful Call (4/6)

(Successful Call Ratio = 60%)

	(as Direct Effect)										
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	1,000,000	-	-	-	-	-	-	-	-	-	1,000,000
Offered Calls (Re-try)	-	360,000	115,200	32,256	7,741	1,548	248	30	2	0	517,026
Successful Calls	600,000	216,000	69,120	19,354	4,645	929	149	18	1	0	910,215
Unsuccessful Calls	400,000	144,000	46,080	12,902	3,097	619	99	12	1	0	606,810
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	40,000	28,800	13,824	5,161	1,548	372	69	10	1	0	89,785
Intended Re-try Calls	360,000	115,200	32,256	7,741	1,548	248	30	2	0	0	517,026

(as the 2nd Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	91,022	-	-	-	-	-	-	-	-	-	91,022
Offered Calls (Re-try)	-	32,768	10,486	2,936	705	141	23	3	0	0	47,060
Successful Calls	54,613	19,661	6,291	1,762	423	85	14	2	0	0	82,849
Unsuccessful Calls	36,409	13,107	4,194	1,174	282	56	9	1	0	0	55,233
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	3,641	2,621	1,258	470	141	34	6	1	0	0	8,172
Intended Re-try Calls	32,768	10,486	2,936	705	141	23	3	0	0	0	47,060

(as the 3rd Effect)

Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	8,285	-	-	-	-	-	-	-	-	-	8,285
Offered Calls (Re-try)	-	2,983	954	267	64	13	2	0	0	0	4,284
Successful Calls	4,971	1,790	573	160	38	8	1	0	0	0	7,541
Unsuccessful Calls	3,314	1,193	382	107	26	5	1	0	0	0	5,027
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	331	239	115	43	13	3	1	0	0	0	744
Intended Re-try Calls	2,983	954	267	64	13	2	0	0	0	0	4,284

Table 13.3.6-3 Estimation of Successful & Unsuccessful Call (5/6)

(Successful Call Ratio = 70%)

(as Direct Effect)											
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	1,000,000	-	-	-	-	-	-	-	-	-	1,000,000
Offered Calls (Re-try)	-	270,000	64,800	13,608	2,449	367	44	4	0	0	351,273
Successful Calls	700,000	189,000	45,360	9,526	1,715	257	31	3	0	0	945,891
Unsuccessful Calls	300,000	81,000	19,440	4,082	735	110	13	1	0	0	405,382
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	30,000	16,200	5,832	1,633	367	66	9	1	0	0	54,109
Intended Re-try Calls	270,000	64,800	13,608	2,449	367	44	4	0	0	0	351,273

(as the 2nd Effect)											
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	94,589	-	-	-	-	-	-	-	-	-	94,589
Offered Calls (Re-try)	-	25,539	6,129	1,287	232	35	4	0	0	0	33,227
Successful Calls	66,212	17,877	4,291	901	162	24	3	0	0	0	89,471
Unsuccessful Calls	28,377	7,662	1,839	386	70	10	1	0	0	0	38,345
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	2,838	1,532	552	154	35	6	1	0	0	0	5,118
Intended Re-try Calls	25,539	6,129	1,287	232	35	4	0	0	0	0	33,227

(as the 3rd Effect)											
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	8,947	-	-	-	-	-	-	-	-	-	8,947
Offered Calls (Re-try)	-	2,416	580	122	22	3	0	0	0	0	3,143
Successful Calls	6,263	1,691	406	85	15	2	0	0	0	0	8,463
Unsuccessful Calls	2,684	725	174	37	7	1	0	0	0	0	3,627
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	268	145	52	15	3	1	0	0	0	0	484
Intended Re-try Calls	2,416	580	122	22	3	0	0	0	0	0	3,143

Table 13.3.6-3 Estimation of Successful & Unsuccessful Call (6/6)

(Successful Call Ratio = 80%)

	(as Direct Effect)										
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	1,000,000	-	-	-	-	-	-	-	-	-	1,000,000
Offered Calls (Re-try)	-	180,000	28,800	4,032	484	48	4	0	0	0	213,368
Successful Calls	800,000	144,000	23,040	3,226	387	39	3	0	0	0	970,695
Unsuccessful Calls	200,000	36,000	5,760	806	97	10	1	0	0	0	242,674
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	20,000	7,200	1,728	323	48	6	1	0	0	0	29,305
Intended Re-try Calls	180,000	28,800	4,032	484	48	4	0	0	0	0	213,368

	(as the 2nd Effect)										
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	97,069	-	-	-	-	-	-	-	-	-	97,069
Offered Calls (Re-try)	-	17,473	2,796	391	47	5	0	0	0	0	20,712
Successful Calls	77,656	13,978	2,236	313	38	4	0	0	0	0	94,225
Unsuccessful Calls	19,414	3,495	559	78	9	1	0	0	0	0	23,556
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	1,941	699	168	31	5	1	0	0	0	0	2,845
Intended Re-try Calls	17,473	2,796	391	47	5	0	0	0	0	0	20,712

	(as the 3rd Effect)										
Times	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Offered Calls (Original)	9,422	-	-	-	-	-	-	-	-	-	9,422
Offered Calls (Re-try)	-	1,696	271	38	5	0	0	0	0	0	2,010
Successful Calls	7,538	1,357	217	30	4	0	0	0	0	0	9,146
Unsuccessful Calls	1,884	339	54	8	1	0	0	0	0	0	2,287
Abandoned Call Ratio	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	-
Abandoned Calls	188	68	16	3	0	0	0	0	0	0	276
Intended Re-try Calls	1,696	271	38	5	0	0	0	0	0	0	2,010

13.4 Further Preparation Studies for the Implementation

In this section, further studies, which should be carried out as soon as possible, are proposed for the preparation of the the Master Plan implementation, in addition to the various matters to be done as described in this report.

13.4.1 Project Management Study

Having proceeded with the Master Plan Study, it seems that a project management study is necessary for TOT in order to assure smooth and efficient implementation of the Master Plan. The study should be conducted for a purpose of reviewing and restructuring the institutional framework of project implementation management systems. The sub-management systems that need studies are:

- | | |
|--------------------------------------|---------------------------|
| 1) Construction, | 2) Procurement |
| 3) Operation and Maintenance | 4) Human resources, |
| 5) Marketing and customer relations, | 6) Budgeting and finance, |
| 7) Management information. | |

The overall management system should further be studied for a purpose of clarifying role, authority and responsibility of the headquarters and regional offices, and designing the best organization structure to coordinate the sub-management systems for implementing the projects. These concepts are shown in Figure 13.4.1.

13.4.2 Further Study for the Metropolitan Area

Needless to say, the Bangkok metropolitan area is the most important area for telecommunications development project in Thailand, not only from the quantitative viewpoint of telephone installation but also from the qualitative viewpoint of introduction of enhanced services.

The Master Plan Study of this time has been performed covering the whole country on the macroscopic basis according to the scope of work. Therefore, as the next step toward implementation of the 7th ESDP, it may be useful to carry out another study for the metropolitan area on the microscopic basis, including field survey for telephone demand forecast in each area, further study of facility expansion plan and market research on the enhanced services such as ISDN and non-voice services, etc.

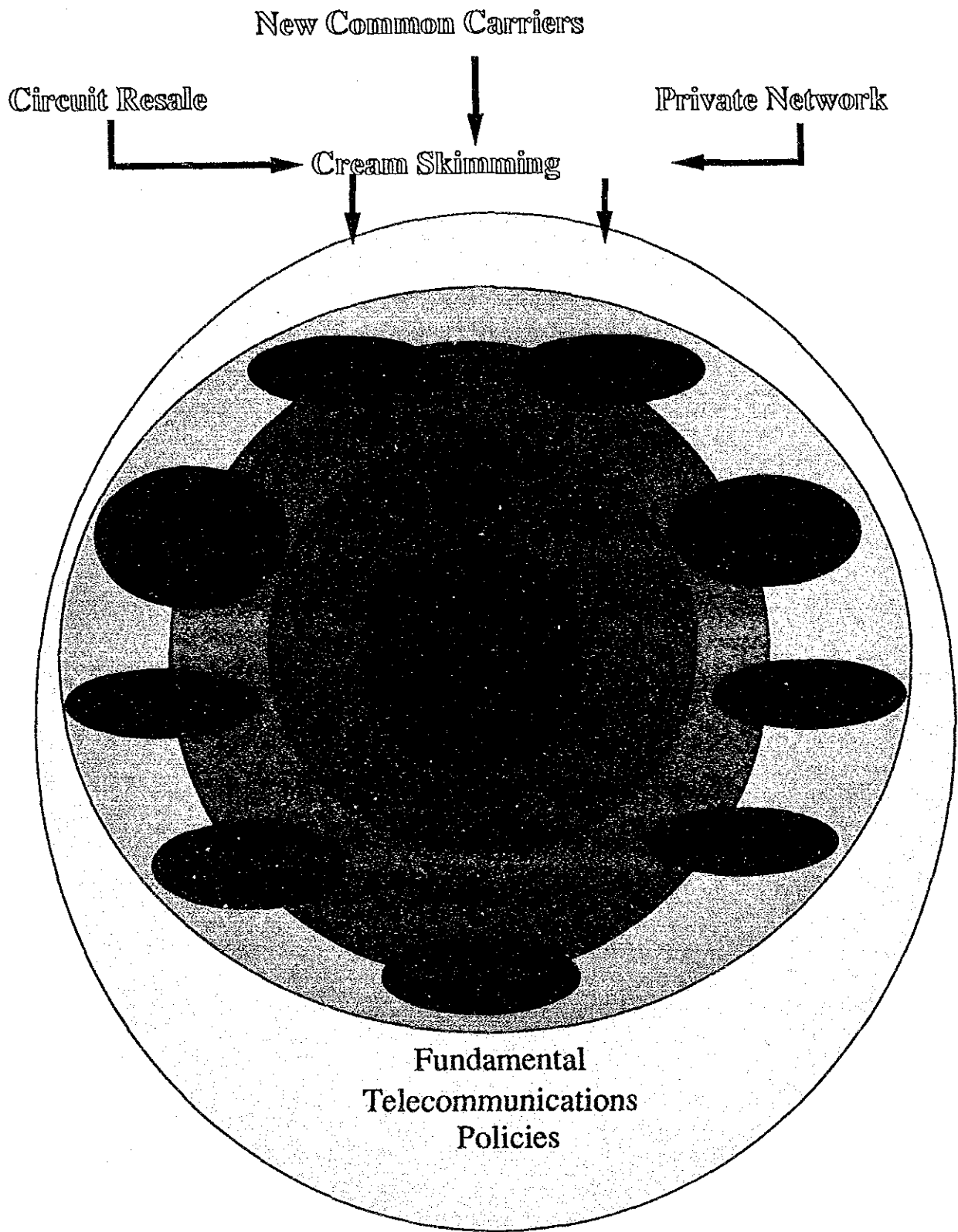


Figure 13.4.1 MasterPlan and Further Studies

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