

## 7.4 Implementation Plan

### (1) Billing-center system

Considering the expected number of subscribers, inasmuch as the Bull billing-center system in Damascus will have insufficient performance for all of Syria in 1996, another new billing system should be implemented for one of the distributed areas in the country within 1996. This is the most urgent implementation on and after 1996. For the location of another billing center, Aleppo is appropriate because it is the second biggest city and the main city in the northern districts.

After implementation of Aleppo billing center, billing processing is done by two billing center according to provinces as follows.

Table 7.4-1 Billing Centers and Divided Area for Each Center (1996-2000)

Billing center	Province
Damascus	Damascus (City), Damascus (Rural), Quennetra, Darra, Sweda
Aleppo	Aleppo, Homs, Hama, Idleb, Der Alzor, Alhasala, Rakkah, Lattakia, Tartous

In this case, as subscribers of Aleppo center are rapidly increasing and will reach to more than 1 million subscribers in the year of 2000, capacity of storage will run short. Before 2000, hard disk of 4 GB or so should be added.

### (2) Telephone-center system

The telephone-center system should be implemented in other telephone centers than 14 centers in Damascus within a few years to cope with increasing new subscribers. It is necessary to start to prepare for the order for implementation. Considering the necessary term needed for preparation, it is expected that in 1997 STE can begin implementation by some vendor.

Most of the implementation should be done in 1997 ideally. It will be difficult, however, to install the system in all target telephone centers (35) at once because it would need a great amount of equipment and many engineers or other personnel. Practically, the installation of systems would be done divided into several projects and in succession considering the number of subscribers, the network expansion investment, efficiency of installation, and so forth.

Here we propose that the installation for telephone centers in Damascus Rural and Aleppo should be done in 1997, and that in Homs, Hama and Lattakia in 1998.

(3) Management information system

As regards the management information system (MIS), because it is relatively small-scale and its application is not so complicated, it should be implemented in 1997.

(4) The installation schedule of 3 computer systems

The installation schedule of billing-center system, telephone-center system and management information system is described in Figure 7.4-1

1996	1997	1998	1999	2000
<ul style="list-style-type: none"> <li>● Development of Billing-center system in Aleppo</li> </ul>	<ul style="list-style-type: none"> <li>● Development of Telephone-center system (Damascus rural area, Aleppo)</li> <li>● Development of Management information system</li> </ul>	<ul style="list-style-type: none"> <li>● Expansion of Hard disk capacity of Billing-center system in Aleppo</li> <li>● Development of Telephone-center system (Homs, Hama, Lattakia)</li> </ul>		

Figure 7.4-1 Installation Schedule

## CHAPTER 8 BUILDING PLAN

The building floor space required for this Project was estimated according to new establishment and expansion sizes of systems, taking account of future expansions within the final capacities of systems.

The required space for each system and the kinds of new space and/or modification are as follows:

### 8.1 Telephone Network

#### (1) Switching System

Office/Bldg.	Exchange Type	Existing space(m2)	Necessary space (m2)		Required space (m2)(2000)	
			Initial(2000)	Ultimate	Modification	New
Al Nasser	NEAX61	282	282	150	---	---
Al Thawra	EWSD	160	160	160	---	---
Kefr Sousch	EWSD	119	150	150	31	---
Domar	EWSD	120	140	150	20	---
Al Mohajrin	EWSD	86	130	150	44	---
	E10A	162	162	150	---	---
Jallaa	EWSD	147	147	147	---	---
Bab Sharki	EWSD	83	83	150	---	---
	E10A	189	189	150	---	---
(Dewelaah)	---	---	110	110	---	110
Mezzeh-1	EMD	289	120	150	120	---
	EWSD	80	80	150	---	---
Mezzeh-2	EWSD	135	135	150	---	---
Al Miedan	EMD	360	150	150	150	---
Al Yarmouk	EWSD	116	116	116	---	---
(Al Kadam)	---	---	100	110	---	100
(Al Sebeyneh)	---	---	100	110	---	100
Rokn Al Dien	EMD	327	130	150	130	---
Barzeh	EWSD	132	132	132	---	---
(Ibn Alamed)	---	---	80	110	---	80
Bagdad	EMD	378	150	150	150	---
	NEAX61	156	156	150	---	---
(Al Abbaseyen)	---	---	110	110	---	110
(Jobar)	---	---	110	110	---	110
Total	---	---	---	---	645	610

## (2) Transmission System

		SDH System equip. space	140M System equip. space	TOTAL equip. space	Required Space [m2] (in 2000) **	
		[m2]	[m2]*	[m2]	Modification	New
A1	Al Nasser	0.963		0.963	0	0
A2	Al Thawra	0.696		0.696	0	0
B	Jallar	0.804		0.804	0	0
C	Bagdad	1.017	2.42	3.437	30	0
E***	Rokn Al Dien	0.321		0.321	0	0
F	Al Miedan	0.483		0.483	0	0
H1	Bab Sharki	0.483		0.483	0	0
K	Kerf Souseh	0.321		0.321	0	0
L1	Al Yarmouk	0.375		0.375	0	0
M	Barzeh	0.75	2.42	3.17	0	0
N1	Zamalka	0.642		0.642	0	0
	JOBAR	0.696		0.696	0	30
	DEWELAAH	0.321		0.321	0	30
	KADAM	0.321		0.321	0	30
	IBNALAMIED		2.42	2.42	0	30
	ABBASEYEN		2.42	2.42	0	30
	SEBEYNEH		2.42	2.42	0	30
	Total				30	180

NOTE\*: applied to Al Thawra equipment space.

NOTE\*\*: Minimum STE space for transmission.

NOTE\*\*\*: Existing French Equipment must be removed.

## (3) Power Supply System

Office/Bldg.	Required space (m2) (2000)			
	Engine Generator	Rectifier	Batteries	TOTAL
Al Nasser	---	---	---	0
Al Thawra	---	---	---	0
Kefr Souseh	---	---	---	0
Domar	20	---	---	20
Al Mohajrin	20	---	---	20
	---	---	---	0
Jallaa	---	---	---	0
Bab Sharki	---	---	---	0
	---	---	---	0
(Dewelaah)	20	32	40	92
Mezzeh-1	20	---	---	20
	---	---	---	0
Mezzeh-2	---	---	---	0
Al Miedan	20	---	---	20
Al Yarmouk	---	---	---	0
(Al Kadam)	20	32	40	92
(Al Sebeyneh)	20	32	40	92
Rokn Al Dien	20	---	---	20
Barzeh	---	---	---	0
(Ibn Alamed)	20	32	40	92
Bagdad	20	---	---	20
	---	---	---	0
(Al Abbaseyen)	20	32	40	92
(Jobar)	20	32	40	92

## (4) MDF Room

Office/Bldg.	Necessary No. of Primary Pairs	Required space (m2) (2000)
		MDF
Al Nasser	66,300	---
Al Thawra	59,250	---
Kefr Souseh	59,250	---
Domar	49,350	---
Al Mohajrin	61,200	---
Jallaa	51,000	---
Bab Sharki	55,350	---
(Dewelaah)	55,350	48
Mezzeh-1	59,250	---
Mezzeh-2	49,350	---
Al Miedan	59,100	---
Al Yarmouk	59,250	---
(Al Kadam)	49,350	43
(Al Sebeyneh)	49,350	43
Rokn Al Dien	39,450	---
Barzeh	59,250	---
(Ibn Alamed)	29,850	28
Bagdad	98,550	---
(Al Abbaseyen)	59,250	50
(Jobar)	59,250	50

## (5) Telephone Network Space Summary

Office/Bldg.	Switching System		Transmission System		Power Supply system		MDF Room		Common Space (New Building)		TOTAL (Telephone network)	
	Mod.	New	Mod.	New	Mod.	New	Mod.	New	Mod.	New	Mod.	New
Al Nasser	0	0	0	0	0	0	0	0	0	0	0	0
Al Thawra	0	0	0	0	0	0	0	0	0	0	0	0
Kefr Souseh	31	0	0	0	0	0	0	0	0	0	31	0
Domar	20	0	0	0	0	20	0	0	0	0	20	20
Al Mohajrin	44	0	0	0	0	20	0	0	0	0	44	20
	0	0	0	0	0	0	0	0	0	0	0	0
Jallaa	0	0	0	0	0	0	0	0	0	0	0	0
Bab Sharki	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
(Dewelaah)	0	110	0	30	0	92	0	48	0	560	0	840
Mezzeh-1	120	0	0	0	0	20	0	0	0	0	120	20
	0	0	0	0	0	0	0	0	0	0	0	0
Mezzeh-2	0	0	0	0	0	0	0	0	0	0	0	0
Al Miedan	150	0	0	0	0	20	0	0	0	0	150	20
Al Yarmouk	0	0	0	0	0	0	0	0	0	0	0	0
(Al Kadam)	0	100	0	30	0	92	0	43	0	530	0	795
(Al Sebeyneh)	0	100	0	30	0	92	0	43	0	530	0	795
Rokn Al Dien	130	0	0	0	0	20	0	0	0	0	130	20
Barzeh	0	0	0	0	0	0	0	0	0	0	0	0
(Ibn Alamed)	0	80	0	30	0	92	0	28	0	460	0	690
Bagdad	150	0	30	0	0	20	0	0	0	0	180	20
	0	0	0	0	0	0	0	0	0	0	0	0
(Al Abbaseyen)	0	110	0	30	0	92	0	50	0	564	0	846
(Jobar)	0	110	0	30	0	92	0	50	0	564	0	846
Total	645	610	30	180	0	672	0	262	0	3208	675	4932

Note : Common space for new buildings = Equipment space x2

: Common space include Customer service windows and Office space.

## 8.2 Mobile Telephone System

The estimated required space for the mobile telephone system, which is assumed to be installed in 1998, is shown in the table below. The details of the system implementation plan are explained in Chapter 5.

No.	Area	Name of Station	Required space (m <sup>2</sup> .)					Total
			MSC BSC	OMC	Billing center	BTS	Transmission	
1	Damascus	Thawra	108	144	144	10	10	416
2		Kefr Souseh				10	15	25
3		Bab Sharki				10	5	15
4		Miodan				10	5	15
5		New				10	10	20
6		Mezzeh I				10	5	15
7		Kadam				10	5	15
8		Jobar				10	5	15
9		Dumar				10	5	15
10		New				10	10	20
11		Kassioun				10	10	20
	Aleppo	Aljamelecha					5	5
12		Alsolymaneych				10	5	15
13		New				10	5	15
14		New				10	5	15
15		New				10	5	15
16	Highway	TV Station				10	10	20
17	Highway	Saraqeb				10	10	20
18		New				10	10	20
19	Hama	Hama				15	10	25
20	Homs	City Center				10	10	20
21		Wadi AlThahab				10	10	20
22		TV Station				10	10	20
23	Highway	Sawan				10	10	20
24		Kaldown				10	10	20
25	Zabadani	Zabadani				10	10	20
26		New				10	10	20
27	Damascus Southern Region	Kisweh				10	10	20
28		Saasa				10	10	20
29		New				10	10	20
30		New				10	10	20
31		New				10	10	20
32		New				10	10	20
33		Shaikh Miskin				10	10	20
34	Suweida	Suweida				10	10	20
35	Daraa	Daraa				10	10	20
36	Qunaytirah	Qunaytirah				10	10	20
		Total	108	144	144	365	320	1,081



### 8.3 Packet Switched Data Network

Expanding the existing PSDN does not place any particular requirements on the building plan. The required additional space is minimal (a few m<sup>2</sup> max., depending on the devices) and should be available in all exchange offices. The required additional space for power supply (220 V, backed-up) is also minimal (compared with what is currently available in exchange offices). While no problems are foreseen, the requirements should be verified for each expansion project.

### 8.4 Computer system

Modifications are needed in the Aleppo billing-center building in order to install the billing-center system, in particular to the computer room and data-entry room.

Table 8.4-1 Building Plan for Computer System

Office/Bldg.	Room type	Necessary space(m2)	Required space	
			Modification	New
Aleppo billing center	computer room	70	70	---
	Data-entry room	70	70	---



## CHAPTER 9 OPERATION AND MAINTENANCE

### 9.1 Policy of Operation and Maintenance

After the completion of the projects, operation and maintenance, which is to connect new subscribers in time and to keep good services to customers, is an important role of STE. Therefore, O/M organization, skill-upgrade of employees through training, enhancement of O/M facilities, appropriate stock/repair of spare parts and tools and so on should be considered.

### 9.2 Telephone Network System

#### 9.2.1 Switching System

##### 9.2.1.1 Present state of O/M

(1) There are five (5) O/MCs (Operation and Maintenance Center) for EWSD switching system (1 O/MC in Damascus and 4 Sub-O/MC in other cities) and each exchange office is connected to the belonging O/MC by data circuits (9,600b/s, 4,800b/s), supervised and controlled by O/M personnel who are working 24 hours at 3-shift. The number of persons in Damascus O/MC is forty one (41).

O/M personnel in each exchange office are working during daytime and its average number is about eight (8) (in EWSD exchange office: four (4)). The configuration of O/MCs is shown in Figure 9.2.1.1-1.

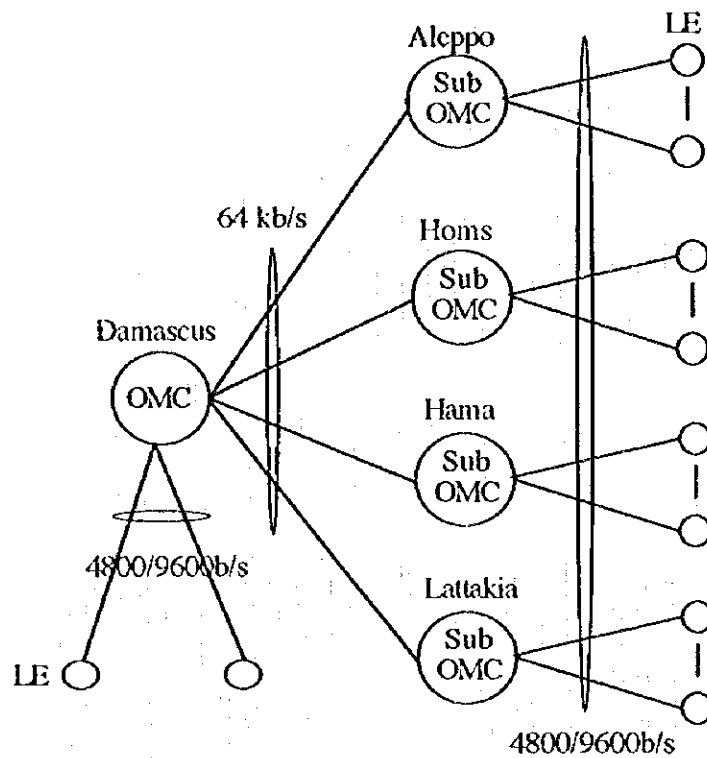


Figure 9.2.1.1-1 OMC Configuration for EWSD Exchanges

- (2) The purchase of spare parts and tools are for five (5) years at the initial stage and it costs 5% to 10% of an exchange cost.
- (3) Training for the digital switching system is for O/M and headquarters' personnel and the average number of trainees per exchange office are as follows:

In manufacturer's country :	2 persons
In Syria :	6 persons

- (4) Maintenance assistance system by manufacturers is employed and the number of assistants is about 1 person per big city. The duration of assistance is about for 1 year after the final completion of project, starting from the first completion of an exchange. The present O/M state is shown in Table 9.2.1.1-1.

Table 9.2.1.1-1 Present O/M State in Damascus City

Office/Bldg. name	Unit Name	Exchange Type	Capacity (1995)	No of O/M Personnel		Training		Total	Remarks
				A Class	B Class	Foreign	In-land		
Al Nasser		OMC				41			
Al Nasser	A1	NEAX-61	40,000	5	9	14	5	0	5
Al Thawra	A2	EWSD	15,000	5	0	5	0	1	1
Keif Souseh	K	EWSD	25,000	2	1	3	2	1	3
Domar	O	EWSD	15,000	2	1	3	1	0	1
Al Mohajrin	G1,2	EWSD	10,000	4	1	5	1	0	1
	G3	E10-A	11,000	10	2	12	5	2	7
Jalaa	B2	EWSD	30,000	4	3	7	1	2	3
Bab Sharki	H2	EWSD	20,000	4	1	5	2	0	2
	H1	E10-A	10,000	12	2	14	3	0	3
(Dewelaah)			0	0	0	0	0	0	0
Mezzeh-1	D1	EMD	10,000	12	0	12	1	0	1
	D2	EWSD	15,000	3	2	5	2	0	2
Mezzeh-2	D3	EWSD	25,000	2	1	3	1	0	1
Al Miedan	F1,2	EMD	17,000	15	0	15	3	0	3
Al Yarmouk	L1	EWSD	30,000	2	1	3	1	0	1
(Al Kadam)			0	0	0	0	0	0	0
(Al Sebeynch)			0	0	0	0	0	0	0
Rokn Al Dien	E	EMD	10,000	9	4	13	0	0	0
Barzeh	M	EWSD	30,000	3	0	3	1	2	3
(Ibn Alamed)			0	0	0	0	0	0	0
Bagdad	C1,2	EMD	20,000	15	1	16	2	8	10
	C3	EWSD	20,000	5	7	12	5	0	5
(Al Abbaseyen)			0	0	0	0	0	0	0
(Jobar)			0	0	0	0	0	0	0
Total			353,000	114	36	150	36	16	52

(Al ....) : new exchanges for the year 2000

### 9.2.1.2 Operation and Maintenance for this Project

In principle, O/M for this project will be extended as the same system as the present O/M. The following O/M plan will be taken:

- (1) Number of O/M personnel  
24 persons (4 persons per new exchange office,  $6 \times 4 = 24$ )
- (2) Spare parts and tools  
For five (5) years at initial stage (the cost is estimated at about 5% of exchange cost)
- (3) Training  
Training in foreign countries : 15 persons (6 new exchange offices x 2 + headquarters 3)  
  
Training in Syria : 12 persons (6 new exchange offices x 2)
- (4) Maintenance assistance  
One (1) person in Damascus city to assist STE and resolve software/hardware problems for 1 year after the final completion of project, starting from the first completion of exchange.

### 9.2.2 Transmission System

#### 9.2.2.1 Current status of Operation and Maintenance in Damascus area

As for the fiber-optic transmission systems constructed under contract 4/A and 40/A, a central monitoring system has been accomplished in Damascus areas, although network management system has not yet been installed for Damascus areas. Faults are usually informed by exchange sectors, and fault localization is made remotely by maintenance staff in the Operation and Maintenance Center at Al Nasser telephone office. They are dispatched to faulty telephone offices for repairing and testing. Measurement of fault location on optical fiber cable is also conducted by them.

The Operation and Maintenance Center at Al Nasser has maintenance staff for transmission, who are on duty 24 hours, 365 days of the year. The shift rotation system is shown below:

- 8:00 - 14:00 10 technicians/ engineers, including a manager
- 14:00 - 20:00 2 technicians/ engineers
- 20:00 - 8:00 2 technicians

Circuits provisioning is handled by the maintenance staff during day time. Circuit provision orders and design are made in the Operation and Maintenance Department.

#### 9.2.2.2 Maintenance and Operation Plan for New SDH systems in Damascus

Monitoring, testing, and circuit provisioning are all conducted at 2 Mbps from a NMS (Network Management System) for STM-4 systems. The NMS is planned to locate in the Operation and Maintenance Center (or TMN center) at Al Nasser telephone office.

At this moment, no NMSs are so compatible each other as aimed in the concept of TMN (Telecommunication Management Network), although manufactures often call them TMN systems. Moreover, automatic protection switching works usually within systems supplied by one manufacture. It is not recommendable that STE uses SDH systems from many manufacturers.

Two sets of portable local monitoring equipment will be provided in the plan at Al Nasser for use in the other telephone offices.

No additional operation and maintenance staff are required for new SDH systems.

#### 9.2.2.3 Training

Factory training (10 persons for 14 calendar days) and on-site training by the suppliers (15 persons for 30 calendar days) should be conducted, as new SDH systems are introduced.

#### 9.2.2.4 Spare parts

Under the following conditions,

- (1) Important common units such as a power supply unit, a clock supply unit are duplicated in a system.
- (2) 50 % of circuits are always secured even in a major trouble by route diverting in a SDH ring.

- (3) It may take from three months to six months to repair faulty units. (Urgent repair may need much less time.)

the plan provides, as spare parts, one unit per each active unit in each of the STM-4 loops (rings).

The spare parts are currently stored in Kerf Souseh telephone office. It is recommended that the Operation and Maintenance Center stores and uses the spare parts for quicker repair-work.

#### 9.2.2.5 Measuring equipment

Special measuring equipment for STM-4 systems must be provided. General measuring equipment such as frequency counters must also be provided to comply with the higher bit rate. Measuring equipment are kept and maintained in the Operation and Maintenance Center.

The following is the list of the required measuring equipment. Note that measuring equipment required for fiber-optic cables are planned in the outside plant.

- (1) Optical Multimenter (Light Source) to be provided in the outside plant plan
- (2) Optical Variable Attenuater: 2 sets
- (3) Optical Power Meter to be provided in the outside plant plan
- (4) OTDR to be provided in the outside plant plan
- (5) SDH Analyzer: 2 sets
- (6) Multimeter: 2 sets
- (7) Frequency counter: 2 sets
- (8) portable local monitoring equipment: 2 sets

#### 9.2.3 Power Plant

Each exchange office is supervised and controlled by O/M personnel who are working 24 hours at 2-shift. The average number of O/M persons for each exchange office is about five (5).

O/M for this project will be extended as the same system as the present O/M.

The following O/M plan will be taken:



- (1) Number of O/M personnel  
30 persons (5 persons per one new exchange office, 6x5=30)
- (2) Spare parts and tools  
For five (5) years at initial stage (the cost is estimated at about 5% of power plant cost)
- (3) Training
  - Training in foreign countries : 15 persons (6 new exchange offices x 2 + headquarters 3)...1 month
  - Training in Syria : 18 persons (6 new exchange offices x 3) ...1 month

#### 9.2.4 Outside Plant

The operation and maintenance policy for subscriber cable lines should be decided in consideration of subscribers' needs and reliability of subscriber cable networks, in order to offer satisfactory telecommunications services.

##### 9.2.4.1 Present State

With regard to outside plant, there are three (3) departments, Study (Planning) Dept., Executive Dept. and Operation/Maintenance (O&M) Dept. under the directorate for the city area of Damascus. The maintenance center which belongs to the O&M Department has been deployed in each individual exchange office except Al Thawra and Mazzeh [D3] exchanges. Moreover, each maintenance center has three (3) sections, Complaint Receiving Section, Service Line Section, and Cable Maintenance Section.

The deployment of the staff to each individual department is shown in Table 9.2.4.1-1.

Table 9.2.4.1-1 Deployment of Staff

	Executive Dept.	Study Dept.	Maintenance Dept.	Total
Administrator	10	1	14	25
Engineer	3	0	4	7
Technician	85	9	284	378
Total	98	10	302	410

The staff of maintenance centers is mainly engaged in subscriber connections and fault clearance and so forth.

The subscriber connections are performed in the following process:

- Connection of jumper wires at the MDF in each exchange.
- Connection of jumper wires in the CCCs.
- Installation of the service lines between DPs and subscribers' premises
- Installation of the in-house wires.
- Installation of the terminal plug sockets and the terminal equipment (telephone sets).

The subscriber fault clearance is performed in the following process:

- the complaint receiving section is first receiving the fault report, and next,
- the subscriber line testing section checks the faulty line between the switching equipment and the MDF in the exchange, and if the fault is not found in the tested section,
- the service line section is actuated via the complaint receiving section and the staff of this section inspects the service line between the DP and the subscriber terminal equipment, and if the fault is not found also in the tested section,
- the cable maintenance section is actuated and start finding the fault in primary cable and secondary cable sections.

If the fault is located in the primary or secondary cable section, a major effort is required for the fault repair work.

#### 9.2.4.2 Operation of Subscriber Cable Networks

After the completion of the Project, it is significant for STE to operate the completed subscriber network in a good condition.

As mentioned in Paragraph 4.5.1.5 in Chapter 4, the unacceptable practices on the aerial cable, service line and interior wire installation seem to cause many subscriber line faults. Therefore, it is recommended to prepare technical and installation standards particularly for aerial cable lines, service lines and interior wires.

It is also indispensable that a regular acceptance procedure including testing methods is introduced and sound acceptance tests are performed before the installed subscriber cable

lines are integrated into the subscriber networks, in order to avoid accepting deficient subscriber cable lines which result from inferior quality in providing and installation and which may impose problems on maintenance later on.

#### 9.2.4.3 Maintenance of Subscriber Cable Networks

Fast clearance of faults is very important; however, decreasing the number of faults is much more significant to offer satisfactory telecommunications services to subscribers. The following items should be considered for the maintenance of the subscriber cable network.

- The subscriber lines which are out of service never generate any revenue.
- The subscriber lines which are out of service for long time dissatisfy the subscribers and cause a negative image to network operators.

According to the statistical data obtained regarding eight (8) out of fourteen (14) exchanges, the number of subscriber line faults amounts to approximately 49/day in each exchange service area in average. It means that the existing subscriber cable networks have not been in a good condition and have required to be improved themselves.

If the newly installed subscriber cable lines be integrated into the existing subscriber networks which remain to be low quality, the newly integrated subscriber cable lines would not obtain high quality.

In considering the conditions mentioned above, it is recommended that the following matters should be achieved as an immediate action in order to decrease the number of line faults and to obtain reliability of the subscriber network before the Project planned in this study area is implemented.

- To grasp inferior facilities and the actual situation on the existing subscriber network.
- To find and list faulty cable lines by periodic and simple tests which consist of continuity test and insulation resistance test.
- To record the lines which are repaired by provisional ways.
- To repair completely the fault lines or to replace the cable sections timely in projects planned for the exchange service areas concerned
- To analyze the fault causes in individual cases.

As a long term solution, the following actions are recommended in order to manage and maintain the whole subscriber cable network.

- To establish the Outside Plant Record for each individual exchange.
- To train engineers to manage comprehensively the fault repair work.
- To establish the maintenance centers equipped with measuring equipment, vehicles and tools necessary for operation and maintenance work.

#### 9.2.4.4 Organization of O&M for Outside Plant

In principle, the organization of the present maintenance centers for the outside plant will be expanded on completion of the Project to be implemented in this study area.

##### (1) Deployment of Maintenance Center

At present, the maintenance center has been deployed in each exchange office except Al Thawra and Mezzeh exchange offices. Al Thawra exchange service area is under construction, while Mezzeh [3] exchange service area has been covered by the maintenance center located in Mezzeh [1, 2] exchange office.

With regard to deployment of maintenance centers, the following matters should be examined to organize the maintenance centers for new exchange service areas to be established in this study area.

- Size of each individual exchange service area.
- Distance between a exchange office and the adjacent exchange offices.
- Amount of future telephone demand in each exchange service area.
- Strategic formation of the operation and maintenance organization

As a conclusion of considering the terms mentioned above, it is recommended that the maintenance center should be organized in the following exchange offices which will be located in the newly established exchange service areas.

- Al Kadam exchange office
- Al Sebeyneh exchange office
- Al Abbseyen exchange office
- Jobar exchange office

With regard to other two (2) exchanges, Dewelaah and Ibn Alamied exchanges, the service area of Dewelaah exchange will be covered by the maintenance center deployed in Bab Sharki exchange because the distance between both exchanges is only within 0.5 km, while the service area of Ibn Alamied exchange will be covered by the maintenance center deployed in Barzeh exchange because the distance between both exchanges is only within 1.5 km, and because the future telephone demand is not so large.

Al Thawra exchange office is now under construction as mentioned above; however, this exchange office will be the most significant point in considering the future strategy on not only domestic telecommunications services but also international telecommunications services in Syria. Since Al Thawra exchange office is located in the center of Damascus city, the maintenance center located in this office should be a base station for the maintenance centers which should be deployed in the study area.

#### (2) Deployment of Staff

At present, approximately 25 persons in average have been deployed to the maintenance center located in each exchange office; however, to decrease the amount of staff must be possible by arrangement of appropriate testing equipment, tools and vehicles.

In principle, the amount of staff to be deployed into newly established maintenance centers will be approximately 80 persons (20 persons times four (4) maintenance center).

#### (3) Arrangement of Vehicles

The following vehicles should be provided so that each maintenance center to perform the maintenance work efficiency. In addition, the allocation plan of vehicles should be formulated by STE, in consideration of the future states by the completion of this Project.

- Van type of vehicles for maintenance duties including fault repair, cable line patrol and management tasks.
- Truck type of vehicles for faulty cable replacement and light cable line extension work necessary for subscriber network operation and maintenance.

#### (4) Arrangement of Measuring equipment and tools

The following measuring equipment and tools will be provided for each maintenance center to achieve the easy and accurate maintenance work.

- Echo meter

- Bridge Megger testing set
- Insulation resistance meter
- Cable route detector
- Poisonous gas detector
- Cable testing kit
- Copper conductor jointing tool kit
- Cable laying tools
- Safety tools

The following optical fiber cable measuring equipment and tools will be provided for the maintenance center located in Al Thawra exchange office to have the feature as a base station.

- Optical fiber analyzer and OTDR 1.3 SM unit
- Optical power meter
- LED light source
- Optical fiber telephone set
- Optical fiber testing tool kit
- Fiber core splicer
- Fiber core splicing tool kit

#### (5) Training

The knowledge of STE' staff seems sufficient to supervise the Project implemented in this study area; however, key persons who manage and control the operation and maintenance work should be trained to acquire the subscriber network planning, project implementation and systematic operation/maintenance procedures in a foreign country advanced on the telecommunications field. The duration of the training will be two (2) months.

For the line men who are engaged in daily operation and maintenance works, it is recommended that they take part in On-the-Job-Training (OJT) as much as possible through the implementation of the Project. Each of them should participate in the training for two (2) month.

The number of trainees are as shown in Table 9.2.4.4-1.

Table 9.2.4.4-1 Number of Trainees

	In Foreign	On-the-Job	Remark
Executive Dept.	2		
Study Dept.	2		
O&M Dept.	2		
Maintenance centers	4	51	4 new maintenance centers x 1 person 17 maintenance centers x 3 person

### 9.3 Mobile Telephone System

The organization for the mobile telephone service, which is planned to be newly established in STE, is explained in chapter 5.7, "Customer Service and Management." Here we summarize them.

The individual organization shall be established solely for mobile telephone service independent of the organization of the PSTN. The organization should take care of the individual billing system that should be established solely for the mobile telephone service. To provide a good service and to maintain the quality of the service, the persons newly assigned to the organization of the mobile telephone service need to be trained. The functions of sections in the organization is as follows:

#### (1) Administration section

This section handles the administrative matters of the mobile telephone organization, such as, personnel matters, account and finance matters, and contract matters.

#### (2) Engineering section

The mobile system is an ever expanding system, same as PSTN. The engineering section is in charge of expanding the system.

The section shall analyze the traffic data and assess whether the present facilities at each station are enough or not. It shall analyze the sales condition and the demand for mobile service at each region/area. Based on the analysis it shall make an expansion plan, considering also the financial condition. Then it shall prepare for a tender and carry out the tender. After the conclusion of the tender, it supervises the installation work.

#### (3) Marketing/Sales section

The marketing and sales section sells the mobile telephone terminals as much as possible to make the service profitable. Nonetheless the mobile terminal can be sold not only by STE but also by the third parties consigned by STE. There are countries where the terminals are sold freely.

The new mobile terminals, or their subscriber identity module (SIM) that is mounted in the mobile terminal, should have their identity registered in the central equipment of the mobile telephone system so that the terminal can be identified as an authorized subscriber



of the system.

(4) Customer service and billing section

The customer service and billing section receives information of the new subscribers from the sales section, and register the new terminals (or subscriber identity module: SIM) into the central equipment so that the terminal shall be recognized as an authorized.

The section shall be also in charge of delivering the invoice bill to the customers and of collecting fee from them. They receive the bills from the billing center and distribute them to the subscribers. They shall monitor the payment of them and shall take warning action or penalty action to the subscribers who delay the payment exceeding to certain limit of time.

(5) Operation and Maintenance section

The function of the operation and maintenance section are mainly as follows:

Equipment management	To monitor the equipment, to maintain the equipment, to recognize malfunctioning and to record it, to diagnose it and to locate the cause of it, to restore the function, and to execute periodical check up as preventive activity.
Network configuration management	To set up the connection among equipment and to set parameters, in order to maintain the equipment at the best condition
Billing management	To manage the data of subscribers regarding charging and billing.
Service quality management	To monitor the quality of the service, and to reconfigure the system in order to improve the quality.
Security management	To manage the parameters and algorithm in order to prevent unauthorized accesses to the mobile telephone network or unauthorized use of it.

The operation and maintenance center (OMC) for the mobile telephone service should be established in Al Thawra telephone office, and a branch office at Aleppo for quick recovery from the failure at remote stations. . They work at OMC 24 hours a day, 7 days a week, 365 days a year, in shift working scheme. Thirty-five (35) staffs are estimated to be required including for the branch office.

#### 9.4 Packet Switched Data Network

The operation and maintenance concept is based on the centralized Network Management System which is collocated with the switches Damas00 and Damas01. Hence the OMC (the PSDN-OMC) is centralized.

A minimal support of OM-personnel at the various other locations is required on demand. There is no need for training for these personal if locations host concentrators only. For locations which will host small switches (that is not yet the case) it is desirable to train about 4 people for the duration of max. 1 week at the PSDN-OMC location.

OMC should be operated in 1.5 shifts (e.g. from 8:00 to 19:00) but supervised 24 hours a day. In case of any serious problems the intervention of trained personnel is required.

Recommended PSDN-OMC staff:

- 2 engineers
- 4 technicians
- 2 secretaries

Training for engineers and technicians:

- 2 weeks (courses abroad and in Syria)

Taking into account that trained staff is partly already available and that fluctuation rate may not be very high it is assumed that 4 persons have to be trained abroad during this 5-year period.

The ISDN-PSDN interworking unit will not require extra staff. It is assumed that 3 persons have to be trained abroad. Duration of training will be 1 week.

#### NGN/MBS

It is assumed that NGN/MBS will be in commercial operation at the end of this 5-year period.

Recommended NGN/MBS-OMC staff:

- 2 engineers
- 4 technicians
- 2 secretaries

6 persons (engineers and technicians) have to be trained abroad. Duration of training will be 3 weeks. It is assumed that these persons do already have basic knowledge in new technologies and data communications before the training starts.

### 9.5 Computer System

To operate the implemented system more effectively, professional staff is needed for the computers in telephone centers and billing centers, except for personnel who have already accumulated managerial experience in telephone or billing centers. Needed personnel for the computerized system are operators, maintenance personnel, and system engineers. The roles of each and necessary number for each system are listed below.

Table 9.5-1 Roles of Required Personnel and Necessary Number

Needed personnel	Location	Role	Necessary Number of staff members
Maintenance person	Telephone center	Maintenance of telephone-center system	One member for each four telephone-center system
Operator	Billing center	Operating and managing billing-center system	Three members for a billing-center
System engineer	Billing center	Developing the application program	Two members for a billing-center
	Headquarters	Maintenance of MIS Developing the application program	One member for the headquarters

According to the implementation plan mentioned above, the number of computer systems is increasing as follows.

Table 9.5-2 Number of Implemented Systems

Needed personnel	Number of system centers					
	year	1996	1997	1998	1999	2000
Telephone-center system		0	18	35	35	35
Billing-center system		1	1	1	1	1
Management information system		0	1	1	1	1

The necessary number of staff members per year is indicated as follows.

Table 9.5-3 Number of Staff Members for the Computer System

Needed personnel	Number of staff members					
	year	1996	1997	1998	1999	2000
Maintenance person		0	5	9	9	9
Operator		3	3	3	3	3
System engineer (for billing center)		2	2	2	2	2
System engineer (for MIS)		1	1	1	1	1
Total		6	11	15	15	15

## CHAPTER 10 IMPLEMENTATION PLAN

### 10.1 Policy of Implementation Plan

The objective of project implementation is that target projects are to be put into service as planned without any delays. In order to achieve this objective, it is important that the implementation plan is made from all over points of view;

- all network system elements such as telephone network (switching, transmission and outside plant), mobile telephone network, packet switching network and computer systems are designed correctly and interactively based on the fact,
- appropriate volumes/periods for installation works are estimated,
- the works are controlled/supervised periodically and necessary actions are taken.

The viewpoints for implementation plan are shown below:

#### 10.1.1 Comprehensive Implementation Schedule

The following items and periods should be estimated and planned in the comprehensive schedule:

- (1) Preparation of finance
- (2) Preparation of tender specifications
- (3) Tendering
- (4) Evaluation of tender
- (5) Contract negotiation
- (6) Manufacturing of equipment and factory inspection
- (7) Transportation of equipment
- (8) Construction of buildings and Installation of systems
- (9) Training

- (10) Provisional and final acceptance test

#### 10.1.2 Planning and Execution

Generally, the following organization and actions are needed to carry out the projects:

- (1) To organize a project team to plan, control and execute the projects

The team members which consists of the STE staff and consultant, control the implementation and coordinate management between sections concerned in order to carry out the project works smoothly without any delay.

- (2) To employ consultants to make technical specifications and supervise installation works, if necessary
- (3) To enhance local contractors' capabilities for civil works, especially for subscriber network, in order to achieve a big amount of works without any delay
- (4) To clarify the responsibilities between STE and contractors for procurement and installation works, taking into account local procurement and local contractors' capabilities
- (5) To participate STEs' employees, who are operation and maintenance staff, in installation works to raise up the skill for advanced technologies such as digital exchanges, optical fiber transmission, mobile telephone, packet switching, etc.
- (6) To control and supervise the installation works to promote the projects as scheduled

#### 10.2 Project Implementation

##### 10.2.1 Tasks of STE Project Team

The main tasks of the Project Team are shown below:

- (1) Preparation of tender specifications

- (2) Evaluation of tender
- (3) Contract negotiation
- (4) Factory inspection
- (5) Supervision of installation works
- (6) Management of training scheme
- (7) Provisional and final acceptance test
- (8) Inspection of plant records

#### 10.2.2 Procurement Plan

Considering the actual market and quality of equipment and materials in Syria, main equipment and materials for the projects will be purchased as follows, separately in Syria and in foreign countries:

##### (1) Procurement in Syria

Materials for civil works such as cement, sand, steel and so on.

##### (2) Procurement in foreign countries

All equipment and materials for all system (Exchanges, transmission system, cables, mobile telephone system, packet switch system and computer system) except for the above are purchased from foreign countries.

#### 10.2.3 Responsibility of Project Works

Responsibilities of projects, which are procurement of equipment/materials, installation work and supervision, are shown in Table 10.2.3-1.

Items	Equipment and materials	Installation	Supervision	Maintenance assistance	Remarks
1. Telephone exchange	○	■	○	○	
2. Transmission system	○	○	○	-----	
3. Power plant	○	■	○	-----	
4. Outside plant	○	* ○ / ■	■	-----	
5. Mobile telephone system	○	■	○	○	
6. Packet switching system	○	* ○ / ■	○	-----	
7. Computer system	○	■	○	○	
8. Land/Building	■	■	■	-----	

Note : ■ STE Part      \* ○ / ■ Contractor & STE  
○ Contractor Part

Figure 10.2.3-1 Responsibility of Project Works



### 10.3 Implementation Schedule

Taking into consideration the target year for this project, which is described in Chapter 2 and the time for preparation of making the projects, the comprehensive schedule for this project will be Figure 10.3-1.

Although the periods of events may be changeable according to each system, the typical detailed implementation schedule including all events is shown in Figure 10.3-2.


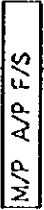


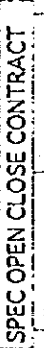




	1995	1996	1997	1998	1999	2000	2001
JICA STUDY	 						
FINANCING TREATMENT AND TENDER DOCUMENT							
TENDERING							
IMPLEMENTATION OF PROJECT							
				MOBILE		TELEPHONE	

Figure 10.3-1 Comprehensive Schedule

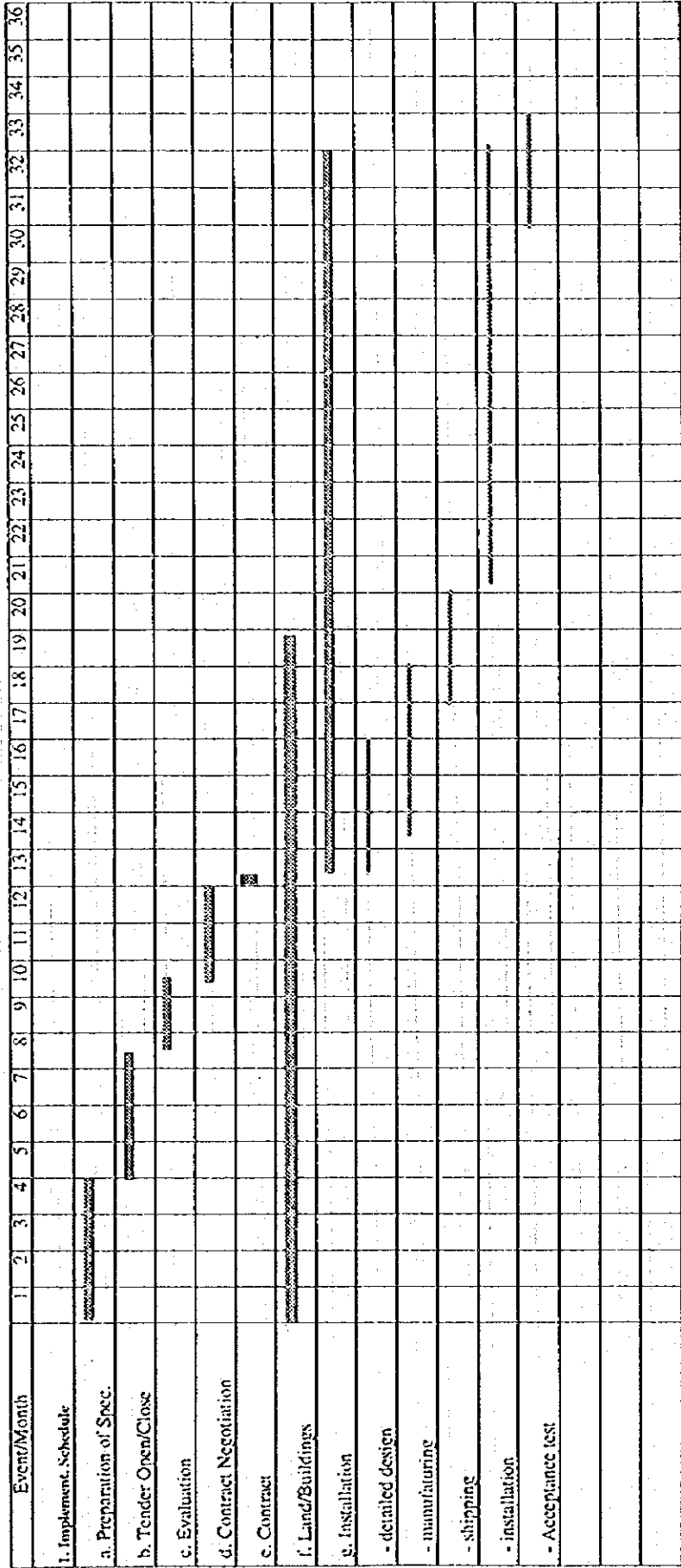


Figure 10.3-2 Typical Detailed Implementation Schedule



## CHAPTER 11 COST ESTIMATION

### 11.1 Conditions for Estimation

The investment cost for this project is estimated based on the scopes of the facility provision plan in Chapter 4 to Chapter 9 and classified into foreign currency and local currency as described in Chapter 10 "The Implementation Plan". The prices of equipment and wages may be changed according to the market situation, inflation and so on, however we estimated the costs referring to the world market and the STE's actual costs. The conditions for estimation are as follows:

- (1) Foreign currency is US\$.
- (2) Local currency is Syrian Pounds.
- (3) The costs for equipment and materials are based on C.I.F. (Cost, Insurance and Freight)
- (4) The exchange rate except for Import Tax is 42 Syrian Pounds per US\$.
- (5) The import tax for telecommunication equipment and materials in Syria is on average 30% average and the exchange rate for import tax is 23 Syrian Pounds per US\$ for cable, 11.25 Syrian Pounds per US\$ for other telecommunications equipment.

### 11.2 Cost Estimation for Each System

The cost components for each system are mainly considered as follows:

- Equipment and materials including spare parts
- Installation including supervision
- Building except for land(including also common space but negligible space for small requirements)
- Tools and measuring equipment
- Training including maintenance assistance(in foreign countries and / or in-land)

The currency of installation cost for each system is in accordance with the responsibility of project works in Chapter 10.

The estimated costs for each system are shown in Table 11.2.1-1 to Table 11.2.4-1.

### 11.2.1 Telephone Network

#### (1) Switching System

Table 11.2.1-1 Cost for Switching System

	Foreign Currency (US\$)	Local Currency (Syrian Pounds)
<b>1. Equipment &amp; Materials</b>	<b>44,362,444</b>	<b>159,523,250</b>
(1) Exchanges	41,509,000	0
(2) Power Plant	2,853,444	*9,800,000
(3) Import tax	0	149,723,250
<b>2. Installation</b>	<b>547,500</b>	<b>2,128,000</b>
(1) Exchanges	383,250	1,456,000
(2) Power Plant	164,250	672,000
<b>3. Building *</b>	<b>0</b>	<b>53,230,500</b>
(1) Exchanges	0	33,748,500
(2) Power Plant	0	19,482,000
<b>4. Training</b>	<b>282,000</b>	<b>384,000</b>
Exchanges	195,000	240,000
Power Plant	87,000	144,000
<b>5. Total</b>	<b>45,191,944</b>	<b>215,265,750</b>

Note: \* High tension facility from PEE

\* Building cost includes the cost for common space which means customer windows and miscellaneous uses in new buildings.

(2) Transmission System

Table 11.2.1-2 Cost for Transmission System

	Foreign Currency (US\$)	Local Currency (Syrian Pounds)
<b>1. Equipment &amp; Material</b>	<b>3,842,615</b>	<b>12,968,826</b>
(1) Transmission	3,618,099	0
(2) Measuring Equipment	224,516	0
(3) Import tax	0	12,968,826
<b>2. Installation</b>	<b>542,715</b>	<b>0</b>
<b>3. Building *</b>	<b>0</b>	<b>4,725,000</b>
<b>4. Training</b>	<b>48,400</b>	<b>120,000</b>
<b>5. Total</b>	<b>4,433,730</b>	<b>17,813,826</b>

Note: For transmission equipment installation, STE have two methods; one is STE installation with contractor supervision, and the other is contractor installation and supervision. The cost estimation above is for the latter case.

\* Building cost includes the cost for common space which means customer windows and miscellaneous use in new buildings.

(3) Subscriber Network

The unit costs to be used for this project are estimated based on the information obtained from STE and based on the data obtained by analyzing the expenditures of the typical projects which were implemented in the city of Damascus before.

Table 11.2.1-3 Cost for Subscriber Network

	Foreign Currency (US\$)	Local Currency (Syrian Pound)
<b>1. Materials &amp; Installation</b>	<b>56,439,000</b>	<b>2,529,888,900</b>
(1) Materials	54,047,000	1,252,608,000
(2) Import Tax	0	372,924,300
(3) Installation	2,392,000	904,356,600
<b>2. Measuring Equipment</b>	<b>254,320</b>	<b>858,330</b>
(1) Measuring Equipment	254,320	0
(2) Import Tax	0	858,330
<b>3. Tools</b>	<b>115,200</b>	<b>388,800</b>
(1) Tools	115,200	0
(2) Import Tax	0	388,800
<b>4. Training</b>	<b>94,000</b>	<b>714,000</b>
<b>5. Total</b>	<b>56,902,520</b>	<b>2,531,850,030</b>



## 11.2.2 Mobile Telephone System

The cost estimation of the mobile telephone system, which is presumed to be installed in 1998, is shown in Table 11.2.2-1. The detail of the system implementation plan is explained in Chapter 5.

Table 11.2.2-1 Cost for Mobile Telephone System

	Foreign Currency (US\$)	Local Currency (Syrian Pound)
<b>1. Equipment &amp; Material</b>	<b>29,073,300</b>	<b>114,292,700</b>
(1) Mobile Equipment	25,591,600	0
(2) Entrance transmission	2,964,400	0
(3) Power Plant	517,300	16,170,000
(4) Import Tax	0	98,122,700
<b>2. Installation</b>	<b>478,800</b>	<b>1,360,800</b>
<b>3. Building</b>	<b>0</b>	<b>8,796,000</b>
<b>4. Training</b>	<b>119,000</b>	<b>200,000</b>
<b>5. Total</b>	<b>29,671,100</b>	<b>124,649,500</b>

Note: Besides using STE's own building, some base transceiver stations (BT's) in Damascus and Aleppo are planned to be installed in rented spaces. The total rental fee is estimated to be 102,000 Syrian Pound / month.

### 11.2.3 Packet Switched Data Network (PSDN)

Cost estimation is based on the assumption that the existing PSDN will be used for packet switched data services and that expansions of the network are necessary to meet the demand forecast contained in chapter 6. Cost estimations include also equipment necessary for PSDN-ISDN interworking and a new generation network. Cost estimations do not include operational costs (e.g. power supply, room costs, repair costs).

The cost estimations for the PSDN expansions are provided in Table 11.2.3-1. Please note that the estimations only include equipment which is directly related to the PSDN, costs for the underlying networks (e.g. telephone switches, access lines and transmission equipment) are not included. These resources are included in the specific chapters.

PSDN upgrade (Ref. No 3) is specified in chapter 6.

Table 11.2.3-1 Cost Estimation for PSDN

Ref. No		2000
1	Delta* dedicated accesses (Qty)	180
2	Delta* dial-up accesses (Qty)	200**
	<b>Costs (US\$)</b>	
3	PSDN upgrade (switches, FEPs, Mux etc.)	400,000
4	Net Mgt Center upgrade	20,000
5	Site infrastructure	15,000
6	Auxiliary equipment (e.g. test facilities)	40,000
7	Miscellaneous	40,000
8	<b>Total Cost</b>	<b>515,000</b>

Notes:

- \* Delta = increase during five-year period
- \*\* Delta figures minus access via ISDN interworking
- The cost are estimated on a five-year basis according to the five-year planning adopted for the development of the telecommunications infrastructure.
- All tax included

- Cost for training (abroad) included in item 3 and 4 (for calculation reasons one can assume that 5% of these cost items are for training)
- Costs for local training are included in item 7 (for calculation reasons one can assume 10,000 US\$ for training)
- Site infrastructure (Ref. No 5) covers power supply equipment, cable, filing cabinets and other material.
- Local currency portions are expressed in US\$ (costs of Ref. No 5 and 50% of costs of Ref. No 7)

Table 11.2.3-2 Cost Estimation for PSDN-ISDN Interworking

Ref. No		2000
1	Total Cost PSDN-ISDN IW	300,000

- All tax included
- Cost for training (abroad) included (for calculation reasons one can assume that 5% of this cost item is for training)
- Costs for site infrastructure and installation are included in PSDN infrastructure

Table 11.2.3-3 Cost Estimation for NGN and MBS Platform

Ref. No		2000
1	Total Cost NGN	1,400,000

Notes:

- Investments mainly in networks based on ATM technology. Because ATM supports any kind of communication, a clear distinction between services (voice, data, video etc.) is not any longer possible.
- All tax included
- Cost for training (abroad) included (for calculation reasons one can assume that 5% of this cost item is for training)
- Costs for site infrastructure and installation are also included (100,000 US\$)

Table 11.2.3-4 Cost Estimation: Equipment Cost Total

(Table 11.2.3-1, Table 11.2.3-2 and Table 11.2.3-3)

Ref. No		2000
1	Total Cost	2,215,000

Table 11.2.3-5 Total Cost for Packet Switching Data Network

	Foreign Currency (US\$)	Local Currency (Syrian Pounds)
<b>1. Equipment &amp; Materials</b>	<b>1,518,462</b>	<b>1,050,000</b>
(1) PSDN	353,077	1,050,000
(1) PSDN-ISDN Interwork	219,231	0
(1) NGN & MBS Platform	946,154	0
<b>2. Import tax</b>	<b>0</b>	<b>5,124,808</b>
<b>3. Installation</b>	<b>100,000</b>	<b>0</b>
<b>4. Building</b>	<b>0</b>	<b>0</b>
<b>5. Training</b>	<b>106,000</b>	<b>420,000</b>
<b>6. Total</b>	<b>1,724,462</b>	<b>6,594,808</b>

## 11.2.4 Computer System

### 11.2.4.1 General

In estimating the cost for the STE computerization the preconditions are as follows:

- To procure hardware in Syria.
- To utilize and customize packaged software.
- The cost of modification of buildings is necessary for the billing center (Aleppo) and not necessary for telephone-centers.
- Training cost for two years after system implementation is included in the cost of application software. And regarding to training after that, the cost is included in the maintenance cost assuming that it should be done by On the Job Training.
- To exclude communications expenses because the network facility is owned.

### 11.2.4.2 Telephone-center System

#### (1) Hardware

According to the implementation plan in the year of 1997, 20 telephone-center systems in Damascus Rural and Aleppo are implemented. The next year, 1998, 15 telephone-center systems in Homs, Hama and Lattakia are implemented.

Table 11.2.4.2-1 Cost of Hardware (US\$)

Year	1997	1998	Total
Cost (Server, Terminal, Laser printer, Printer, Hub, MODEM, UPS)	2,155,860	1,674,750	3,830,610

#### (2) Software

The cost of application software is especially variable because it depends on number of subscribers, requested specification, performance, reliability and other conditions. Therefore, the unit price for application software shown below is not definite. And we assume that an packaged application software should be purchased and customized in 1997 and the same one is used for the telephone-center systems implemented in 1998. Accordingly, the cost of an application software is not included in the cost for 1998.

Table 11.2.4.2-2 Cost of Software (US\$)

Year	1997	1998	Total
Cost (Operating system for server, Database, Network, Application software)	2,537,210	222,885	2,760,095

Note\*: The price of the application software is considered to include training price for users.

(3) Installation Cost

Beside hardware cost and software cost, we need consider system installation cost. It is calculated according to this formula; Cost of hardware × 5% (including access control equipment, cables and other small devices). It is paid by local currency because installation is considered to be done by local staff of a vender.

Table 11.2.4.2-3 Installation Cost (S.P.)

Year	1997	1998	Total
Cost	4,527,306	3,516,975	8,044,281

(4) Total Cost of Telephone Center System

Table 11.2.4.2-4 Total Cost of Telephone Center System

	Foreign Currency (US\$)	Local Currency (S.P.)
1. Hardware	3,830,610	
2. Software	2,760,095	
3. Import tax		22,243,629
4. Installation		8,044,281
5. Total	6,590,705	30,287,910

11.2.4.3 Billing-center System

(1) Hardware

During the Eighth National Five-Year Plan (1996-2000), by the end of 1996 Aleppo billing-center system should be implemented in addition to Damascus billing-center system implemented in 1995.

Moreover, in accordance with the rapid increase of subscribers, hard disk should be added in the year of 1998, before the number of subscribers dealt with by Aleppo billing-center system reaches 1,000,000.

Table 11.2.4.3-1 Cost of Hardware (US\$)

Year	1996	1998	Total
Cost (Server, Terminal, Laser printer, Magnetic tape unit, Printer, Hub, Router, MODEM, UPS, Hard disk)	283,678	5,600	289,278

Note: When the system is implemented initially, the additional hard disk is not necessary.

(2) Software

The application software for Damascus billing-center system should be utilized for Aleppo, so the cost of the application software is not included.

Table 11.2.4.3-2 Cost of Software (US\$)

Year	1996	1998	Total
Cost (Operating system for server, Database, Operating system for terminal, Compiler, Application software)	29,178	---	29,178

Note\*: The price of the application software is considered to include training fee for users.

(3) Installation Cost

Air-conditioners are needed to keep appropriate temperature and humidity for computers. And in the same way as for the telephone-center system, system installation cost should be included in the cost of billing-center system;  $\text{cost of hardware} \times 5\%$  (including access control equipment, cables and other small devices). It is paid by local currency.

Table 11.2.4.3-3 Installation Cost

Year	1996	1998	Total
Foreign Currency (US\$) <air-conditioner>	4,000	---	4,000
Local Currency (S.P.)	607,484	---	607,484

Note: The First implementation cost excluding additional hard disk 13

(4) Building Cost

The cost of modification of Aleppo billing-center building should be included as the initial cost.

Table 11.2.4.3-4 Building Cost (S.P.)

Year	1996	1998	Total
Cost of building modification	630,000	---	630,000

(5) Total Cost of Billing Center System

Table 11.2.4.3-5 Total Cost of Billing Center System

	Foreign Currency (US\$)	Local Currency (S.P.)
1. Hardware	289,278	
2. Software	29,178	
3. Import tax		1,088,289
4. Installation	4,000	607,484
5. Building		630,000
6. Total	322,456	2,325,773

11.2.4.4 Management Information System (MIS)

(1) Hardware

MIS for headquarters and 5 big cities (Damascus, Aleppo, Homs, Hama, Lattakia) is implemented in the year of 1997.

Table 11.2.4.4-1 Cost of Hardware (US\$)

Year	1997	1998	Total
Cost (Server, Terminal, Laser printer, Printer, Hub, MODEM, UPS)	180,970	---	180,970



(2) Software

Table 11.2.4.4-2 Cost of Software (US\$)

Year	1997	1998	Total
Cost (Operating system for server, Database, Network, Operating system for terminal, Application software)	35,149	---	35,149

Note: The price of application software is considered to include training price for users.

(3) Installation Cost

System installation cost is calculated in the same manner;  $\text{Cost of hardware} \times 5\%$  (including access control equipment, cables and other small devices). It is paid by local currency.

Table 11.2.4.4-3 Installation Cost (S.P.)

Year	1997	1998	Total
Cost	380,037	---	380,037

(4) Total Cost of Management Information System

Table 11.2.4.4-4 Total Cost of Management Information System

	Foreign Currency (US\$)	Local Currency (S.P.)
1. Hardware	180,970	
2. Software	35,149	
3. Import tax		729,402
4. Installation		380,037
5. Total	216,119	1,109,439

#### 11.2.4.5 Total Cost of Computer System

Table 11.2.4.5-1 Total Cost of Computer System

	Foreign Currency (US\$)	Local Currency (S.P.)
1. Telephone center	6,590,705	30,287,910
2. Billing center	322,456	2,325,773
3. Management Inf. Sys	216,119	1,109,439
4. Total	7,129,280	33,723,122

#### 11.3 Summary of Cost Estimation

The total cost for all facilities is estimated as shown in Table 11.3-1

Table 11.3-1 Total Cost

	Foreign Currency (US\$)	Local Currency (Syrian Pounds)
<b>1. Telephone Network</b>	<b>106,528,194</b>	<b>2,764,929,606</b>
(1) Switching	45,191,944	215,265,750
(2) Transmission	4,433,730	17,813,826
(3) Subscriber Network	56,902,520	2,531,850,030
<b>2. Mobile Telephone System</b>	<b>29,671,100</b>	<b>124,649,500</b>
<b>3. Packet Switching System</b>	<b>1,724,462</b>	<b>6,594,808</b>
<b>4. Computer System</b>	<b>7,129,280</b>	<b>33,723,122</b>
(1) Billing Center System	322,456	2,325,773
(2) Telephone Center	6,590,705	30,287,910
(3) Management Information System	216,119	1,109,439
<b>5. Sub-Total ( 1 to 4)</b>	<b>145,053,036</b>	<b>2,929,897,036</b>
<b>6. Contingency(10% of Sub-Total)</b>	<b>14,505,304</b>	<b>292,989,704</b>
<b>7. Total</b>	<b>159,558,340</b>	<b>3,222,886,740</b>

## CHAPTER 12 PROJECT EVALUATION

### 12.1 Financial Evaluation

#### 12.1.1 Summary of Current Financial Position for STE

The operating results for STE from 1991-94 are summarized in Table 12.1.1-1.

Table 12.1.1-1 Comparative Income Statement (Unit: 1000 US\$)

Revenue	1990	1991	1992	1993	1994
Local call	8,048	8,667	12,786	14,286	15,714
Long distance call	4,500	4,571	6,333	6,571	8,857
International call	27,381	28,667	31,429	41,024	69,595
Facsimile installation	0	0	0	190	381
Telex	4,262	6,333	7,738	8,881	4,524
Telegraph	2,310	1,762	1,929	2,024	2,310
Other telephone service	12,881	16,357	13,905	27,476	51,310
Other revenue	1,214	1,048	1,333	1,738	1,881
<b>Total</b>	<b>60,595</b>	<b>67,405</b>	<b>75,452</b>	<b>102,190</b>	<b>154,571</b>
Expenditure	30,095	28,714	34,381	40,905	65,167
Profits	30,500	38,690	41,071	61,286	89,405
Income Tax	17,842	22,634	24,027	35,852	52,302
<b>Profits after Tax</b>	<b>12,658</b>	<b>16,057</b>	<b>17,045</b>	<b>25,434</b>	<b>37,103</b>

STE's return on fixed assets had achieved as 18% in the year 1994 (calculated by dividing the profit after tax of US 37,103,000 dollars with the fixed assets of US 205,421,000 dollars). During the past four years, the revenue and expenses showed parallel movement. The ratio of profit on sales has remained unchanged. For future rapid development, the efforts for effective expense control seems necessary. One of such measures as early collection of accounts receivable would contribute significantly.

The operating expenditure during 1990-1994 are shown in Table 12.1.1-1. Total expenditure shares 44% of total revenues on average during the same period. This ratio had remained unchanged, though its growth rate shows an significant increases in Table 12.1.1-3. At the same time, the amounts of income taxes during the same period shows the constant shares in total revenues. Thus, the net income (profit after tax) to revenue had remained constant, around 23% on average, throughout the same period.

Table 12.1.1-2 Common-size Income Statement

Revenue Share	1990	1991	1992	1993	1994
Local call	13.3%	12.9%	16.9%	14.0%	10.2%
Long distance call	7.4%	6.8%	8.4%	6.4%	5.7%
International call	45.2%	42.5%	41.7%	40.1%	45.0%
Facsimile installation	0.0%	0.0%	0.0%	0.2%	0.2%
Telex	7.0%	9.4%	10.3%	8.7%	2.9%
Telegraph	3.8%	2.6%	2.6%	2.0%	1.5%
Other telephone service	21.3%	24.3%	18.4%	26.9%	33.2%
Other revenue	2.0%	1.6%	1.8%	1.7%	1.2%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
Expenditure	49.7%	42.6%	45.6%	40.0%	42.2%
Profits	50.3%	57.4%	54.4%	60.0%	57.8%
Income Tax	29.4%	33.6%	31.8%	35.1%	33.8%
<b>Profits after Tax</b>	<b>20.9%</b>	<b>23.8%</b>	<b>22.6%</b>	<b>24.9%</b>	<b>24.0%</b>

Table 12.1.1-3 Comparative Growth Rates

Revenue	1990	1991	1992	1993	1994
Local call	8,048	7.7%	47.5%	11.7%	10.0%
Long distance call	4,500	1.6%	38.5%	3.8%	34.8%
International call	27,381	4.7%	9.6%	30.5%	69.6%
Facsimile installation					100.0%
Telex	4,262	48.6%	22.2%	14.8%	-49.1%
Telegraph	2,310	-23.7%	9.5%	4.9%	14.1%
Other telephone service	12,881	27.0%	-15.0%	97.6%	86.7%
Other revenue	1,214	-13.7%	27.3%	30.4%	8.2%
<b>Total</b>	<b>60,595</b>	<b>11.2%</b>	<b>11.9%</b>	<b>35.4%</b>	<b>51.3%</b>
Expenditure	30,095	-4.6%	19.7%	19.0%	59.3%
Profits	30,500	26.9%	6.2%	49.2%	45.9%

## 12.1.2 Scope of Evaluation

### (1) Tools for Evaluation

The following three financial statements will be forecasted and evaluation criteria indexes will be presented as the results of evaluation.

- Forecast Cash flow statement..... Financial Internal rate of return (FIRR)
- Forecast Income statement..... Operating ratio
- Forecast Fund flow statement.... Debt service ratio

#### a. Financial internal rate of return (FIRR)

This is, obtained from a cash flow statement, a discounting factor when total cost equal to revenue. This is usually compared with opportunity cost of capital, which combines returns on both invested capital and debt such as interest rate of lending fund from banks or the government. STE has several funding resources such as Kuwaiti fund, the government. When FIRR is larger than this cost of capital, the project is considered to be feasible.

#### b. Operating ratio

This figure is obtained from an income statement, dividing total expenditure by total revenue. This ratio should be less than 1.0, which means that total revenue must be larger than total expenditure.

The countries with high telephone penetration have relatively lower value around 30%. With telephone supply volume increased, the share of depreciation and interest payment increases. Thus, a measures must be taken to reduce the share of operating expenditure for expansion of supply volume.

#### c. Debt-service ratio

This is obtained from a fund flow statement, dividing Internal Reserve (Net Income plus Depreciation) by "Repayment of loan amount". This ratio should be, at least, more than one. The other criteria derived from this statement is "Accumulated Surplus" (total surplus amount in the ending balance), which must realize to be positive as early as possible. When this figure is negative, STE must procure a short-term loan, which will create a

burden on profits.

(2) Premises and assumptions

The following premises and assumptions are adopted for this evaluation.

- a. Evaluation periods of services rendering from each facilities plan are assumed to 10 years (until the year 2008), and 20 years (until the year 2018), on the basis of life time of major equipment's. Thus, system operation will be terminated in the year 2018. No salvage value should be allowed for.
- b. No inflation should be taken into consideration. This means that the constant price at the year 1995 should be used as a basic price. Consequently, the tariff as of 1995 should be used for evaluation.
- c. A foreign exchange rate of Syrian Pounds (SP) 42 = US dollar (US\$) 1 will be used in this evaluation.

(3) Estimation of project revenue

Revenue of telecommunication project will be derived only on the condition that all the systems are equipped. However, most of projects will be taken up as a part of full system like this project. Thus, the revenue for this project will accrue only when other facilities are expanded at the same time and when other facilities that already exist can accommodate this project. This is one of the unique features of telecommunications project. Revenue accrued to this project can be calculated only through utilization of system component ratios in terms of this project cost sharing total system costs. Based on the STE's assets data, the following ratios have been adopted as the contribution of this project cost over the total cost to be incurred to meet the expansion required.

	Telephone	Fax	ISDN	PSDN	Mobile	New Service
Installation & Subscription	100%	100%	100%	100%	100%	100%
Local Call	100%	100%	100%	100%	100%	--
Long distance Call	90%	90%	90%	90%	100%	--
International Call	80%	80%	80%	80%	--	

During the period from the service-in of the projected system, the revenue is accrued to the expanded portion of the telecommunication system including the investment required for this project and other additional investment. Even though the current system naturally

has the service capacity to accommodate new subscribers in and after the service-in, by considering the all past investments which enables such services as a sunk cost, such services would not be deemed as a part derived from the past projects.

### 12.1.3 Project Costs

Total project cost amounted in US 214,812,000 dollars required to implement the project excluding contingency cost. Total project cost is summarized in Table 12.1.3-1. The project cost will be disbursed during the period of 1996-2000 along with the implementation plan described in Chapter 11. Expenditure plan in percentage share of each sub-project are shown in Table 12.1.3-2. It is assumed that the construction cost will spend more than 80% of total in the year 1998 and 1999. The ratio of foreign currency portion in total construction cost is 68%.

Table 12.1.3-1 Total Project Costs (US\$ 1,000)

	Total	1996	1997	1998	1999	2000
Foregin Portion	145,053	317	5,474	64,202	53,666	21,394
Local Portion	69,759	55	561	23,012	32,952	13,180
Equity		0	0	0	0	0
<b>Total</b>	<b>214,812</b>	<b>372</b>	<b>6,035</b>	<b>87,214</b>	<b>86,618</b>	<b>34,574</b>

Table 12.1.3-2 Common-size Project Cost Disbursement

	1996	1997	1998	1999	2000	Total
<b>Telephone Network</b>			<b>24.07%</b>	<b>40.12%</b>	<b>16.05%</b>	<b>80.24%</b>
Foreign Portion			14.88%	24.80%	9.92%	49.59%
Local Portion			9.19%	15.32%	6.13%	30.65%
<b>Mobile Telephone Network</b>			<b>15.19%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>15.19%</b>
Foreign Portion			13.81%	0.00%	0.00%	13.81%
Local Portion			1.38%	0.00%	0.00%	1.38%
<b>PSDN</b>		<b>0.29%</b>	<b>0.34%</b>	<b>0.20%</b>	<b>0.05%</b>	<b>0.88%</b>
Foreign Portion		0.26%	0.31%	0.19%	0.04%	0.80%
Local Portion		0.02%	0.03%	0.02%	0.01%	0.07%
<b>Computer System</b>	<b>0.17%</b>	<b>2.52%</b>	<b>1.00%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>3.69%</b>
Foreign Portion	0.15%	2.29%	0.89%	0.00%	0.00%	3.32%
Local Portion	0.03%	0.24%	0.11%	0.00%	0.00%	0.37%
<b>Total</b>	<b>0.17%</b>	<b>2.81%</b>	<b>40.60%</b>	<b>40.32%</b>	<b>16.09%</b>	<b>100.00%</b>
Foreign Portion	0.15%	2.55%	29.89%	24.98%	9.96%	67.53%
Local Portion	0.03%	0.26%	10.71%	15.34%	6.14%	32.47%

## 12.1.4 Operating Expenditure

### (1) Operation and Maintenance Costs

Table 12.1.4-1 shows the summary of maintenance cost estimation. The maintenance work will incur right after the completion of construction. The amounts of maintenance cost after 2001 continues to incur as much as that of 2001, that is, US 12,402,000 dollars. The maintenance cost for service and administration in Table 12.1.4-1 indicates the contribution of this project to the total common cost of STE such the general administration and operation costs as salaries, office supply, travel, printing directories, training, selling and marketing expenses incurring in the headquarters should be included as a project overhead cost to examine its feasibility. This amounts is assumed to be 10% of total project maintenance costs.

Table 12.1.4-1 Operation and Maintenance Costs (US\$ 1,000)

	1996	1997	1998	1999	2000	2001
Telephone Network		98.1	82.5	7,288.0	7,604.0	7,604.0
Swiatching System			53.1	375.0	661.8	661.8
Transmission System		98.1	29.4	78.5	98.1	98.1
Subscriber Network				6,834.5	6,844.1	6,757.1
Mobile Telephone Network			916.0	2,577.0	2,930.0	2,930.0
PSDN		3.2	7.3	10.8	14.0	8.6
Computer System	6.4	27.1	48.1	48.1	48.1	48.1
Service&Administration	0.6	22.7	113.6	1,721.2	1,820.0	1,810.8
<b>Total</b>	<b>7.0</b>	<b>151.0</b>	<b>1,167.6</b>	<b>11,645.1</b>	<b>12,416.1</b>	<b>12,401.5</b>

The share of maintenance cost in the year 2001 to total investment cost are shown as below. This ratios indicate the level of maintenance costs. On average, total maintenance cost shares 7.46% to the total investment cost. Mobile Telephone Network has the highest value while PSDN is the lowest.

Telephone Network	3.92%
Mobile Telephone Network	8.98%
PSDN	0.46%
Computer System	0.61%
Total	5.77%

### (2) Provisions for Depreciation



STE adopts the straight line method of depreciation by category of each assets. The service life and annual depreciation rate of each equipment's are as under determined on the basis of the current practice operating in STE. Net salvage value (salvage value at the service life termination) is assumed to set at nil in this analysis. Further, the value prior to the service life termination will be not considered for cost estimation at the time of project termination.

Table 12.1.4-2 Depreciation

Category		Life (year)	Annual Rate
Switch	EWSD	16	6.25%
	EMD	10	10.00%
Cable	Within cities	16	6.25%
	Between cities	20	5.00%
Power Generators		10	10.00%
Terminal Equipment	Telephone	5	20.00%
Building		40	2.50%
Heating & Conditioning Equip.		20	5.00%
Office Machine		5	20.00%
Furniture		10	10.00%
Transportation Cars		5	20.00%
Motor Cycles		5	20.00%
Electronic Computers		5	20.00%
Garage & Workshop Equipment		10	10.00%

(3) Provisions for Bad Debts

This is assumed at the 5% of the forecast subscription and call revenues for the Mobile Telephone Service.

(4) Working Capital

Working capital is definitely required for the project in view of smooth financial operation right after the construction. The following factors should be considered for estimating the required amounts of working capital:

- a. the cost to be incurred due to the duration of time between call completion and the actual collection,
- b. the available fund at hand due to the time lag between material purchase and the actual payments for those,
- c. the cost by keeping maintenance materials and equipment in stock,

d. the necessary cash on hand.

This analysis assumes the working capital requirement as 30% of an annual operating revenue, by considering the average tariff charges collection period of 100 days. The amounts of working capital is apportioned in proportion to increase or decrease of a revenue size gained every year, and is recovered in the final year of the project termination.

#### 12.1.5 Operating Revenues

##### (1) Current Operating Revenues

The current revenue level of STE has been indicated in Table 12.1.5-1. The average call revenue per subscriber in 1994 is US 137 dollars. This has increased 1.7 times from 1990. The share of international call revenue is 74% in 1994 while its share of long-distance (national) call is only 9% in 1994.

Table 12.1.5-2 shows the results of call revenues estimation for Damascus. Data is obtained from only EWSD switches and their telephone offices based on the fourth quarter of 1994 and the first quarter of 1995. These original 90 days data is converted into annual based data simply multiplying 4 times. The call revenue per subscriber for Damascus is twice as large as that of national average amounts in 1994. The share of international call revenue is 81% while its share of national call is 9%.

Table 12.1.5-1 Comparative Call Revenues per Subscriber in Syria (US\$)

	1990	1991	1992	1993	1994
Telephone Main Subscribers	496,360		513,000	550,000	688,500
Local call revenue per sub.	16.2		24.9	26.0	22.8
Long distance call revenue per sub.	9.1		12.3	11.9	12.9
International call revenue per sub.	55.2		61.3	74.6	101.1
<b>Total call revenue per sub.</b>	<b>80.4</b>		<b>98.5</b>	<b>112.5</b>	<b>136.8</b>

Table 12.1.5-2 Call revenues per Sunscriber in Damascus in 1994/5. (US\$)

	City	Rural	Total
Subscription Fee per Sub./Year	28.70	27.25	28.51
Total Call Revenue per Sub./Year	301.53	151.19	281.67
Local Call Revenue per Sub./Year	31.75	12.50	29.21
National Call Revenue per /Sub./Year	21.24	45.56	24.46
International Revenue /Sub./Year	248.53	93.13	228.00

(2) Methods of Operating Revenue Forecast during the Project Evaluation Period

Revenue to accumulate from commissioning of the system constructed by the project is assumed to be of three categories, i.e., Installation Charge, Subscription Charge, and Call Charges. The tariff rate applied for this analysis is employed the current tariff rates in 1995.

a. Installation Charge

The main revenues from new subscriber installation charged is categorized as follows: new connection, internal extensions, transfers, etc. Installation Charges are categorized by type of services. However, its revenue is calculated as follows:

- Number of new subscribers by year x installation charge

b. Subscription Charge

The subscription charges varies with the class of services: business lines, residential lines, PBX equipment, and leased circuits. The subscription revenues are calculated as follows:

Number of new accumulated subscribers by year x subscription charge

c. Call Charge

Call revenues are calculated on the basis of traffic forecast prepared in the foregoing chapters. The traffic conditions such as call mix, and traffic distribution for revenue forecast is summarized as follows:

**For Basic Telephone Service**

- Subscriber Traffic Intensity
  - Business user : 0.065 erl. per subscriber
  - Residential user : 0.040 erl. per subscriber
- Successful Call Ratio : 70%
- Busy Hour Concentration Ratio : 11.7%
  - Off peak Hour (22:00-7:00) ratio : 4%
- Annual Working Day : 300 Days
- Traffic Distribution

Category 1

Category 2&3

Local Call	88%	90%
National Call	8%	8%
International Call	4%	2%

	<u>National Call</u>	<u>International Call</u>
Zone 0	1.04%	—
Zone 1	4.15%	13.52%
Zone 2	17.5%	5.23%
Zone 3	24.42%	40.65%
Zone 4	17.32%	19.29%
Zone 5	32.75%	1.52%
Zone 6	2.82%	18.63%
Zone 7		1.16%
Total	100.00%	100.00%

- Business & Residential Subscriber Ratio

	<u>Business</u>	<u>Residential</u>
Category 1	40%	60%
Category 2	35%	65%
Category 3	30%	70%

- Local Call Revenue

Paid Call Revenue = Local Call Revenue x 78.25%

(This is based on the data from Damascus.)

- International Call Revenue

It is assumed that there is no settlements between outgoing and incoming call revenues.

- The calculation formula employed for this analysis is as follows:

$BT \times 60 \times 1/BCR \times \text{Annual working days} \times P \times \text{Tariff}$

Where,

BT : Traffic intensity of each category of call in Erlangs

BCR : Busy hour concentration ratio

P : Successful call ratio

**For PSDN service,**

- Traffic Intensity : 120 minuets per day

- User Distribution by Category

Dedicated line : 56%, Public telephone : 44%

1200-4800 bps : 80%, 9600bps : 20%

- Traffic Distribution

National : 80%,

International : 20%

To Arab : 60%, Europe : 20%, Others : 20%

For ISDN service,

Traffic Intensity : 0.096 erl. per subscriber

(3) Results of Forecast

The forecast operating revenues are given in Table 12.1.5-3.

Table 12.1.5-3 Revenues Forecast (US \$1,000)

	1997	1998	1999	2000	2001	2002	2003
Telephone Revenue	0	0	1,591	25,728	12,638	17,731	52,151
Fax Revenue	0	0	51	267	292	81	11
PSDPN	222	732	1,319	2,055	2,132	2,132	2,132
ISDN	0	259	1,095	2,351	3,031	3,031	3,031
New Service	0	0	16	118	211	326	375
Mobile	0	11,297	23,298	25,945	25,978	21,067	21,067
<b>Total</b>	<b>222</b>	<b>12,288</b>	<b>30,401</b>	<b>56,464</b>	<b>74,611</b>	<b>77,667</b>	<b>82,369</b>

12.1.6 Financial Evaluation

(1) Analysis of Cash Flow Statement

The primary objective of financial study is to evaluate financially worthwhile to implement the project for STE as a implementing body. This study will employed the criteria of financial internal rate of return (FIRR) for the feasibility of the project. Since FIRR is the discount rate to discount annual expenditure and revenue and to make their respective totaled present worth equal, the project is certified to be feasible for investors when FIRR is higher than total opportunity cost of capital. STE's return on fixed assets had achieved 18% in the year 1994 while STE can procure loans at the 9 % of interest rate from local loan (Government loan), and the 6.5% from Kuwaiti fund. Thus, financial leverage effect is realized from an procurement of loans from outside. Thus, the more than 7.75% of FIRR is considered to be a critical value for evaluation when this project will be financed from both for each 50% of construction cost.

Table 12.1.6-1 shows the cash flows from which 12.4% of FIRR is calculated for ten

years project evaluation period, and 17.6% for twenty years project evaluation period.

In analyzing FIRR, another type of FIRR is in due importance. That is an treatment of income tax. Since this project is to be implemented by STE, FIRR for the implementing body is just as important as the former FIRR (including tax). Under the case of FIRR excluding tax, it is assumed that the government as a member of financing group so that a tax from this project is a mere transfer of benefit.

The projects consisted of several sub-projects, such as basic telephone network project, PSDPN project, mobile telephone project, and computer system project. The FIRR for basic telephone network project including fax, ISDN, new services, were calculated as 7.5% for ten years project period, and 13.7% for twenty years. The FIRR for mobile telephone project were calculated as 32.7%, and 34.6% respectively.

**Sensitivity Analysis**

The above analysis is made on the basis of 100% demand fulfillment, the present tariff unchanged and the cost unchanged. Sensitivity analysis is required to certify, even under the worsening situations for the financial feasibility in the following aspects.

- Revenue decrease due to demand decrease or tariff change
- Cost increase due to construction cost overrun or exchange rate change or inflation

The sensitivity chart of FIRR to cost or revenue fluctuation are seen as follows:

<u>Decrease/Increase</u> <u>in Revenue</u>	<u>Decrease/Increase in Investment Cost</u>			
	90%	100%	110%	120%
90%	13.0(%)	10.5(%)	<b>8.3(%)</b>	6.4(%)
100%	15.1	12.4	10.1	8.1
110%	16.9	14.2	11.8	9.8

'100%' indicates the original amounts for both revenue and investment cost. Thus, '105%' means 5% increase of the original amounts.

Even in the event of 10% decrease of revenue and 20% of cost increase, FIRR stands at 10.5% and 8.1% respectively. However, FIRR stands at 6.4% in the combined case with 10% decrease of revenue, and 20% of cost increase. This results proved that the sensitivity of cost change to FIRR is greater than that of revenue change. The bold letter of 9% in this chart indicate the critical border line, means the lower part of this line shows

the feasibility zone, and the upper part be the infeasibility zone.

(2) Analysis of Income Statement

The income statement is prepared in Table 12.1.6-2. It is seen that the net income turns into black as early as the full commencement year of the services. The operating ratios in total indicate 29%.

(3) Analysis of Fund Flow Statement

The fund flow statement is prepared as an example of the following conditions. Total investment for the project amounts US 214,812,000 dollars of which the foreign currency portion will be financed by foreign soft loan (23 years maturity period with 5.2% p.a. interest with grace period of 10 years). The local currency portion is to be financed with the government (15 years maturity period with 9% p.a. interest with grace period of 5 years). The repayment method for both loans is to repay in equal amount during the remaining period after the grace period of principal repayment. The short-term loan should be procured when a cash balance becomes negative, is assumed to be 10% p.a. interest for this analysis.

The fund flow statement shown in Table 12.1.6-3 indicates that the total cash balance generated during the project periods is estimated about US 384,931,000 dollars, and the investment cost shares 56% of this amount. This means that this project can generate 1.8 times cash balance as large as the total investment amount.

By the year 2002, the cash balance turns surplus to cover the costs and keep its positive accounting position until the end of service life. Debt-service ratio shifting to 3.2 at the year end, indicates the stability of financial position of the project and well capability to repay the foreign loan. Therefore, the project provides a sound investment opportunity if the shortage of fund in the beginning of the project period will be covered by the smooth procurement of short-term loan with a good terms of procurement conditions, since the larger amount of loans make weaken its repayment capability.

Table 12.1.6-1 Cash Flow Statement

	3	2	1	2	3	4	5	6	7	8	9	10	11	
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cash Inflow .....	222	8,722	27,174	43,424	59,047	55,966	57,816	56,438	56,063	55,692	55,311	54,780	54,005	
Cash Outflow .....	379	6,253	92,001	103,697	54,808	17,846	13,319	13,357	11,946	11,946	11,946	11,946	11,946	11,946
Operating Expenses.....	7	218	4,788	17,079	20,235	17,846	13,319	13,357	11,946	11,946	11,946	11,946	11,946	11,946
Construction Costs.....	372	6,035	87,214	86,618	34,574	0	0	0	0	0	0	0	0	0
Net Cashflow .....	-379	-6,031	-83,279	-76,523	-11,385	+1,201	-2,648	-4,489	-4,492	-4,117	-3,746	-3,365	-2,834	-2,089

F.I.R.R = 12.4% (Including Tax)

	12	13	14	15	16	17	18	19	20	Total
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2018
Cash Inflow .....	53,188	52,437	51,734	51,152	50,722	47,425	44,093	42,560	27,765	1,005,736
Cash Outflow .....	0	0	0	0	0	0	0	0	0	0
Operating Expenses.....	11,946	11,946	11,946	11,946	11,946	11,946	11,946	11,946	-12,765	456,142
Construction Costs.....	11,946	11,946	11,946	11,946	11,946	11,946	11,946	11,946	-12,765	241,329
Net Cashflow .....	41,242	40,491	39,788	39,205	38,776	35,479	32,147	30,614	40,529	549,594



Table 12.1.6-2 Income Statement (1/2)

(Unit: \$S1,000)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Operating Revenue.....		222	12,288	30,401	56,464	74,611	77,667	82,369	82,369	82,369	82,369	82,369	82,369	82,369
Operating Expenses.....	7	287	5,975	24,044	32,644	32,428	26,749	26,787	24,941	24,928	24,923	24,923	24,923	24,720
O&M Cost .....	7	151	1,168	11,645	12,416	12,402	12,402	11,946	11,946	11,946	11,946	11,946	11,946	11,946
Depreciation.....		69	1,188	6,966	12,409	14,382	13,430	13,430	12,995	12,982	12,977	12,977	12,977	12,774
Working Capital.....	0	67	3,620	5,434	7,819	5,444	917	1,411	0	0	0	0	0	0
Operating Income.....	7	-65	6,313	6,357	23,820	42,184	50,918	55,582	57,428	57,441	57,446	57,446	57,446	57,649
Non-Operating Income.....	-1	-25	-209	-832	-1,521	-15,570	-13,815	-13,602	-13,093	-12,465	-11,836	-11,185	-10,277	-9,155
Interest Receipt.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Payment: Long-term.....						13,821	13,815	13,602	13,093	12,465	11,836	11,185	10,277	9,155
Interest Payment: Short-term.....	1	25	209	832	1,521	1,749	0	0	0	0	0	0	0	0
Net Income .....	-9	-90	6,104	5,525	22,299	26,614	37,103	41,980	44,335	44,975	45,609	46,260	47,168	48,494
Income Tax .....			3,566	3,227	13,040	15,564	21,701	24,553	25,931	26,306	26,677	27,058	27,589	28,364
Income After Tax .....	-9	-90	2,538	2,298	9,259	11,049	15,402	17,426	18,404	18,669	18,933	19,203	19,579	20,130
Operating Ratio			48.6%	79.1%	57.8%	43.5%	34.4%	32.5%	30.3%	30.3%	30.3%	30.3%	30.3%	30.0%
Net Income to Revenue			20.7%	7.6%	16.4%	14.8%	19.8%	21.2%	22.3%	22.7%	23.0%	23.3%	23.8%	24.1%

Table 12.1.6-2 Income Statement (2/2)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Operating Revenue.....	82,369	82,369	82,369	82,369	82,369	82,369	82,369	82,369	82,369	1,569,556
Operating Expenses.....	24,532	24,457	24,457	24,422	19,265	14,250	12,209	-12,501	-12,501	453,927
O&M Cost .....	11,946	11,946	11,946	11,946	11,946	11,946	11,946	11,946	11,946	241,329
Depreciation.....	12,586	12,510	12,510	12,476	7,419	2,304	263	263	263	212,598
Working Capital.....	0	0	0	0	0	0	0	0	-24,711	0
Operating Income.....	57,837	57,912	57,912	57,947	63,004	68,119	70,160	94,870	94,870	1,115,629
Non-Operating Income.....	-7,947	-6,739	-5,537	-4,541	-3,843	-3,262	-2,682	-2,102	-1,522	-151,764
Interest Receipt.....	0	0	0	0	0	0	0	0	0	0
Interest Payment: Long-term... : Short-term.....	7,947	6,739	5,537	4,541	3,843	3,262	2,682	2,102	1,522	147,427
Net Income .....	49,890	51,173	52,376	53,371	54,105	59,741	65,436	68,058	93,348	963,865
Income Tax .....	29,181	29,932	30,635	31,217	31,647	34,944	38,276	39,809	54,604	563,820
Income After Tax .....	20,709	21,241	21,741	22,154	22,458	24,797	27,161	28,249	38,744	400,044
Operating Ratio	29.8%	29.7%	29.7%	29.7%	29.6%	23.5%	17.3%	14.8%	-15.2%	28.9%
Net Income to Revenue	25.1%	25.8%	26.4%	26.9%	27.3%	30.1%	33.0%	34.3%	47.0%	25.5%

Table 12.1.6-3 Fund Flow Statement (1/2)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sources of Funds.....	393	6,424	93,508	102,272	61,751	17,924	16,590	24,392	30,813	33,251	32,363	32,633	32,574	33,112
Net Income.....	-9	-90	2,538	2,298	9,259	11,049	15,402	17,426	18,404	18,669	18,933	19,203	19,579	20,130
Depreciation.....					0	69	1,188	6,966	12,409	14,582	13,430	13,430	12,995	12,982
Long-term Debts.....	372	6,035	87,214	86,618	34,574									
Foreign Loan.....	317	5,474	64,202	53,656	21,394									
Local Loan.....	55	561	23,012	32,952	13,180									
Short-term Debts.....	30	479	3,756	13,356	17,919	6,806								
Equity.....	0	0	0	0	0									
Subsidy.....														
Application of Funds.....	393	6,425	93,507	102,272	61,751	17,924	6,868	2,363	5,658	6,976	7,000	7,421	12,360	16,488
Investment.....	372	6,035	87,214	86,618	34,574									
Additional Investment.....						5	62	2,363	5,658	6,976	7,000	7,421	12,360	16,488
Repayment of Long-term Debts														
:Interest.....	21	357	5,766	11,522	13,821									
Repayment of Short-term Debts														
:Interest.....	30	447	3,228	9,225	4,563	11,113	16,529	22,029	25,155	26,275	25,362	25,211	20,214	16,624
Ending of Balance.....	0	-30	-476	-3,705	-12,930	-17,492	-6,379	10,149	32,178	57,333	83,608	108,970	134,182	154,396
(With Short-term Loan)														
Net Surplus/Loss.....	0	-1	1	-1	0	0	9,723	22,029	25,155	26,275	25,362	25,211	20,214	16,624
Ending of Balance.....	0	0	0	0	0	0	0	9,723	31,752	56,906	83,182	108,544	133,755	153,969
Debt-service Coverage Ratio						2024.5	269.2	10.3	5.4	4.8	4.6	4.4	2.6	2.0

Table 12.1.6-3 Fund Flow Statement (2/2)

	2010	2011	2012	2013	2014	2015	2016	2017	2018 Total
Sources of Funds.....	33,686	34,219	34,718	34,928	35,044	37,308	39,671	40,759	51,220
Net Income.....	20,709	21,241	21,741	22,154	22,458	24,797	27,161	28,249	38,744
Depreciation.....	12,977	12,977	12,977	12,774	12,886	12,510	12,510	12,510	12,476
Long-term Debts.....									214,812
Foreign Loan.....									145,053
Local Loan.....									69,759
Short-term Debts.....									42,346
Equity.....									0
Subsidy.....									0
Application of Funds.....	18,124	18,128	18,072	15,771	12,476	11,158	11,158	11,158	11,158
Investment.....	0	0	0	0	0	0	0	0	214,812
Additional Investment.....	0	0	0	0	0	0	0	0	0
Repayment of Long-term Debts	18,134	18,128	18,072	15,771	12,476	11,158	11,158	11,158	185,547
: Interest	0	0	0	0	0	0	0	0	31,488
Repayment of Short-term Debts	0	0	0	0	0	0	0	0	42,773
Net Surplus/Loss.....	15,552	16,090	16,645	19,157	22,568	26,150	28,513	29,601	40,062
Ending of Balance.....	171,020	186,572	202,662	219,308	238,464	261,032	287,182	315,695	345,296
(With Short-term Loan)									385,358
Net Surplus/Loss.....	15,552	16,090	16,645	19,157	22,568	26,150	28,513	29,601	40,062
Ending of Balance.....	170,593	186,145	202,236	218,881	238,038	260,606	286,755	315,269	344,869
Debits-service Coverage Ratio	1.9	1.9	1.9	2.2	2.8	3.3	3.6	3.7	4.6

## 12.2 Economic Evaluation

### 12.2.1 Objectives

Since the Telecom project is a profit-oriented venture, the basic objectives of financial appraisal is to provide decision makers with the information needed by them to judge the financial viability of a specific project they may wish to proceed. Thus, the purpose of the financial analysis is to determine whether the proposed investment would generate a stream of future income sufficient to meet the minimum financial return requirements of the investor (service provider) in a time frame acceptable to him. The financial viability of the project does not given an accurate indication of a project's net impact on a country's economy. The economic rate of return measure determines the economic merit of the project from country's viewpoint. An acceptable project should increase national income. Income by itself does not create welfare but leads to the consumption of goods and services which can serve as a proxy for increased welfare.

### 12.2.2 Classification of Economic Benefits

The cost and benefits to be incurred by the project implementation shall be classified as follows:

	Cost	Benefits
User	Subscription Fees Monthly Rental Fees Call Charges	Economic Benefits (Consumer Surplus)
Service Provider	Investment Costs Maintenance Costs Operation Costs Taxes	Financial Revenue Subsidy from the Government
Society & Government	Subsidy Investment Cost	Taxes from the and Users Increases in GDP

The economic benefits can be measured by paying our attentions for the aspects of either the users benefits , the society's income such as GDP, or the Government taxes increment due to the company's profit increases with Telecommunication investment.

### 12.2.3 Consumer Surplus Approach

This analysis is a convenient method to measure user's benefits by analyzing the user's willingness to pay for the telecommunication services. If we assume that the rational individual, household, office workers, and official workers shall behave to lower the amount of payment for the services than the benefits receiving from the services, the differences from the received benefits and the payment for the charges is called "Consumer Surplus".

According to the questionnaire survey conducted by the Team in March 1996, seven samples of business users, and forty one residential users were obtained from Damascus city. Business users answered that the costs reduction were realized due to telephone usage. This is estimated by around 1.3 times as large as telephone charges. Residential users answered that if telephone service is not available, 27% of total frequencies (No. of users x frequencies of monthly call) will be substitute to the travel to call destination or use alternative means such as car transportation, sending messengers by spending 48% of total forty one user' telephone charges. These means that consumer surplus for business user is 30%, and for residential users is 48%.

However, this approach still does not explain us how to aggregate total benefits for telecommunication developments, and does explain only one aspect at one moment since this is not discussed communication structure/behavior, and its real cause results relationship with economic activity.

#### 12.2.4 Communication Structure Approach

Telecommunication is one of the communication media which can make available to communicate at direct dial line (at distant areas at once). Telephone is one of the telecommunication media and widely accepted as a both-ways personal communication media.

Information has been widely recognized as a fourth element of production following after capital, labor, and land. Its efficient utilization becomes one of key success factors to hold a dominant position in competition. Media are means of exchanging information. Its value should depend on the value of information, and usage cost. The advancement of the media itself increase the value of information through the sales or income increase. The sophisticated media can functions to deepen information contents, and expand number of nodes to networking society more closely. Impact on the telecommunication can be classified largely into the network (expansion) effect, and the efficiency

improvement on the communication behavior through the transition of the media use (the cost saving effect).

Network Effect is that expanding communication nodes can be attained by Telecom projects, which means the increment of the accessibility to social services, business services, and etc., which we have not been able to communicate in the past. This effect include the 'Value Acceleration Effect' or 'Value Linkage Effect'. These effect can be measured with 'Time Value' only if we can clarify information flow from daily activities.

Cost Saving Effect is that more efficient utilization of media for the present communication matrix will be achieved through the media choice mechanism. This will results in the saving of communication expenses realized by the internalization of trading cost. We should measure this effect by the amount of cost savings if sales amount is the same as that 'Without the project' and by the increment of profits if communication expenses is the same as that 'Without the project'.

In short, the cause-effect relationship between economic activity and communication activity are summarized as follows;

Activity Level	Effects
Economic Activity	Network Effect (Nodes and Traffic increases)
Information Activity	Cost Saving Effect (Media Choice)
Communication Activity	

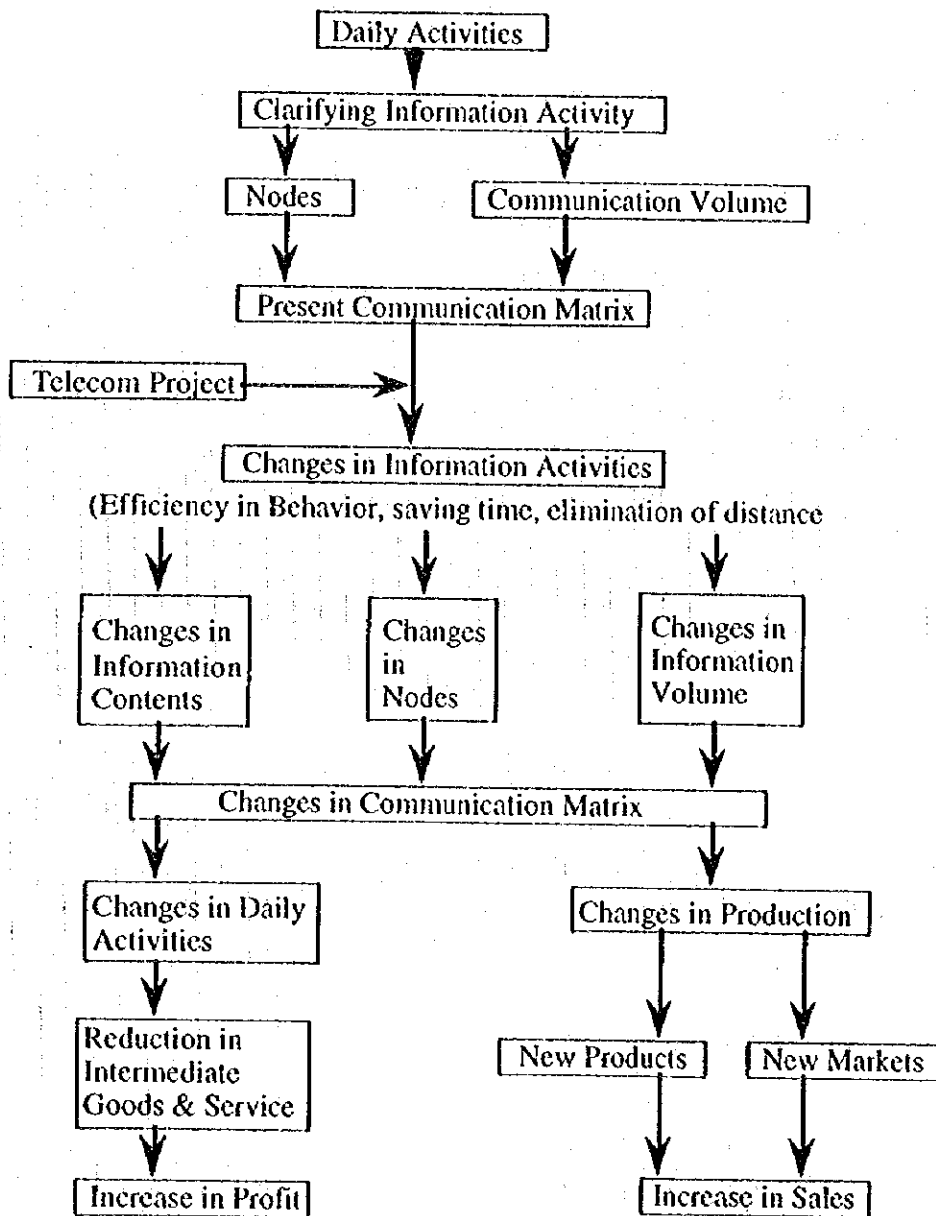
Information activity will be increased larger than economic activity since, in general, the economy will shift toward "information society" as the development is proceeded. An Increases of information activity will expand communication activity in its frequency, contents, and nodes. In its process, an efficient communication media such as telecommunication will be deployed more due to technology development. On the other hand, the advancement of telecommunication technology will bring backward to more efficient communication activity through the coordination of media deployment (media choice). As the results of it, economic activity will be in creased.

In the past years, Japan had experienced that the volume of foreign movement flow increased in human trip, and in goods, however, four times larger than those in information through telecommunication media. In particular, both human trip and information flow seems to be increased larger in movement frequencies than distance. The

increment rate of telecommunication expenses in total household expenses increased 4% in 1987 from 1% in 1970, though others including travel expense was from 1% to 2%. These facts indicates that the role of telecommunications had been changed a lot for both business and residential users.

Telecom projects promote the development of the media in volume and functions, which will change information activities. These changes can be assessed by the changed volume of the sales, or profits increase, as direct economic benefits, caused with Telecom projects through the production activities changes such as goods production and money flow.

The following shows the conceptual flow to measure benefits.





For understanding the relation between economic activity and communication activity, we should further clarify i) the relation between business working hours and its production, ii) the relation between business working hours and communication, since communication and economic activity is not directly correlated with each other. This relation can be defined only through working hours.

Human activity is limited to 24 hours a day, and spend its time more for business to produce nation's wealth. If we classify working hours into in detail, Japan experienced that telephone call hours increases, instead of the reduction of trip out office hour for communication, which indicates the substitutional effect of telephone call among communication media (cost saving effect). And we may imagine that the reduced time for communication should be utilized more for productive activity.

As economy develop toward "information society", the share of tertiary sector increase in GDP as well as working population, and at the same time, office workers will shift their working hours from "direct work" hours to "thinking (brain) work" hours, or communication hours. Therefore, if we succeed to find proper cause-effect relationship between an change of working hours and communication level such as an change of nodes, contents, and frequencies, we can apply its results to national/regional level from corporate level very easily since it is easy task to clarify the relationship between office working hours and corporate profit level, and then, the relationship between corporate activity results and its industrial GDP by referring the past experiences of developed countries.









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